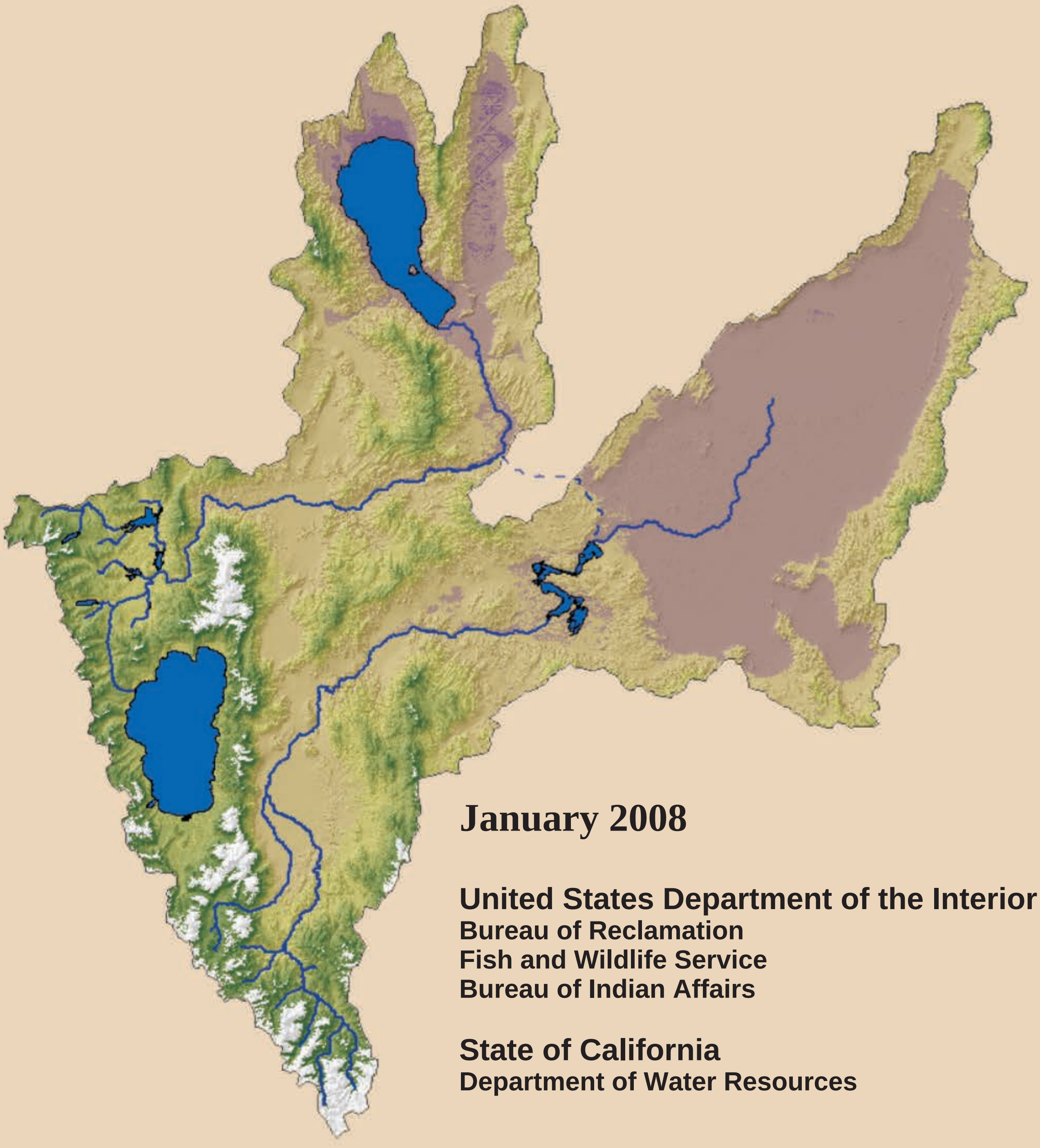
Final Environmental Impact Statement/Environmental Impact Report

Truckee River Operating Agreement



January 2008

United States Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service
Bureau of Indian Affairs

State of California
Department of Water Resources

Final Environmental Impact Statement/Environmental Impact Report
Truckee River Operating Agreement
Alpine, El Dorado, Nevada, Placer, and Sierra Counties, California
Carson City, Churchill, Douglas, Lyon, Pershing, Storey, and
Washoe Counties, Nevada

Co-Lead Agencies:

U.S. Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service
Bureau of Indian Affairs

State of California
Department of Water Resources

For further information contact:

Mr. Kenneth Parr
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
705 North Plaza Street
Carson City, Nevada 89701
Telephone: 775-882-3436
Fax: 775-882-7592
E-mail: kparr@mp.usbr.gov

Mr. Michael Cooney
State of California
Department of Water Resources
901 "P" Street, Suite 313B
Sacramento, California 95814
Telephone: 916-651-0746
Fax: 916-651-0726
E-mail: mikec@water.ca.gov

This final environmental impact statement/environmental impact report (final EIS/EIR) evaluates current conditions and three alternatives, including the Truckee River Operating Agreement (TROA) Alternative, which is the proposed action and preferred alternative. TROA has been negotiated pursuant to section 205(a) of Public Law 101-618. As proposed, TROA would modify operations of five Federal and two non-Federal reservoirs to implement the Congressional allocation of Lake Tahoe, Truckee River, and Carson River waters between the States of California and Nevada. TROA would, in part, (1) enhance conditions for endangered and threatened fishes throughout the Truckee River basin; (2) increase municipal and industrial (M&I) drought protection for Truckee Meadows (Reno-Sparks metropolitan area); (3) improve river water quality downstream from Sparks, Nevada; and (4) enhance streamflows and recreational opportunities in the Truckee River basin.

This final EIS/EIR was prepared in compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). It is intended to serve public information requirements pursuant to all appropriate Executive orders, Fish and Wildlife Coordination Act, Endangered Species Act of 1973, as amended, and National Historic Preservation Act of 1966 (section 106).

California State Clearinghouse No. 2004042078

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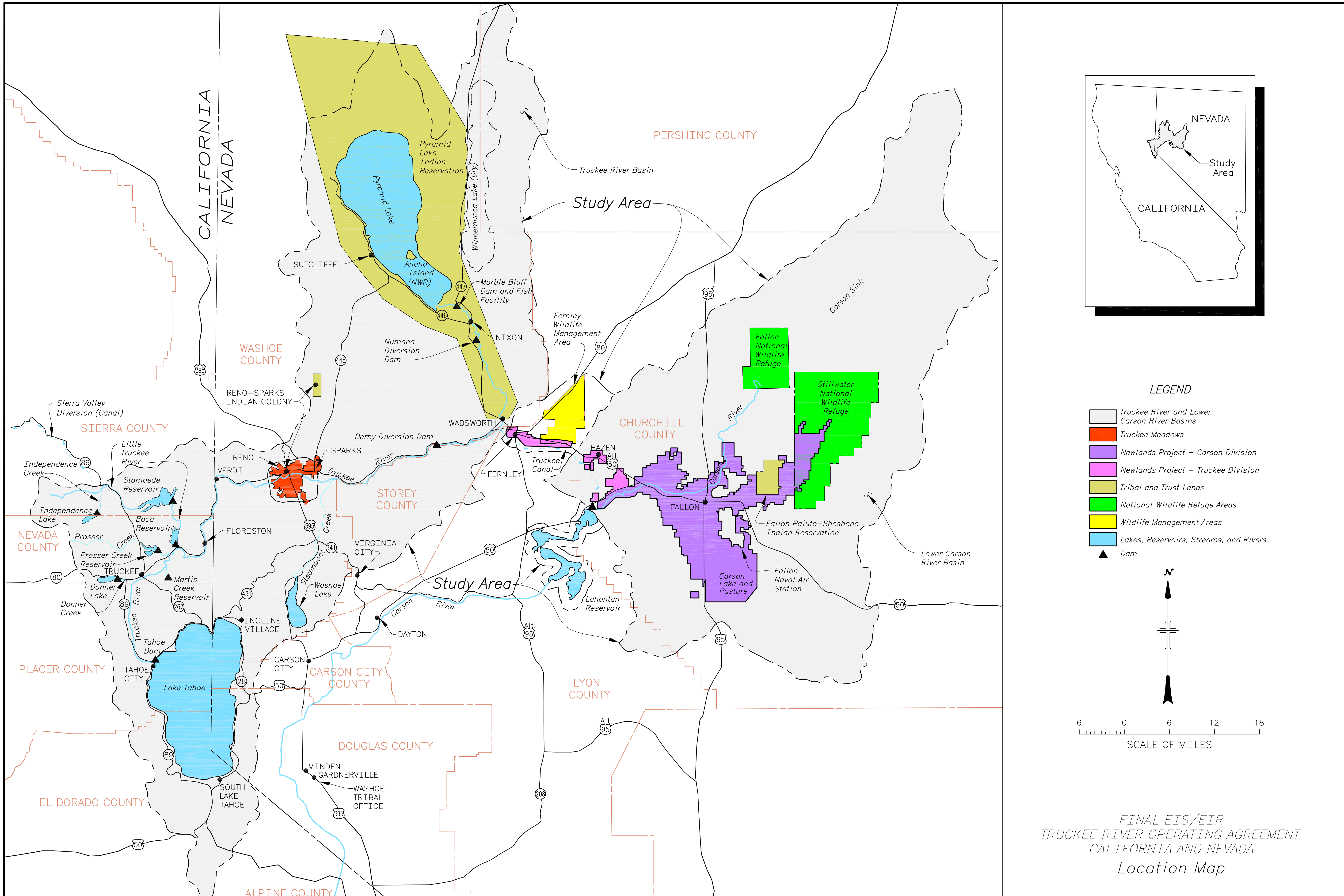

FINAL EIS/EIR
TRUCKEE RIVER OPERATING AGREEMENT
CALIFORNIA AND NEVADA
Location Map

ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
AQI	Air Quality Index
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BNR	biological nitrogen removal
CARB	California Air Resources Board
CCP	Comprehensive Conservation Plan
CCR	California Code of Regulations
CCT	current conditions with TROA
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CDWR	California Department of Water Resources
CE	cumulative effects
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
Compact	Interstate Compact
CWC	California Water Code
DEIS/EIR	draft environmental impact statement/environmental impact report
DO	dissolved oxygen
Draft Agreement	October 2003 Draft Truckee River Operating Agreement
DRI	Desert Research Institute
DSS	Decision Support System
DSSAMt	Dynamic Stream Simulation and Assessment Model with temperature

EIP	Environmental Improvement Program
EIS/EIR	environmental impact statement/environmental impact report
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973, as amended
ºF	degrees Fahrenheit
FOIA	Freedom of Information Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
FWS	U.S. Fish and Wildlife Service
GIS	geographic information system
H_2S	hydrogen sulfide
Interior	U.S. Department of the Interior
JPFCW	Joint Program Fish Credit Water
Justice	U.S. Department of Justice
LCT	Lahontan cutthroat trout
LRWQCB	Lahontan Regional Water Quality Control Board
LTBA	Lake Tahoe Basin Act
LVPLFWF	Lahontan Valley Pyramid Lake Fish and Wildlife Fund
LWSA	Local Water Supply Alternative
M&I	municipal and industrial
MCL	maximum contaminant level
MOU	Memorandum of Understanding
msl	mean sea level
MUN	municipal and domestic supply
MWh	megawatt-hours
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NASF	Naval Air Station Fallon
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation

NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
No Action	No Action Alternative
NO_2	nitrogen dioxide
NPCW	Newlands Project Credit Water
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NWA	Nevada Waterfowl Association
NWR	National Wildlife Refuge
O_3	ozone
OCAP	Operating Criteria and Procedures
ONR	Outstanding Natural Resource
operations model	Truckee River Operations Model
Pb	lead
P.L.	Public Law
PM_{10}	particulate matter
PSA	Preliminary Settlement Agreement, as modified by the Ratification Agreement
PSI	Pollution Standard Index
Pyramid Tribe	Pyramid Lake Paiute Tribe of Indians
Reclamation	Bureau of Reclamation
revised DEIS/EIR	revised draft environmental impact statement/ environmental impact report
RMHQ	requirements to maintain existing higher quality
RMP	Resource Management Plan
ROD	Record of Decision
SCORP	State Comprehensive Outdoor Recreation Plan
Secretary	Secretary of the Interior
Settlement Act	Title II of Public Law 101-618, the Truckee-Carson-Pyramid Lake Water Settlement Act of 1990
SHPO	State Historic Preservation Office
Sierra Pacific	Sierra Pacific Power Company

SIP	State Implementation Plan
SO_2	sulfur dioxide
States	California and Nevada
STMWRF	South Truckee Meadows Water Reclamation Facility
SWRCB	California State Water Resources Control Board
TCID	Truckee-Carson Irrigation District
TDS	total dissolved solids
TMDL	total maximum daily load
TMWA	Truckee Meadows Water Authority
TMWRF	Truckee Meadows Water Reclamation Facility
TPEA	Tahoe-Prosser Exchange Agreement
TRA	Truckee River Agreement
TRBWG	Truckee River Basin Water Group
TRIT	Truckee River Basin Recovery Implementation Team
TROA	Truckee River Operating Agreement
TRPA	Tahoe Regional Planning Agency
Truckee Meadows	Reno-Sparks metropolitan area
TTSA	Tahoe-Truckee Sanitation Agency
UNR	University of Nevada, Reno
U.S.C.	United States Code
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USRS	U.S. Reclamation Service
VMS	Visual Management System
VQO	Visual Quality Objectives
VRM	Visual Resource Management System
VRP	visibility-reducing particles
WARMF	Watershed Analysis Risk Management Framework
WCWCD	Washoe County Water Conservation District
WMA	Wildlife Management Area
WQSA	Truckee River Water Quality Settlement Agreement
WRAP	Water Rights Acquisition Program for Stillwater National Wildlife Refuge

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EXECUTIVE SUMMARY

I. Introduction

In February 1998, the U.S. Department of the Interior (Interior) and California Department of Water Resources (CDWR) jointly issued a draft environmental impact statement/environmental impact report (DEIS/EIR) evaluating a draft Truckee River Operating Agreement (TROA) and a No Action Alternative. That agreement was based on elements that negotiators tentatively agreed to in May 1996. Because negotiations continued after the February 1998 DEIS/EIR was released, many elements of that agreement were revised, and a new Draft Agreement was issued by the parties in October 2003 and a revised DEIS/EIR was prepared and released for public review in August 2004. Further negotiations culminated on August 28, 2007, in an agreement acceptable to negotiators for all signatories—the proposed Negotiated Agreement[1]—which is the basis for this final environmental impact statement/environmental impact report (EIS/EIR).

This final EIS/EIR, again prepared jointly by Interior and CDWR, describes (1) TROA, the proposed action and preferred alternative; (2) an alternative to TROA, the Local Water Supply Alternative (LWSA); and (3) a No Action Alternative (No Action). It also describes the current status of resources (e.g., hydrologic, biological, socioeconomic, and cultural) of the study area and presents an evaluation of the potential effects of the alternatives on these resources. The alternatives are based upon conditions assumed to exist in the study area when the annual demand for Truckee Meadows Water Authority's (TMWA) municipal and industrial (M&I) water in the Reno-Sparks metropolitan area (Truckee Meadows) is 119,000 acre-feet—the year 2033—based upon current population projections. Current conditions are based on documented statistics from the year 2002. This document also describes the status of resources of the study area and presents an evaluation of the potential effects of the alternatives on these resources. The study area includes the Truckee River basin in northeastern California and northwestern Nevada, the Truckee Division of the Newlands Project, Lahontan Reservoir, and the lower Carson River basin in northwestern Nevada.

The proposed action is the signing, adoption, and implementation of TROA by the Secretary of the Interior (Secretary) and State of California, including promulgation of TROA as a Federal rule; changing of California water rights permits and licenses to allow the water storage, transfers, and exchanges provided for in the Negotiated Agreement; and entering into contracts with the owners of Credit Water created pursuant to the Negotiated Agreement for storage of that water in Federal reservoirs.

[1] For the purposes of the revised DEIS/EIR, the draft Truckee River Operating Agreement was referred to as the Draft Agreement, distinct from TROA; for the purposes of this final EIS/EIR, TROA refers to both the proposed Negotiated Agreement and proposed action.

The primary purpose of the proposed action is to implement section 205(a) of Public Law (P.L.) 101-618, which directs the Secretary to negotiate an agreement with California and Nevada to increase the operational flexibility and efficiency of certain reservoirs in the Lake Tahoe and Truckee River basins. The proposed action would provide additional opportunities to store water in existing reservoirs for future M&I demands during periods of drought conditions in Truckee Meadows, and enhance spawning flows in the lower Truckee River for the benefit of Pyramid Lake fishes (i.e., federally endangered cui-ui and threatened Lahontan cutthroat trout [LCT]). In addition, it would satisfy all applicable dam safety and flood control requirements and ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of *Orr Ditch* and *Truckee River General Electric* decree water rights and minimize the Secretary's costs associated with operating and maintaining Stampede Reservoir. It would also increase recreational opportunities in the Federal reservoirs, improve streamflows and fish habitat throughout the Truckee River basin, and improve water quality in the Truckee River.

The proposed action would satisfy the terms, conditions, and contingencies of the Preliminary Settlement Agreement as Modified by the Ratification Agreement (PSA) by changing the operation of Truckee River storage facilities and exercise of Truckee River water rights in order to improve spawning conditions for Pyramid Lake fishes and to provide water to serve Truckee Meadows during drought periods as required by section 205(a). The Agreement's entry into effect would trigger certain provisions of P.L. 101-618 also to become effective, including the California-Nevada Interstate Allocation (section 204 of P.L. 101-618) of waters of the Lake Tahoe and Truckee River basins, and the confirmation of the *Alpine* decree as part of the interstate allocation for the Carson River basin.

A number of statutory and regulatory procedures must be completed before TROA can be implemented. The National Environmental Policy Act/California Environmental Quality Act (NEPA/CEQA) processes must be completed before any final Agreement can be approved by the Secretary and California. The other mandatory signatories—Nevada, Pyramid Lake Paiute Tribe of Indians (Pyramid Tribe), and TMWA—must also approve TROA.[2] To enter into effect, TROA must be promulgated as a Federal regulation and published in the *Federal Register*. TROA must also be submitted to the U.S. District Courts that supervise and administer the *Orr Ditch* and *Truckee River General Electric* decrees[3] for approval of any necessary modifications in the provisions of those decrees.

[2] The revised DEIS/EIR referenced Sierra Pacific Power Company (Sierra Pacific) as the party signatory to TROA. On June 11, 2001, Sierra Pacific transferred its water company serving Truckee Meadows to the newly-created municipal entity, Truckee Meadows Water Authority (TMWA). For the purpose of description and analysis in this document, TMWA is presumed to have assumed ownership of water rights and property for the four Truckee River hydroelectric powerplants. Therefore, the final EIS/EIR references TMWA as the party signatory to TROA and Sierra Pacific is referred to primarily in a historical context.

[3] The U.S. District Courts that supervise and administer the *Truckee River General Electric, Orr Ditch,* and *Alpine* decrees also are referred to as the *Truckee River General Electric, Orr Ditch*, and *Alpine* courts, respectively, in this document.

This EIS/EIR will satisfy NEPA requirements for storage contracts entered into pursuant to TROA. The California State Water Resources Control Board (SWRCB) may consider the final EIS/EIR in determining whether and how to approve any water rights applications, change petitions, and time extensions submitted pursuant to TROA.

P.L. 101-618 requires the dismissal of five specific Truckee River lawsuits with prejudice, or other final resolution, before TROA and other specified provisions (i.e., PSA, Pyramid Lake Paiute Economic Development Fund, and interstate allocations between California Nevada and of the waters of Lake Tahoe, the Truckee River, and the Carson River) become effective. For TROA to become effective, it must also be signed by the mandatory signatories—the Secretary, California, Nevada, and the parties to the PSA (Pyramid Tribe and TMWA as the successor to Sierra Pacific); approved by the *Orr Ditch* and Truckee River *General Electric* courts; and published as a Federal regulation.

II. Background

Most of the runoff in the Truckee River basin originates in the Sierra Nevada in California. A portion of that runoff is stored in Federal reservoirs—Lake Tahoe in California and Nevada, and Prosser Creek, Stampede, Boca and Martis Creek Reservoirs—and non-Federal reservoirs—Donner and Independence Lakes—in California. Operation of these reservoirs regulates much of the flow in the Truckee River basin in most years. These reservoirs together can store about a million acre-feet of water. A number of court decrees, agreements, and regulations govern day-to-day operations of these reservoirs, administered by the Federal Water Master for the *Orr Ditch* court. The reservoirs are operated to capture runoff as available when flow in the river is greater than that needed to serve downstream water rights in Nevada and to maintain prescribed streamflows in the Truckee River, known as Floriston Rates, measured at the Farad gauge near the California-Nevada State line. Floriston Rates provide water to serve hydropower generation, M&I use in Truckee Meadows, flow, and agricultural water rights. In general, each reservoir currently has authorization to serve specific uses. Releases are made from the reservoirs as necessary to meet dam safety or flood control requirements and to serve water rights when unregulated flow cannot be diverted to serve those rights. Minimum reservoir releases are maintained as specified in applicable agreements and the reservoir licenses.

III. Alternatives Development

The proposed action, TROA, is the result of 17 years of negotiations among representatives of the United States, California, Nevada, Pyramid Tribe, Sierra Pacific, TMWA, and other entities in California and Nevada. During negotiations, a number of operational provisions were developed and evaluated. As each provision was considered, parts that were acceptable to all the parties became part of the proposed draft TROA, and those not acceptable to the parties were rejected. This agreement for the operation of Truckee River reservoirs is prescribed in section 205(a) of P.L. 101-618.

Without adoption of TROA, Truckee River reservoirs would continue to be operated as described under current operations in the near-term and, in the long-term, as under either No Action or LWSA. LWSA is an action alternative similar to No Action but with the addition of water supply options that may be authorized by State and local government agencies. The three alternatives also include projections by TMWA, Reno, Sparks, and Washoe County of different amounts of supplemental water from water rights acquisition, groundwater pumping and recharge, and water conservation practices that would be necessary under each alternative to meet future M&I demand in Truckee Meadows. In addition, the alternatives include projections by CDWR of different amounts of surface water and groundwater that would be used in the Lake Tahoe and Truckee River basins in California under each alternative.

IV. No Action

Under No Action, Truckee River reservoir operations would remain unchanged from current operations and would be consistent with existing court decrees, agreements, and regulations that currently govern surface water management (i.e., operating reservoirs and maintaining streamflows) in the Lake Tahoe and Truckee River basins. TMWA's existing programs for surface water rights acquisition and groundwater pumping for M&I use would continue. Groundwater pumping (according to Nevada State Engineer's Groundwater Management Order 1161) and water conservation in Truckee Meadows, however, would satisfy a greater proportion of projected future M&I demand than under current conditions. Groundwater pumping in California also would increase to satisfy a greater projected future M&I demand.

The apportionment of waters of Lake Tahoe and the Truckee River and Carson River basins conditionally approved by the Congress in section 204(b) and (c), respectively, of P.L. 101-618 would not become effective under No Action. Current surface water administrative policies would continue. For California, it is assumed that current surface water administrative policies would continue, including SWRCB's moratorium, in effect since 1972, on acting on pending water right applications in the Lake Tahoe basin that would exceed the draft California/Nevada Interstate Compact allocation or subsequent policy equivalent.

V. LWSA

LWSA is an action similar to No Action but with water supply options that may be authorized by State and local government agencies. LWSA describes a probable water management approach in the Truckee River basin if TROA were not implemented. It may be thought of as a continuation of current trends in the study area for the next 26 years (to 2033), when the annual demand for TMWA's M&I water in Truckee Meadows is projected to reach 119,000 acre-feet. It assumes that surface water management operations and storage facilities would be the same as under No Action, but that groundwater pumping and M&I water conservation in Truckee Meadows and the Truckee River basin in California would differ. It also assumes that local water authorities would obtain the necessary authorizations to implement various strategies and actions to meet projected demands if TROA were not implemented.

For California, LWSA assumes action by SWRCB to approve some pending applications to appropriate surface water, allowing an estimated 1,200 acre-feet per year of surface water to be used in lieu of groundwater otherwise used in the Truckee River basin in California. Total annual water usage, however, is anticipated to be the same as under No Action.

VI. TROA

TROA, the proposed action and preferred alternative, is intended to (1) enhance water management flexibility, water quality, conditions for Pyramid Lake fishes, reservoir recreational opportunities, and reservoir efficiency; (2) increase M&I drought supply, minimum reservoir releases, and the capacity for carryover storage; (3) provide procedures to implement the allocation of Truckee River water between California and Nevada; and (4) avoid water use conflicts as compared to No Action and LWSA. To this end, implementation of TROA would modify operations of Truckee River reservoirs to enhance coordination and flexibility while ensuring that existing water rights are served and flood control and dam safety requirements are met. TROA would incorporate, modify, or replace certain provisions of the Truckee River Agreement (TRA) and the Tahoe-Prosser Exchange Agreement (TPEA). TROA would supersede all requirements of any agreements concerning the operation of Truckee River reservoirs, including those of TRA and TPEA, and would become the sole operating agreement for these reservoirs.

All reservoirs would generally continue to be operated under TROA for the same purposes as under current conditions and with most of the same Project Water storage priorities as under No Action and LWSA. TROA is required to ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of *Orr Ditch* decree water rights.

The primary difference between TROA and the other alternatives is that TROA would create opportunities for storing and managing categories of Credit Water. Signatories to the Negotiated Agreement generally would be allowed to accumulate Credit Water in reservoir storage by retaining or capturing water that otherwise would have been released from storage or passed through the reservoir to serve a downstream water right. Such storage could only take place after a transfer in accordance with State water law and with execution of a storage contract. Once accumulated, Credit Water would be classified by category with a record kept of its storage, exchange, and release. Credit Water would be retained in storage or exchanged among the reservoirs until needed to satisfy its beneficial use.

While TROA allows water managers flexibility in using Fish Water to enhance bypass flows at TWMA's four hydroelectric diversion dams on the Truckee River, the management strategy that they will employ is not known at this time. Depending on how water is managed under TROA, the amount of fish habitat in the river associated with the four hydroelectric diversion dams would range from less than under No Action and current conditions in the Farad reach, to the same as or greater than under No Action and current conditions in all four reaches.

VII. Analytical Process

A computer model, the Truckee River Operations Model (operations model), was used to assist in evaluating current conditions and the alternatives. The operations model used a 100-year (1901-2000) runoff record of monthly data for the Lake Tahoe, Truckee River, and Carson River basins to simulate monthly reservoir storage, releases, and spills; flows; and diversions and return flows under current conditions and the alternatives. Operations model results were compared to illustrate each alternative's capacity to manage water and satisfy demand and also to identify and evaluate the potential effects on resources in the study area.

VIII. Surface Water

The total amount of water stored in Truckee River reservoirs and Donner and Independence Lakes—and that is available for release—is an indicator of the water supply than can meet consumptive and nonconsumptive demands. Operations model results show that the total amount of water stored under TROA is greater than under No Action, LWSA, or current conditions, primarily in Stampede, Boca, and Prosser Creek Reservoirs.

Each alternative includes target releases for environmental and recreational benefits. In dry hydrologic conditions, operations model results show that flows in Independence Creek, Little Truckee River, and Prosser Creek under TROA are appreciably greater than under the other alternatives because of greater minimum flow releases and the ability to exchange Credit Water among the reservoirs. In addition, under TROA, in dry hydrologic conditions, summer and early fall Truckee River flows through and downstream from Truckee Meadows are greater than under current conditions because of the greater amount of storage from Credit Waters available for release. In Truckee Meadows, agricultural demand is not met in all years under current conditions and the alternatives.

For the Newlands Project, it is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes. Under current conditions and the three alternatives, Carson Division demands are met in wet, median, and dry hydrologic conditions; they are not met in hydrologic conditions with less than a 10 percent probability of exceedence (i.e., in drier than dry hydrologic conditions) under any of the alternatives.

In California, M&I demands in the Lake Tahoe and Truckee River basins are met under current conditions and the alternatives. In Nevada, M&I demand in the Lake Tahoe basin is met under current conditions and the alternatives. Truckee Meadows M&I demand is met under current conditions. In the minimum supply year, Truckee Meadows M&I supply under TROA is greater than under No Action or LWSA; M&I water supply during the drought periods is greater under TROA than under No Action and LWSA in all years. Fernley M&I demand is met by groundwater under current conditions. A portion of future Fernley M&I demand is met by transfer of Truckee Division agricultural water rights. In the minimum supply year, M&I supply is the same under all alternatives.

Lower Truckee River agricultural and M&I demands are met under all alternatives.

IX. Groundwater

Analysis shows no major differences in Truckee River flows through Truckee Meadows among the alternatives; therefore, recharge of the shallow aquifer adjacent to the Oxbow reach would not be affected. Effects on the shallow aquifer in Truckee Meadows and establishment of a new groundwater equilibrium would vary among the alternatives and depend upon many local factors, such as the amount of groundwater pumping, recharge, and the localized groundwater flow gradients. Seepage loss from the Truckee Canal would be similar under all alternatives. With criteria established for new well construction in California under TROA, assumed limitations on groundwater use, and development of surface-water drought supplies, TROA likely would have the least effect on future groundwater resources among the alternatives.

X. Water Quality

Overall, modeling shows that water quality would be better under TROA than under No Action or current conditions because flows would be greater and flow timing would be more favorable. Under TROA, water stored for water quality purposes would be released to improve riverine water quality in representative dry years, the most critical periods for aquatic resources. As a result, under TROA, Nevada temperature standards would be met much more often in representative dry years and somewhat more often in median years; dissolved oxygen standards would be met much more often in representative dry years and about as often in median years. On rare occasions, in median years, water quality could be slightly worse under TROA than under No Action. However, the total water quality benefits realized in representative dry years under TROA would outweigh these effects. There are few water quality problems in representative wet years.

XI. Sedimentation and Erosion

Shoreline erosion at Lake Tahoe would not increase under No Action, LWSA, or TROA; water quality would not be degraded; and the maximum elevation at which the lake is currently operated would not be exceeded.

Erosion and sediment transport in the Truckee River from Donner Creek to the Little Truckee River confluence would not differ significantly under any alternative.

In the Little Truckee River from Stampede Dam to Boca Reservoir and the Lockwood reach of the Truckee River, erosion and sediment transport would not be significantly affected under any of the alternatives.

In the Spice reach, erosion and sediment transport would not be affected because there is no known sediment source to influence this reach.

In the Nixon reach, erosion and sediment transport would not be significantly affected under any of the alternatives. Moreover, operations model results show that average annual flows are greater under TROA; these greater flows could promote the expansion of riparian vegetation, which, in turn, would have a stabilizing effect on the river channel and reduce sediment production.

The higher water surface elevation expected under TROA could improve the connectivity between the Truckee River and Pyramid Lake for fish migration and spawning; connectivity could be adversely affected under No Action and LWSA. Other aspects of Truckee River delta dynamics would not be affected under the alternatives.

XII. Biological Resources

Conditions for fish in more reaches of the Truckee River and its tributaries, as well as in Prosser Creek, Stampede, and Boca Reservoirs, would be better under TROA than under LWSA, No Action, or current conditions. Foraging habitat for waterfowl and shorebirds at Stampede Reservoir would be better under TROA than under LWSA, No Action, or current conditions, but potential predation on Canada geese would be greater than under current conditions. Potential for enhancing riparian vegetation along some reaches of the Truckee River would be greater under TROA than under LWSA or No Action in median hydrologic conditions and along all mainstem and tributary reaches in dry and extremely dry hydrologic conditions. Under TROA, riparian habitat along a few mainstem and tributary reaches would be enhanced in wet and median hydrologic conditions and along most mainstem reaches in dry and extremely dry hydrologic conditions, when compared to LWSA, No Action, or current conditions.

Habitat conditions for Pyramid Lake fishes would be better under TROA than under LWSA, No Action, or current conditions. Habitat conditions for the prey base of the federally threatened bald eagle at Stampede and Boca Reservoirs also would be better under TROA than under LWSA, No Action, or current conditions.[4] No significant, long-term effect would occur to Tahoe yellow cress, a Federal candidate species, under TROA, LWSA, or No Action. Other special status species would benefit from the riparian enhancement that TROA would provide compared to LWSA, No Action, or current conditions.

XIII. Recreation

Visitation at Prosser Creek, Stampede, and Boca Reservoirs generally would be greater under TROA than under No Action and current conditions, primarily because annual average water elevations would be higher under TROA, thus enhancing recreational access and ensuring a higher quality recreational experience. Visitation at Donner Lake would be negligibly (less than 1 percent) less under TROA than under current conditions, but greater than under either No Action or LWSA.

Effects on boat ramp usability would be the same in all hydrologic conditions at Pyramid Lake and at Prosser Creek and Lahontan Reservoirs under TROA, LWSA, and No Action. Boat ramps would be more usable in median hydrologic conditions at Donner Lake, in dry hydrologic conditions at Stampede Reservoir, and in wet hydrologic conditions at Boca Reservoir under TROA than under No Action and LWSA. Boat ramps would be less usable in dry hydrologic conditions at Donner Lake and in median hydrologic conditions at Boca Reservoir under TROA than under No Action. Usability of stationary docks at Donner Lake would not be significantly affected under any alternative during June, July, or August.

Effects on flows for fly fishing, rafting, and kayaking would be minimal under No Action, LWSA, and TROA. Because of the nature of spin/lure/bait fishing, and because anglers can and will still pursue their sport when flows are other than desired, none of the effects on flows for anglers under any of the alternatives is considered significant.

XIV. Economic Environment

Economic model results show that recreation-based employment and income are about the same under the alternatives as under current conditions (differences of less than 1 percent). Such small differences would not significantly affect the regional economy.

[4] A notice was published in the Federal Register on July 9, 2007 (72 FR 37346) announcing the delisting of the bald eagle effective August 8, 2007. The bald eagle remains protected under the Bald and Golden Eagle Protection Act.

Two analyses were conducted to show the effects of (1) meeting the M&I water demand in Truckee Meadows in 2033 and (2) transferring agricultural water rights in Truckee Meadows and the Truckee Division of the Newlands Project to M&I, water quality, and fish and wildlife use.

For the first analysis, the economic model calculated the amount of employment and income that could be supported by the increase (approximately 36,000 acre-feet) in M&I water supplies from current conditions to meet the future M&I demand of 119,000 acre-feet in Truckee Meadows under No Action, LWSA, and TROA. Model results show the same amount of employment and income would be associated with that future demand under the alternatives.

For the second analysis, the economic model calculated the effects of transferring agricultural water rights on employment and income. Economic model results show slightly (less than 1 percent) less employment and income in the study area under No Action, LWSA, and TROA than under current conditions. The economic model also shows slightly less employment and income under TROA than under No Action; the overall effect on the regional economy would be less than 1 percent. The benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be greater than the projected reduction in employment and income associated with the reduction of water rights for agricultural production in Truckee Meadows and the Truckee Division of the Newlands Project.

Analysis of operations model results shows that, under TROA, both hydroelectric power generation and gross revenues for Truckee River run-of-the-river hydroelectric powerplants are about 0.4 percent less than under No Action and 0.5 percent less than under current conditions in wet hydrologic conditions; about 3.0 percent less than under No Action and current conditions in median hydrologic conditions; and about 3.0 percent greater than under No Action and 4.6 percent greater than under current conditions in dry hydrologic conditions. Any reduction in gross revenue would require compensation.

For Lahontan Dam hydroelectric powerplants, both generation and gross revenues under TROA are about the same as under No Action in all hydrologic conditions and about 3 percent less than under current conditions in all hydrologic conditions.

On the basis of information provided by TMWA, groundwater usage to meet future M&I water demand would vary under current conditions, No Action, LWSA, and TROA. Groundwater production and recharge has associated capital, operation, and maintenance costs. Based on a comparison of the annual groundwater costs for each of the alternatives, the least cost alternative is TROA ($2.15 million), followed by No Action ($3.48 million), and LWSA ($4.70 million), all more costly than current conditions ($1.52 million). Under No Action and LWSA, the higher annual costs are due to greater groundwater pumping. Groundwater pumping not only would be greater under LWSA than under current conditions and TROA, but because of groundwater recharge provisions for this alternative, it has greater future capital investments.

XV. Social Environment

Overall, effects on the social environment indicators of population, urbanization of Truckee Meadows, and air quality under TROA and LWSA would be the same as under No Action.

In the future, under all alternatives, the study area is projected to experience a steadily increasing population, an expansion of M&I water use, and a decline in agricultural-based living. Between 2000 and 2033, the population of Truckee Meadows is projected to increase from 284,147 to 440,874. Under the alternatives, agricultural water rights would be acquired and transferred to M&I use in response to increasing population until demand in the Truckee Meadows service area reaches 119,000 acre-feet. Local and State governments would continue to implement regulatory and monitoring programs to maintain compliance with air quality standards.

XVI. Cultural Resources

Projected effects on cultural resources under TROA would be minimal and depend on location. Five percent fewer cultural resources at lakes and reservoirs would be affected under TROA than under current conditions and the other alternatives. However, expectations are different for cultural resources located along rivers and creeks. Operations model results show that 3 percent more sites along the rivers and creeks would be affected under TROA (and current conditions) than under the No Action or LWSA. Actual effects for sites along these rivers and creeks could be different and, if the numbers of potentially affected sites due to fluctuating stream elevations were higher, field research and validation would be required to determine possible adverse effects.

XVII. Indian Trust Resources and Aesthetic Resources

Indian trust resources are legal interests in property or natural resources held in trust by the United States for Indian Tribes or individuals. For the Pyramid Tribe, lower Truckee River flow and discharge to Pyramid Lake would be greater under TROA. With increased flow and the capacity to manage such water, TROA would assist in improving lower river water quality; enhance the elevation of Pyramid Lake; enhance the riparian canopy in and stabilize the lower river; enhance recreational opportunities at Pyramid Lake; enhance spawning opportunities for cui-ui; and enhance river habitat for Pyramid Lake fishes. In addition, the exercise of lower Truckee River agricultural and M&I water rights, including those of the Pyramid Tribe, would continue to be satisfied under all alternatives. For Reno-Sparks Indian Colony, implementation of any of the action alternatives would have no effect on the exercise of Truckee River water rights. For the Fallon Paiute-Shoshone Tribe, the Carson Division water supply is minimally affected under any of the action alternatives and the Tribe would receive a full water supply as frequently under TROA as under No Action. For the Washoe Tribe, TROA would not affect flows of the Carson River and would have no effect on land and water resources in the Lake Tahoe basin.

Effects on the aesthetic resources from implementation of TROA would be beneficial; effects under any alternative or current conditions would be similar and minimal.

XVIII. Growth-Inducing Impacts

Although sources of water or mechanisms to meet water demands might differ among the alternatives, population growth and resulting water demand are projected to be the same under No Action, LWSA, and TROA. The projected changes are within the parameters of planning for growth within the study area, including land use, transportation, housing, schools, public services, environmental resources, and infrastructure planning. Therefore, implementation of TROA would not be growth inducing.

XIX. Environmental Justice

Neither LWSA nor TROA involves facility construction, population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. Consequently, it is concluded that implementing LWSA or TROA would have no adverse human health or environmental effects on minority or low-income populations as defined by environmental justice policies and directives.

XX. Other Resource Effects

Because of exchange and storage agreements that are components of TROA, a more assured long-term drought water supply for Truckee Meadows would be obtained, and improved flow conditions would be possible for Pyramid Lake fishes and aquatic species in general. California’s water supply from the Lake Tahoe and Truckee River basins is established, which would have the effect of making M&I supplies more secure, and could be utilized in the short run to improve environmental conditions in the Truckee River.

Because TROA allows much flexibility in using Fish Water to enhance bypass flows at TWMA’s four hydroelectric diversion dams on the Truckee River, a wide range of management strategies for using Fish Water is available to water managers. However, the management strategy that the United States and the Pyramid Tribe will employ is not known at this time. Depending on how water is managed under TROA, the amount of fish habitat in the river associated with the four hydroelectric diversion dams would range from less than under No Action and current conditions in the Farad reach, to the same as or greater than under No Action and current conditions in all four reaches.

XXI. Cumulative Effects

By providing operational flexibility in the exercise of existing water rights, TROA would allow opportunity to tailor reservoir operations to enhance specified resources. By not requiring construction of water storage and other facilities, TROA would not preclude implementation of technologically more advanced measures to provide additional water or improve water quality from being implemented at some future time. TROA also would allow opportunity to enhance benefits for economic, social, biological, and trust resources in the study area, which previously had no water rights or had water rights of junior priority. Establishment of a habitat restoration fund and opportunity to add measurably to an existing biological resources fund could assist in restoring, enhancing, and protecting environmental values and processes long affected by more narrowly focused reservoir operations. As no significant adverse cumulative effects have been identified for the implementation of TROA, no mitigation would be necessary and none is proposed.

XXII. Consultation and Coordination

Concurrent with preparation of this document, agency coordination and consultation have been conducted in accordance with the Fish and Wildlife Coordination Act, Endangered Species Act of 1973, as amended, and National Historic Preservation Act of 1966. Additionally, consultation with Indian tribes in the study area has included the Pyramid Tribe, Reno-Sparks Indian Colony, Fallon Paiute Shoshone Tribe, and Washoe Tribe of Nevada and California.

Input to the decisionmaking process came from several sources, including the policy, legal, and technical representatives of the negotiators of TROA and the public, including interest groups in California and Nevada.

Public involvement is a process by which interested and affected individuals, organizations, agencies, and governmental entities are consulted and included in the decisionmaking process. Public involvement is an ongoing effort.

XXIII. Summary of Effects

Table ES.1 summarizes the effects of the alternatives on the resources of the study area. The table presents relative differences between the action alternatives and No Action, and between the alternatives and current conditions. No significant adverse effects are expected to occur under TROA.

Table ES.1—Summary of effects of alternatives on resources

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: End-of-month reservoir storage and average monthly releases (acre-feet, unless noted)				
Total storage	Wet: 946,300 Median: 790,000 Dry: 64,000	Slightly less than under current conditions	Similar to No Action	Much greater than under No Action or current conditions
Lake Tahoe	Wet: 672,900 Median: 557,100 Dry: 52,600	Slightly less storage and similar releases as under current conditions	Similar storage and releases as under No Action	Similar storage and much greater May-June releases and less August-January releases than under No Action or current conditions
Donner Lake	Wet: 6,500 Median: 5,800 Dry: 5,100	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Similar storage, except slightly less storage in July and August than under No Action or current conditions; slightly greater June-August releases, less September releases, and greater October releases than under No Action or current conditions
Prosser Creek Reservoir	Wet: 18,800	Wet: similar storage and releases as under current conditions	Similar to No Action in all three hydrologic conditions	Wet: similar storage and releases as under No Action or current conditions
	Median: 14,400	Median: greater August -September storage; less May-July releases; much greater October releases than under current conditions		Median: greater May-September storage; less May-July releases and much greater September-October releases than under No Action or current conditions
	Dry: 3,100	Dry: much greater January-December storage; less May-July releases; greater October releases than under current conditions		Dry: much greater January-December storage; less May releases; greater August-October releases than under No Action or current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: End-of-month reservoir storage and average monthly releases (acre-feet, unless noted) – continued				
Independence Lake	Wet: 15,700	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Wet: similar storage and releases as under No Action or current conditions, except less releases in September
	Median: 15,600			Median: similar storage and releases as under No Action or current conditions, except greater February and August releases and less March and September releases
	Dry: 15,000			Dry: in general, slightly less January-December storage; slightly greater June-September releases; similar October-May releases as under No Action or current conditions
Stampede Reservoir	Wet: 212,900	Wet: slightly greater August-September storage and similar releases as under current conditions	Similar storage and releases as under No Action	Wet: greater May-September storage and greater September-November releases than under No Action or current conditions
	Median: 181,200	Median: similar January-December storage and lower August-September releases than under current conditions		Median: much greater January-December storage; less November-July releases and much greater September-October releases than under No Action or current conditions
	Dry: 22,000	Dry: similar January-December storage and greater March and July releases than under current conditions		Dry: much greater January-December storage and releases than under No Action or current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: End-of-month reservoir storage and average monthly releases (acre-feet, unless noted) – continued				
Boca Reservoir	Wet: 34,500	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Wet: less August and greater October-December storage than under No Action or current conditions
	Median: 20,300			Median: greater August-March storage than under No Action or current conditions
	Dry: 3,400			Dry: greater January-December storage than under No Action or current conditions
Lahontan Reservoir	Wet: 277,300	Wet: slightly greater September-February storage; similar releases as under current conditions	Similar to No Action	Similar to No Action
	Median: 160,500	Median and dry: less January-December storage; less April-September releases than under current conditions		
	Dry: 99,100			

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: Truckee River average monthly flows (cfs)				
Farad	Wet: 1,420	Slightly less than under current conditions	Similar to No Action	Wet: greater December-June flows than under No Action or current conditions and less August-September flows than under No Action or current conditions
	Median: 650			Median: less November-February flows than under No Action or current conditions and less July-September flows than under No Action or current conditions
	Dry: 430			In general, in dry to very dry hydrologic condition: greater July-September flows than under No Action or current conditions and less November-June flows than under No Action or current conditions
Vista	Wet: 1,460	Generally slightly less than under current conditions	Similar to No Action	Wet: slightly greater December-June flows than under No Action or current conditions
	Median: 640			Median: less November-February flows than under No Action or current conditions
	Dry: 400			Dry: greater July-October flows than under No Action or current conditions
Surface Water: Effects on Pyramid Lake				
Pyramid Lake	Ending elevation: 49 feet higher by the end of 100-year period of analysis Ending storage: 28,430,000 acre-feet Average inflow: 496,720 acre-feet per year	Ending elevation, storage, and inflow less than under current conditions	Ending elevation, storage, and inflow less than under No Action or current conditions	Ending elevation, storage, and inflow greater than under No Action or current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

<table>
<tr><th>Indicator/location</th><th>Current conditions</th><th>No Action</th><th>LWSA</th><th>TROA</th></tr>
<tr><td colspan="5">Surface Water: Effects on Pyramid Lake – continued</td></tr>
<tr><td rowspan="3">Nixon (Pyramid Lake inflow)</td><td>Wet: 1,410 cfs</td><td>Wet: Generally slightly less flows than under current conditions</td><td rowspan="3">Similar to No Action</td><td>Wet: slightly greater December-June flows than under No Action or current conditions</td></tr>
<tr><td>Median: 600 cfs</td><td rowspan="2">Median to dry: greater August-September flows than under current conditions</td><td>Median: less November-February flows than under No Action or current conditions and similar to slightly greater July-October flows than under No Action or current conditions</td></tr>
<tr><td>Dry: 150 cfs</td><td>Dry: slightly greater August-October flows than under No Action or current conditions</td></tr>
<tr><td colspan="5">Surface Water: Effects on Exercise of Water Rights to Meet Demand – Agricultural</td></tr>
<tr><td>Truckee Meadows</td><td>Demand of 40,770 acre-feet per year and 21.3 percent of demand met in minimum supply year</td><td>Much less demand and a greater percent of demand met in minimum supply year than under current conditions</td><td>Same demand as under No Action and a greater percent of demand met in minimum supply year than under current conditions</td><td>Much less demand than under No Action or current conditions and greater percent of demand met in minimum supply year than under No Action or current conditions</td></tr>
<tr><td>Newlands Project Truckee Division</td><td>Demand of 18,520 acre-feet per year and 51.5 percent of demand met in minimum supply year</td><td>No demand; water rights acquired by TMWA and Fernley</td><td>Same as under No Action</td><td>Same as under No Action, i.e., no demand; water rights acquired by TMWA and Fernley</td></tr>
<tr><td>Newlands Project Carson Division</td><td>Demand of 275,720 acre-feet per year and 47.2 percent of demand met in minimum supply year</td><td>Slightly less demand and less percent of demand met in minimum supply year than under current conditions</td><td>Same demand and slightly less percent of demand met in minimum supply year than under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions</td><td>Same demand and similar percent of demand met in the minimum supply year as under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions</td></tr>
<tr><td>Lower Truckee River</td><td>Demand of 12,040 acre-feet per year and 100 percent of demand met in minimum supply year</td><td>Much greater demand and same percent of demand met in minimum supply year as under current conditions</td><td>Same as under No Action</td><td>Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions</td></tr>
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Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: Effects on Exercise of Water Rights to Meet Demand – M&I				
Lake Tahoe California	Demand of 18,700 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Lake Tahoe Nevada	Demand of 11,000 acre-feet year and 100 percent of demand met in minimum supply year	Same demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., same demand and same percent of demand met in minimum supply year as under current conditions
Truckee River California	Demand of 8,570 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Truckee Meadows	Demand of 83,140 acre-feet per year and 100 percent of demand met in minimum supply year	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply sufficient to meet demand of 119,000 acre-feet in all drought years
Fernley	Demand of 3,280 acre-feet per year and 100 percent of demand met in minimum supply year by groundwater	Much greater demand and less percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and less percent of demand met in minimum supply year as under current conditions
Lower Truckee River	Demand of 1,120 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Groundwater				
Recharge of aquifer adjacent to Truckee River in the Oxbow reach	Not quantified	Slightly less than under current conditions	Same as under No Action	Slightly more than under No Action; same as under current conditions
Recharge of the shallow aquifer in Truckee Meadows	Not quantified	Slightly less than under current conditions	Same as under No Action	Less than under No Action; much less than under current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Groundwater – continued				
Recharge of shallow aquifer near Truckee Canal due to seepage losses	Not quantified	Much less than under current conditions	Slightly less than under No Action; much less than under current conditions	Slightly more than under No Action; much less than under current conditions
Groundwater pumping in Truckee River basin in California (acre-feet per year)	7,750	19,600	18,400	Less than under No Action; much more than under current conditions
Groundwater pumping in Truckee Meadows	15,350 acre-feet (average annual modeled pumping)	Less than under current conditions	Slightly more than under No Action; less than current conditions	Less than under No Action; less than under current conditions
Water Quality				
Truckee River flows upstream of TTSA, down-stream from Reno, and into Pyramid Lake	Greater flows in wet and median hydrologic conditions and comparatively low flows in dry hydrologic conditions	Slightly greater flows than under current conditions in dry hydrologic conditions	Same as under No Action	Slightly greater flows than under No Action or current conditions in dry hydrologic conditions
Number of days temperature standards exceeded down-stream from Reno (in representative dry years)	85	120	119	87
Number of days dissolved oxygen standards exceeded down-stream from Reno (in representative dry years)	109	42	39	3
Total dissolved solids, total nitrogen, and total phosphorus loadings to Pyramid Lake	Large loadings in representative wet and average years, and comparably minimal loadings in representative dry year because of lower flows	Similar to current conditions, except slightly less in representative dry years	Same as under No Action	Overall, similar to No Action and current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Sedimentation and Erosion				
Shoreline erosion at Lake Tahoe				
	Minimal	No manmade induced degradation of any water quality parameters	Same as under No Action	Same as under No Action
Stream channel erosion and sediment transport capacity				
Truckee River from Donner Creek to the Little Truckee River	No overall effect	No overall effect	Same as under No Action	No significant effect
Little Truckee River from Stampede Dam to Boca Reservoir	No overall effect	No overall effect	No overall effect	No overall effect
Spice	No overall effect	Potential significant effect	Same as under No Action	No overall effect
Lockwood	No overall effect	No significant effect	Same as under No Action	No significant effect
Nixon	No overall effect	No significant effect	Same as under No Action	No significant effect
Truckee River delta dynamics at Pyramid Lake				
	No effect	Potential adverse effect on connectivity between the Truckee River and Pyramid Lake	Same as under No Action	Improved connectivity between Truckee River and Pyramid Lake for fish migration and spawning
Biological Resources				
Fish in rivers and tributaries	Preferred flows for brown and rainbow trout sustained less frequently in many reaches	Better conditions for fish in a few reaches; significant adverse effects in some reaches compared to current conditions	Same as under No Action	Significant beneficial effects in many reaches compared to No Action and current conditions
Fish in lakes and reservoirs	Reservoir storage frequently falls below thresholds recommended to minimize algal blooms	Significant beneficial effect on fish in Prosser Creek Reservoir compared to current conditions	Same as under No Action	Significant beneficial effects on fish in Prosser Creek, Stampede, and Boca Reservoirs compared to No Action and current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Biological Resources – continued				
Waterfowl and shorebirds	Available foraging habitat varies by reservoir and hydrologic condition	Same as under current conditions	Same as under No Action	Significant beneficial effect at Stampede Reservoir compared to No Action and current conditions
Riparian habitat and associated species	Amount of riparian habitat varies by reach and habitat type. Ability to manage flows for riparian establishment and maintenance is limited, especially in dry and extremely dry hydrologic conditions	Wet and median hydrologic conditions: significant beneficial effects in a few reaches compared to current conditions Dry and extremely dry hydrologic conditions: significant beneficial effects in most reaches compared to current conditions	Same as under No Action	Median hydrologic conditions: significant beneficial effects in a few reaches compared to No Action and current conditions Dry and extremely dry hydrologic conditions: significant beneficial effects in all reaches compared to No Action and current conditions
Endangered, threatened, and other special status species	Cui-ui currently recovering; LCT not established in mainstem Truckee River	Cui-ui and LCT: significant adverse effects compared to current conditions	Cui-ui and LCT: Same as under No Action	Cui-ui and LCT: significant beneficial effects compared to No Action and current conditions
	Bald eagles nest at Lake Tahoe, Independence Lake, and Boca, Stampede, and Lahontan Reservoirs	Bald eagle at Stampede Reservoir: significant beneficial effects compared to current conditions	Bald eagle at Stampede Reservoir: significant adverse effects compared to No Action	Bald eagle at Stampede and Boca Reservoirs: significant beneficial effects compared to No Action and current conditions
	Tahoe yellow cress populations fluctuate based on Lake Tahoe levels	Tahoe yellow cress: same as under current conditions	Tahoe yellow cress: same as under No Action	Tahoe yellow cress: same as under No Action
	American white pelican: dependent on cui-ui for food source	American white pelican: significant adverse effects compared to current conditions	American white pelican: same as under No Action	American white pelican: significant beneficial effects compared to No Action and current conditions
	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Recreation				
Seasonal recreation visitation	Recreational visitation varies among hydrologic conditions at all reservoirs, with greatest losses in visitation occurring in dry hydrologic conditions. Visitation losses occur in median hydrologic conditions, but losses are not as great as in dry hydrologic conditions.	Same as under current conditions, except slightly less at Donner Lake in median hydrologic conditions	Same as under No Action, except slightly more at Donner Lake in median hydrologic conditions	Same as under No Action, except more at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in some hydrologic conditions
Boat ramp usability	Boat ramps are unusable from 0 to 100 percent of the recreation season, depending on lake or reservoir and hydrologic condition. Boat ramps are unusable the greatest number of months in dry hydrologic conditions at Prosser Creek Reservoir; ramps are usable the greatest number of months at Stampede Reservoir in wet and median hydrologic conditions.	Same as under current conditions, except slightly more usable at Boca Reservoir in wet hydrologic conditions	Same as under No Action	Same as under No Action and current conditions, except slightly more or less usable at Donner Lake and Boca Reservoir in certain hydrologic conditions
Suitability of flows for fly fishing	Flows are suitable 71 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions, with a few exceptions	Same as under No Action	Same as under No Action

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Recreation – continued				
Suitability of flows for spin/lure/bait fishing	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Desired flows would occur more often in the Little Truckee River from Independence Creek to Stampede Reservoir and in the Trophy reach in wet hydrologic conditions and less often in the Mayberry, Oxbow, and Spice reaches in dry hydrologic conditions than under current conditions	Same as under No Action, except desired flows would occur more often in the Mayberry, Oxbow, and Spice reaches in median hydrologic conditions	Desired flows would occur more often in Prosser Creek in median hydrologic conditions and in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions and less often in several reaches, primarily in wet hydrologic conditions, than under No Action and current conditions
Suitability of flows for rafting	Flows are suitable 43 to 0 percent of the recreation season, depending on location and hydrologic condition. The Trophy section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Suitability of flows for kayaking	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Economic Environment				
Recreation-based employment and income	Baseline (California) Employment: 23,814 jobs Income: $576 million	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Employment and income affected by changes in water supply	Baseline (Nevada) Employment: 267,689 jobs Income: $15.2 billion	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Economic Environment – continued				
Hydroelectric power generation and revenues: run-of-the-river	Wet hydrologic conditions: 67,829 MWh; $3.20 million	Wet hydrologic conditions: same as under current conditions	Wet hydrologic conditions: same as under No Action and current conditions	Wet hydrologic conditions: .4 percent less than under No Action; .5 percent less than under current conditions
	Median hydrologic conditions: 65,910 MWh; $3.11 million	Median hydrologic conditions: same as under current conditions	Median hydrologic conditions: approximately the same as under No Action and current conditions	Median hydrologic conditions: 3.1 percent less than under No Action; 3.1 percent less than under current conditions
	Dry hydrologic conditions: 45,985 MWh; $2.17 million	Dry hydrologic conditions: 1.8 percent greater than under current conditions	Dry hydrologic conditions: about the same as under No Action; 1.5 percent greater than under current conditions	Dry hydrologic conditions: 2.8 percent greater than under No Action; 4.6 percent greater than under current conditions
Hydroelectric power generation and revenues: Lahontan Dam	Wet hydrologic conditions: 26,837 MWh; $1.27 million	Wet hydrologic conditions: about 3 percent less than under current conditions	Wet hydrologic conditions: about the same as under No Action; about 3 percent less than under current conditions	Wet hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Median hydrologic conditions: 22,866 MWh; $1.08 million	Median hydrologic conditions: about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Dry hydrologic conditions: 21,520 MWh $1.02 million	Dry hydrologic conditions: about 3 percent less than under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
Total annual groundwater development costs	$1,520,395	$3,348,102 or 120 percent greater than under current conditions	40 percent greater than under No Action; $4,696,483 or 200 percent greater than under current conditions	36 percent less than under No Action; $2,151,982 or 42 percent greater than under current conditions

Table ES.1—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Social Environment				
Population of Truckee Meadows	284,147	440,874	440,874	440,874
Urbanization of Truckee Meadows	M&I water supply of 83,140 acre-feet Baseline employment: 267,689 jobs Baseline income $15.2 billion	Change in M&I water supply to meet additional 36,000 acre-foot demand (total 119,000 acre-foot demand) would support 74,400 full- and part-time jobs and $2.56 billion in personal income	Same as under No Action	About the same as under No Action (differences in employment and income of less than 1 percent from baseline)
Air Quality	Regulatory programs and monitoring in place to comply with air quality criteria standards	Same as under current conditions	Same as under No Action	Same as under No Action
Cultural Resources				
In Area of Potential Effect, number of recorded cultural resources at lakes and reservoirs and as [percent] of total recorded resources affected	100 [38]	99 [38]	99 [38]	88 [33]
In Area of Potential Effect, number of recorded cultural resources along river and stream reaches and as [percent] of total recorded resources affected	18 [11]	9 [6]	9 [6]	18 [11]

Chapter 1

PURPOSE OF AND NEED FOR ACTION

In February 1998, the U.S. Department of the Interior (Interior) and California Department of Water Resources (CDWR) jointly issued a draft environmental impact statement/environmental impact report (DEIS/EIR) evaluating a draft Truckee River Operating Agreement (TROA) and a No Action Alternative. That agreement was based on elements that negotiators tentatively agreed to in May 1996. Because negotiations continued after the February 1998 DEIS/EIR was released, many elements of that agreement were revised, and a new Draft Agreement was issued by the parties in October 2003 and a revised DEIS/EIR was prepared and released for public review in August 2004. Further negotiations culminated on August 28, 2007, in an agreement acceptable to negotiators for all signatories—the proposed Negotiated Agreement[1]—(included as the Negotiated Agreement Appendix), which is the basis for this final environmental impact statement/environmental impact report (EIS/EIR).

The lead agencies for this study are Interior and CDWR. This document is a joint Federal-State document prepared by three Interior bureaus—Bureau of Reclamation (Reclamation), Fish and Wildlife Service (FWS), and Bureau of Indian Affairs—and by CDWR.

This final EIS/EIR describes (1) TROA, the proposed action and preferred alternative; (2) an alternative to TROA, the Local Water Supply Alternative; and (3) a No Action Alternative (chapter 2). It also describes the current status of resources (e.g., hydrologic, biological, socioeconomic, and cultural) of the study area and presents an evaluation of the potential effects of the alternatives on these resources (chapter 3).

This final EIS/EIR complies with the National Environmental Policy Act of 1969 (NEPA)[2] and with the Council on Environmental Quality regulations that implement NEPA, as well as with the California Environmental Quality Act (CEQA)[3] and the regulations that implement CEQA, commonly known as the "CEQA Guidelines." This document will also be used to satisfy consultation requirements of the Fish and Wildlife Coordination Act; the Federal Endangered Species Act (ESA) of 1973, as amended; the California Endangered Species Act; and section 106 of the National Historic Preservation Act of 1966, as amended, as addressed in chapter 5. Also, as addressed in chapter 5, this document complies with the cultural resources consultation requirements of CEQA.

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[1] For the purposes of the revised DEIS/EIR, the draft Truckee River Operating Agreement was referred to as the Draft Agreement, distinct from TROA; for the purposes of this final EIS/EIR, TROA refers to both the proposed Negotiated Agreement and proposed action.

[2] 42 United States Code (U.S.C) section 4321 *et seq*.

[3] California Public Resources Code section 21000 *et seq*.

I. Proposed Action

This final EIS/EIR considers the following elements as part of the proposed action:

- Signing, adoption, and implementation of TROA by the Secretary of the Interior (Secretary) and California, including subsequent promulgation of TROA as a Federal rule when also signed by the other mandatory and optional signatories.

- Changing California water rights permits, licenses, and appropriations to allow the water storage, transfers, and exchanges that are provided for in TROA.

- Entering into contracts with the owners of Credit Water created pursuant to TROA for the storage of Credit Water in Truckee River reservoirs.

II. Purpose of and Need for Proposed Action

The primary purpose of the proposed action is to implement section 205(a) of Public Law (P.L.) 101-618[4] (attachment A of this EIS/EIR) in order to secure the intended benefits for the Lake Tahoe and Truckee River basins. (See Section V, "Background and History," for a description of the laws, decrees, and agreements that govern Truckee River operations.)

Paragraph 205(a)(1) directs the Secretary to negotiate an agreement (i.e., TROA) with California and Nevada, after consultation with other parties designated by the Secretary or the States, to increase the operational flexibility and efficiency of reservoirs in the Lake Tahoe and Truckee River basins. These reservoirs include Federal reservoirs and non-Federal reservoirs. The Federal reservoirs, also known as the Truckee River reservoirs, are Lake Tahoe and Boca, Prosser Creek, Martis Creek, and Stampede Reservoirs. The non-Federal reservoirs are Donner and Independence Lakes. Federal and non-Federal reservoirs are collectively referred to in this document as "all reservoirs."[5]

[4] Title II of P.L. 101-618 is known as the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990.

[5] The collective terms "Truckee River reservoirs," "Federal reservoirs," and "non-Federal reservoirs" may each be used in this document; reservoirs are also referenced individually. The term "Truckee River reservoirs" is used interchangeably with the term "Federal reservoirs." "Truckee River reservoirs" is defined in P.L. 101-618, Title II, as "the storage provided by the dam at the outlet of Lake Tahoe, Boca Reservoir, Prosser Creek Reservoir, Martis Reservoir, and Stampede Reservoir."

Paragraph 205(a)(2) directs that such agreement must:

- Carry out the terms, conditions, and contingencies of the Preliminary Settlement Agreement as Modified by the Ratification Agreement (PSA).[6]

- Provide for enhancement of spawning flows[7] available in the lower Truckee River[8] for the Pyramid Lake fishes (i.e., federally endangered cui-ui and threatened Lahontan cutthroat trout [LCT]) in a manner consistent with the Secretary's responsibilities under ESA.

- Ensure that water is stored in and released from Truckee River facilities to satisfy the exercise of water rights in conformance with the *Orr Ditch* and *Truckee River General Electric* decrees.

- Satisfy all applicable dam safety and flood control requirements.

- Minimize the Secretary's costs associated with operation and maintenance of Stampede Reservoir.

PSA (attachment B) is a 1989 agreement between Sierra Pacific Power Company (Sierra Pacific)[9] and the Pyramid Lake Paiute Tribe of Indians (Pyramid Tribe) to change the operation of Federal reservoirs and Sierra Pacific's exercise of its Truckee River water rights to (1) improve spawning conditions for the Pyramid Lake fishes and (2) provide additional municipal and industrial (M&I) water for the Reno-Sparks metropolitan area

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[6] The original PSA was modified by the Congress to include the United States, and references to it should now include the language "as Modified by the Ratification Agreement."

[7] The term "spawning flows" is generic for riverine fish habitat.

[8] The term "lower Truckee River" refers to the reach downstream from Derby Diversion Dam to Pyramid Lake.

[9] The revised DEIS/EIR referenced Sierra Pacific as the party signatory to TROA. On June 11, 2001, Sierra Pacific transferred its water company serving the Reno-Sparks metropolitan area (Truckee Meadows) to the newly-created municipal entity, Truckee Meadows Water Authority (TMWA). TMWA is recognized as the principal water purveyor for Truckee Meadows. After receiving required approvals from the California Public Utility Commission and after June 11, 2001, Sierra Pacific conveyed all of its water rights associated with three of its Truckee River hydroelectric powerplants to TMWA and now is in the process of transferring title to those hydroelectric powerplants to TMWA. While transfer of water rights and ownership associated with Farad facilities have been delayed by the process to rebuild Farad Diversion Dam, those actions related to Farad facilities as well are assumed to be completed at some future time, and, for the purpose of description and analysis in this document, TMWA is presumed to have assumed ownership of water rights and property for the four Truckee River hydroelectric powerplants. Therefore, the final EIS/EIR refers to TMWA as the party signatory to TROA, and Sierra Pacific is referred to primarily in a historical context.

By Federal law, contracts and agreements to which the United States is a party may not be assigned to another party without the consent of the United States. In this matter, Sierra Pacific has sought to assign its rights and obligations under the Preliminary Settlement Agreement that Congress identified in Sec. 205(a)(2)(c) of P.L. 101-618, and under two Federal Court decrees prescribing the manner of operation of Federal reservoirs on the Truckee River. Accordingly, the United States must give its assent to these assignments if they are to be valid under Federal law. Approval of the assignments from Sierra Pacific to TMWA is in process.

(Truckee Meadows) during drought situations. Section 29(f) of PSA states that PSA cannot take effect until an operating agreement (i.e., TROA) has been executed by at least the United States, the Pyramid Tribe, and Sierra Pacific.

The proposed action would also increase boating- and fishing-related recreational opportunities in Federal reservoirs in California, improve streamflows and fish habitat in the Truckee River and its three main tributaries, and help improve water quality in the Truckee River downstream from Truckee Meadows. Paragraph 205(a)(3) states that an operating agreement may address other matters including, but not limited to, the following:

- Administration of TROA
- Means of ensuring compliance with PSA
- Operations of Truckee River system facilities that will not be changed
- Operations and procedures for using Federal reservoirs to ensure compliance with ESA
- Methods for reducing the likelihood that Lake Tahoe will drop below its natural rim and for improving the efficient use of Lake Tahoe under extreme drought situations
- Procedures for managing and operating Federal reservoirs
- Procedures for operating Federal reservoirs for beneficial uses in streams
- Procedures for operating non-Federal reservoirs in the Truckee River basin to the extent that owners of affected storage rights become parties to TROA
- Procedures and criteria for implementing California’s allocation of Truckee River water

TROA’s entry into effect is also a condition precedent to the effectiveness of the California-Nevada Interstate Allocation (section 204 of P.L. 101-618) of waters of the Lake Tahoe and Truckee River basins, and the confirmation of the *Alpine* decree as part of the interstate allocation for the Carson River basin.

Additionally, paragraph 210(b)(9) of P.L.101-618 requires the Secretary to comply with Federal environmental and wildlife conservation laws, such as ESA, in taking action under section 205.

Finally, because implementation of TROA would entail changes in the use of Truckee River reservoirs, the water right licenses and permit issued by the California State Water Resources Control Board (SWRCB) for those reservoirs must be changed. Sections 1250 through 1398 and 1700 through 1740 of the California Water Code (CWC) provide procedures for appropriating water and for changing the points of diversion, rediversion, and redistribution; purposes of use; and places of use of post-1914 appropriative and other water rights, respectively. SWRCB is responsible for the administration of post-1914 appropriative water rights in California (CWC 174). In general, before approving a water right change petition or application to appropriate water, SWRCB must publicly notice the petition and consider any comments that are filed against the proposed change or application, hold a hearing or field investigation if the comments cannot be resolved through negotiation, consider the environmental effects of the proposed change(s) or application(s) in compliance with CEQA, section 21000 *et seq*. of the California Public Resources Code, and find that the proposed change(s) or application(s) will not operate to the injury of any legal user of the water involved. In its approval, SWRCB can include terms and conditions to protect the water rights, public trust, and public interest, as necessary, consistent with the law and SWRCB's findings.

III. Decision Process and Decisions Needed

A. Use of Final EIS/EIR by the Secretary

The Secretary will use the final EIS/EIR in deciding whether or not to sign and adopt TROA, as finally negotiated. Section 205(a)(9) of P.L. 101-618 specifically requires: "The Secretary may not become a party to the operating agreement if the Secretary determines that the effects of such action, together with cumulative effects, are likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any designated critical habitat of such species." This determination is made through consultation with FWS under section 7 of ESA.

B. Use of Final EIS/EIR by California

CEQA requires the final EIS/EIR to list agencies that may use the EIR in their decision process and to list agency approvals expected to be based on the conclusions of the EIR.

California will consider the final EIS/EIR in deciding whether or not to sign and adopt TROA, as finally negotiated.

In accordance with section 2053 of the California Fish and Game Code (California Endangered Species Act) it is the policy of California that State agencies should not approve projects as proposed that would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would avoid jeopardy.

Reclamation, Washoe County Water Conservation District (WCWCD), and TMWA have filed water right change petitions and applications (change petitions and applications) with SWRCB. Change petitions were filed to add points of diversion, rediversion, and redistribution; purposes of use; and places of use to the post-1914 appropriative water rights for Prosser Creek, Boca, and Stampede Reservoirs and Independence Lake, and two time extension petitions for Stampede Reservoir seeking additional time for the changes to be implemented and water to be put to beneficial use. Applications were filed to appropriate water in Stampede and Prosser Creek Reservoirs. (See the SWRCB Notice of Petitions and Water Appropriation Applications Appendix.) If and when SWRCB approves these change petitions and water appropriation applications, the owners will be able to operate the reservoirs in accordance with the exchange provisions of TROA. SWRCB may use this final EIS/EIR in deciding whether or not to approve the change petitions and water appropriation applications.

C. Steps to Completion of TROA

A number of statutory and regulatory procedures must be completed before TROA can be implemented. The NEPA/CEQA process must be completed before TROA can be approved by the Secretary and California. The first steps in this process were publication of the DEIS/EIR and, later, the revised DEIS/EIR for public comment, based on the Draft Agreement. Following the close of the comment period for the revised DEIS/EIR, the negotiators considered the comments and other issues that required resolution, and modified the Draft Agreement, as appropriate, to make it acceptable for signature by the negotiators for all signatories. The next step was to prepare this final EIS/EIR for public review. The final step is to prepare a Record of Decision (ROD). A ROD can be published a minimum of 30 days after the Notice of Availability of the final EIS/EIR is published in the *Federal Register*. A ROD is a Federal document that identifies the alternative selected for implementation among the alternatives considered in an environmental impact statement (in this instance, EIS/EIR) and any conditions that might apply to its implementation. Preparation of the ROD completes the NEPA process. Once the TROA alternative is selected and the ROD signed, the Secretary is authorized to approve TROA.

CEQA requires that, prior to approving TROA, the lead agency (CDWR) must certify that the final EIS/EIR has been completed in compliance with CEQA, that the decision maker has reviewed and considered the information in the final EIS/EIR, and that the final EIS/EIR reflects the lead agency’s independent judgment.

The other mandatory signatories—Nevada, the Pyramid Tribe, and TMWA—must also approve TROA.[10] Once TROA has been approved by the mandatory signatories, it must be promulgated as a Federal regulation and published in the *Federal Register*.

TROA must also be submitted to the U.S. District Courts that supervise and administer the *Orr Ditch* and *Truckee River General Electric* decrees (Section V, "Background and History") for approval of any necessary modifications in the provisions of those decrees.[11] Reclamation will negotiate storage contracts with the various parties that will enable them to store their water in Federal reservoirs pursuant to TROA. This final EIS/EIR will satisfy NEPA requirements for those storage contracts.

TROA has been negotiated as a settlement of litigation and by law cannot become effective until certain litigation has been resolved. Section 210(a)(1) of P.L. 101-618 requires the dismissal of five specific Truckee River lawsuits with prejudice, or other final resolution, before TROA and other specified provisions of P.L. 101-618 become effective. At the same time, the dismissal of this litigation depends on the execution by the mandatory signatories—the Secretary, California, Nevada, and the parties to PSA (Pyramid Tribe and TMWA as the successor to Sierra Pacific)—of an operating agreement that satisfies the requirements of sections 205(a)(2) and 205(a)(9), and which is approved by the *Orr Ditch* and Truckee River *General Electric* courts, and published as a Federal regulation.

The provisions of P.L. 101-618 which section 210(a)(2) makes contingent upon TROA and the dismissal of litigation are as follows:

- Interstate allocations between Nevada and California of the waters of Lake Tahoe, the Truckee River and the Carson River (section 204)

- PSA

- Pyramid Lake Paiute Economic Development Fund (section 208(a)(3)(d))

In addition, two separate actions are related to TROA. Reclamation, WCWCD, and TMWA have filed change petitions and applications with SWRCB in advance of TROA becoming effective, to add points of diversion, rediversion, and redistribution; purposes of use; and places of use in (in California and Nevada) to the California licenses and permits for Prosser Creek, Stampede, and Boca Reservoirs and Independence Lake, and

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[10] While section 205(a)(4) specifies that TROA shall be executed by the Secretary, and California and Nevada to enter into effect, section 205(a)(1)(C) requires TROA to carry out the terms of the Preliminary Settlement Agreement, which then included the Pyramid Tribe and Sierra Pacific. These five parties—the Secretary, California, Nevada, Tribe, and Sierra Pacific (now TMWA)—are collectively referred to as the "mandatory signatories."

[11] The U.S. District Courts that supervise and administer the *Truckee River General Electric*, *Orr Ditch*, and *Alpine* decrees also are referred to as the *Truckee River General Electric*, *Orr Ditch*, and *Alpine* courts, respectively, in this document.

two time extension petitions for Stampede Reservoir seeking additional time for the changes to be implemented and water to be put to beneficial use. As a responsible agency under CEQA, SWRCB may use this final EIS/EIR in determining whether and how to approve any change petitions or water appropriation applications submitted pursuant to TROA. The changes and appropriations proposed by Reclamation would not become effective unless and until TROA is executed and, by its terms, becomes effective. And, to complete storage contracts with TMWA, California, Reno, Sparks, Fernley, Washoe County, and WCWCD, Reclamation's Director of the Mid-Pacific Region must receive approval from the Commissioner of Reclamation via a "basis of negotiation" to initiate formal negotiations with the parties. Upon completion of negotiations and formal approval by the contracting parties, the contracts will be available to the public for comment. Following the public comment period, the Commissioner must approve the draft contracts and the regional director will execute the contracts, contingent upon TROA becoming effective.

Also, TROA would rely on the authority in Operating Criteria and Procedures (OCAP) to allow Newlands Project Credit Water operations as provided in OCAP as well as in TROA, following the Federal rulemaking process. Those additional operations would address storage of Floriston Rate Water or Truckee River flow in excess of Floriston Rates or Reduced Floriston Rates in Truckee River reservoirs to create, exchange, and release Newlands Project Credit Water.[12] The potential environmental effects of all such Credit Water are addressed in this document.

Furthermore, as identified in Article Twelve of TROA, the following conditions remain to be satisfied before it enters into effect:

- United States acknowledges that the indemnity agreement executed by Sierra Pacific, WCWCD, and Truckee-Carson Irrigation District (TCID), dated July 1, 1935, is no longer in effect.

- Certain litigation initiated by the Pyramid Tribe is resolved.

- The U.S. District Courts responsible for the *Truckee River General Electric* and *Orr Ditch* decrees have approved the modification of the decrees as necessary to allow for the implementation of TROA.

- Change petitions for Truckee River reservoir storage licenses and permit, and the Independence Lake license, are approved by SWRCB. Applications for changes in place of use, manner of use, and points of diversion of water rights are approved by the Nevada State Engineer. (Changes would not be effective unless and until TROA is executed and, by its terms, becomes effective.)

[12] See chapter 2, tables 2-2 and 2-7, for definitions of these water categories.

- Independence Lake vested storage water rights are changed to allow Credit Water to be accumulated.

- Pyramid Tribe's water right granted under Nevada State Engineer Ruling 4683 to the remaining waters of the Truckee River is confirmed.

IV. Study Area

The study area includes the 3,060-square-mile Truckee River basin in northeastern California and northwestern Nevada, Lahontan Reservoir, and the lower Carson River basin[13] in northwestern Nevada. The two basins are hydraulically linked by the Truckee Canal, which extends from Derby Diversion Dam on the Truckee River to Lahontan Reservoir on the Carson River. (See location map.)

The Truckee River originates at the outlet of Lake Tahoe at Tahoe City, California, and flows approximately 120 miles to Pyramid Lake, a terminal lake that is part of and located within the Pyramid Lake Indian Reservation. The Carson River originates in the Sierra Nevada south of Lake Tahoe and flows about 125 miles to Lahontan Reservoir, which captures Carson River inflow plus water diverted from the Truckee River via the Truckee Canal.

Most of the runoff in the Truckee River basin originates in the Sierra Nevada in California. A portion of that runoff is stored in Federal and non-Federal reservoirs located in California: Lake Tahoe (the top 6.1 feet of which are regulated by Lake Tahoe Dam), and Prosser Creek, Stampede, and Boca Reservoirs (all Federal); Donner Lake (which includes storage space jointly owned by TMWA and TCID); and Independence Lake (owned and operated by TMWA). Operation of these reservoirs regulates much of the flow in the Truckee River basin in most years.

While Truckee River runoff is stored in California, most of the stored water is used in Nevada to meet M&I demands in Truckee Meadows, fish flow requirements, hydroelectric power demands, and irrigation demands. The amount of Truckee River flow diverted at Derby Diversion Dam to the Truckee Canal to serve water rights in the Newlands Project varies monthly and annually depending on irrigation demand, Lahontan Reservoir storage, and forecast Carson River runoff into the reservoir. The Newlands Project includes the Truckee Division (in and around Fernley, Nevada) and the larger Carson Division (in and around Fallon, Nevada) in the lower Carson River basin. TCID has a contract with Reclamation to operate the Newlands Project.

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[13] The lower Carson River begins at the outlet of Lahontan Reservoir and flows through Lahontan Valley to its terminus in the Carson Sink.

V. Background and History

A. History of Reservoir and River Operations

The first facility to impound the waters of the Truckee River was a private timber crib dam constructed at the outlet of Lake Tahoe in 1870. Construction of this dam initiated a series of disputes over rights to the use of the waters of Lake Tahoe and the Truckee River. The dam was used to regulate flows in the Truckee River so that logs could be floated to saw mills in Truckee, California. It also was used for milling purposes and to generate hydroelectric power. Several small run-of-the-river hydroelectric powerplants were constructed on the Truckee River around the turn of the 20th century. In 1908, the Truckee River General Electric Company, predecessor to Sierra Pacific, purchased the dam from the Floriston Pulp and Paper Company and the Floriston Land and Power Company and agreed to maintain specific flows (Floriston Rates) at the State line.

Following enactment of the Reclamation Act of 1902, the Secretary authorized construction of the Newlands Project, and the Reclamation Service (predecessor of Reclamation) began construction of Derby Diversion Dam and the Truckee Canal, which were completed in 1905 and 1906, respectively.

In 1903, Reclamation made claim to rights to the water stored in Lake Tahoe for delivery to the Newlands Project. The United States subsequently filed a condemnation lawsuit and entered into a series of lengthy negotiations with the owners of Lake Tahoe Dam and other local interests. These negotiations culminated in a 1915 Federal court decree known as the *Truckee River General Electric* decree, which gave the United States an easement for and the right to operate Lake Tahoe Dam and its controlling works. Between 1909 and 1913, Reclamation and the Electric Company reconstructed the dam at Lake Tahoe to its present configuration. The dam controls the top 6.1 feet of storage at Lake Tahoe as a Federal reservoir.[14]

In 1913, to secure water rights for the Newlands Project and Pyramid Lake Indian Reservation, the United States filed a quiet title action in Federal court in Reno, Nevada. This lawsuit, *United States* v. *Orr Water Ditch Company, et al.,* No. A-3, sought a comprehensive determination of water rights on the Truckee River and its tributaries and named as defendants all water users on the Truckee River in Nevada. In 1924, the special master assigned to hear the case issued a report and proposed decree, which was accepted by the Federal court and formed the basis of a temporary restraining order in 1926.

A severe drought from 1929 to 1935 resulted in extensive controversy among Reclamation, irrigators (both in Newlands Project and Truckee Meadows), and

[14] The natural lake rim and the dam at Tahoe City (creating the reservoir portion of the lake) restrict discharge from Lake Tahoe. The natural lake rim is at an elevation of 6,223.0 feet mean sea level (msl), Lake Tahoe datum, and the dam is operated according to the Truckee River Agreement to prevent the lake from exceeding elevation 6,229.1 feet msl.

landowners at Lake Tahoe over water rights, lake elevation, and attempts to pump water from the lake. Negotiations to settle these disputes resulted in the Truckee River Agreement of 1935 (TRA). Parties to TRA are Interior, Sierra Pacific, TCID, WCWCD, and other water right owners ("parties of the fifth part").

During the 1930s, additional water storage was purchased and developed to further control flows in the Truckee River system. In 1939, Sierra Pacific reconstructed Independence Lake Dam with an associated reservoir capacity of 3,000 acre-feet and additional capacity of 14,500 acre-feet, for a total capacity of 17,500 acre-feet. In 1943, Sierra Pacific and TCID purchased the rights to 9,500 acre-feet of storage in Donner Lake. Operation of Donner Lake is governed by the Donner Lake Indenture.

Following Congressional authorization for the Truckee Storage Project in 1935, Reclamation began construction of Boca Dam on the Little Truckee River. Construction was completed in 1939. The dam is operated by WCWCD.

In 1944, the U.S. District Court for the District of Nevada entered a final decree (*Orr Ditch* decree) in the quiet title action brought by the United States in 1913 to determine water rights on the Truckee River. The *Orr Ditch* decree affirmed individual water rights as to the "amount, place and type of use, and priority" in Nevada and incorporated TRA, which provided for operation of Lake Tahoe and Boca Reservoir to serve those rights. Parties to the *Orr Ditch* decree include the United States, Sierra Pacific, WCWCD, and individual water rights holders in Nevada, many of them agricultural water users in Truckee Meadows; subsequent to the entry of final judgment in the *Orr Ditch* case, the Pyramid Tribe intervened and is now a party to the decree.

Following Congressional authorization of the Washoe Project in 1958, Reclamation completed construction of Prosser Creek Dam on Prosser Creek in 1962. An agreement among Reclamation, Sierra Pacific, TCID, and WCWCD, the Tahoe-Prosser Exchange Agreement (TPEA) of 1959, provides for the conjunctive operation of Lake Tahoe Dam and Prosser Creek Dam. A purpose of TPEA—the first agreement in the Truckee River basin to exchange water stored in one reservoir with water stored in another reservoir to achieve multiple benefits—was to maintain fish flows in the Truckee River immediately downstream from Lake Tahoe. Also under authorization of the Washoe Project Act, Reclamation completed construction of Stampede Dam on the Little Truckee River in 1970. As a result of litigation (*Carson-Truckee Water Conservancy District* v. *Watt*, 1982), a Federal court upheld a determination of the Secretary that his obligations under ESA took precedence over his obligation to contract for delivery of water for irrigation and M&I uses from Stampede Reservoir. The court ruled that the Secretary must utilize all Project Water[15] stored in Stampede Reservoir for the benefit of the Pyramid Lake fishes until the cui-ui and LCT are no longer threatened or endangered, or until sufficient water for their conservation becomes available from other sources.

[15] Project Water is water stored in Lake Tahoe, Prosser Creek Reservoir, Stampede Reservoir, and Boca Reservoir pursuant to existing storage licenses or permit.

In 1967, the Secretary issued regulations for the Newlands Project known as OCAP. The principal purpose of OCAP was to regulate diversions at Derby Diversion Dam to maximize use of Carson River water and minimize use of Truckee River water for the Newlands Project. As a result of litigation (*Pyramid Lake Paiute Tribe of Indians* v. *Morton*, 1973), a Federal court ruled that OCAP then in effect was insufficiently protective of Pyramid Lake. The Secretary issued new OCAP in February 1973 to comply with the court's order. The 1973 OCAP imposed stricter limits on diversions from the Truckee River to the Newlands Project than had the previous OCAP.

In 1968, the California-Nevada Interstate Compact Commission approved a provisional Interstate Compact (Compact) for allocation of the waters of the Lake Tahoe, Truckee, and Carson basins. The Compact was ratified by California and Nevada in 1970 and 1971, respectively, but never ratified by the Congress. Even without such approval, the States have generally agreed to honor the Compact's allocations which are similar to the allocations in section 204 of P.L. 101-618 (incorporating modifications to address concerns of the United States and Pyramid Tribe), that would be implemented when TROA becomes effective.

In 1980, the U.S. District Court for the District of Nevada entered a final decree (*Alpine* decree) in response to *United States* v. *Alpine Land and Reservoir Company, et al.*, CV-D-183, a quiet title action brought by the United States, which adjudicated the rights and priorities to use the surface waters of the Carson River in California and Nevada, including for storage in Lahontan Reservoir and use on the Newlands Project, and established water duties for use on various lands. Following the entry of a final *Alpine* decree and the signing of a new contract between Reclamation and TCID in 1984, Interior issued a series of three, one-year "interim OCAP" while a longer term OCAP was prepared. OCAP was issued in 1988, and adjusted most recently in December 1997.

The Preliminary Settlement Agreement was entered into in 1989 by Sierra Pacific and the Pyramid Tribe to provide for more flexible operation of Federal reservoirs and the exercise of water rights of the parties to (1) improve spawning conditions for the Pyramid Lake fishes and (2) provide additional M&I water for Truckee Meadows during drought periods. Thus, under that agreement, Sierra Pacific agreed, among other things, to waive or change its rights to require releases of water from Truckee River reservoirs for hydroelectric power generation under the *Truckee River General Electric* and the *Orr Ditch* decrees. To address concerns of the United States, it was later changed to Preliminary Settlement Agreement as Modified by the Ratification Agreement (PSA).

P.L. 101-618 was enacted by Congress in 1990 to provide the direction, the authorities, and the mechanisms for resolving a number of issues involving water resources and water rights in the Truckee River and Carson River basins, among other matters. To achieve these purposes, P.L. 101-618 directs, among other actions, negotiation of an operating agreement for Truckee River reservoirs (i.e., TROA), and that that agreement, in part, carry out the terms, conditions, and contingencies of PSA.

The Interim Storage Agreement among the Secretary, Sierra Pacific, WCWCD, and the Pyramid Tribe, agreed to in 1994, allows Sierra Pacific (now TMWA) to store privately owned water in Stampede and Boca Reservoirs to meet domestic, municipal, and industrial water needs in Truckee Meadows during drought situations. This agreement will be superseded by TROA when TROA is implemented.

On October 10, 1996, the U.S. Department of Justice (Justice), U.S. Environmental Protection Agency, and Interior joined the Nevada Division of Environmental Protection, Washoe County, Reno, Sparks, and Pyramid Tribe in signing the Truckee River Water Quality Settlement Agreement (WQSA). WQSA resulted in dismissal of litigation over expansion of the Reno-Sparks wastewater treatment facility (Truckee Meadows Water Reclamation Facility). WQSA establishes a program to improve water quality by increasing flows in the Truckee River through the purchase and dedication of Truckee River water rights for instream flow. It obligates the United States and Truckee Meadows communities to each acquire $12 million worth of Truckee River water rights and transfer those rights for the purposes of water quality and instream flow in the lower Truckee River and Pyramid Lake. Water associated with the exercise of water rights acquired pursuant to WQSA would be stored, when possible, in Truckee River reservoirs and would be managed by the parties acquiring water rights under WQSA and by the Pyramid Tribe.

On August 28, 2007, the negotiators for the signatories—Interior and Justice, California and Nevada, Pyramid Tribe, TMWA, and other entities in California and Nevada—approved a proposed Negotiated Agreement for the final EIS/EIR. The result of 17 years of negotiations, it represents the negotiators' proposed action and preferred alternative for operating reservoirs in the Lake Tahoe and Truckee River basins in a manner that will carry out terms of P.L. 101-618, as described elsewhere in this document.

B. Water Rights Administration on the Truckee River Today

Water rights in California and Nevada generally are administered by SWRCB and the Nevada State Engineer, respectively. California surface water rights may be held under riparian or appropriative rights or certain other doctrines. California has no statewide system for administering groundwater rights, except for subterranean streams flowing through known and definite underground channels; such water is subject to the water rights process for surface water (CWC section 1200).[16] Nevada water law is based on the appropriative rights doctrine with a statewide water rights system for administering both surface water and groundwater.

[16] Groundwater rights are regulated in certain parts of California, mostly by local agencies. Certain groundwater basins have been specially adjudicated; others are regulated by a special act management district or by a county which has adopted a groundwater ordinance.

In California, under the riparian rights doctrine, persons owning land contiguous to a stream or a lake have the right to make reasonable use of the water's natural flow (precluding long-term storage) on such lands within the watershed of the stream or lake. All riparians share the natural flow irrespective of priority (see following), and their rights are correlative; if the flow decreases, each riparian's share decreases proportionately. Riparian rights may not be used outside the boundaries of the riparian holding, and cannot be sold or transferred for use on nonriparian land. Riparian rights are not lost through nonuse or forfeiture. No water right permit is required for riparian use in California, but such users are required to file a "Statement of Water Diversion and Use" with SWRCB. There are few riparian rights on the Truckee River, and no riparian rights are affected by TROA.

In California and Nevada, the appropriative rights doctrine is based on the concept of first in time, first in right, i.e., the first person to take a quantity of water and put it to beneficial use (e.g., agriculture, M&I, domestic use, hydroelectric power generation, or recreation) has a higher ("senior") priority of right of use than a subsequent ("junior") appropriative user. Senior rights must be fully satisfied before a junior appropriator may divert water. A person initiating a modern appropriative right must file an application with SWRCB or the Nevada State Engineer. Approval of the application results in the issuance of a water right permit, which may later be converted into a license (California) or certificate (Nevada). At the time of licensing or certification, the right may be limited to what the permittee has actually used. The license, certificate, or permit will identify point(s) of diversion, purpose(s) of use, and place(s) of use for the water to serve the project. Although the actual practices and terminology may vary between California and Nevada, in general, the use of an appropriative water right (referred to as "exercise") may involve capturing and retaining streamflow in a reservoir ("diversion to storage" or "storage"), removing water from a stream ("direct diversion") or reservoir ("rediversion"), or retaining water in a stream and allowing it to continue to flow.[17]

Appropriative rights may be sold or transferred from land to which they are appurtenant. An appropriative right may be lost through non-use in California, if the water is not put to beneficial use for a period of 5 years ("forfeiture"); in Nevada, an appropriative water right may be lost through abandonment, which requires proof of intent to forsake or relinquish the right. An application or petition must be filed with the Nevada State Engineer or SWRCB to change the manner, type, or place of use of a water right. All actions regarding appropriative water rights are public processes.

In *National Audubon Society* v. *Superior Court*, the California Supreme Court held that California water law is an integration of the public trust doctrine and the appropriative water right system. The public trust doctrine, which arose from the sovereign ownership

[17] Nevada law recognizes appropriation of water for instream (or "*in situ*") uses, where the appropriated water is allowed to remain in the stream to serve fish and wildlife or recreational uses. California law does not recognize appropriation of water for instream uses, but it does allow an owner of an appropriative or riparian or other water right to petition SWRCB to change it into an instream flow right (CWC section 1707). In addition, California has a number of regulatory statutes and the public trust doctrine, which can require maintenance of instream flows.

of tidelands and navigable river beds, requires the State to protect public trust resources, such as fish and wildlife, recreation, and environmental values. The *Audubon* case holds that the State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and no water right holder has a vested right to use water in a manner harmful to the trust. When SWRCB approves a water diversion, therefore, it must consider the effect of such diversions on public trust resources and avoid or minimize any harm to those resources where feasible. The California courts and SWRCB have concurrent jurisdiction to review diversions of water and their impacts on public trust resources. All uses of water, including public trust uses, must conform to the standard of reasonable use under the California Constitution, article X, section 2.

With the exception of Lake Tahoe, Federal reclamation projects in the Truckee River basin hold permits or licenses from California. In Nevada, Truckee River water rights are administered pursuant to the *Orr Ditch* decree. The Federal Water Master appointed by the *Orr Ditch* court oversees and coordinates reservoir operations and the delivery of water for *Orr Ditch* decree water rights, as well as maintains a water accounting system and issues TMWA daily reports of hydrologic data measurements. The Nevada State Engineer has primary jurisdiction over applications to change the manner, purpose, or place of use of water rights subject to the *Orr Ditch* decree. (General operations under administration of the Federal Water Master are described in the following section.)

C. Current Reservoir and River Operations in the Truckee River Basin

The Truckee River is a highly regulated river system. Dams at the outlet of Lake Tahoe and on several major tributaries in the Truckee River basin (location map) create reservoirs that together can store about a million acre-feet of water. As described previously, a number of court decrees, agreements, and regulations govern day-to-day operations of these reservoirs, administered by the Federal Water Master for the *Orr Ditch* court. The reservoirs are operated to capture runoff as available when flow in the river is greater than that needed to serve downstream water rights in Nevada and to maintain prescribed streamflows, known as Floriston Rates, in the Truckee River measured at the Farad gauge near the California-Nevada State line. Floriston Rates provide water to serve hydroelectric power generation, M&I use in Truckee Meadows, streamflow, and agricultural water rights. In general, reservoir releases are made as necessary to meet dam safety or flood control requirements and to serve water rights when unregulated flow cannot be diverted to serve those rights. Minimum reservoir releases are maintained as specified in applicable agreements and the reservoir licenses and/or permits.

In general, each reservoir currently has authorization to serve specific uses. For example, Lake Tahoe and Boca Reservoir are jointly operated to store and release Floriston Rate Water solely to maintain Floriston Rates. Prosser Creek and Stampede Reservoirs store and release Project Water at specific times to benefit cui-ui and LCT of the lower Truckee River and Pyramid Lake. Project Water in Prosser Creek Reservoir is also exchanged with Floriston Rate Water in Lake Tahoe to maintain prescribed minimum flows in the Truckee River immediately downstream from Lake Tahoe Dam. Martis Creek Reservoir, a U.S. Army Corps of Engineers facility, is only used for flood control. Independence Lake is operated to supplement water for M&I use in Truckee Meadows, hydroelectric power generation, and occasionally to assist in achieving Floriston Rates. Donner Lake is operated for lake-related recreation and to supplement water M&I use in Truckee Meadows, hydroelectric power generation, occasionally to assist in achieving Floriston Rates, and for irrigation on the Newlands Project when allowed by OCAP.

A more detailed description of current reservoir operations is presented in the discussion of the No Action Alternative in chapter 2.

VI. Other Authorities

In addition to the pertinent court decrees, decisions, laws, regulations, and agreements that govern water storage and river operations in the Truckee River basin discussed previously, TROA may be subject to some or all of the environmental authorities listed in table 1.1.

VII. Participating Agencies

A. Signatories

The following entities participated in the negotiation and development of TROA and are the anticipated signatories (those identified by * are mandatory signatories):

- Interior*
- California*
- Nevada*
- TMWA*
- Pyramid Tribe*
- Sierra Pacific
- WCWCD
- City of Reno, Nevada
- City of Sparks, Nevada
- City of Fernley, Nevada
- Washoe County, Nevada
- Sierra Valley Water Company
- Carson-Truckee Water Conservancy District
- North Tahoe Public Utility District
- Truckee Donner Public Utility District

Table 1.1—Environmental authorities

Authority	Reference
National Environmental Policy Act	42 U.S.C. 4321 *et seq*.
Council on Environmental Quality Regulations	40 Code of Federal Regulations parts 1500-1508
Department of the Interior Implementing Procedures	516 Departmental Manual 1-7
Endangered Species Act, as amended	16 U.S.C. 1531 *et seq*.
National Historic Preservation Act and implementing regulations	16 U.S.C. 470 *et seq*. 36 Code of Federal Regulations 800
Antiquities Act of 1906	16 U.S.C. 431 *et seq*.
Archeological Resources Protection Act, as amended	16 U.S.C. 470aa *et seq*.
California Environmental Quality Act	Public Resources Code section 21000, *et seq*. Title 14, Section 15000 *et seq*. of the California Code of Regulations (commonly known as the CEQA Guidelines
California Environmental Justice	Government Code Section 65040.12 and Public Resources Code Section 72000
Clean Air Act	42 U.S.C. 7401 *et seq*.
Clean Water Act	33 U.S.C. 1251 *et seq*.
Pollution Prevention Act of 1990	42 U.S.C. 13101 *et seq*.
Safe Drinking Water Act	42 U.S.C. s/s 300f *et seq*.
Migratory Bird Treaty Act	16 U.S.C. 703-711
NEPA Protection and Enhancement of Environmental Quality	Executive Order No. 11512
National Historic Preservation Act	Executive Order No. 11593
Floodplain Management	Executive Order No. 11988
Protection of Wetlands	Executive Order No. 11990
Federal Compliance with Pollution Control Standards	Executive Order No. 12088
Environmental Justice	Executive Order No. 12898
Indian Sacred Sites	Executive Order No. 13007
Consultation and Coordination with Indian Tribal Governments	Executive Order No. 13084
Invasive Species	Executive Order No. 13112
Government to Government Relations with Native American Tribal Governments	Memorandum for the Heads of Executive Department and Agencies (April 29, 1994)
American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act	Secretarial Order No. 3206
Porter-Cologne Water Quality Control Act	California Water Code – Division 7
Prohibition on waste of water	California Constitution, article X, section 2
Beds and banks and Appropriation of water	California Public Trust Doctrine
Water rights administration and groundwater management	California Water Code – Divisions 1, 2, 6, 7
Historic preservation, wild and scenic rivers, and environmental quality	California Public Resources Code sections 5020, 21000, 5093
Endangered species, fish flows, and streambed alteration agreements	California Fish and Game Code sections 2050, 5937, 1601
Nevada Water Quality Standards	Nevada Revised Statutes 445A

B. Cooperating/Responsible Agencies

Most of the following are cooperating or responsible agencies and have jurisdiction by law over some aspect of TROA or contributed special expertise to the EIS/EIR:

- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Forest Service
- U.S. Geological Survey
- Bureau of Land Management
- California Department of Fish and Game
- California State Water Resources Control Board
- California State Lands Commission
- Lahontan Regional Water Quality Control Board
- California State Historic Preservation Officer
- Nevada Department of Conservation and Natural Resources
    - Nevada Division of Water Resources
- Nevada Department of Wildlife
- Nevada State Historic Preservation Office
- Washoe County, Nevada
- Truckee Meadows Water Authority
- Tahoe Regional Planning Agency

C. Interested Parties

The following non-Federal agencies and entities with an interest in the Truckee River and reservoir operations or with technical expertise contributed to the EIS/EIR:

- Truckee-Carson Irrigation District
- Churchill County, Nevada
- Fallon, Nevada
- Carson Water Subconservancy District
- Lahontan Valley Environmental Alliance
- Newlands Water Protective Association
- Lyon County, Nevada
- California Resources Agency
- Del Oro (Donner Lake) Water Company
- Glenshire Mutual Water Company
- South Tahoe Public Utility District
- Truckee River Basin Water Group

- Tahoe-Truckee Sanitation Agency
- Town of Truckee
- Nevada County
- Placer County
- Sierra County
- North Tahoe Public Utility District
- Tahoe City Public Utility District
- Truckee Donner Public Utility District
- Truckee Donner Recreation and Park District
- Northstar Community Service District
- Sierra Valley Water Company
- Alpine Springs County Water District
- Squaw Valley Mutual Water Company
- Squaw Valley Public Service District
- Poulsen Water Company
- Placer County Water Agency
- Tahoe Resource Conservation District

VIII. Summary of Issues

A public involvement program, beginning with public scoping meetings, encouraged the general public and governmental agencies to help identify issues related to the resources in the Truckee River basin. (See chapter 5 for detailed information.) The identified issues are summarized by the following statement:

- Modifying operations of Truckee River reservoirs could affect the storage and elevations of lakes and reservoirs and the quantity, quality, timing, and duration of flows, thus affecting related resources.

Potentially affected resources were grouped into the following categories:

- Water (surface water and groundwater supply, rights, quality, sedimentation, and erosion)
- Biological (fish, wildlife, and plants in and along reservoirs and streams, and endangered, threatened, and other special status species)
- Socio-economics (including recreational resources)
- Cultural
- Indian trust resources

These resources and related effects are described in chapter 3, “Affected Environment and Environmental Consequences.”

Chapter 2

ALTERNATIVES

This chapter describes the process used to develop the alternatives, describes those alternatives considered and rejected, and provides a narrative and tabular comparison of the alternatives considered. Additionally, a table at the end of the chapter (table 2.10) summarizes the effects of the alternatives on the resources of the study area.

I. Development of Alternatives

This section presents a brief history of negotiations for proposed TROA and a description of the process used to develop alternatives.

A. History of Negotiations

Use of Truckee River water has been in dispute for more than a century, beginning with the construction of a dam across the outlet of Lake Tahoe in 1870. (See chapter 1, Section V. A., "History of Reservoir and River Operations.") The Washoe Project Feasibility Report by the Bureau of Reclamation (Reclamation) in 1954 stimulated negotiations to allocate use of Truckee River water between Nevada and California. In 1955, the California-Nevada Interstate Compact Commission, with representatives from California, Nevada, and United States, was formed to develop an interstate allocation. Ten years of negotiations, which were expanded to include the waters of the Carson and Walker Rivers, produced a draft Interstate Compact (Compact).[1] Ultimately, the State legislatures passed legislation adopting the draft Compact, but it was never ratified by the Congress.

The latest effort to resolve the water issues and to provide for future demands was the passage by the Congress of Public Law (P.L.) 101-618 in 1990. Many parties—public agencies, water users, and environmental groups—participated in developing that legislation. (See chapter 1, Section V. A., "History of Reservoir and River Operations.") In addition to many other water use issues, P.L. 101-618 addresses the Preliminary Settlement Agreement as Modified by the Ratification Agreement (PSA) and the draft Compact ratified by Nevada and California in the early 1970s.

On December 10, 1990, the Department of the Interior (Interior) conducted an organizational meeting to discuss its obligations and responsibilities—timing, direction, organization, coordination, and cooperation—for implementing P.L. 101-618, including negotiation of TROA. That meeting was widely announced and well attended; a number

[1] California-Nevada Interstate Compact, California Water Code Sec. 5976 and Nev. Rev. Stat. Sec. 538.600 (as ratified and approved by the legislature of both States, but not consented to by Congress).

of agencies, governments, and organizations, including the five mandatory signatories to TROA (United States, California, Nevada, Pyramid Lake Paiute Tribe of Indians [Pyramid Tribe], and Sierra Pacific Power Company [Sierra Pacific][2]), were represented. On February 20-21, 1991, Interior conducted the first of many working meetings to "draft a management plan for the preparation of the Truckee River Operating Agreement over the next 3 or 4 years." In addition to the five mandatory signatories, eight other negotiating parties (for a total of 13) were identified to participate in this process. Invitations were also extended to interested parties to attend as observers. The 13 negotiators were:

- United States (Departments of the Interior and Justice)
- Nevada
- California
- Pyramid Tribe
- Sierra Pacific
- Washoe County, Nevada
- Reno, Nevada
- Sparks, Nevada
- Washoe County Water Conservation District
- Fernley, Nevada
- Truckee-Carson Irrigation District (TCID)
- Churchill County, Nevada
- Fallon Paiute-Shoshone Tribes

TCID, Churchill County, and the Fallon Paiute-Shoshone Tribe did not continue to participate in the negotiations. Since 1991, Carson-Truckee Water Conservancy District, Truckee Donner Public Utility District, Sierra Valley Water Company, and North Tahoe Public Utility District have joined the negotiations. This group of 14 parties negotiated the terms of the proposed Negotiated Agreement (hereafter simply referred to as Negotiated Agreement).

Numerous negotiating sessions, technical meetings, drafting sessions, and public plenary meetings have been conducted in the 17 years since the first meeting, and a number of public and private interest groups from Nevada and California have participated in the negotiation process as observers and commentators. In May 1996, the parties completed a Draft Agreement, and Interior and California jointly issued a draft environmental impact statement/environmental impact report (DEIS/EIR) for that Draft Agreement in February 1998. Negotiations resumed in 1999 to address a number of new issues that had emerged since 1996. This second set of negotiations, completed in October 2003, resulted in another Draft Agreement that was substantially different from the May 1996

[2] Truckee Meadows Water Authority (TMWA) is the successor to Sierra Pacific, one of the original mandatory signatories of TROA. See chapter 1 for more information about Sierra Pacific selling its water company to TMWA.

version. As a result, a decision was made to prepare an environmental analysis of the October 2003 Draft Agreement. A revised DEIS/EIR was released in August 2004. This final EIS/EIR evaluates the Negotiated Agreement, which contains many of the same provisions as the October 2003 Draft Agreement. (Exhibit A in the attachment to chapter 2 presents highlighted changes to the October Draft Agreement.)

B. Development Process for the TROA Alternative

Current Truckee River reservoir operations (Section I, “Affected Environment” in “Surface Water” in chapter 3 describes current conditions) are not sufficiently flexible to serve future Truckee Meadows municipal and industrial (M&I) drought demand and to enhance riverine habitat for Pyramid Lake fishes. Therefore, easing or removing operational restrictions to increase flexibility was central to developing TROA.

During the negotiation process, several alternatives for increasing operational flexibility and efficiency of existing reservoirs in the Lake Tahoe and Truckee River basins were developed, evaluated, and submitted to the negotiators for consideration. (See Section V, “Alternatives Considered and Rejected,” in this chapter.) As each alternative was considered, elements of the alternative that were acceptable to the negotiators became part of the proposed agreement, and those not acceptable to the negotiators were rejected.

The process of developing alternatives began in 1992, concurrent with negotiations. The initial intent of the negotiators was to develop and analyze a range of reasonable alternatives for the EIS/EIR, assuming the negotiated agreement would fall within that range.

By 1994, the alternatives being considered gave priority to specific issues identified through the scoping process or negotiations, as follows:

- Enhancements for endangered and threatened species
- Enhancements for general fish and wildlife resources
- Maintenance of recreational pools in reservoirs
- Storage of California’s surface water
- Water supply for drought relief in Nevada

The negotiators explored these thematic alternatives to determine if elements of any of these might reasonably fit into an agreement framework. In 1995, the negotiators began to evaluate the potential effects of these alternatives in light of water rights, storage, and streamflow.

Analysis of these thematic alternatives was presented in the Report to the Negotiators. Distributed to the negotiators in January 1996, the report followed the format of an EIS/EIR (summarized in “Alternatives Considered and Rejected”).

In reviewing the Report to the Negotiators, and through subsequent negotiations, the negotiators concluded that many identified water management goals could be achieved only by providing flexibility to allow exchanges and transfers of water among reservoirs. In most cases, the objective of an alternative could not be fully achieved unless the negotiators agreed on cooperative management measures, including relinquishing control of timing of water releases. This conclusion led to negotiations on topics such as exchange procedures, including mandatory exchanges, priorities for exchanges, and accounting.

The Report to the Negotiators brought recognition that the proposed agreement should, to the extent possible, incorporate the thematic issues that had previously been described in separate alternatives. The negotiation process then began to separate those elements that could be agreed upon and made part of the agreement from those that could not be agreed to by one or more of the negotiators for the mandatory signatories and were, therefore, dropped from further consideration. As a result of negotiations, alternatives discussed in the Report to the Negotiators were eliminated from consideration in a DEIS/EIR because they did not meet the requirements of P.L. 101-618.

A DEIS/EIR was published for public review and comment in 1998. Negotiations since that time have resulted in a number of changes to the May 1996 version to produce the October 2003 Draft Agreement; also, another action alternative was developed. To serve the purposes of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), a revised DEIS/EIR was published for public review and comment in 2004.

C. Alternatives Considered

Three alternatives, based on projected future conditions when TROA is anticipated to be fully implemented (the year 2033), are evaluated in this final EIS: No Action Alternative (No Action), Local Water Supply Alternative (LWSA), and TROA Alternative (TROA). Potential effects of the action alternatives are compared to No Action as well as to current conditions (chapter 3). Current conditions are not adequate to serve future demands.

Adoption and implementation of the Negotiated Agreement is the proposed action. Without adoption of the Negotiated Agreement, operation of all reservoirs under No Action or LWSA would continue to be the same as under current conditions. LWSA is an action alternative similar to No Action but with additional water supply options that may be authorized by local government agencies. Table 2.1 provides a comparison of water management provisions among the alternatives.

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letters and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter)

Text sections	No Action	LWSA	TROA
A. Overview			
	See No Action	See LWSA	See TROA
B. Interstate allocation			
Interstate Allocation of Truckee River and Lake Tahoe	1. Though not in effect without Federal approval, States would probably abide by the allocation of the draft Compact	1. Same as No Action	1. Truckee River and Lake Tahoe allocation between California and Nevada fully executed as provided in P.L. 101-618
	2. Continue moratorium or policy equivalent on issuing new surface water rights in California	2. Approval of some pending surface water rights applications in California	2. Approval of some pending surface water rights applications in California
			3. Establishes well drilling criteria for upper Truckee River basin
C. Water operations and facilities			
1. Water categories			
Water categories	Project Waters, Newlands Project Credit Storage (NPCS), and Private Water	Same as No Action	Credit Waters in addition to those under No Action
2. Floriston Rates			
Floriston Rates	As required by *Truckee River General Electric* and *Orr Ditch* decrees – may be reduced to serve *Orr Ditch* decree water rights during drought	Same as No Action	Floriston Rate Water could be retained in storage to accumulate Credit Water or used to maintain Floriston Rates
3. Reservoir operations			
Project Water and Private Water operations (storage and release priorities)	Same as current operations	Same as No Action	Most Project Water (includes Private Water by definition) operations would continue, except some Credit Water operations could change Stampede and Prosser Project Water operations
Newlands Project Credit Storage (NPCS) operations	Same as current operations	Same as No Action	Expands Newlands Project Credit Water (includes NPCS by definition) operations and storage locations

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
Flood control and dam safety	Same as current operations	Same as No Action	Same as No Action
a. Accumulation, storage, and release			
i. Lake Tahoe and Boca Reservoir			
Lake Tahoe and Boca Reservoir operations	Store and release Floriston Rate Water for maintenance of Floriston Rates in accordance with Truckee River Agreement (TRA) and *Truckee River General Electric* decree	Same as No Action	Floriston Rate Water could be retained in storage to accumulate Credit Water or used to maintain Floriston Rates
ii. Donner Lake			
Private Water operations	TMWA and TCID operate in accordance with the 1943 Donner Lake Indenture and dam safety	Same as No Action	Similar to No Action, except TMWA Private Water could be used to create M&I Credit Water
iii. Prosser Creek Reservoir			
Store and exchange Tahoe-Prosser Exchange Water for minimum releases from Lake Tahoe	According to TPEA	Same as No Action	Elements of Tahoe-Prosser Exchange Agreement (TPEA) retained, but Credit Water releases would reduce the need for TPEA exchange water
Use Prosser Project Water for minimum reservoir releases and Pyramid Lake fishes consistent with the Endangered Species Act of 1973, as amended (ESA)	Yes	Same as No Action	Expands maintenance of minimum releases and continues use of water for Pyramid Lake fishes, even if they are no longer listed
9,800 acre-feet of Prosser Project Water retained in storage until following year	Reserved for possible TPEA exchange during following year	Same as No Action	Credit Water reserved in lieu of Prosser Project Water for TPEA exchange the following year and could be drawn down to 5,000 acre-feet in the fall
iv. Independence Lake			
Store and release Private Water	To serve immediate M&I demand	Same as No Action	TMWA could create M&I Credit Water or serve immediate M&I demand

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
Store and release Fish Water, Fish Credit Water, and Joint Program Fish Credit Water	No	No	Provide spawning access for Independence Lake Lahontan cutthroat trout (LCT) by maintaining lake elevation
v. Stampede Reservoir			
Storage permit	126,000 acre-feet of Fish Water may be accumulated annually	Same as No Action	Supports permit to allow additional Fish Water to be stored in available space (up to 100,000 acre-feet) as Fish Credit Water
Stampede Project Water used for Pyramid Lake fishes consistent with ESA and U.S. District court ruling	Yes	Same as No Action	Stampede Project Water used for Pyramid Lake fishes even if de-listed under ESA, but would be junior in priority to a few Credit Water operations
Interim Storage Agreement	Continue for duration of agreement	Same as No Action	Terminated
Hydroelectric power generation	Incidental to reservoir release	Same as No Action	Same as No Action
Storage of Water Quality Water	Only as exchange for Stampede Project Water	Same as No Action	Allows full implementation of Truckee River Water Quality Settlement Agreement (WQSA) - Water Quality Credit Water managed pursuant to WQSA
vi. Martis Creek Reservoir			
Use to temporarily store flood water	Yes	Same as No Action	Same as No Action
vii. Lahontan Reservoir			
Use to store water for Carson Division	Yes	Same as No Action	Same as No Action
b. Recreation pools			
Maintenance of recreation pools	None	Same as No Action	Not required, but Administrator would encourage scheduling of releases to meet recreation objectives in California Guidelines - U.S. would attempt to maintain 19,000 acre-feet in Prosser Creek Reservoir during summer

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
c. Minimum fish pools			
Maintenance of pools	None	None	5,000 acre-feet in Prosser Creek Reservoir
d. Minimum reservoir releases			
Minimum releases	As shown in table 2.4, though all would not be mandatory	Same as No Action	All releases would be mandatory and a few could be greater than those in table 2.4
Use of Credit Water to enhance minimum releases	No	No	Enhanced minimum releases required to the extent Credit Water exchanged
e. Flood control operations (reservoirs) and dam safety requirements			
Operations during flood conditions	In accordance with U.S. Army Corps of Engineers (COE) requirements	Same as No Action	Same as No Action
f. Spills, conveyance losses, and evaporation looses			
Operations during spills and precautionary release	In accordance with COE and dam safety requirements	Same as No Action	In accordance with COE and dam safety requirements, generally Credit Waters would spill before Project Water
g. Reservoir pumping			
Lake Tahoe	Requires Federal court order, Secretary's approval for irrigation, approval of California and Nevada for M&I, and according to applicable laws	Same as No Action	Requires Federal court order, approval of California, Nevada, and Secretary only for M&I during extreme drought conditions and according to applicable laws
Independence Lake	Obtain necessary California permits and comply with Federal and State laws	Same as No Action	Same as No Action
h. Emergencies			
Emergency and maintenance operations	Reservoir operations would not interfere	Same as No Action	Same as No Action
4. TMWA's hydroelectric diversion dams			
TMWA hydroelectric diversions	Single purpose water right—requires maintenance of Floriston Rates	Same as No Action	TMWA would waive single purpose water right so Credit Water could be accumulated

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
Hydroelectric bypass flow	1. Farad - 150 cfs minimum	Same as No Action	All four facilities – 50 cfs minimum and up to 150 cfs of Fish Water could be bypassed to enhance stream flows
	2. Fleish, Verdi, and Washoe - 50 cfs minimum	Same as No Action	
Divert any water from river to remove ice from Highland Ditch during December – February	Yes	Same as No Action	TMWA could continue to divert water from the river, except for Fish Water and Fish Credit Water released to compensate for ditch diversion.
Accumulation of Credit Water adverse to TMWA's hydroelectric water rights under Claims Number 5 through 9.	No	No	TMWA would not object as long as compensated according to TROA provisions
5. Water exportation from Little Truckee River to Sierra Valley			
About 7,000 acre-feet of Little Truckee River water could be exported annually to Sierra Valley	Yes	Same as No Action	Yes, except water could be acquired and retained as Credit Water in the Truckee River basin.
6. Municipal and industrial water resources			
a. TMWA—Actions to meet future M&I demand of 119,000 acre-feet per year			
Exercise of existing water rights	Continue to exercise rights to 40 cfs, Private Water, acquired irrigation water rights, and Interim Storage Agreement Water	Same as No Action	TMWA would continue to exercise existing water rights and Credit Water would replace Interim Storage Agreement Water
Transfer of irrigation water rights to M&I use	Developers would continue to be required to dedicate former irrigation water rights for new M&I service	Same as No Action	1. Developers would dedicate former irrigation water rights at a 1.11/1.00 ratio, the excess used to accumulate Credit Water.
			2. U.S. would not object to TMWA acquiring TCID's half of Donner or seeking permission to pump 2,000 from Sparks Marina Lake
Pumping Truckee Meadows groundwater	1. Normal water years, 12,570 acre-feet	1. Normal water years, 12,570 acre-feet	1. Normal water years, 12,570 acre-feet
	2. Dry water years, up 22,000 acre-feet	2. Dry water years, up to 26,500 acre-feet	2. Dry water years, 15,950 acre-feet

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
		3. Initiate a 1,000 acre-feet per year recharge program	
Water conservation	1. Water saved through meter retrofit would not be reserved for dry water years	1. Same as No Action	1. Water saved through meter retrofit would be reserved for dry water years as Credit Water.
	2. Anticipated water conservation: 10% normal water years 19% dry water years	2. Anticipated water conservation: 10% normal water years 14.7% dry water years	2. Anticipated water conservation: 10% normal water years 15% dry water years
b. Fernley			
Actions to meet future M&I demand	Use groundwater and surface irrigation rights from the Newlands Project	Same as No Action	In addition to using surface water and groundwater, excess surface water stored as Credit Water
c. Lake Tahoe in Nevada			
Actions to meet future M&I demand	Diverted from tributaries and pumping Lake Tahoe and groundwater	Same as No Action	Same as No Action
d. Truckee River and Lake Tahoe basins in California			
Actions to meet future M&I demand	1. Truckee River basin: Increase annual ground-water usage by 12,030 acre-feet	1. Truckee River basin: Increase annual ground-water usage by 10,830 acre-feet and increase annual surface water diversions by 1,200 acre-feet	Same as LWSA
	2. Lake Tahoe basin: Increase annual surface/ groundwater usage by 4,300 acre-feet	2. Lake Tahoe basin: Increase annual combined surface water/groundwater usage by 4,300 acre-feet	
7. Administration, accounting, and schedule			
Administration of *Orr Ditch* decree	Federal Water Master	Same as No Action	Federal Water Master would still administer the decree, and the Administrator would carry out the terms of TROA
8. Additional elements unique to TROA			
California Guidelines for flows and storage	No incentive to follow guidelines	No incentive to follow guidelines	Administrator would encourage scheduling parties to follow
Habitat restoration fund	None	None	Parties to TROA would establish a 30-year fund for riverine habitat restoration

Table 2.1—A comparison of water management provisions among the alternatives (Table entries correspond to sub-sections [numbers/letter and titles] under Sections II. No Action, III. LWSA, and IV. TROA in this chapter) – continued

Text sections	No Action	LWSA	TROA
Storage contract and hydroelectric power compensation	None	None	Parties to TROA would have storage contract with Reclamation and TMWA would be compensated for the loss of certain hydroelectric power generation

The three alternatives also include projections by TMWA, Reno, Sparks, and Washoe County (March 12, 2003, letter[3] to the Bureau of Indian Affairs in attachment C) that different amounts of supplemental water[4] from water right acquisitions, groundwater pumping and injection wells, and water conservation practices would be secured under each alternative to meet future M&I demand in Truckee Meadows. Because TMWA is responsible for most of the Truckee Meadows water supply and has undertaken a resource planning process to evaluate all alternative water supplies (2005–2025 Water Resource Plan: Working Draft Volume 2, November 5, 2002; and the final version, 2005-2025 Water Resource Plan, March 2003), these projections were included in the alternatives. In addition, the alternatives include projections by California Department of Water Resources (CDWR) that different amounts of surface water and groundwater would be used in the Lake Tahoe and Truckee River basins in California under each alternative.[5] (See attachment D.)

II.   No Action

Evaluation of No Action is required by regulations implementing both NEPA (40 Code of Federal Regulations [CFR] 1502.14(d)) and CEQA (Title 14, California Code of Regulations [CCR] section 15126.6). No Action describes water management in the Truckee River basin if the proposed action or other action alternatives were not implemented. No Action may be thought of as a continuation of current operations and trends in the study area for the next 26 years (to 2033) when the annual demand for TMWA's M&I water in Truckee Meadows is projected to reach 119,000 acre-feet. No Action assumes that current surface water administrative policies would continue. Such policies include California's State Water Resources Control Board (SWRCB)

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[3] Projections given in this letter were based on TMWA's 2005-2025 Water Resource Plan, March 2003. TMWA's board of directors accepts this water budget and water resource plan as fulfillment of its responsibility under the Joint Powers Authority agreed to by Washoe County, Reno, and Sparks on October 20, 2000.

[4] See the associated section C.6.a in each alternative for a description of supplemental water resources.

[5] See the associated section C.6.d and table 2.5 for a description of California water usage associated with each alternative.

moratorium or policy equivalent on processing pending water right applications that would exceed the interstate allocation as established in the draft Compact for the Lake Tahoe basin.

A. Overview

Under No Action, Truckee River reservoir operations would remain unchanged from current operations (described in "Water Operations and Facilities") and would be consistent with existing court decrees, agreements, and regulations described in chapter 1 that currently govern surface water management (i.e., operating reservoirs and maintaining streamflows) in the Lake Tahoe and Truckee River basins. TMWA's existing programs for surface water rights acquisition and groundwater pumping for M&I use would continue. Groundwater pumping and water conservation in Truckee Meadows, however, would satisfy a greater proportion of projected future M&I demand than under current conditions. Groundwater pumping in California also would increase to satisfy a greater projected future M&I demand.

B. Interstate Allocation

The apportionment of waters of Lake Tahoe and the Truckee River and Carson River basins conditionally approved by the Congress in section 204(b) and (c), respectively, of P.L. 101-618 would not become effective under No Action. Current surface water administrative policies would continue.

California and Nevada may continue to honor, as far as possible, the allocations in the draft Compact (though not ratified by the Congress), which are similar to the allocations in P.L. 101-618. It is assumed for purpose of the No Action analysis that current surface water administrative policies would continue, including SWRCB's moratorium in effect since 1972, on acting on pending water right applications in the Lake Tahoe basin that would exceed the draft Compact's allocation or subsequent policy equivalent.

It is also reasonable to assume that, because of projected community growth in the study area, some existing appropriative and riparian water rights not being fully used could be used more efficiently or that diversion amounts could be lawfully increased in the future. When asked to identify a specific quantity for input to the operations model, CDWR estimated that an additional 300 acre-feet per year could be made available in the Truckee River basin in California under existing appropriative and riparian water rights.[6] For example, subject to the requirements of existing law, a water right permittee may build up diversions and use over time to the full amount authorized in the permit. This type of action, together with other lawful adjustments to diversions, is assumed to increase water diversions by 300 acre-feet by 2033, without granting any new water rights permits.

[6] The upper Truckee River basin is defined as the Truckee River basin in California.

C. Water Operations[7] and Facilities

1. Water Categories

No Action assumes that water would continue to be stored and managed as water categories identified in table 2.2, as under current operations.

2. Floriston Rates

The *Truckee River General Electric* and *Orr Ditch* decrees would continue to be implemented as under current operations to maintain prescribed flows (known as Floriston Rates) in the Truckee River at the Farad gauge. Floriston Rates provide water to serve hydroelectric power generation, M&I, and agriculture water rights specified in the *Orr Ditch* decree. The decrees also establish criteria for storing Floriston Rate Water in Lake Tahoe and Boca Reservoir and for later release to maintain Floriston Rates. These rates of flow are determined by the water surface elevation of Lake Tahoe and month as shown in table 2.3. Sufficient Floriston Rate Water is released to achieve such rates when unregulated flow is otherwise insufficient.

Water would continue to be diverted from the Truckee River in accordance with the *Orr Ditch* decree. Floriston Rate Water and unregulated water in the river that are not required to satisfy the Pyramid Tribe's irrigation rights[8] or TMWA's right to continuously divert 40 cfs from the river, and not legally diverted by other senior water rights holders, could be diverted at Derby Diversion Dam for use on the Newlands Project, consistent with Operating Criteria and Procedures (OCAP). Remaining water in the Truckee River would flow to Pyramid Lake as Pyramid Tribe Appropriated Water. TMWA would continue to be allowed to divert any amount of water from the Truckee River during December, January, and February as needed to remove ice from the Highland Ditch (serves Chalk Bluff Water Treatment Facility in Reno).

If Floriston Rates could not be achieved for the entire April-September period, the Truckee River Basin Committee (signatories to the Truckee River Agreement [TRA]) could, by unanimous agreement, reduce Floriston Rates in order to extend the otherwise shortened water delivery season. Diversion of available water would be administered according to decreed priorities.

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[7] "Water operations" means the management of categories of water stored in a reservoir or flowing in a river to meet specific objectives (e.g., serve water rights, achieve streamflows). Operations include such techniques as accumulating water in storage, exchanging water categories, and releasing water from storage.

[8] Claim Nos. 1 and 2 of the *Orr Ditch* decree, which are the most senior rights on the river.

Table 2.2—Water categories[1] and uses under No Action

Project Water	Water stored in Lake Tahoe, Prosser Creek Reservoir, Stampede Reservoir, and Boca Reservoir pursuant to existing storage license with SWRCB
Floriston Rate Water	Project Water stored in Lake Tahoe and Boca Reservoir pursuant to the *Orr Ditch* decree, water exchanged under the Tahoe-Prosser Exchange Agreement (TPEA), and unregulated flow in the Truckee River are used to achieve Floriston Rates
Stampede Project Water	Project Water stored in Stampede Reservoir pursuant to the existing U.S. storage permit with SWRCB and released to benefit Pyramid Lake fishes[2] and to maintain minimum reservoir releases
Prosser Project Water	Project Water stored in Prosser Creek Reservoir pursuant to the existing U.S. storage license with SWRCB, exchanged under TPEA, released to benefit of Pyramid Lake fishes and to maintain minimum reservoir releases
Newlands Project Credit Storage	Water temporarily stored in Stampede Reservoir in accordance with the terms of Operating Criteria and Procedures (OCAP) for the Newlands Project (43 CFR 418.20)
TMWA Interim Storage	Private Water stored in Stampede and Boca Reservoirs in accordance with the Interim Storage Agreement[3]
Private Water	Water stored by TMWA in Independence Lake and Donner Lake, and by TCID in Donner Lake
TCID Private Water	Private Water stored pursuant to the water rights of TCID in Donner Lake for the benefit of TCID
TMWA Private Water	Private Water stored pursuant to the water rights of TMWA in Independence Lake and Donner Lake for M&I use in TMWA's service area (generally Truckee Meadows)
Tahoe-Prosser Exchange Water	Project Water stored in Prosser Creek Reservoir pursuant to the existing United States' storage license/permit with SWRCB and released pursuant to TPEA to make up for Floriston Rate Water previously released to maintain minimum releases from Lake Tahoe
Pyramid Tribe Appropriated Water	Water in the Truckee River not subject to vested and perfected rights as of 1984, that was appropriated by the Pyramid Tribe pursuant to Nevada State Engineer Ruling No. 4683[4]
Water Quality Water	Water associated with water rights acquired under the Truckee River Water Quality Settlement Agreement

[1] To simplify the discussion, some water category names used here and some in table 2.7 were altered slightly from those used in the Negotiated Agreement (e.g., Private Water is referred to as Privately Owned Stored Water in the Negotiated Agreement), while others were altered to conform to names used in the Negotiated Agreement.
[2] Cui-ui and Lahontan cutthroat trout are collectively referred to as Pyramid Lake fishes.
[3] Absent TROA, the Interim Storage Agreement will terminate in 2018, but may be renewed at that time by the parties. Under TROA, the Interim Storage Agreement automatically terminates.
[4] The ruling is pending on appeal.

Table 2.3—Floriston Rates (cfs) as a function of Lake Tahoe elevation and month

Lake Tahoe elevation (Lake Tahoe datum[1])	October	November-February	March	April-September
Below 6225.25	400	300	300	500
6225.25-6226.00	400	350	350	500
Above 6226.00	400	400	500	500

[1] Lake Tahoe datum is an elevation reference point at Lake Tahoe Dam for measuring the elevation of Lake Tahoe. The point is assumed to be at an elevation of 6230.0 feet.

3. Reservoir Operations

No Action assumes that all reservoirs would continue to accumulate[9] water designated for the storage categories identified in table 2.2.[10] The following priorities to accumulate water under No Action would be the same as under current operations. Except for the filling of Donner Lake (9,500 acre-feet) and the first 3,000 acre-feet of water accumulated in Independence Lake each year, all reservoirs in the Lake Tahoe and Truckee River basin accumulate water so as not to interfere with maintaining Floriston Rates and in accordance with priorities and other terms of their respective storage licenses. When Floriston Rates are being achieved or exceeded, Lake Tahoe and Boca Reservoir are the first in priority to accumulate Project Water (up to full reservoir and 25,000 acre-feet, respectively). When diversions at Derby Diversion Dam for the Newlands Project are not required to satisfy OCAP targets, Project Water can be accumulated in the remaining space of Boca Reservoir (15,850 acre-feet), followed by the remaining space of Independence Lake (14,500 acre-feet), then Stampede Reservoir (126,000 acre-feet) and finally Prosser Creek Reservoir (30,000 acre-feet).[11] Martis Creek Reservoir (20,400 acre-feet) only temporarily accumulates water according to U.S. Army Corp of Engineers (COE) flood control requirements.

a. Accumulation, Storage, and Release

(1) Lake Tahoe and Boca Reservoir

Lake Tahoe and Boca Reservoir operations would continue as under current operations to be coordinated to maintain Floriston Rates, in accordance with TRA. Therefore, the following operations would continue to be practiced. Floriston Rate Water would be released from these reservoirs as available when unregulated flow in the basin is insufficient to maintain Floriston Rates. Boca Reservoir would be the primary source of stored water for maintaining Floriston Rates when Lake Tahoe is above 6,225.5 feet from April through October, at which time releases from Lake Tahoe would be reduced to achieve only minimum streamflows to the extent Floriston Rate Water can be stored in Prosser Creek Reservoir. (See “Minimum Reservoir Releases.”) Lake Tahoe would be the primary source to support Floriston Rates from April through October when its elevation is equal to or below 6,225.5 feet. From November through March, Boca Reservoir would generally provide water for Floriston Rate Water, though Lake Tahoe is frequently a major contributor.

(2) Donner Lake

TMWA and TCID own the rights to 9,500 acre-feet storage space in Donner Lake as tenants in common. Under No Action, as under current operations, TMWA would

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[9] For this final EIS/EIR, the term “accumulate” means to create and increase storage of a water category in a reservoir. In the Negotiated Agreement, however, “accumulation,” “impoundment,” and “establishment” are defined terms that relate separately to different water categories and operations.

[10] This does not include Pyramid Tribe Appropriated Water and Water Quality Water, which may not be accumulated under No Action in Truckee River reservoirs.

[11] Prosser Creek Reservoir capacity is 29,800 acre-feet; SWRCB license is 30,000 acre-feet.

continue to manage its half (TMWA Private Water) for M&I use in Truckee Meadows and for power generation at TMWA's four hydroelectric powerplants along the Truckee River. TCID would continue to manage its half (TCID Private Water) to serve irrigation rights on the Newlands Project when OCAP would allow diversions from the Truckee River. Other than when required by its respective owners in the fall, stored water must be released for dam safety purposes. Water released for dam safety purposes may then be used to achieve Floriston Rates.

Donner Lake is currently, and would continue to be under No Action, operated according to the 1943 Donner Lake Indenture, which requires that the dam be operated to prevent the lake from exceeding elevation 5935.8 feet, and prohibits water from being released (other than minimum releases for streamflow purposes) during June, July, or August when lake elevation is less than 5932.0 feet. Water rights of the Donner Lake Water Company and its successors reserved by the 1943 Donner Lake Indenture are quantified and made applicable to specified lands in the Donner Lake basin by an agreement dated April 27, 1998, among Sierra Pacific, TCID, and the Donner Lake Water Company under which up to 990 acre-feet per year may be used for domestic and commercial uses on the specified lands. Dam safety requirements specify that the discharge gates of the dam be held open from November 15 through April 15 to prevent the water surface from exceeding elevation 5926.9 feet. During droughts, California may allow the gates to remain closed longer in the fall and to be closed earlier in the spring.[12]

(3) Prosser Creek Reservoir

United States and the Pyramid Tribe would continue to manage Prosser Project Water as under current operations and the following operations would continue. Once Floriston Rates, OCAP diversion allowance, and storage targets for other reservoirs have been satisfied, the United States may accumulate up to 30,000 acre-feet in Prosser Creek Reservoir after April 10. Prosser Project Water is first used to satisfy provisions of TPEA. (See "Minimum Reservoir Releases.") Such Tahoe-Prosser Exchange Water may be carried over in storage from one year to the next (up to the winter maximum of 9,800 acre-feet), but usually is released during the year in which it was accumulated. The U.S. Fish and Wildlife Service (FWS) and the Pyramid Tribe would continue to jointly manage Prosser Project Water stored in excess of that needed for TPEA, in coordination with Stampede Project Water operations, for the benefit of Pyramid Lake fishes. For later exchanges under TPEA, however, Prosser Project Water is reserved to fill the 9,800 acre-feet of carryover space not occupied by Tahoe-Prosser Exchange Water; in essence, this creates a maximum annual release of about 20,000 acre-feet.

(4) Independence Lake

TMWA, which owns rights to the reservoir portion of Independence Lake, would continue to accumulate and release TMWA Private Water for M&I use in Truckee Meadows.

[12] Donner Lake operations are now the subject of a lawsuit between TCID and TMWA, and the assumed operations could change depending on the outcome of that suit.

The Interim Storage Agreement (chapter 1, "History of Reservoir and River Operations") allows TMWA Private Water in Independence and Donner Lakes to be re-stored in Stampede and Boca Reservoirs as TMWA Interim Storage. Each year, any TMWA Interim Storage in excess of 5,000 acre-feet on September 1 is converted to Stampede Project Water. In addition, when storage in Independence Lake is forecast to be below 7,500 acre-feet during the summer, California may direct TMWA to provide and maintain a fish channel through the Independence Creek delta.

(5) Stampede Reservoir

Once Floriston Rates, OCAP diversion allowance, and storage targets for all reservoirs, except Prosser Creek Reservoir, are met, the United States may accumulate up to 126,000 acre-feet in Stampede Reservoir annually. FWS and the Pyramid Tribe would continue to jointly manage Stampede Project Water consistent with the U.S. District Court's opinion in *Carson-Truckee Water Conservancy District, et al.* v. *Watt*, 1982. As under current operations, if the runoff forecast indicates that unregulated flow in the lower Truckee River is not likely to be sufficient for the management objective for Pyramid Lake fishes, FWS and the Pyramid Tribe could release Stampede Project Water to supplement lower Truckee River flow. Therefore, once released, Stampede Project Water could not be diverted from the river, other than temporarily at TMWA's hydroelectric diversion dams for generating electricity, and could not be used to achieve Floriston Rates. Management objectives vary from year to year depending on forecasted runoff, the amount of Stampede and Prosser Project Waters in storage, and the management objectives for Pyramid Lake fishes (chapter 3). These Project Waters may also be released to benefit riparian habitat along the lower Truckee River, which would indirectly benefit Pyramid Lake fishes.

In addition to TMWA Interim Storage, Water Quality Water (chapter 1, "History of Reservoir and River Operations") could be stored in Stampede Reservoir, as under current operations and assuming compliance with SWRCB permits, licenses, and applicable California law. Such storage could be accomplished by exchanging Water Quality Water flowing in the lower Truckee River for an equal amount of Stampede Project Water or Prosser Project Water scheduled to be released. As with Project Waters, once Water Quality Water is released, it could not be diverted from the river, other than temporarily for generating electricity at TMWA's Truckee River hydroelectric powerplants, and could not be used to achieve Floriston Rates.

In accordance with OCAP, Reclamation would continue under No Action to: (1) refine diversions of Truckee River water to Lahontan Reservoir at Derby Diversion Dam, (2) maximize the use of Carson River water for the Newlands Project, and (3) minimize diversions of Truckee River water to Lahontan Reservoir in order to maintain as much water in the lower Truckee River as possible. Management of Newlands Project Credit Storage in Stampede Reservoir, along with other mechanisms in OCAP, would be used to accomplish these objectives.

Newlands Project Credit Storage could be accumulated each year from the end of the previous irrigation season (usually mid-November) through June in either of two ways: (1) allowing Truckee River water that otherwise would have been diverted at Derby Diversion Dam to flow to Pyramid Lake in exchange for an equal amount of Stampede Project Water, or (2) capturing in Stampede Reservoir water in excess of Floriston Rates or Reduced Floriston Rates that would otherwise have been passed through and diverted to Lahontan Reservoir. Consistent with OCAP, the storage would be released by the end of the irrigation season as needed to achieve Lahontan Reservoir storage targets. Such water would not be diminished by evaporation or seepage while in storage, nor conveyance loss during delivery. Any Newlands Project Credit Storage remaining in Stampede Reservoir at the end of the irrigation season would convert to water dedicated to the conservation of Pyramid Lake fishes.

(6) Martis Creek Reservoir

COE would continue to use the 20,400-acre-foot capacity of the reservoir for temporary flood control. Because no long-term storage is permitted, no minimum release is required to maintain streamflow.

(7) Lahontan Reservoir

TCID would continue to operate Lahontan Reservoir for Newlands Project purposes in accordance with OCAP. Lahontan Reservoir receives inflow primarily from the Carson River, supplemented by the Truckee River via the Truckee Canal, when Lahontan Reservoir storage is forecast to be below the monthly target set by OCAP.

b. Recreational Pools

As under current operations, no recreational pools would be maintained in the Federal reservoirs or Independence Lake under No Action. The 1943 Donner Lake Indenture would continue to require a recreational pool for Donner Lake.

c. Minimum Fish Pools

As under current operations, no minimum reservoir pools to protect fish populations would be required under No Action.

d. Minimum Reservoir Releases

Minimum releases from all reservoirs would be the same under No Action as under current operations (table 2.4) and would be maintained (to the extent water is available, except for Lake Tahoe) even if the water could not be re-stored or used for its intended purpose.

(1) Lake Tahoe

As under current conditions, TPEA (chapter 1, “History of Reservoir and River Operations”) would be applicable under No Action for maintaining minimum releases from Lake Tahoe when no releases would otherwise have been made. TPEA allows water to be released from Lake Tahoe for the benefit of fish resources immediately downstream in exchange for an equivalent amount of water in Prosser Creek Reservoir

Table 2.4—Minimum reservoir releases (cfs)

Lake Tahoe – October through March – April through September	 50 70
Donner Lake	2-3
Prosser Creek Reservoir	0-5
Independence Lake	2
Stampede Reservoir	30
Boca Reservoir	None

that is reserved to maintain Floriston Rates. From April 1 through September 30, the minimum release from Lake Tahoe is 70 cfs; otherwise, it is 50 cfs. These releases are made only if there is sufficient water accumulated in Prosser Creek Reservoir for the exchange (or if Prosser Creek inflow is simultaneously converted or stored as the exchange occurs). Tahoe-Prosser Exchange Water is released later in lieu of releases from Lake Tahoe or Boca Reservoir to maintain Floriston Rates. Because storage of exchange water may not interfere with COE flood storage space requirement for Prosser Creek Reservoir, the Federal Water Master strives to release all exchange water before November 1. As under current operations, the Federal Water Master may vary the release of Floriston Rate Water from Lake Tahoe and Boca Reservoir in order to avoid a TPEA exchange.

(2) Donner Lake

As under current operations, the minimum release from Donner Lake for the benefit of fish resources would be 2 cfs when the flow immediately downstream from the confluence with Cold Creek is 5 cfs or more; otherwise, the minimum release would be 3 cfs. Because the gates of the dam must be held open from November 15 through April 15, lake level determines the outflow for that period; thus, flow could be less than the 2 or 3 cfs otherwise required.

(3) Prosser Creek Reservoir

A minimum release of 5 cfs, or inflow to the reservoir, whichever is less, would be required, as under current operations. If pass-through water or release of exchange water were not sufficient, then Prosser Project Water would be released to Pyramid Lake.

(4) Independence Lake

A minimum release of 2 cfs would be maintained, as under current operations.

(5) Sierra Valley Diversion Structure

The minimum bypass flow[13] at the Sierra Valley diversion structure on the Little Truckee River is 5 cfs from March 15 through June 15, and 3 cfs from June 16 through September 30. No diversions are made from October 1 through March 14.

(6) Stampede Reservoir

United States, through an informal agreement with CDFG, would maintain a minimum release of 30 cfs from Stampede Reservoir for the benefit of fish and wildlife in the Little Truckee River.[14] Any Stampede Project Water released for minimum flow and not required in the lower Truckee River would be re-stored in Boca Reservoir for later release or exchanged back to Stampede Reservoir by capturing in Stampede Reservoir an equivalent amount of water which could otherwise be accumulated in Boca Reservoir.

(7) Boca Reservoir

No minimum release would be required from Boca Reservoir.

(8) Martis Creek Reservoir

No minimum release would be required from Martis Creek Reservoir.

e. Flood Control Operations and Dam Safety Requirements

As under current operations, Prosser Creek, Stampede, Boca, and Martis Creek Reservoirs would be operated in accordance with existing COE flood control regulations, which attempt to limit Truckee River flow to a maximum of 6,000 cfs through Reno. While not part of the COE flood control plan, under No Action, Lake Tahoe would continue to be operated to conform to this restriction as long as such operation did not cause the lake elevation to exceed 6229.1 feet. Donner Lake and Independence Lake would continue to be operated in accordance with dam safety requirements.

As under current operations, Prosser Creek Reservoir would be managed to provide 20,000 acre-feet of flood space from November 1 to at least April 10 of the following year. If the forecasted runoff is greater than that prescribed in the Flood Control Manual for the Truckee River (COE, 1985), then flood space must be held vacant for a longer period. Stampede and Boca Reservoirs would continue to provide a combined 30,000 acre-feet of flood space with similar restrictions as described for Prosser Creek Reservoir. Martis Creek Reservoir would continue to provide 20,000 acre-feet of flood space.

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[13] "Bypass flow" is water that is not diverted at a structure but is allowed to flow downstream.

[14] This 30 cfs minimum release, while being honored under current operations, is more than twice the minimum required by the SWRCB Stampede Reservoir permit.

f. Spills, Conveyance Losses, and Evaporation Losses

As under current operations, water could be released to prevent or reduce the magnitude of a spill (called a precautionary release). Project Water would be the last category of stored water to spill or be released for precautionary purposes. Project Water in Lake Tahoe and Prosser Creek Reservoir, and Private Water in Donner and Independence Lakes would be charged evaporation losses when inflow is insufficient to compensate for the loss. Conversely, Project Water stored in Boca and Stampede Reservoirs would be charged the loss regardless of inflow. Project Waters released to the river would share conveyance losses proportionately to other water in the river, while Private Water would not be charged a share of the loss until it is the only water in the river.

g. Reservoir Pumping

As under current operations, water could be pumped (or siphoned) from Lake Tahoe and Independence Lake under certain conditions. According to TRA, Lake Tahoe could only be pumped or siphoned for hydroelectric power generation or irrigation if agreed to by the Secretary, and for "sanitary or domestic uses" if agreed to by California and Nevada.

TMWA could only pump water from Independence Lake after obtaining the necessary permits from California. These actions would be required to comply with applicable Federal and California laws (e.g., NEPA and CEQA).

h. Emergencies

As under current operations, Federal, State, or local governmental agencies would respond to emergencies involving their water management facilities or water resources. Also, the Federal Water Master would continue to be authorized to take actions necessary to respond to an emergency.

4. TMWA's Hydroelectric Diversion Dams

TMWA's hydroelectric diversion dams (Farad, Fleish, Verdi, and Washoe) located on the Truckee River between the confluence of the Little Truckee River and Reno[15] would continue to be used to divert water into flumes for conveyance to hydroelectric powerplants, where the water would be either passed through turbines or overflow into spillways before returning to the river. TMWA has *Orr Ditch* decree rights to divert sufficient water from the Truckee River to provide from 327 cfs to 400 cfs at these plants[16] to generate hydroelectric power.

[15] Though transfer of the Farad facilities from Sierra Pacific to TMWA has been delayed by the process to rebuild Farad Diversion Dam, TMWA is assumed for this final EIS/EIR to be the owner. (See chapter 1 for details.)

[16] TMWA advises that it must divert 425 to 450 cfs to meet decreed flows at the individual plants.

The minimum bypass flow for the Farad Diversion Dam would continue to be 150 cfs or the flow of the Truckee River immediately upstream of the diversion, whichever is less.[17] While there would continue to be no mandatory minimum bypass flow at the diversion dams for Fleish, Verdi, and Washoe hydroelectric powerplants, an informal agreement between TMWA and FWS would continue to maintain a minimum flow of 50 cfs over each dam.

5. Water Exportation from Little Truckee River to Sierra Valley

Under No Action, about 7,000 acre-feet would continue to be exported annually from the Little Truckee River for irrigation in Sierra Valley (Feather River basin) under the *Sierra Valley* decree.

6. Municipal and Industrial Water Resources[18]

a. TMWA

To meet the 2033 projected annual M&I demand of 119,000 acre-feet in TMWA's service area under No Action, TMWA plans to continue to exercise its existing water rights and expand its present conservation and acquisition programs.

(1) Exercise of Existing Water Rights

TMWA plans to continue to exercise its rights (1) under TRA to divert up to 40 cfs from the Truckee River, (2) to the surface flows of Hunter Creek, (3) to existing irrigation water that has been converted to M&I use, and (4) to private storage in Independence Lake and Donner Lake, including TMWA Interim Storage in Stampede and Boca Reservoirs.

(2) Transfer of Irrigation Water Rights to Municipal and Industrial Use

TMWA anticipates that, under No Action, developers in Truckee Meadows would continue the current practice of dedicating water rights for new service commitments. As is the current practice, dedicated water rights would be obtained from existing *Orr Ditch* decree irrigation water rights in the Truckee Meadows, Verdi, Spanish Springs, and Tracy areas. In the past as a drought protection measure, TMWA required developers to dedicate more water rights than necessary to serve new commitments during normal water years.[19] TMWA, however, anticipates that, under No Action, developers would not

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[17] Required by term and condition *No. 12 of SWRCB's 401 Certification for the Farad Diversion Dam Replacement Project Proposed by Sierra Pacific (2003.* It is assumed for this final EIS/EIR that the Farad Diversion Dam has been rebuilt.

[18] Usage assumptions and water resources, in addition to those given in this section, are described in chapter 3, "General Methods and Assumptions" and "Surface Water."

[19] A normal water year would exist when the April 15 forecast for the Truckee River indicates there would be sufficient unregulated flow and Floriston Rate Water storage to maintain Floriston Rates through the water year (October through September).

be required to dedicate additional water rights. Currently, TMWA has accumulated 57,170 acre-feet of former irrigation water rights. Under No Action, TMWA anticipates that developers would provide an additional 25,860 acre-feet by 2033.

(3) Pumping Truckee Meadows Groundwater

Under No Action, TMWA is expected to use the Nevada State Engineer's Groundwater Management Order 1161, dated May 16, 2000, (attachment E) to increase its pumping of groundwater from Truckee Meadows during dry water years[20] in exchange for reduced pumping during normal water years. As a consequence, TMWA would pump less than its entitlement during normal water years in order to be allowed to pump more during dry water years. Therefore, TMWA would pump about 12,570 acre-feet during normal water years, though entitled to pump 15,950 acre-feet, and up to 22,000 acre-feet during dry water years. It is assumed that any new production wells would be drilled in the aquifer addressed in Groundwater Management Order 1161.

(4) Water Conservation

TMWA plans to use water saved through the residential water meter retrofit program and M&I conservation practices to serve existing and new water customers. TMWA contends that chapter 617 of the 1989 Statutes of Nevada, which prohibits water conserved by retrofitting residences with water meters from being served to water customers during normal water years, does not apply to it.

In addition to the current conservation program (with the objective to reduce annual demand by 10 percent), TMWA anticipates that more conservation measures would be implemented during dry water years under No Action so as to reduce annual demand by an additional 9 percent.

b. Fernley

To meet its M&I demand under No Action, Fernley plans to continue to exercise existing surface water rights (about 4,000 acre-feet) and to pump groundwater from the local aquifer, along with an additional 10,000 acre-feet of surface water rights acquired through its existing acquisition program. Because of competition between the Truckee River Water Quality Settlement Agreement (WQSA) and Fernley's M&I acquisition program, the No Action analysis for this study estimated that Fernley would acquire only an additional 6,800 acre-feet and the WQSA would acquire the remaining 10,300 acre-feet of surface water rights in the Truckee Division of the Newlands Project. (See chapter 3, "Surface Water," for more details.)

[20] A dry water year would exist when the April 15 forecast for the Truckee River indicates there would not be sufficient unregulated flow and Floriston Rate Water storage to maintain Floriston Rates through the water year (October through September).

c. Lake Tahoe Basin in Nevada

Under No Action, surface water would continue to be diverted from tributaries entering Lake Tahoe and pumped from Lake Tahoe and local aquifers to provide a combined annual supply of up to 11,000 acre-feet of water for M&I demand in the Lake Tahoe basin in Nevada.

d. Truckee River and Lake Tahoe Basins in California

California anticipates that the annual demand for water (both surface and ground) in the Truckee River and Lake Tahoe basins in California by 2033 under No Action would be 22,700 acre-feet and 23,000 acre-feet, respectively (table 2.5). The State also estimates that surface water usage in California's Truckee River basin likely would increase by 300 acre-feet (for recreational or other purposes), while annual groundwater pumping in the basin likely would increase from the current 7,570 acre-feet up to 19,600 acre-feet to serve all other uses. In addition, annual water usage in the Lake Tahoe basin likely would increase from the current annual usage of 18,700 acre-feet to 23,000 acre-feet.

Table 2.5—Water usage (acre-feet per year)
Truckee River and Lake Tahoe basins in California

	No Action	LWSA	TROA
Truckee River basin	22,700	22,700	22,700
Surface water	3,100	4,300	4,300
Groundwater	19,600	18,400	18,400
Lake Tahoe basin	23,000	23,000	23,000

7. Administration, Accounting, and Scheduling

The Federal Water Master appointed by the *Orr Ditch* court would continue to oversee and coordinate reservoir operations and the delivery of water to serve *Orr Ditch* decree water rights, maintain a water accounting system, and issue periodic reports of hydrologic data measurements.

III. LWSA

LWSA is an action alternative similar to No Action but with water supply options that may be authorized by State and local government agencies. LWSA describes a probable water management approach in the Truckee River basin if TROA were not implemented. It may be thought of as a continuation of current trends in the study area for the next 26 years (to 2033), when the annual demand for TMWA's M&I water in Truckee Meadows is projected to reach 119,000 acre-feet. It assumes that surface water management operations and storage facilities would be the same as described under No Action, but that groundwater pumping and M&I water conservation in Truckee Meadows and the Truckee River basin in California would differ. It also assumes that local water authorities would obtain the necessary authorizations to implement various strategies and actions to meet projected demands if TROA were not implemented.

For California, LWSA assumes action by SWRCB to approve some pending applications to appropriate surface water, allowing, by 2033, an estimated 1,200 acre-feet per year of surface water to be used in lieu of groundwater otherwise used in the Truckee River basin in California. Total annual water usage, however, is anticipated to be the same as under No Action.

A. Overview

The following would be the same under LWSA as under No Action:

- All elements of Truckee River reservoir operations
- River flow management
- Truckee River hydroelectric powerplant operations
- Minimum reservoir releases
- Reservoir spill and precautionary release criteria
- Water exportation from the Lake Tahoe and upper Truckee River basins

The principal differences between No Action and LWSA would be the source of water used for M&I purposes, extent of water conservation, implementation of an injection well recharge program in Truckee Meadows, and assumptions regarding governmental approval of new water supply proposals.

B. Interstate Allocation

As under No Action, the apportionment of the waters of Lake Tahoe, the Truckee River basin, and the Carson River basin agreed upon by California and Nevada, and conditionally approved by Congress in section 204 of P.L. 101-618, would not become effective. According to CDWR (attachment D), it is assumed for purposes of LWSA that SWRCB would lift its moratorium and begin processing and approving some pending applications to appropriate surface water. LWSA assumes that, by 2033, this process would allow an estimated 1,200 acre-feet per year of surface water to replace groundwater otherwise used in the Truckee River basin in California. Total water use, however, is anticipated to remain the same as under No Action.

C. Water Operations and Facilities

1. Water Categories

Storage and management of water categories would be the same under LWSA as under No Action.

2. Floriston Rates

Floriston Rate operations would be the same under LWSA as under No Action.

3. Reservoir Operations

Reservoir operations would be the same under LWSA as under No Action.

4. TMWA's Hydroelectric Diversion Dams

TMWA would operate its four hydroelectric diversion dams on the Truckee River the same as under No Action.

5. Water Exportation from Little Truckee River to Sierra Valley

Water exportations from the Little Truckee River to Sierra Valley would be the same as under No Action.

6. Municipal and Industrial Water Resources

a. TMWA

To meet a projected annual M&I demand of 119,000 acre-feet in Truckee Meadows by 2033 under LWSA, TMWA would continue to exercise its existing water rights and expand its conservation and acquisition programs.

(1) Exercise of Existing Water Rights
Existing water rights would be exercised as they are under No Action.

(2) Transfer of Irrigation Water Rights to Municipal and Irrigation Use
Irrigation water rights would continue to be transferred to TMWA for new M&I water service as under No Action. TMWA anticipates that, through the dedication program, developers would provide an additional 25,860 acre-feet by 2033.

(3) Pumping Truckee Meadows Groundwater
Under LWSA, TMWA expects to pump about 4,500 acre-feet more groundwater during dry water years than under No Action. This additional withdrawal would be possible because TMWA would use injection wells to recharge the Truckee Meadows aquifer during normal water years with about 1,000 acre-feet of water from the Truckee River. It is assumed that new production and injection wells would be drilled in the aquifer as addressed by Groundwater Management Order 1161.

(4) Water Conservation
As under No Action, TMWA plans to use water saved by the residential water meter retrofit program and M&I conservation practices to serve existing and new water customers during normal and dry water years. The Truckee Meadows M&I conservation program would continue under LWSA and is anticipated to reduce annual M&I use by

about 10 percent. In addition to this savings, TMWA anticipates that an additional usage reduction of 4.7 percent would be required during dry water years. Less M&I conservation would be needed during dry water years under LWSA than under No Action because of the groundwater recharge program described under "Pumping Truckee Meadows Groundwater."

b. Fernley

The same amount of surface water and groundwater would be used to serve M&I demand in the vicinity of Fernley under LWSA as under No Action.

c. Lake Tahoe Basin in Nevada

As under No Action, surface water would continue to be diverted from tributaries entering Lake Tahoe and pumped from Lake Tahoe and local aquifers to serve M&I demand in the Lake Tahoe basin in Nevada.

d. Truckee River and Lake Tahoe Basins in California

California anticipates that the annual demand for water (both surface and ground) in the Lake Tahoe and Truckee River basins in California by 2033 under LWSA would be the same as under No Action, except that the water sources in the Truckee River basin in California (table 2.5) would differ from those under No Action. Annual usage of upper Truckee River basin surface water rights likely would increase from the current usage of 2,800 acre-feet to 4,300 acre-feet, while annual groundwater pumping in the basin likely would increase from the current 7,570 acre-feet to 18,400 acre-feet (1,200 acre-feet less than under No Action). As under No Action, annual water usage in the Lake Tahoe basin in California likely would increase from the current usage of 18,700 acre-feet to 23,000 acre-feet.

7. Administration, Accounting, and Scheduling

Administration, accounting, and scheduling would be the same as under No Action.

IV. TROA

TROA describes operation of all reservoirs and associated water management if the Negotiated Agreement were implemented. This section includes the following:

- Overview of TROA
- Description of the interstate allocation
- Description of water and facility operations under TROA
- Description of change petitions and water rights applications requiring SWRCB approval

The complete text of the Negotiated Agreement is included as an appendix.

A. Overview

Implementation of TROA would modify operations of Federal and non-Federal reservoirs to enhance coordination and flexibility while ensuring that existing water rights are served and flood control and dam safety requirements are met. TROA would incorporate, modify, or replace certain provisions of TRA and TPEA. TROA would supersede all requirements of any agreements concerning the operation of Truckee River reservoirs, including those of TRA and TPEA, and would become the sole operating agreement for these reservoirs. Exhibits B and C in the attachment to chapter 2 describe how TRA and TPEA provisions, respectively, are addressed in the Negotiated Agreement. Table 2.6 lists the principal elements of TROA that differ from No Action and LWSA.

All reservoirs would generally continue to be operated under TROA for the same purposes as under current operations (table 2.2) and with most of the same Project Water storage priorities as under No Action and LWSA. TROA is required to ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of *Orr Ditch* decree water rights. These elements in table 2.6 are intended to: (1) enhance water management flexibility, water quality, conditions for Pyramid Lake fishes, reservoir recreational opportunities, and reservoir efficiency; (2) increase M&I drought supply, minimum reservoir releases, and the capacity for carryover storage; (3) provide procedures to implement the allocation of Truckee River water between California and Nevada; and (4) decrease water use conflicts as compared to No Action and LWSA.

The primary difference between TROA and the other alternatives is that TROA would create opportunities for storing and managing categories of Credit Water. (See Section C, “Water Operations and Facilities,” table 2.7.) Signatories to the Negotiated Agreement generally would be allowed to accumulate Credit Water in reservoir storage by retaining or capturing water that otherwise would have been released from storage or passed through the reservoir to serve a downstream water right (e.g., reduction in the release of water necessary to achieve Floriston Rates). Such storage could only take place after a transfer in accordance with State water law. Once accumulated, Credit Water would be classified by category with a record kept of its storage, exchange, and release. Credit Water would be retained in storage or exchanged among the reservoirs until needed to satisfy its beneficial use. The Interim Storage Agreement would be superseded by a new storage agreement between Reclamation and TMWA.

TROA would provide procedures for facilitating and encouraging coordination of scheduled water releases and exchanges among the reservoirs. A scheduled release from one reservoir could be substituted for a release from another reservoir, and the respective water accounts in each reservoir would be credited and debited as appropriate. In these ways, existing water rights and storage rights would be served while streamflows and recreational pools could be enhanced, the potential for spills or need for precautionary releases could be reduced, and reservoir storage space would be used more effectively.

Table 2.6—Principal elements of TROA that differ from No Action and LWSA (* indicates items that do not appear in TROA, but are elements of PL 101-618 that would become effective upon implementation of TROA or must be satisfied before TROA becomes effective)

- Incorporates, modifies, or replaces certain provisions of TRA and TPEA
- Allows TROA signatories to accumulate water individually in all reservoirs (as Credit Water) by retaining water that would have otherwise been released from or passed through a reservoir to serve their individual downstream water right
- Allows TROA signatories to exchange Credit Waters and Project Water among all reservoirs
- Establishes rules and priorities for storing, managing, and spilling all categories of water
- Requires coordinated scheduling of all reservoir operations under TROA
- Provides for the implementation of the interstate allocation (section 204 of P.L. 101-618) between California and Nevada*
- Establishes criteria for acquiring water rights to meet a demand up to and exceeding 119,000 acre-feet within TMWA's service area
- Establishes criteria for new wells in the Truckee River basin in California to minimize short-term reduction of streamflow
- Increases minimum reservoir releases
- Provides for Prosser Project Water and Stampede Project Water to be used for Pyramid Lake fishes even after the fishes are no longer listed under ESA
- Expands procedures for accumulating Newlands Project Credit Water
- Allows full benefits of WQSA to be realized by allowing water acquired pursuant to WQSA to be stored in Truckee River reservoirs*
- Supports an application to SWRCB to increase Stampede Reservoir's California Water Right so that the full capacity of the reservoir (226,500 acre-feet) could be used in the event that such quantity of water is available from Nevada rights
- Supports an application to SWRCB to eliminate the 20,126 acre-feet per year limit on releases from Prosser Creek Reservoir
- Establishes more strict conditions and approval requirements for pumping or siphoning water from Lake Tahoe
- Provides for the settlement of litigation*
- Establishes the Habitat Restoration Fund for the Truckee River
- Provides for the termination of the Interim Storage Agreement
- Encourages water managers to accommodate California Guidelines for streamflow and recreational pool targets
- Creates the positions of Administrator (to oversee implementation of TROA) and Truckee River Special Hearing Officer (to resolve disputes over administration of TROA)
- Identifies cost sharing among parties (for administering TROA)

TROA would also contain provisions (Article Six of the Negotiated Agreement) to implement various portions of the interstate allocation of Lake Tahoe and Truckee River waters between Nevada and California (section 204 of P.L. 101-618). In addition, signatories would support the Nevada State Engineer's ruling on Permit Nos. 48061 and 48494 that allocate the remaining waters of the Nevada portion of the Truckee River to the Pyramid Tribe, and recognition by the *Orr Ditch* court that the Nevada portion of the Truckee River and its tributaries would be fully appropriated.

The position of Administrator would be created to oversee implementation of the Agreement. The Federal Water Master would continue to have the authority to enforce *Orr Ditch* decree water rights. Although the Agreement is written to protect the exercise of vested or perfected water rights, if operations inadvertently reduced the delivery amount of the water a person was legally entitled to receive, the Administrator would be empowered to take any actions necessary to avoid or replace the reduction of water.

The Negotiated Agreement also contains provisions to resolve any disputes which may arise among the parties over the administration of TROA. It would provide for the Truckee River Special Hearing Officer to decide such disputes. Decisions of the hearing officer could be reviewed by petition to the *Orr Ditch* court, the U.S. District Court in Reno with continuing jurisdiction over the *Orr Ditch* decree. Disputes arising under the *Orr Ditch* decree would continue to be subject to the jurisdiction of the *Orr Ditch* court.

United States, as plaintiff in the original *Orr Ditch* case, and the Pyramid Tribe, because of its intervention in that case for all purposes, are subject to the jurisdiction of the *Orr Ditch* court. Nevada, because of its intervention in the *Orr Ditch* case for all purposes, is subject to the court's jurisdiction. California has agreed in the Negotiated Agreement to be subject to the jurisdiction of the *Orr Ditch* court for certain limited purposes relating to TROA.

Nothing in the Negotiated Agreement is intended to alter other applicable Federal or State laws, including laws or procedures applicable to the water conditionally allocated to the States by P.L. 101-618, and dam safety or flood control. It is not intended to abrogate or expand the jurisdiction of SWRCB or the Nevada State Engineer. In addition, it would not affect the operation of the Carson River or the power of the U.S. District Court for the District of Nevada (or its Federal Water Master) under the *Alpine* decree.

B. Interstate Allocation

TROA differs from No Action and LWSA in that certain Congressional actions would go into effect when TROA becomes effective: (1) allocations of Lake Tahoe and Truckee River waters between Nevada and California and (2) the confirmation of the *Alpine* decree as part of the interstate allocation for the Carson River basin as conditionally approved by the Congress in section 204 of P.L. 101-618. TROA would not allocate these waters between the States, but would provide an operational basis for serving Truckee River water rights consistent with such allocation. This surface water allocation would be in addition to water currently exported from Lake Tahoe and Truckee River basins (in California), including that decreed to Sierra Valley Water Company. Surface water available for diversion in California but remaining in the river would be available for diversion in Nevada.

According to CDWR (attachment D), it is assumed for purposes of this analysis, as with LWSA, that SWRCB would lift its moratorium and begin processing pending water rights applications and approving some applications to appropriate surface water, allowing, by 2033, an estimated 1,200 acre-feet per year of surface water to replace groundwater otherwise used in the Truckee River basin in California. However, total water use is anticipated to remain the same as under No Action.

1. Lake Tahoe Basin

a. Diversions and Reuse

Under TROA, Nevada and California could annually divert up to 11,000 acre-feet and 23,000 acre-feet, respectively, from combined surface water and groundwater sources in the Lake Tahoe basin for use in the basin. The interstate allocation would allow depletion (i.e., complete consumption with no return flow) of water within the Lake Tahoe basin without additional charge to either allocation, subject to existing law that currently requires export of all treated effluent from the Lake Tahoe basin.

b. Snowmaking

After 350 and 600 acre-feet of water have been used for snowmaking each year in the Lake Tahoe basin in Nevada and California, respectively, 16 percent of the additional water diverted and used in each State for snowmaking would be charged as a diversion against each State’s allocation.

2. Truckee River Basin in California

Consistent with section 204 of P.L. 101-618, TROA would provide that California could divert no more than 32,000 acre-feet per year from the upper Truckee River basin, with a maximum of 10,000 acre-feet per year coming from surface water.[21] The State, however, could deplete no more than 17,600 acre-feet per year. Any new appropriations of surface water allocation in the Truckee River basin in California would be served according to the following priority:

(1) Pyramid Tribe’s Claim Nos. 1 and 2 of the *Orr Ditch* decree

(2) All California beneficial uses initiated before November 16, 1990

(3) TMWA’s 40 cfs right

[21] Surface water diversions to Sierra Valley from the Little Truckee River would not be included in the 10,000 acre-foot limit.

(4) All California beneficial uses, except commercial irrigated agricultural, initiated on or after November 16, 1990

(5) All Nevada beneficial uses, including streamflow for fish and inflow to Pyramid Lake

(6) Commercial, irrigated agriculture in California initiated on or after November 16, 1990

Surface water allocated to California from the upper Truckee River basin to generate hydroelectric power could only be used incidental to other releases.

a. Snowmaking

After 225 acre-feet of water have been used for snowmaking each year in the Truckee River basin, 16 percent of the additional water diverted and used for snowmaking would be charged as a diversion against California's allocation.

b. Diversion to Use

California could divert unregulated flow for beneficial use so long as its surface water allocation is not exceeded. For M&I purposes, California could also divert releases of some Credit Water categories and Project Water, as long as it compensates for such diversion by releasing a similar amount of California M&I Credit Water. Diversions using California water rights issued after May 1, 1996, could be no greater than 25 percent of the right within a month. Within the Donner Lake basin, in addition to the 990 acre-feet per year recognized in the April 29, 1998, agreement among TMWA, TCID, and Donner Lake Water Company, TROA would allow up to 40 acre-feet per year for small domestic registrations under California law. In the Independence Creek basin, TROA would allow up to 50 acre-feet of water per year for small domestic registrations that could be exercised adverse to TMWA's rights to Private Water under conditions specified in TROA.

c. Surface Storage

California could accumulate California M&I Credit Water in reservoirs for later use in the Truckee River basin, so long as such accumulation, together with its diversions to use, would not exceed its surface water allocation. Accumulation of California M&I Credit Water with California water rights issued after May 1, 1996, could be no greater than 25 percent of the annual entitlement within a month and could not take place if Floriston Rate water is insufficient to maintain Floriston Rates. The unused portion of California's surface water allocation could be used to accumulate Credit Water to serve environmental needs. (See "California Environmental Credit Water and Additional California Environmental Credit Water.")

California would retain the right to build or authorize construction of facilities in the upper Truckee River basin to store its surface water allocation. Accumulation in those facilities could not interfere with maintaining Floriston Rates or minimum reservoir releases. Using water rights issued after May 1, 1996, the total amount of water in new facilities at any one time could not exceed 10,500 acre-feet and such water could only be stored for M&I use or for the benefit of fish and wildlife. For new storage capacity in excess of 2,500 acre-feet, California's allowable storage of California M&I Credit Water and California Environmental Credit Water in all reservoirs would be reduced by an equal amount. These storage and usage limitations do not apply to the storage of the consumptive use portion of water rights issued in California on or before May 1, 1996, or to any *Sierra Valley* decree water rights transferred to the Truckee River basin in California.

#### *d.	Underground Storage*

Each year, California could authorize diversion of a portion of its surface water allocation to underground storage.

#### *e.	Well Criteria*

The interstate allocation provisions of P.L. 101-618 provide that all new wells drilled in the Truckee River basin in California after November 16, 1990, be designed to minimize short-term reductions of surface streamflows to the maximum extent feasible (in accordance with section 204(c)(1)(B) of P.L. 101-618). TROA would include specific approval criteria for wells drilled after May 1, 1996. These criteria provide incentives to locate wells away from surface water sources. TROA would preclude any signatory party from challenging the construction of any water supply well under section 204(c)(1)(B) if the well: (1) was constructed prior to May 1, 1996; (2) served a single-family dwelling irrigating less than 1 acre of land; or (3) was in a special zone and met specific criteria for that special zone. Most special zone criteria in the Negotiated Agreement specify that wells be drilled: (1) at least 500 feet from the Truckee River, the Little Truckee River, and lakes or reservoirs located on these rivers; (2) at least 200 feet from perennial tributaries and lakes located on such tributaries; (3) at least 100 feet from any springs; and (4) at least 50 feet from ephemeral tributaries and lakes located on such tributaries. In zones overlying the Martis Valley Aquifer, the criteria would also specify casings down to 100 feet for wells located between 500 and 1,320 feet from the river. These criteria would supplement California standards for the design of water supply wells. TROA would provide for compliance with these requirements through notice and enforcement provisions. After the Negotiated Agreement is implemented, notice would be required before most wells[22] could be constructed. Wells constructed during the interim period between May 1, 1996, and implementation of the Negotiated Agreement would have to comply with P.L. 101-618 and the notice and enforcement provisions in the Negotiated Agreement, unless specifically excluded through listing in the Negotiated Agreement. (See section 10.B.1(e) of the Negotiated Agreement.) Wells may be included on this list by written request and approval of the mandatory signatories up until the agreement is signed.

[22] Certain wells are excluded from notice requirements, e.g., domestic wells and monitoring wells.

3. Carson River Basin in California

Confirmation of the interstate allocation of the Carson River basin (chapter 1) would not preclude the assertion of any additional water rights which could have been established prior to January 1, 1989, but which were not recognized in the *Alpine* decree, so long as the total amount of any such additional allocations does not exceed 1,300 and 2,131 acre-feet per year by depletion for use in California and Nevada, respectively. TROA would not affect the operation of the Carson River under the *Alpine* decree.

C. Water Operations and Facilities

This section describes the water categories that would be created and managed under TROA, as well as Floriston Rate operations, reservoir operations, operation of TMWA's hydroelectric diversion dams, water exportation to Sierra Valley, M&I water resources for urban areas in California and Nevada, administration, and additional provisions unique to TROA.

1. Water Categories

In addition to the water categories listed in table 2.2, TROA would also provide for the new Credit Water categories listed in table 2.7. TROA would establish priorities for accumulating, exchanging, releasing, displacing,[23] and spilling all water categories. This priority system would increase the likelihood that certain waters in a reservoir would be available when needed, avoid adverse effects to *Orr Ditch* decree water rights, improve minimum reservoir releases, and decrease the likelihood of adversely affecting Truckee River water quality.

TROA contains many provisions for (1) accumulating Credit Water in all reservoirs; (2) exchanging Credit Water among reservoirs; and (3) using and limiting the amount of Credit Water in storage.

a. Accumulating Credit Water

Credit Water could be accumulated in all reservoirs primarily by retaining Floriston Rate Water already in storage and by retaining inflow that would have otherwise been diverted downstream. It could also be accumulated by (1) trading water that has been released or is in storage for water that is stored in another reservoir or has been released; (2) converting water in storage from one category to another; and (3) with consent, using water rights of another party. Imported water and Private Water could also be used to accumulate Credit Waters. Credit Waters could be stored in any Truckee River reservoir without interfering with that reservoir's Project Water and generally would be retained until released or spilled.

[23] "Displacement" is an operation whereby a water category of higher storage priority causes one of lower storage priority in the same reservoir to be exchanged, released, or spilled to the extent that both categories cannot be simultaneously stored in the reservoir.

Table 2.7—TROA Credit Water categories, water right ownership, and uses

Category	Owner	Use
Additional California Environmental Credit Water	California	Non-consumptive, stream and riparian environmental uses
California Environmental Credit Water	California	Non-consumptive, stream and riparian environmental uses
California M&I Credit Water	California entities	M&I demand and groundwater injection well recharge of aquifers in the Truckee River basin in California
Fernley Municipal Credit Water	Fernley	M&I, recharge and storage in the local aquifer, re-vegetation of former agricultural lands, improve water quality in local wetlands, or enhance Pyramid Lake fish flows
Fish Credit Water	United States and Pyramid Tribe	Benefit cui-ui in lower Truckee River/Pyramid Lake and LCT in the Truckee River basin
Fish Water[1]	United States and Pyramid Tribe	Same as Stampede Project Water and Prosser Project Water in table 2.2
Joint Program Fish Credit Water	United States and Pyramid Tribe	Managed by California to enhance streamflows in California and recreational pools in all reservoirs
Newlands Project Credit Water (replaces the name, Newlands Project Credit Storage, used in table 2.2)	United States	Used to refine diversions of Truckee River water to Lahontan Reservoir
Other Credit Water	Any applicant	As may be proposed
TMWA Emergency Credit Water[2]	TMWA	M&I use in TMWA's service area during a drought or emergency
TMWA M&I Credit Water (Firm and Non-Firm)	TMWA	M&I use in TMWA's service area during a drought or emergency
Project Water (combines Project Water and Private Water defined in table 2.2)	Holder of storage permits or licenses	Same as Project Water and Private Water in table 2.2, except may also be used to establish Credit Water
Project Water in Another Reservoir	Original holder of storage permits or licenses	Same use as the initial Project Water
Water Quality Credit Water (replaces the name, Water Quality Water, used in table 2.2)	Reno, Sparks, Washoe County, United States and Pyramid Tribe	Improve Truckee River water quality by enhancing Truckee River flow downstream from Sparks, Nevada

[1] Fish Water is not a Credit Water category, but is listed here because of its numerous interactions with Credit Waters. It may only be reclassified when restored in or exchanged to another reservoir as Fish Credit Water or Project Water in Another Reservoir, and it may only be used for the benefit of cui-ui and LCT, and released as minimum releases from Stampede Reservoir.
[2] The term "TMWA Emergency Drought Supply" is used in the Negotiated Agreement.

b. Exchanging Credit Waters Among Reservoirs

Water stored in any Federal or non-Federal reservoir could be exchanged with water stored in any other Federal or non-Federal reservoir within the Lake Tahoe and Truckee River basins. Also, a scheduled release from one reservoir could be substituted for a release from another reservoir, the respective water accounts in each reservoir would be credited and debited accordingly, and water would not be physically moved. Exchanges would be the main procedure for enhancing the availability of Credit Water, enhancing streamflows, reducing spill potential, and maintaining reservoir recreational pools.

c. Credit Water Accumulation, Storage, and Use Limitations

Each Credit Water category would have specific accumulation, storage, and use limitations.

(1) California Environmental Credit Water and Additional California Environmental Credit Water

California could accumulate up to 8,000 acre-feet of California Environmental Credit Water and 10,000 acre-feet of Additional California Environmental Credit Water with diversion rights acquired in California and Nevada or *Sierra Valley* decreed water rights.

California could use these categories of Credit Water only to benefit non-consumptive stream and riparian environmental uses, not for recreational pools or to mitigate any adverse effects of TROA. Once released and not re-stored, water associated with water rights originating in California would be available for diversion in Nevada, while that from water rights in Nevada would flow to Pyramid Lake.

(2) California M&I Credit Water

California entities could use a portion of California's Truckee River surface water allocation to accumulate California M&I Credit Water, which could be released later to serve M&I demand and groundwater recharge in the upper Truckee River basin.

Once California M&I Credit Water is accumulated in Lake Tahoe (up to 8,000 acre-feet) it could be exchanged to other Federal reservoirs, to a maximum of 3,000 acre-feet. Water to serve the purposes of California M&I Credit Water could also be accumulated in any new facilities built in California in the future for that purpose, but storage for California M&I Credit Water in Federal reservoirs would be reduced by the amount of water that California accumulates in excess of 2,500 acre-feet in any new facilities. Accumulation would also have to comply with additional terms and conditions that SWRCB might establish.

(3) Fernley Municipal Credit Water

Fernley could use its changed diversion rights and privately owned water to accumulate Fernley Municipal Credit Water in Federal reservoirs. If a drought situation[24] does not exist by April 15, any Fernley Municipal Credit Water accumulated in excess of 10,000 acre-feet on April 1 of the same year would then be converted to Fish Credit

[24] A drought situation would exist when the April 15 run-off forecast for the Truckee River indicates there would not be sufficient unregulated water and Floriston Rate Water to maintain Floriston Rates through the water year (October through September), or if the elevation of Floriston Rate Water in Lake Tahoe is forecast to drop below 6223.5 feet Lake Tahoe datum before November 15.

Water. Storage of Fernley Municipal Credit Water would not be limited during a drought situation. Fernley would only use this water for M&I use in the Fernley area, recharge of or storage in the local aquifer, to re-establish vegetation on former agricultural lands, improve water quality in local effluent-based wetlands, or enhance Pyramid Lake fish flows.

(4) Fish Credit Water

The United States and the Pyramid Tribe would only use this water for the benefit of cui-ui in the lower Truckee River/Pyramid Lake and LCT in the Truckee River basin. Under limited circumstances, however, a small amount of Fish Credit Water could be temporarily reserved for Non-Firm M&I Credit Water purposes (See "TMWA M&I Credit Water").[25]

Fish Credit Water could be accumulated in four ways: (1) retention of water otherwise used only to satisfy TMWA's hydroelectric water rights;[26] (2) capture of Pyramid Tribe Appropriated Water; (3) conversion of Stampede Project Water, Prosser Project Water or Credit Water already in storage; and (4) expansion of the Stampede Reservoir storage license to allow a maximum of 226,500 acre-feet to be captured annually in Stampede Reservoir.[27] An unlimited amount of Fish Credit Water could be accumulated.

(5) Joint Program Fish Credit Water

A portion of Fish Credit Water (not to exceed 50 percent each year),[28] up to the amount of California's Truckee River surface water allocation that is not diverted, could be reserved as Joint Program Fish Credit Water. California would manage this Credit Water to enhance streamflows in California and recreational pools in Federal reservoirs. However, no more than 20,000 acre-feet of Joint Program Fish Credit Water could be stored in Federal reservoirs at any given time. Once released and not exchanged or restored, this water would flow unimpaired to Pyramid Lake.

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[25] This is a safeguard against storing large volumes of Fish Water and Fish Credit Water in Stampede Reservoir during normal and low water years which would prevent TMWA from storing TMWA M&I Credit Water up to prescribed base amounts. The reservation would occur when Lake Tahoe is at or below 6,227 feet on November 15 and less than 20,000 acre-feet of Non-Firm M&I Credit Water, Fish Credit Water and Fish Water have spilled from Stampede in the previous 12 months. See Section 8.F.6 of the Negotiated Agreement for more details.

[26] TMWA would waive its single purpose hydroelectric water rights (*Orr Ditch* decree Claim Nos. 5-9) when Floriston Rate Water is required solely to generate hydroelectric power at its four Truckee River hydroelectric powerplants. This means that no water right holder other than TMWA would require this water at the time, and as such, it would flow to Pyramid Lake after diversion through the hydroelectric powerplants. The waiver would allow Fish Credit Water to be accumulated from Floriston Rate Water in storage or being passed through the reservoir. In order to implement this waiver, either *Orr Ditch* decree Claims Nos. 5-9 or Pyramid Tribe Appropriated Water right would be modified.

[27] SWRCB must approve a modification of the Stampede Reservoir storage permit to allow an additional 100,000 acre-feet of Project Water to be captured annually in Stampede Reservoir. Under the terms of TROA, however, this water would be Fish Credit Water.

[28] Excludes Fish Credit Water created through conversion of Credit Water or Project Water.

(6) Newlands Project Credit Water

As under No Action, Newlands Project Credit Storage, now referred to as Newlands Project Credit Water, could be accumulated and managed. TROA would also provide additional opportunities for accumulating and managing Newlands Project Credit Water. If credit water elements of OCAP were to be repealed or modified so as to impair achieving the purpose of credit water (see "Stampede Reservoir" under the description of No Action), TROA would provide procedures for the continued accumulation and management of Newlands Project Credit Water.

In addition to Newlands Project Credit Water operations allowed under OCAP, TROA would allow from November through June a portion of Truckee River flow scheduled to be diverted to the Newlands Project to be accumulated as Newlands Project Credit Water by (1) exchanging with Fish Credit Water in storage for an equal amount of water at Derby Diversion Dam that would then flow to Pyramid Lake or (2) retaining in storage a portion of a scheduled release or pass-through of Floriston Rate Water that would otherwise have been diverted at Derby Diversion Dam. Newlands Project Credit Water accumulated in this manner, would be released as required by OCAP (as much as possible before August 1) to achieve Lahontan Reservoir storage targets. Newlands Project Credit Water not required for diversion to the Newlands Project would be reclassified to the water category it would have been at the time it was stored.

(7) Other Credit Water

In anticipation of future requests to use any remaining storage space, TROA would provide for the category of Other Credit Water in all reservoirs.

(8) TMWA M&I Credit Water

TMWA could accumulate TMWA M&I Credit Water using the consumptive use portion of its *Orr Ditch* decree water rights and TMWA Private Water not needed to meet the M&I demand in its service area.

(a) Firm and Non-Firm M&I Credit Water

TMWA M&I Credit Water would be classified as either Firm or Non-Firm. Firm M&I Credit Water could be stored only in Stampede Reservoir, while Non-Firm M&I Credit Water could be stored in any Truckee River reservoir. Compared to most categories of Credit Water, Firm M&I Credit Water would be a relatively secure supply because, among other things, it would have a higher priority to be stored in Stampede Reservoir than Fish Water. Non-Firm M&I Credit Water would be less secure than Firm M&I Credit Water because it could not interfere with storage or release of Project Water, except Fish Water under certain drought circumstances.

The amount of Firm and Non-Firm M&I Credit Water stored and carried over from one year to the next would be calculated based on M&I demand in TMWA's service area, the amount of water used in the Truckee River basin in California, and the existence of a drought situation. As M&I demand for Truckee River water in Truckee Meadows increases and as California's M&I use increases, the carryover limit for Firm M&I Credit

Water would increase from 2,000 acre-feet to 12,000 acre-feet, and the carryover limit for Non-Firm M&I Credit Water would increase from 4,000 acre-feet to 20,000 acre-feet. (See Appendices 7.A, 7.B, and 7.C of the Negotiated Agreement.) On April 15 of each year when a drought situation does not exist, all Non-Firm M&I Credit Water in excess of the April 1 carryover limit would be converted to Fish Credit Water. However, when a drought situation exists on April 15, TMWA could retain any Non-Firm M&I Credit Water already in storage to serve M&I demand until that drought situation ends, or until the following April 15, whichever is later.

TMWA M&I Credit Water would be stored until needed to supply the current M&I demand during a drought situation or converted to Fish Credit Water. In addition to the drought situation requirement, this water may only be used when TMWA's normal water supplies[29] are insufficient to meet the normal water year M&I demands, and TMWA has exhausted its Private Water in Donner Lake and water in excess of 7,500 acre-feet in Independence Lake. TMWA M&I Credit Water may be used without restriction during an emergency or repair situation.[30]

(b) TMWA Emergency Credit Water

TMWA could accumulate up to 7,500 acre-feet of TMWA Emergency Credit Water in Stampede Reservoir by either (1) re-storing Private Water in Stampede Reservoir; (2) accumulating water from changed diversion rights; or (3) converting the first Fish Credit Water accumulated in Stampede Reservoir. This category would not spill and not be required to be released for minimum streamflows. TMWA could release this water for M&I purposes during an emergency or repair situation or a drought situation after it had exhausted its normal water supplies and its TMWA M&I Credit Water and, to the extent permitted, pumped 5,000 acre-feet of water from Independence Lake. (See "Reservoir Pumping.")

(c) Toilet Replacement Water

Water conserved in Truckee Meadows through Washoe County's toilet replacement program would be accumulated (up to 4,000 acre-feet per year) and used as Non-Firm M&I Credit Water. When the storage of conserved water causes Non-Firm M&I Credit Water to exceed its carryover limit on April 1, the conserved water would be converted to Water Quality Credit Water.

(9) Project Water in another Reservoir

In general, Project Water exchanged to another reservoir would be retained for its original purpose but would be classified as a Credit Water category with less security from spill or evaporation than most Credit Waters. Project Water in Another Reservoir is usually reclassified as Project Water when exchanged back to its reservoir of origin.

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[29] TMWA's normal water supplies, as defined in the Negotiated Agreement, are the water sources that TMWA ordinarily uses in the absence of a drought to meet its customer M&I demands.

[30] "Emergency or repair situation" means any circumstance when scheduled alteration or repair of TMWA's water storage or delivery system prevents use of some of its normal water supplies to meet customer demand.

(10) Water Quality Credit Water
Under TROA, Water Quality Water would be renamed Water Quality Credit Water. This category of Credit Water could be stored in all reservoirs. As under the other alternatives, Reno, Sparks, Washoe County, United States, and the Pyramid Tribe would manage this water under TROA in accordance with WQSA.[31, 32]

2. Floriston Rates

Accumulating and releasing Floriston Rate Water to serve *Orr Ditch* decree water rights would continue to be the foundation of Lake Tahoe and Boca Reservoir operations. TROA would allow flows associated with Floriston Rates to be reduced to create Credit Water. Parties to TROA holding *Orr Ditch* decree water rights would be allowed to withhold releases of Floriston Rate Water that would otherwise have been subject to diversion from the Truckee River (or tributaries) to serve those water rights.

3. Reservoir Operations

Credit Water operations would not interfere with Project Water operations (except for water rights voluntarily relinquished), flood control operations, or dam safety requirements.

a. Accumulation, Storage, and Release

(1) Lake Tahoe and Boca Reservoir
Except for Credit Water operations, including exchange of Floriston Rate Water, operation of Lake Tahoe and Boca Reservoir would be similar to that under No Action and LWSA.

(2) Donner Lake
Private Water in Donner Lake would continue to be stored and released under TROA as under No Action and LWSA. (See footnote 12 in this chapter.) TROA would also allow TMWA Private Water in Donner Lake to be exchanged with Credit Waters from other reservoirs. California, with the approval of any non-signatory party with Private Water in Donner Lake (currently only TCID), could also arrange an exchange of their Private Water with Joint Program Fish Credit Water, California Environmental Credit Water, or Additional California Environmental Credit Water from other reservoirs.

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[31] In order to prevent Credit Water operations from diminishing water quality downstream from Sparks, Nevada, several categories of Credit Water would not be allowed to accumulate in Truckee River reservoirs when flows of Floriston Rate Water at the Sparks gauge are less than 275 cfs during the summer and fall or less than 120 cfs during the winter and spring. See section 7.A.5 of the Negotiated Agreement for details.

[32] Pursuant to an agreement dated February 13, 2007, between Reno, Sparks, Washoe County, and the Pyramid Tribe to provide 6,700 acre-feet of water rights for water quality water purposes, the cities and county agreed in the Negotiated Agreement to provide such water no later than when TROA takes effect.

(3) Prosser Creek Reservoir

As under No Action and LWSA, Prosser Project Water would continue to be dedicated first to TPEA and then to maintaining minimum releases from Prosser Creek Reservoir, with the remaining Prosser Project Water used for the benefit of Pyramid Lake fishes. Under TROA, however, the remaining Prosser Project Water could continue to be used for Pyramid Lake fishes even if the fish are no longer listed under the Endangered Species Act of 1973, as amended (ESA). TROA would also allow the United States to apply to SWRCB to eliminate the 20,162 acre-foot per year limit on releases from Prosser Creek Reservoir, though the minimum pool requirement would remain in effect. (See “Minimum Fish Pools.”) Reclamation has submitted an application to SWRCB in advance of TROA becoming effective, but the proposed change would not become effective unless and until TROA is executed and, by its terms, becomes effective.

(4) Independence Lake

Private Water in Independence Lake would continue to be stored and released to serve M&I demand under TROA as under No Action and LWSA. However, during a drought situation when storage in Independence Lake is less than 7,500 acre-feet, TMWA could only release its water to maintain minimum streamflows, for emergencies, or to meet customer demands when its water from Donner Lake and TMWA M&I Credit Water are insufficient.

TROA would require the United States and California to exchange water with TMWA to maintain Independence Lake at an elevation that would allow LCT to move to upstream spawning habitat. As under the Interim Storage Agreement, California could direct TMWA to provide and maintain a fish channel through the Independence Creek delta when storage is forecast to be below 7,500 acre-feet during the summer. The Interim Storage Agreement would terminate with TROA, and TMWA Interim Storage (table 2.2) under No Action and LWSA would be replaced with TMWA M&I Credit Water.

(5) Stampede Reservoir

As under No Action and LWSA, Stampede Project Water would continue to be managed for minimum releases from Stampede Reservoir and for the benefit of Pyramid Lake fishes. Under TROA, however, Stampede Project Water would continue to be used for Pyramid Lake fishes even if they are no longer listed under ESA. TROA would also allow the United States to apply to SWRCB to increase Stampede Reservoir’s California Water Right to a maximum diversion to storage of 226,500 acre-feet annually, of which only the first 126,000 acre-feet could be stored as Stampede Project Water and the remainder as Fish Credit Water. Reclamation has submitted an application to SWRCB in advance of TROA becoming effective, but the proposed change and appropriation would not become effective unless and until TROA is executed and, by its terms, becomes effective. As under No Action and LWSA, water stored in Stampede Reservoir under TROA could only be used to generate electricity at Stampede Dam’s two hydroelectric powerplants incidental to its release for other purposes.

(6) Martis Creek Reservoir

Operation of Martis Creek Reservoir would be the same as under No Action and LWSA.

(7) Lahontan Reservoir

Operation of Lahontan Reservoir would be the same as under No Action and LWSA, except for the addition of the opportunity to accumulate and manage Newlands Project Credit Water. (See "Newlands Project Credit Water.")

b. Recreational Pools

As under No Action and LWSA, TROA would not require recreational pools to be maintained, but would provide opportunities under California Guidelines to voluntarily achieve and maintain recreational pools in certain reservoirs. (See "California Guidelines." Also, see exhibit D in the attachment to chapter 2 for a sample of the California Guidelines.)

c. Minimum Fish Pools

As a protection mechanism for fish, TROA would require that releases of Credit Water and Project Water from Prosser Creek Reservoir not allow storage to fall below 5,000 acre-feet or such lesser amount as determined by the California Department of Fish and Game to better service fishery resources.

d. Minimum Reservoir Releases

Minimum releases from all reservoirs, except Prosser Creek Reservoir and Independence Lake, to maintain streamflows would be the same as under No Action and LWSA (table 2.4). TROA, however, would provide more opportunities to achieve minimum releases and more opportunities to provide greater-than-minimum releases (i.e., enhanced minimum releases).

(1) Prosser Creek Reservoir

Under TROA, a minimum release of 5 cfs would be maintained from Prosser Creek Reservoir to the extent water is available, even if inflow to the reservoir is less than the minimum release.

(2) Independence Lake

Compared to No Action and LWSA, TROA would require greater minimum releases from Independence Lake that would not be subject to exchange and re-storage rules for enhanced minimum releases. (See "Enhanced Minimum Releases.") These releases would vary with the month and volume of water stored. During a normal season (defined in table 2.8), minimum releases would be increased by 0 to 6 cfs above the No Action minimum release of 2 cfs as long as at least 12,500 acre-feet are in storage. When storage is below this amount but greater than 7,500 acre-feet, releases would be maintained so that the average Independence Creek flow would be at least 0 to 6 cfs greater than the minimum flows under No Action. Under these circumstances, however, not less than 2 to 4 cfs would be released from storage. No additional releases would be

Table 2.8—Enhanced minimum releases (cfs) from specified reservoirs during normal[1] and dry[2] seasons (these releases include minimum releases shown in table 2.4)

Reservoir/lake	Normal season	Dry season
Tahoe	75	[3]37.5
Donner	8	4
Prosser Creek		
September - February	25	8
March - August	12	8
Stampede	45	[4]22.5

[1] "Normal" season is a monthly characterization of water conditions when either the amount of Floriston Rate Water stored in Lake Tahoe or the April through July forecast for the California Truckee River basin supply is "moderate to high." (See figures 9-1 through 9-10 of the Negotiated Agreement.)
[2] "Dry" season is a monthly characterization of water conditions when either the amount of Floriston Rate Water stored in Lake Tahoe or the April through July forecast for the California Truckee River basin supply is "low." (See figures 9-1 through 9-10 of the Negotiated Agreement.)
[3] The greater of 37.5 cfs or the minimum release.
[4] The greater of 22.5 cfs or the minimum release.

made when storage is less than 7,500 acre-feet. During a dry season (defined in table 2.8), additional releases up to 2 cfs would be made only when storage is greater than 7,500 acre-feet.

(3) Enhanced Minimum Releases

During normal and dry seasons, Credit Water and Project Waters could be used to enhance minimum releases.[33] These waters would supplement minimum releases shown in table 2.4 to achieve the enhanced minimum release shown in table 2.8. These waters could only be used to enhance minimum releases if they could be re-stored in another reservoir or exchanged for water in another reservoir.

e. Flood Control Operations and Dam Safety Requirements

Flood control operations and dam safety requirements would be the same as under No Action and LWSA.

f. Spills, Conveyance Losses, and Evaporative Losses

Because more than one water category could be in a reservoir when the reservoir begins to spill, TROA would establish the order in which the water categories would spill (table 2.9). Firm M&I Credit Water and TMWA Emergency Credit Water would not

[33] An owner of Private Water not signatory to TROA could choose, but it is not required, to use its water to maintain enhanced minimum releases.

Table 2.9—Water spill order (first to last)[1]

1.	Other Credit Water and Additional California Environmental Credit Water
2.	Newlands Project Credit Water
3.	Project Water in Another Reservoir
4.	Water Quality Credit Water and Fernley Municipal Credit Water
5.	California Environmental Credit Water
6.	California M&I Credit Water
7.	Fish Credit Water, Joint Program Fish Credit Water, and Non-Firm M&I Credit Water[2]
8.	Project Waters from their respective reservoirs[3]

[1] Where two or more categories appear, they generally share equally.
[2] The spill order within this group varies with the type of water year.
[3] Prosser Project Water reserved for Pyramid Lake fishes would spill before that reserved for minimum releases, then TMWA Emergency Credit Water, and last would be Tahoe-Prosser Exchange Water.

spill. In general, the Administrator would allocate stream channel conveyance losses proportionally among the water categories in the channel and evaporative losses proportionally to each water category in storage, except that Private Water would not suffer conveyance losses and Firm M&I Credit Water, TMWA Emergency Credit Water, Tahoe-Prosser Exchange Water (or Project Water in Another Reservoir[34]), and dead and inactive storage[35] would not evaporate until they are the last categories in storage, and then in the order presented here. Fish Water and Fish Credit Water would compensate for evaporative and conveyance losses of Newlands Project Credit Water.

g. Reservoir Pumping

Under certain conditions, permission could be sought to pump (or siphon) water from Lake Tahoe and Independence Lake.

(1) Lake Tahoe

Pumping or other means could be used to remove water from Lake Tahoe to the Truckee River for M&I purposes only when all of the following conditions are met: (1) TMWA's M&I water supply is less than that provided during the 1928-1935 period,[36] (2) water could not be released by gravity (i.e., lake elevation is below the rim); (3) the action complies with applicable Federal and California laws (e.g., NEPA, CEQA, Clean Water Act, and water right laws); and (4) the Secretary of the Interior, Governor of California, and Governor of Nevada concur.

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[34] This category only relates to Floriston Rate Water from Lake Tahoe that is stored in Stampede Reservoir.

[35] This is storage in a reservoir that cannot be released by gravity flow.

[36] This time period is referred to in the Negotiated Agreement as the "critical drought period."

(2) Independence Lake

TMWA could pump water from Independence Lake to Independence Creek only when all of the following conditions are met: (1) water cannot be released sufficiently by gravity; (2) TMWA holds necessary permits; and (3) an emergency or drought situation exists.

h. Emergencies

As under No Action and LWSA, Federal, State, or local government agencies would continue to respond to emergencies involving facilities or resources addressed in TROA. The Administrator would be authorized to take actions necessary to respond to an emergency.

4. TMWA's Hydroelectric Diversion Dams

TMWA's hydroelectric diversion dams (Farad, Fleish, Verdi, and Washoe) would be operated under TROA similar to No Action, except that the minimum bypass flow at each would be 50 cfs. The United States and the Pyramid Tribe, under certain conditions and at their discretion, could supplement the minimum bypass flows with the release of Fish Water.[37] Implementation of the TROA minimum bypass flow provision for the Farad Diversion Dam depends on a revision of the 150-cfs minimum bypass flow described under No Action.[38]

TMWA would continue to be allowed to divert water from the Truckee River during December-February as needed to remove ice from the Highland Ditch. TROA, however, would allow Fish Credit Water and Fish Water to be released and bypassed for streamflow to compensate for this diversion.

5. Water Exportation from Little Truckee River to Sierra Valley

Exporting water from the Little Truckee River to Sierra Valley would be the same as under No Action and LWSA. In addition, TROA recognizes that, if an agreement were negotiated with holders of rights to the Sierra Valley diversion, to transfer water or water rights pursuant to California law, any water so transferred could be retained in the Truckee River basin and stored as Credit Water.

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[37] Under TROA, the rate at which Fish Water must be bypassed at each hydroelectric powerplant diversion dam to supplement minimum bypass flows depends on the season and the rate at which Fish Credit Water, Other Credit Water owned by the United States, and Newlands Project Credit Water are being captured in storage at the time. Up to 50 cfs of Fish Water (October–April) or up to 150 cfs (May–September) may be released for such supplementation.

[38] According to term and condition No. 12 of SWRCB's 401 Certification for the Farad Diversion Dam Replacement Project proposed by Sierra Pacific Power Company, "SPPC shall maintain a minimum flow of 150 cfs in the bypass reach below the diversion dam, or total Truckee River flow immediately upstream of the diversion dam, whichever is less, in the operation area. The SWRCB may, in its discretion, revise this flow requirement to take into account relevant TROA provisions, if information in the final EIS/EIR [for TROA] indicates that a revised flow is more effective than Condition 6-3 [same as item 12]."

6. Municipal and Industrial Water Resources

a. TMWA

As under No Action and LWSA, TMWA would continue to exercise its existing water rights and expand its conservation and acquisition programs. In addition, TROA would not prevent TMWA from (1) acquiring Truckee River basin water rights in addition to those necessary to meet its normal water year demand of 119,000 acre-feet, (2) importing water to the Truckee River basin, and (3) developing groundwater rights in excess of 15,950 acre-feet. Such actions, however, could not adversely affect water rights of the Pyramid Tribe or the United States, and TMWA would comply with all applicable Federal, State, and local laws.

(1) Exercise of Existing Water Rights

TMWA would continue to exercise, as under No Action and LWSA, its: (1) right under TRA to divert up to 40 cfs from the Truckee River, (2) rights to surface flows of Hunter Creek, (3) Private Water in Donner Lake and Independence Lake, and (4) former irrigation water rights addressed in the next paragraph.

(2) Transfer of Irrigation Water Rights to M&I Use

As under No Action and LWSA, developers in Truckee Meadows would continue to purchase and dedicate irrigation water rights to TMWA for new water service. Because TROA would require 1.11 acre-feet of water rights for every acre-foot of new service commitment (versus 1.00 acre-foot per acre-foot of commitment under No Action and LWSA) and because TROA requires that water conserved by retrofitting residences with water meters not be used to serve customers during normal water years, TMWA anticipates that under TROA developers would provide an additional 36,380 acre-feet by 2033 (10,520 acre-feet more than under No Action and LWSA). This extra water would be used to accumulate TMWA M&I Credit Water. This requirement would remain in effect until TMWA's normal water year supply from all TROA-related sources[39] reached 119,000 acre-feet. This excess water would be used to store TMWA M&I Credit Water during non-drought years and to serve its customers during drought situations.

TMWA could attempt to supplement its water rights by acquiring TCID's right in Donner Lake which it could then manage as provided under TROA to increase its drought supply. TMWA could seek permission to pump up to 2,000 acre-feet from the Sparks Marina Lake when making emergency repairs or during a drought situation.

(3) Pumping Truckee Meadows Groundwater

Under TROA, TMWA likely would pump up to 12,570 acre-feet of groundwater from the Truckee Meadows aquifer during normal water years and up to 15,950 acre-feet during drought situations.

[39] TMWA could use resources not covered by TROA (e.g., imported water), to serve its customers.

(4) Water Conservation

TMWA would not use water saved by the M&I conservation practices to serve existing and new water customers during normal water years unless agreed to by the Pyramid Tribe and the Secretary, and unless applicable laws are changed. TROA would require that water conserved by retrofitting residences with water meters not be used to serve water customers during normal water years. In addition to the normal water year conservation program (10 percent annual savings target), TMWA anticipates that an additional 5 percent would be saved during drought situations under TROA.

b. Fernley

The same amount of surface water and groundwater would be used to serve M&I demand in the vicinity of Fernley under TROA as under No Action and LWSA. Fernley Municipal Credit Water would be used for M&I demand, environmental purposes, and recharging the local aquifer.

c. Lake Tahoe Basin in Nevada

As under No Action and LWSA, surface water would continue to be diverted from tributaries entering Lake Tahoe and pumped from Lake Tahoe and the local aquifers to serve M&I demand in the Lake Tahoe basin in Nevada.

d. Truckee River and Lake Tahoe Basins in California

As under No Action and LWSA, surface water would continue to be diverted and groundwater pumped from local aquifers to serve M&I demand in California. California anticipates that the annual demand for water (both surface and ground) in the upper Truckee River and Lake Tahoe basins by 2033 would be the same under TROA as under No Action and LWSA, though the water source under TROA would differ from that under No Action (table 2.5). Annual use of upper Truckee River basin surface water rights likely would increase from the current 2,800 acre-feet to 4,300 acre-feet, while annual groundwater pumping in basin likely would increase from the current pumping rate of 7,570 acre-feet to 18,400 acre-feet (rather than 19,600 acre-feet under No Action). As under No Action and LWSA, annual water usage in the Lake Tahoe basin in California under TROA likely would increase from the current 18,700 acre-feet to 23,000 acre-feet.

7. Administration, Accounting, and Scheduling

The Administrator would be responsible for carrying out the terms and conditions of TROA. Primary responsibilities would be to (1) classify Credit Waters as they are stored; (2) keep records of and prepare reports covering water storage, release, exchange and use; (3) schedule and coordinate operations; (4) ensure that Credit Waters are used for their designated purposes; and (5) coordinate with the Federal Water Master to avoid conflicts with water rights under the *Orr Ditch* decree. The Federal Water Master would continue to be responsible for administering the provisions of the *Orr Ditch* decree and would become the first TROA Administrator. The Truckee River Special Hearing

Officer would be appointed by a four-member committee—representing United States, California, Nevada, and the Pyramid Tribe—to resolve disputes arising under TROA.

a. Scheduling

Water managers would formulate water storage and release schedules, and the Administrator would combine all such schedules into an operating plan for Truckee River reservoirs to satisfy the exercise of water rights and minimum streamflows.

b. Accounting

TROA would provide criteria for developing and maintaining a water accounting system. Accounting requirements identified in P.L. 101-618 for surface water and groundwater use in the Lake Tahoe and Truckee River basins would be established to determine compliance with the interstate allocations.

c. Cost of Administration

United States, California, and Nevada would share the cost of administration (40, 20, and 40 percent, respectively).

8. Additional Elements Unique to TROA

a. California Guidelines

California would issue each year a set of streamflow, reservoir storage level, and other environmental objectives for reservoir operations that would enhance fish habitat, riparian vegetation, water quality, and recreational opportunities in the upper Truckee River basin. Although not mandatory, the Administrator would encourage the parties to consider the guidelines in their scheduling consistent with their water rights and provisions of TROA.

b. Habitat Restoration Fund

Parties to TROA would provide $50,000 to $100,000 per year for 30 years to a habitat restoration fund. California would receive the money during the first 2 years. During the following 28 years, the money would be given annually to California, Nevada, or the Pyramid Tribe until each received 10 yearly allocations. The fund would be used for fish habitat restoration or to maintain projects in the Truckee River basin. The three parties are encouraged to leverage their distributions with any other funds under their control, and with donations and grants.

c. Storage Contract and Hydroelectric Compensation

Any party accumulating Credit Water in Federal reservoirs under TROA, except United States and the Pyramid Tribe, and California in relation to Joint Program Fish Credit Water, would be required to have a storage contract with United States. Storage contracts are one of the administrative mechanisms needed to implement TROA. As TROA is signed, accepted by the courts, and implemented, storage contracts also would be executed to effectuate the storage aspects of TROA. The environmental effects of TROA and, by extension, these storage contracts, are analyzed in this final EIS/EIR. Contracts for TMWA, Reno, Sparks, Washoe County, California, and Fernley to use Federal reservoirs under Reclamation's jurisdiction would be for 40 years, and renewable every 40 years thereafter as long as TROA is in effect. Renewal would be conditioned on re-negotiation of storage fees. Storage fees would be used according to section 205(b)(2) of P.L. 101-618: first to pay for the operation and maintenance costs of Stampede Reservoir, and secondly for the Lahontan Valley and Pyramid Lake Fish and Wildlife Fund created under section 206(f) of P.L. 101-618.

TMWA could also impose storage fees consistent with the Negotiated Agreement for Credit Water in Independence Lake and in its portion of Donner Lake. Washoe County Water Conservation District would be compensated for the incremental increase in operation and maintenance costs associated with Boca Reservoir due to Credit Water and Stampede Project Water operations.

Agreement would be reached with TMWA regarding compensation for reduction in hydroelectric power generation, if any, arising from the operation of Fish Credit Water, Newlands Project Credit Water, Other Credit Water, some California Environment Credit Water, and releases of Fish Water for streamflow immediately downstream (bypass flow) from each hydroelectric powerplant diversion dam. TMWA would waive compensation for operation of Water Quality Credit Water, Fernley Municipal Credit Water, and California M&I Credit Water.

d. Mitigation

TROA would include measures, as necessary, to reduce or avoid significant adverse environmental effects, if any, resulting from implementation of the Negotiated Agreement.

e. California Public Trust Doctrine

Section 1.A.2 of the Negotiated Agreement declares that TROA is intended to implement California's responsibilities under the public trust doctrine by effecting a balancing between recreation, streamflows, and other public trust uses of water with the requirements of P.L. 101-618. The public trust doctrine requires the State to protect public trust uses, to balance between public trust uses and consumptive uses when allocating water, and to avoid or minimize harm to public trust resources where feasible. Section 1.A.3 of the Negotiated Agreement acknowledges that California will evaluate impacts to resources protected by the public trust when it considers the final EIS/EIR and makes the findings required by CEQA. SWRCB will consider public trust when considering any projects discussed in the final EIS/EIR that require its approval.

f. Certain Credit Waters

Section 205(a)(3) of P.L. 101-618 provides great flexibility for TROA to accommodate other actions to provide benefits beyond those originally contemplated in the Preliminary

Settlement Agreement as Modified by the Ratification Agreement. TROA makes use of this flexibility, including the "...may include, but is not limited to..." language at section 205(a)(3) and addresses provisions that could improve operations to even better provide for protection and enhancement of fish listed under the Endangered Species Act (205(a)(3)(D)), enhance instream beneficial uses (205(a)(3)(G)), and accommodate California's allocation of Truckee River water (205(a)(3)(I)) through Credit Water provisions. Specifically, the Negotiated Agreement provides for California Environmental Credit Water, California Additional California Environmental Credit Water, and Other Credit Water. In each case, further action (beyond TROA being signed and entering into effect) would be required to implement these provisions (i.e., storage contracts in the case of the California categories and possibly Other Credit Water); proposals for their use have not yet been specified.

g. Adjusting Operations or Changing the Negotiated Agreement

TROA would provide procedures for adjusting reservoir operations and operational policies. However, section 205(a)(5) of P.L. 101-618 mandates that the Negotiated Agreement can only be changed in the same manner as it was originally developed.

D. Change Petitions and Water Right Applications

California water right licenses for Prosser Creek Reservoir, Independence Lake, and Boca Reservoir, and California water right permit for Stampede Reservoir must be changed to allow water categories other than those currently described in the licenses or permit to be captured and stored in these reservoirs. Because the parties to the Negotiated Agreement consider such changes necessary to accomplish the purposes of TROA (Article Twelve of the Negotiated Agreement), it could not enter into effect unless SWRCB approved the related change petitions.[40]

Under TROA, the Secretary would file water right applications with SWRCB to increase the amount of Stampede Project Water captured in Stampede Reservoir and remove the release limit from Prosser Creek Reservoir. (See "Prosser Creek Reservoir" and "Stampede Reservoir.") These applications would allow for increased storage and retention of Fish Credit Water until needed by Pyramid Lake fishes. Because the parties to the Negotiated Agreement consider such applications useful, but not essential, to accomplish the purpose of TROA, TROA would enter into effect even if SWRCB did not approve these water right applications.[41]

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[40] Change petitions would request additional points of diversion, additional purposes of use, and expanded places of use in both California and Nevada. Reclamation has also filed two time extension petitions for Stampede Reservoir to seek time for the changes to be implemented and water to be put to beneficial use.

[41] Provisions of the Negotiated Agreement dependent on the approval of the SWRCB would not enter into effect.

TROA would include measures as necessary to reduce or avoid significant adverse environmental effects, if any, from its implementation.

V. Alternatives Considered and Rejected

As discussed previously in Section I.B, numerous alternatives were evaluated to assist the negotiators in developing an operating agreement. Constructing a new reservoir was not considered as an alternative because it would have exacerbated degradation of riverine fish and riparian habitat as well as created additional cumulative environmental impacts throughout the Truckee River basin.

In January 1996, a Report to the Negotiators was completed and circulated to all negotiators. The document was originally expected to serve as the DEIS/EIR for TROA. However, during review of the draft document, the TROA EIS/EIR Management Team concluded that numerous issues, whose environmental effects were indeterminate, were still being negotiated and it was premature to issue a DEIS/EIR for public review. Consequently, the title of the document was modified, and its distribution was restricted to the negotiators. The Report to the Negotiators served three purposes: (1) to provide analytical information requested by the negotiators; (2) to highlight issues raised during public scoping; and (3) to provide the negotiators with additional information on potential impacts of proposals being considered. In the chapter 2 attachment, exhibit E, part 1, is a detailed account of the Report to the Negotiators, and exhibit E, part 2, is a list of operational components rejected from further consideration in the report. Exhibit E, part 3, is a detailed description of computer simulations used in the report to evaluate impacts of various reservoir operations on streamflow and recreational pools.

The Report to the Negotiators included a NEPA-style analysis of five potential project alternatives. Even though a number of issues had yet to be resolved through negotiations at the time the Report to the Negotiators was completed, one alternative represented some essential components of TROA. Four additional alternatives addressed each of the predominant issues identified during the public scoping process: streamflow, recreational pools, threatened and endangered species, and storage of California water. Potential impacts to water supply in the study area were given special attention, and an extensive hydrologic modeling effort was completed to characterize possible differences among the alternatives.

In reviewing the alternatives identified in the Report to the Negotiators, the negotiators recognized a number of important issues. Foremost among those was that water rights, frequently those of M&I water supplies, would be compromised to varying degrees by each of the four additional alternatives. To achieve the identified objectives, these alternatives would have required water to be stored and released without permission of the owners, precluded certain storage and release for decreed water rights and uses, and provided benefits to non-water-righted uses at the expense of water-righted uses. Such actions were in conflict with section 205(a)(2) of P.L. 101-618, which states that water is to be stored and released from Truckee River reservoirs to satisfy the exercise of water rights in conformance with both the *Orr Ditch* and the *Truckee River General Electric* decrees. One or more of the negotiators with mandatory signature authority rejected these alternatives because of their potential adverse impact to water rights. The Basic TROA Alternative had the least adverse impact on water rights, but it, too, created conditions that were unacceptable to negotiators and, in some cases, did not comply with existing law. Accordingly, the alternatives evaluated in the Report to the Negotiators were rejected, and the negotiations continued.

A. Basic TROA Alternative

This alternative emphasized implementing PSA, i.e., providing drought relief for Truckee Meadows and enhancing spawning flows for Pyramid Lake fishes. As part of this alternative, the portion of California's surface water allocation not needed to satisfy projected future water rights would remain in the Truckee River to serve downstream water rights. Existing mandatory minimum streamflows would remain in place, and Credit Water stored pursuant to PSA could be exchanged to increase the potential for maintaining streamflows. Preferred streamflows were identified as being desirable but not mandatory for fish resources. In addition, storage and releases of Credit Water could be exchanged among reservoirs to achieve non-mandatory recreational pool storage targets.

This alternative would have increased the average storage in Lake Tahoe and in Prosser Creek, Stampede, and Boca Reservoirs as compared to No Action, and improved flow conditions for cui-ui spawning. However, water supplies for M&I use in Truckee Meadows and agricultural use in Truckee Meadows and the Carson Division of the Newlands Project would be less than under No Action. Streamflows for spring spawning fish would benefit at the expenses of fall spawning fish.

B. Streamflow Alternative

This alternative responded to issues raised during scoping regarding general well-being of fish and wildlife, stream-based recreation, and water quality in the Truckee River. It identified higher mandatory minimum flows, preferred streamflows, and enhanced spawning flows for cui-ui. The reservoirs would be operated to provide those mandatory streamflows by releasing all categories of water (Floriston Rate Water, Credit Water, and Private Water whenever needed and available). No storage credit would be provided to compensate for these releases. California's excess surface water—the portion of California's 10,000-acre-foot allocation not used to satisfy existing water rights—would be stored as Secondary Stored Water[42] and released to help maintain mandatory flows. This alternative tended to release water when it could not be used to serve water rights.

[42] Secondary Stored Water is an earlier name for Other Credit Water.

In comparison to No Action, this alternative would increase flows in the Truckee River, particularly during the summer when flows are the lowest, thereby benefiting spring spawning fish, riparian vegetation, and water quality. These benefits would be realized, however, at the expense of reservoir storage, which would reduce recreational opportunities and the amount of water available for M&I and agricultural uses. Fall spawning fish would also be adversely impacted.

C. Recreational Pools Alternative

This alternative responded to the issue of lake and reservoir-based recreation. It created mandatory storage targets for all reservoirs from May through August, with the intent of enhancing recreational opportunities. To achieve mandatory reservoir storage targets, releases were prohibited any time storage was less than or equal to the established target. This alternative did not optimize the use of storage to serve water rights.

This alternative would increase opportunities for recreational activities in Prosser Creek, Stampede, and Boca Reservoirs. Populations of fall and spring spawning fish in some tributaries would benefit by more frequent achievement of minimum and preferred flows. LCT in Independence Lake and cui-ui would have less favorable conditions than under No Action. Water supplies, however, would be less than under No Action for M&I use in Truckee Meadows and for agriculture in Truckee Meadows and the Newlands Project.

D. Threatened and Endangered Species Alternative

This alternative responded to the issue of Pyramid Lake fishes. It established mandatory minimum streamflow requirements that were greater than existing minimum streamflow requirements to provide higher flows in the lower Truckee River during the spawning season. To achieve the flow targets, categories of water could be released and exchanged irrespective of whether they could be re-stored or protected from depletion. This alternative tended to release storage necessary to serve water rights in a drought.

This alternative would substantially increase flows for cui-ui and LCT in the lower Truckee River as compared those under the other alternatives. This increase would also benefit water quality, but would be adverse to fall spawning fish. Water supplies availability, however, would be less than under No Action for M&I use in Truckee Meadows and for agriculture in Truckee Meadows and the Newlands Project. There would be little impact to recreation.

E. California Assured Storage Alternative

This alternative was California's preliminary proposal to maintain 50,000 acre-feet of carryover storage to serve beneficial uses in California. The unused portion of the interstate allocation, assumed to be 8,800 acre-feet, could be stored each year in Prosser Creek and Stampede Reservoirs, and any storage could be carried over from year to year up to a maximum of 50,000 acre-feet.

Storage of California water would be greater under this alternative than under No Action. Riparian habitat would also improve. Spring spawning fish would benefit by more frequent achievement of preferred and minimum flows, while opposite flow conditions would occur for fall spawning fish. Water supplies availability, however, would be less than under No Action for M&I use in Truckee Meadows and agriculture in the Truckee Meadows and Newlands Project. There would be little impact to recreation.

VI. Identification of the Preferred Alternative (NEPA) and Environmentally Superior Alternative (CEQA)

Council of Environmental Quality regulations (40 CFR 1502.14(e)) require identifying a preferred alternative in the draft EIS, if such a preference is known. In this instance, TROA is the preferred alternative because it is the result of a multi-party negotiation process and the five mandatory signatories have expressed their preference for and willingness to abide by the conditions in the Negotiated Agreement.

Section 15126.6 of the CEQA Guidelines requires an EIR to describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. In cases where the environmentally superior alternative is the “no project” alternative, Section 15126.6(e) further requires the EIR to identify an environmentally superior alternative. Although not required to be identified in this EIR, TROA is the environmentally superior alternative, because it contains procedures designed to make more efficient use of existing Truckee River reservoirs and to provide multiple benefits, such as enhanced conditions for endangered cui-ui and threatened Lahontan cutthroat trout; reduced streamflow variability; enhanced season streamflows and water quality; and maintenance of reservoir storage to better serve recreational uses.

VII. Summary of Effects

Table 2.10 presents a qualitative summary of effects of the alternatives on the resources of the study area. The table presents relative differences between the action alternatives and No Action, and between all the alternatives and current conditions. Current conditions data for some indicators, including population, employment, and income, are presented in the table to provide a specific basis of comparison with the alternatives. Current conditions are described in chapter 3, under “Affected Environment,” for each resource. No significant adverse effects are expected to occur under TROA.

Table 2.10—Summary of effects of alternatives on resources

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: End-of-month reservoir storage and average monthly releases (acre-feet, unless noted)				
Total storage	Wet: 946,300 Median: 790,000 Dry: 64,000	Slightly less than under current conditions	Similar to No Action	Much greater than under No Action or current conditions
Lake Tahoe	Wet: 672,900 Median: 557,100 Dry: 52,600	Slightly less storage and similar releases as under current conditions	Similar storage and releases as under No Action	Similar storage and much greater May-June releases and less August-January releases than under No Action or current conditions
Donner Lake	Wet: 6,500 Median: 5,800 Dry: 5,100	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Similar storage, except slightly less storage in July and August than under No Action or current conditions; slightly greater June-August releases, less September releases, and greater October releases than under No Action or current conditions
Prosser Creek Reservoir	Wet: 18,800	Wet: similar storage and releases as under current conditions	Similar to No Action in all three hydrologic conditions	Wet: similar storage and releases as under No Action or current conditions
	Median: 14,400	Median: greater August -September storage; less May-July releases; much greater October releases than under current conditions		Median: greater May-September storage; less May-July releases and much greater September-October releases than under No Action or current conditions
	Dry: 3,100	Dry: much greater January-December storage; less May-July releases; greater October releases than under current conditions		Dry: much greater January-December storage; less May releases; greater August-October releases than under No Action or current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: End-of-month reservoir storage and average monthly releases (acre-feet, unless noted) – continued				
Independence Lake	Wet: 15,700	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Wet: similar storage and releases as under No Action or current conditions, except less releases in September
	Median: 15,600			Median: similar storage and releases as under No Action or current conditions, except greater February and August releases and less March and September releases
	Dry: 15,000			Dry: in general, slightly less January-December storage; slightly greater June-September releases; similar October-May releases as under No Action or current conditions
Stampede Reservoir	Wet: 212,900	Wet: slightly greater August-September storage and similar releases as under current conditions	Similar storage and releases as under No Action	Wet: greater May-September storage and greater September-November releases than under No Action or current conditions
	Median: 181,200	Median: similar January-December storage and lower August-September releases than under current conditions		Median: much greater January-December storage; less November-July releases and much greater September-October releases than under No Action or current conditions
	Dry: 22,000	Dry: similar January-December storage and greater March and July releases than under current conditions		Dry: much greater January-December storage and releases than under No Action or current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

<table>
<tr><th>Indicator/location</th><th>Current conditions</th><th>No Action</th><th>LWSA</th><th>TROA</th></tr>
<tr><th colspan="5">Surface Water: End-of-month reservoir storage and average monthly releases
(acre-feet, unless noted) – continued</th></tr>
<tr><td rowspan="3">Boca Reservoir</td><td>Wet: 34,500</td><td rowspan="3">Similar storage and releases as under current conditions</td><td rowspan="3">Similar storage and releases as under No Action</td><td>Wet: less August and greater October-December storage than under No Action or current conditions</td></tr>
<tr><td>Median: 20,300</td><td>Median: greater August-March storage than under No Action or current conditions</td></tr>
<tr><td>Dry: 3,400</td><td>Dry: greater January-December storage than under No Action or current conditions</td></tr>
<tr><td rowspan="3">Lahontan Reservoir</td><td>Wet: 277,300</td><td>Wet: slightly greater September-February storage; similar releases as under current conditions</td><td rowspan="3">Similar to No Action</td><td rowspan="3">Similar to No Action</td></tr>
<tr><td>Median: 160,500</td><td rowspan="2">Median and dry: less January-December storage; less April-September releases than under current conditions</td></tr>
<tr><td>Dry: 99,100</td></tr>
</table>

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: Truckee River average monthly flows (cfs)				
Farad	Wet: 1,420	Slightly less than under current conditions	Similar to No Action	Wet: greater December-June flows than under No Action or current conditions and less August-September flows than under No Action or current conditions
	Median: 650			Median: less November-February flows than under No Action or current conditions and less July-September flows than under No Action or current conditions
	Dry: 430			In general, in dry to very dry hydrologic condition: greater July-September flows than under No Action or current conditions and less November-June flows than under No Action or current conditions
Vista	Wet: 1,460	Generally slightly less than under current conditions	Similar to No Action	Wet: slightly greater December-June flows than under No Action or current conditions
	Median: 640			Median: less November-February flows than under No Action or current conditions
	Dry: 400			Dry: greater July-October flows than under No Action or current conditions
Surface Water: Effects on Pyramid Lake				
Pyramid Lake	Ending elevation: 49 feet higher by the end of 100-year period of analysis Ending storage: 28,430,000 acre-feet Average inflow: 496,720 acre-feet per year	Ending elevation, storage, and inflow less than under current conditions	Ending elevation, storage, and inflow less than under No Action or current conditions	Ending elevation, storage, and inflow greater than under No Action or current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: Effects on Pyramid Lake – continued				
Nixon (Pyramid Lake inflow)	Wet: 1,410 cfs	Wet: Generally slightly less flows than under current conditions	Similar to No Action	Wet: slightly greater December-June flows than under No Action or current conditions
	Median: 600 cfs	Median to dry: greater August-September flows than under current conditions		Median: less November-February flows than under No Action or current conditions and similar to slightly greater July-October flows than under No Action or current conditions
	Dry: 150 cfs			Dry: slightly greater August-October flows than under No Action or current conditions
Surface Water: Effects on Exercise of Water Rights to Meet Demand – Agricultural				
Truckee Meadows	Demand of 40,770 acre-feet per year and 21.3 percent of demand met in minimum supply year	Much less demand and a greater percent of demand met in minimum supply year than under current conditions	Same demand as under No Action and a greater percent of demand met in minimum supply year than under current conditions	Much less demand than under No Action or current conditions and greater percent of demand met in minimum supply year than under No Action or current conditions
Newlands Project Truckee Division	Demand of 18,520 acre-feet per year and 51.5 percent of demand met in minimum supply year	No demand; water rights acquired by TMWA and Fernley	Same as under No Action	Same as under No Action, i.e., no demand; water rights acquired by TMWA and Fernley
Newlands Project Carson Division	Demand of 275,720 acre-feet per year and 47.2 percent of demand met in minimum supply year	Slightly less demand and less percent of demand met in minimum supply year than under current conditions	Same demand and slightly less percent of demand met in minimum supply year than under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions	Same demand and similar percent of demand met in the minimum supply year as under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions
Lower Truckee River	Demand of 12,040 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Surface Water: Effects on Exercise of Water Rights to Meet Demand – M&I				
Lake Tahoe California	Demand of 18,700 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Lake Tahoe Nevada	Demand of 11,000 acre-feet year and 100 percent of demand met in minimum supply year	Same demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., same demand and same percent of demand met in minimum supply year as under current conditions
Truckee River California	Demand of 8,570 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Truckee Meadows	Demand of 83,140 acre-feet per year and 100 percent of demand met in minimum supply year	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply sufficient to meet demand of 119,000 acre-feet in all drought years
Fernley	Demand of 3,280 acre-feet per year and 100 percent of demand met in minimum supply year by groundwater	Much greater demand and less percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and less percent of demand met in minimum supply year as under current conditions
Lower Truckee River	Demand of 1,120 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Groundwater				
Recharge of aquifer adjacent to Truckee River in the Oxbow reach	Not quantified	Slightly less than under current conditions	Same as under No Action	Slightly more than under No Action; same as under current conditions
Recharge of the shallow aquifer in Truckee Meadows	Not quantified	Slightly less than under current conditions	Same as under No Action	Less than under No Action; much less than under current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Groundwater – continued				
Recharge of shallow aquifer near Truckee Canal due to seepage losses	Not quantified	Much less than under current conditions	Slightly less than under No Action; much less than under current conditions	Slightly more than under No Action; much less than under current conditions
Groundwater pumping in Truckee River basin in California (acre-feet per year)	7,750	19,600	18,400	Less than under No Action; much more than under current conditions
Groundwater pumping in Truckee Meadows	15,350 acre-feet (average annual modeled pumping)	Less than under current conditions	Slightly more than under No Action; less than current conditions	Less than under No Action; less than under current conditions
Water Quality				
Truckee River flows upstream of TTSA, down-stream from Reno, and into Pyramid Lake	Greater flows in wet and median hydrologic conditions and comparatively low flows in dry hydrologic conditions	Slightly greater flows than under current conditions in dry hydrologic conditions	Same as under No Action	Slightly greater flows than under No Action or current conditions in dry hydrologic conditions
Number of days temperature standards exceeded down-stream from Reno (in representative dry years)	85	120	119	87
Number of days dissolved oxygen standards exceeded down-stream from Reno (in representative dry years)	109	42	39	3
Total dissolved solids, total nitrogen, and total phosphorus loadings to Pyramid Lake	Large loadings in representative wet and average years, and comparably minimal loadings in representative dry year because of lower flows	Similar to current conditions, except slightly less in representative dry years	Same as under No Action	Overall, similar to No Action and current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Sedimentation and Erosion				
Shoreline erosion at Lake Tahoe				
	Minimal	No manmade induced degradation of any water quality parameters	Same as under No Action	Same as under No Action
Stream channel erosion and sediment transport capacity				
Truckee River from Donner Creek to the Little Truckee River	No overall effect	No overall effect	Same as under No Action	No significant effect
Little Truckee River from Stampede Dam to Boca Reservoir	No overall effect	No overall effect	No overall effect	No overall effect
Spice	No overall effect	Potential significant effect	Same as under No Action	No overall effect
Lockwood	No overall effect	No significant effect	Same as under No Action	No significant effect
Nixon	No overall effect	No significant effect	Same as under No Action	No significant effect
Truckee River delta dynamics at Pyramid Lake				
	No effect	Potential adverse effect on connectivity between the Truckee River and Pyramid Lake	Same as under No Action	Improved connectivity between Truckee River and Pyramid Lake for fish migration and spawning
Biological Resources				
Fish in rivers and tributaries	Preferred flows for brown and rainbow trout sustained less frequently in many reaches	Better conditions for fish in a few reaches; significant adverse effects in some reaches compared to current conditions	Same as under No Action	Significant beneficial effects in many reaches compared to No Action and current conditions
Fish in lakes and reservoirs	Reservoir storage frequently falls below thresholds recommended to minimize algal blooms	Significant beneficial effect on fish in Prosser Creek Reservoir compared to current conditions	Same as under No Action	Significant beneficial effects on fish in Prosser Creek, Stampede, and Boca Reservoirs compared to No Action and current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Biological Resources – continued				
Waterfowl and shorebirds	Available foraging habitat varies by reservoir and hydrologic condition	Same as under current conditions	Same as under No Action	Significant beneficial effect at Stampede Reservoir compared to No Action and current conditions
Riparian habitat and associated species	Amount of riparian habitat varies by reach and habitat type. Ability to manage flows for riparian establishment and maintenance is limited, especially in dry and extremely dry hydrologic conditions	Wet and median hydrologic conditions: significant beneficial effects in a few reaches compared to current conditions Dry and extremely dry hydrologic conditions: significant beneficial effects in most reaches compared to current conditions	Same as under No Action	Median hydrologic conditions: significant beneficial effects in a few reaches compared to No Action and current conditions Dry and extremely dry hydrologic conditions: significant beneficial effects in all reaches compared to No Action and current conditions
Endangered, threatened, and other special status species	Cui-ui currently recovering; LCT not established in mainstem Truckee River	Cui-ui and LCT: significant adverse effects compared to current conditions	Cui-ui and LCT: Same as under No Action	Cui-ui and LCT: significant beneficial effects compared to No Action and current conditions
	Bald eagles nest at Lake Tahoe, Independence Lake, and Boca, Stampede, and Lahontan Reservoirs	Bald eagle at Stampede Reservoir: significant beneficial effects compared to current conditions	Bald eagle at Stampede Reservoir: significant adverse effects compared to No Action	Bald eagle at Stampede and Boca Reservoirs: significant beneficial effects compared to No Action and current conditions
	Tahoe yellow cress populations fluctuate based on Lake Tahoe levels	Tahoe yellow cress: same as under current conditions	Tahoe yellow cress: same as under No Action	Tahoe yellow cress: same as under No Action
	American white pelican: dependent on cui-ui for food source	American white pelican: significant adverse effects compared to current conditions	American white pelican: same as under No Action	American white pelican: significant beneficial effects compared to No Action and current conditions
	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species	Other special status species: see riparian habitat and associated species

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Recreation				
Seasonal recreation visitation	Recreational visitation varies among hydrologic conditions at all reservoirs, with greatest losses in visitation occurring in dry hydrologic conditions. Visitation losses occur in median hydrologic conditions, but losses are not as great as in dry hydrologic conditions.	Same as under current conditions, except slightly less at Donner Lake in median hydrologic conditions	Same as under No Action, except slightly more at Donner Lake in median hydrologic conditions	Same as under No Action, except more at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in some hydrologic conditions
Boat ramp usability	Boat ramps are unusable from 0 to 100 percent of the recreation season, depending on lake or reservoir and hydrologic condition. Boat ramps are unusable the greatest number of months in dry hydrologic conditions at Prosser Creek Reservoir; ramps are usable the greatest number of months at Stampede Reservoir in wet and median hydrologic conditions.	Same as under current conditions, except slightly more usable at Boca Reservoir in wet hydrologic conditions	Same as under No Action	Same as under No Action and current conditions, except slightly more or less usable at Donner Lake and Boca Reservoir in certain hydrologic conditions
Suitability of flows for fly fishing	Flows are suitable 71 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions, with a few exceptions	Same as under No Action	Same as under No Action

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Recreation – continued				
Suitability of flows for spin/lure/bait fishing	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Desired flows would occur more often in the Little Truckee River from Independence Creek to Stampede Reservoir and in the Trophy reach in wet hydrologic conditions and less often in the Mayberry, Oxbow, and Spice reaches in dry hydrologic conditions than under current conditions	Same as under No Action, except desired flows would occur more often in the Mayberry, Oxbow, and Spice reaches in median hydrologic conditions	Desired flows would occur more often in Prosser Creek in median hydrologic conditions and in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions and less often in several reaches, primarily in wet hydrologic conditions, than under No Action and current conditions
Suitability of flows for rafting	Flows are suitable 43 to 0 percent of the recreation season, depending on location and hydrologic condition. The Trophy section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Suitability of flows for kayaking	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Economic Environment				
Recreation-based employment and income	Baseline (California) Employment: 23,814 jobs Income: $576 million	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Employment and income affected by changes in water supply	Baseline (Nevada) Employment: 267,689 jobs Income: $15.2 billion	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Economic Environment – continued				
Hydroelectric power generation and revenues: run-of-the-river	Wet hydrologic conditions: 67,829 MWh; $3.20 million	Wet hydrologic conditions: same as under current conditions	Wet hydrologic conditions: same as under No Action and current conditions	Wet hydrologic conditions: .4 percent less than under No Action; .5 percent less than under current conditions
	Median hydrologic conditions: 65,910 MWh; $3.11 million	Median hydrologic conditions: same as under current conditions	Median hydrologic conditions: approximately the same as under No Action and current conditions	Median hydrologic conditions: 3.1 percent less than under No Action; 3.1 percent less than under current conditions
	Dry hydrologic conditions: 45,985 MWh; $2.17 million	Dry hydrologic conditions: 1.8 percent greater than under current conditions	Dry hydrologic conditions: about the same as under No Action; 1.5 percent greater than under current conditions	Dry hydrologic conditions: 2.8 percent greater than under No Action; 4.6 percent greater than under current conditions
Hydroelectric power generation and revenues: Lahontan Dam	Wet hydrologic conditions: 26,837 MWh; $1.27 million	Wet hydrologic conditions: about 3 percent less than under current conditions	Wet hydrologic conditions: about the same as under No Action; about 3 percent less than under current conditions	Wet hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Median hydrologic conditions: 22,866 MWh; $1.08 million	Median hydrologic conditions: about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Dry hydrologic conditions: 21,520 MWh $1.02 million	Dry hydrologic conditions: about 3 percent less than under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
Total annual groundwater development costs	$1,520,395	$3,348,102 or 120 percent greater than under current conditions	40 percent greater than under No Action; $4,696,483 or 200 percent greater than under current conditions	36 percent less than under No Action; $2,151,982 or 42 percent greater than under current conditions

Table 2.10—Summary of effects of alternatives on resources – continued

Indicator/location	Current conditions	No Action	LWSA	TROA
Social Environment				
Population of Truckee Meadows	284,147	440,874	440,874	440,874
Urbanization of Truckee Meadows	M&I water supply of 83,140 acre-feet Baseline employment: 267,689 jobs Baseline income $15.2 billion	Change in M&I water supply to meet additional 36,000 acre-foot demand (total 119,000 acre-foot demand) would support 74,400 full- and part-time jobs and $2.56 billion in personal income	Same as under No Action	About the same as under No Action (differences in employment and income of less than 1 percent from baseline)
Air Quality	Regulatory programs and monitoring in place to comply with air quality criteria standards	Same as under current conditions	Same as under No Action	Same as under No Action
Cultural Resources				
In Area of Potential Effect, number of recorded cultural resources at lakes and reservoirs and as [percent] of total recorded resources affected	100 [38]	99 [38]	99 [38]	88 [33]
In Area of Potential Effect, number of recorded cultural resources along river and stream reaches and as [percent] of total recorded resources affected	18 [11]	9 [6]	9 [6]	18 [11]

Chapter 2 Attachment

Exhibit A – Highlights of Changes to the October 23 Draft Agreement that Resulted in the Proposed Negotiated Agreement

Exhibit B – Relation of Provisions of the Truckee River Agreement to the Proposed Negotiated Agreement

Exhibit C – Relation of Provisions of the Tahoe-Prosser Exchange Agreement to the Proposed Negotiated Agreement

Exhibit D – Sample – California Guidelines for Truckee River Reservoir Operations

Part 1 – Specific Goals and Objectives for Truckee River Reservoir Operations – Sample Year - 2002

Part 2 – General Goals and Objectives for Truckee River Reservoir Operations

Exhibit E – Selected Elements of the Report to the Negotiators

Part 1 – Alternatives Considered and Rejected

Part 2 – TROA Components Considered and Rejected During Negotiations

Part 3 – Computer Analysis of Streamflow and Recreational Pool Elements Considered for TROA

Exhibit A

Highlights of Changes to the
October 2003 Draft Agreement that Resulted in
the Proposed Negotiated Agreement

Exhibit A: Highlights of Changes to the October 2003 Draft Agreement that Resulted in the Proposed Negotiated Agreement

Section	Proposed Negotiated Agreement
Throughout document	Where appropriate, the name "Power Company" was replaced with the name "Water Authority"
Definitions	Deleted the reference to a map
Preface	Deleted
Recitals	Added the name of Truckee Donner Public Utility District
Recitals	Deleted the name Donner Lake Water Company
Recitals	Added statement about the Secretary's responsibilities under TROA as they relate to the case of *Pyramid Lake Paiute Tribe of Indians* v. *Morton*, 354 F. Supp. 252 (D.D.C. 1973)
1.A.2	Finalized the environmental impact avoidance section
1.C.5	Added a new section that addresses the rights and obligations of Water Authority and TCID for the operation of Donner Lake and their privately owned stored water in the lake
1.E.4	Changed the section to only address by which time Reno, Sparks, and Washoe Co. would provide 6,700 acre-feet of water for water quality purposes as required by a separate agreement between these parties and the Pyramid Tribe
2.B.5(c)	Slightly modified California's jurisdiction statement as to the *Orr Ditch* Decree
2.C.2(a)	Amended United State's share of administrative expenses
2.C.2(b)	Amended California's share of administrative expenses
4.F.1(d)	Modified section so that it was not necessary to list the specific water systems
5.A.1(a)	Deleted the first version of 5.A.1(a) in the 2003 Draft Agreement about prior agreements
5.B.4(a)	Clarified that the section applies to the successor in interest to the Donner Lake Water Company
5.C.3	Added provision that spilled Newlands Project Credit Water may be diverted to the Newlands Project pursuant to OCAP
5.D.1	Added provision that evaporation of Newlands Project Credit Water would be compensated by conversion of Fish Water and Fish Credit Water
5.E.2	Modified this section to address conveyance losses of Newlands Project Credit Water
6.C.1(h)	Modified the text to clarify that all management and use of water charged to California's allocation for the generation of hydroelectric power shall be incidental to all other uses
6.C.2(b)(2)	Modified the text to clarify the applicability of conditions on water rights
6.C.4(b)	Clarified conditions on permits or licenses (including amendments) authorized after May 1, 1996, for the diversion of surface water to underground storage

Exhibit A: Highlights of Changes to the October 2003 Draft Agreement that Resulted in the Proposed Negotiated Agreement – continued

Section	Proposed Negotiated Agreement
6.C.5(a)(2)(i)	Clarified that the section applies to the successor in interest to the Donner Lake Water Company
6.C.5(b)(1)	Clarified conditions or actions that the California State Water Resources Control Board will require of permits or licenses, or of permittee or licensee.
Article Seven	Deleted three notes from the beginning of the article
7.A.4(b)(5)	Deleted the section because it was no longer necessary after changes to Section 7.F
7.A.4(d)	Deleted the section because it was no longer necessary after changes to Section 7.H
7.A.5(a)	Added Fernley Municipal Credit Water to the list of affected Credit Waters
7.A.6(a)	Clarified that compensation would be based on the terms and conditions of the storage contract between Water Authority and United States on a given date – the five specific conditions of this section were deleted
7.A.8	Added a new provision that addresses the disposition of water stored under Interim Storage Contract once TROA goes into effect
7.B.4(b)	Clarified the “non-firm credit multiplier” as the “Non-Firm M&I Credit Water multiplier”
7.F	Conditioned the use of Fernley Municipal Credit Water on compliance with applicable laws and acquisition of necessary approvals, and clarified the reservation of rights to assert claims
7.H	Rewrote the entire section to address establishment of Newlands Project Credit Water under the provisions of OCAP
Appendix 7.D	Added an appendix to address establishment of Newlands Project Credit Water in the event that the credit water provisions of OCAP are repealed or significantly modified
10.B.1	Added a list of wells that are “conclusively presumed” to comply with the Settlement Act
12.A.3(d)	Deleted the last clause of the section about mitigation so that it only states that California has complied with California Endangered Species Act
12.A.3(g)	Listed the case, *Pyramid Lake Paiute Tribe* v*. Lujan*, Civ. S-87-1281-LKK, United States District Court, Eastern District of California, as being resolved
12.A.3(h)	Added a section that states that the provision of Section 1.E.4 has been satisfied
12.A.4(g)	Moved reference to the case, *Pyramid Lake Paiute Tribe* v*. Lujan*, Civ. S-87-1281-LKK, United States District Court, Eastern District of California, to Section 12.A.3(g)
14.B and 14.B.1	Changed the title to Audit Clause Required in Agreements with the State of California, and modified the section accordingly

Exhibit B

Relation of Provisions of the
Truckee River Agreement to the
Proposed Negotiated Agreement

Exhibit B: Relation of Provisions of the Truckee River Agreement to the Proposed Negotiated Agreement

This table is intended for informational purposes only—as an aid for finding parallel references between the Truckee River Agreement and proposed Negotiated Agreement—and is not intended to be for any substantive purposes.

Truckee River Agreement	Proposed Negotiated Agreement
Article I. Definitions	
(A) Diverted Flow	Term not defined, but referred to in Section 5.A.7
(B) Floriston Rates	Definition (40)
(C) Iceland Gage	Definition (33) - Now Farad Gage
(D) Municipal and Domestic Uses	Definition (52)
(E) Natural Flow	Term not used
(F) 1915 Decree	Definition (92) - *Truckee River General Electric* decree
(G) Operative Date of this Agreement	Not included
(H) Person	Definition (62)
(I) Pondage	Definition (99) - Now Water Authority Boca Storage
(J) Privately Owned Stored Water	Definition (64)
(K) Reduced Floriston Rates	Definition (73)
(L) Supplemental Reservoir	Boca Reservoir
(M)(1) Supplemental Storage Water	Definition (9) - Now Boca Storage Water
(M)(2) Additional Supplemental Storage Water	Definition (3) - Now Additional Boca Storage Water
(N) Truckee Canal Water	Term not used
(O) Truckee River Final Decree	Definition (58) - *Orr Ditch* decree
(P) Year	Definition (e)
Article II. Construction, operation and ownership of Pondage and Supplemental Reservoir	
(A) Construction of Pondage	Not included
(B) Construction of Supplemental Reservoir	Not included
(C) Operation, Ownership and Maintenance of Pondage and Supplemental Reservoir	
(1) Operation of Pondage and Supplemental Reservoir	Section 5.A.5(b)
(2) Ownership of Pondage and Supplemental Reservoir	Not included
(D) Construction of Regulating Reservoirs	Not included

Exhibit B: Relation of Provisions of the Truckee River Agreement to the Proposed Negotiated Agreement – continued

This table is intended for informational purposes only—as an aid for finding parallel references between the Truckee River Agreement and proposed Negotiated Agreement—and is not intended to be for any substantive purposes.

Truckee River Agreement	Proposed Negotiated Agreement
Article III. Rates of flow in Truckee River	
(A) Maintenance of Floriston Rates and Reduced Floriston Rates	
(1) All water in Lake Tahoe to be Released for Floriston Rates	Section 5.B.3
(2) Floriston Rate Water not to be Released above Floriston Rates	Section 5.A.2(a)(3)
(3) Temporary reduction in Floriston Rates	Section 5.A.3(b)
(4) Exchange of Privately Owned Stored Water for Floriston Rate Water	Section 5.A.2(b)
(5) Floriston Rates in effect when Tahoe above 6,226.0 feet elevation	Section 5.A.2(a)
(B) Rates of Flow at Iceland Gage when Lake Tahoe is below 6226.0 feet	
(1) Conditions when Reduced Floriston Rates are in effect	Section 5.A.2(a)(2)
(2) Deviation from Reduced Floriston Rates for Power Company	Section 5.A.2(c)
(3) Reductions in Floriston Rates	Section 5.A
(4) Releases of Floriston Rate Water for Power Company	Section 5.A.2(c)
(C) Release of water from Lake Tahoe and of Supplemental Storage Water for purpose of maintaining Floriston Rates and Reduced Floriston Rates	Sections 5.A.4 and 5.A.5
(1) Use of 4,000 acre-feet by Power Company to regulate flow	Section 5.A.5(b)
(2) Releases for Floriston Rates when Tahoe above 6,225.5 feet elevation	Section 5.A.4(a)
(3) Releases for Floriston Rates when Tahoe below 6,225.5 feet elevation	Section 5.A.4(b)
(4) Use of Boca Storage Water impounded before October 1st	Section 5.A.4(c)(1)
(5) Use of Boca Storage Water impounded after October 1st	Section 5.A.4(c)(2)
(D) Release of 4,000 acre-feet of Truckee Canal Water for Power Company use	Section 5.A.2(c)
(E) Release of water for removal of ice	Section 5.A.3(c)

Exhibit B: Relation of Provisions of the Truckee River Agreement to the Proposed Negotiated Agreement – continued

This table is intended for informational purposes only—as an aid for finding parallel references between the Truckee River Agreement and proposed Negotiated Agreement—and is not intended to be for any substantive purposes.

Truckee River Agreement	Proposed Negotiated Agreement
(F) Release of water from Lake Tahoe to prevent High Water Damage	Section 5.A.3(d)
(G) Release of Additional Supplemental Reservoir	Section 5.A.4(d)
Article IV. Impounding Water in Supplemental Reservoir	
(A) Impounding 25,000 acre-feet of Boca Storage Water	Section 5.B.9(a)
(B) Impounding Additional Boca Storage Water up to capacity of Boca Reservoir	Section 5.B.9(b)
(C) General Conditions	
(1) Maximize Truckee Canal Water	Section 5.B.9(f)
(2) Release for TCID during first year of TRA	Not included
(3) Maximize storage in Boca	Section 5.B.9(f)
Article V. Diversions by Power Company from Truckee River into Highland Ditch and from Hunter Creek	
(A) 40 cfs diversion from Truckee River	Section 5.A.6
(B) Diversion into Highland Ditch to remove ice	Sections 5.A.6 and 5.A.8
(C) Diversion from Hunter Creek	Section 5.A.6
Article VI. 4,000 acre-feet of Truckee Canal Water for Power Company use	Section 5.B.2
Article VII. Allocation of Diverted Flow of Truckee River after Operative Date of this Agreement	Section 5.A.7
Article VIII. Limitation of Area Irrigated within the Conservation District	Not included
Article IX. Releases and Diversion of Privately Owned Stored Water	Section 5.E.2
Article X. Truckee River Final Decree	Not included
Article XI. Rights of the United States to use of water of Truckee River upon Pyramid Lake Indian Reservation Lands	Not included
Article XII. Withdrawal of protest against granting application Nos. 5169 and 6534 filed with California Division of Water Rights	Not included

Exhibit B: Relation of Provisions of the Truckee River Agreement to the Proposed Negotiated Agreement – continued

This table is intended for informational purposes only—as an aid for finding parallel references between the Truckee River Agreement and proposed Negotiated Agreement—and is not intended to be for any substantive purposes.

Truckee River Agreement	Proposed Negotiated Agreement
Article XIII. Recognition of Right of Irrigation District to enlarge Truckee Canal to a capacity of 1,200 cubic fee per second and to increase capacity of Lahontan Reservoir	Not included
Article XIV. Excuses for non-performance and delay in performance	Not included
Article XV. 1915 Decree not to be affected by this Agreement	Section 12.A.4(c)
Article XVI. Agreement between United States and Irrigation District dated December 18, 1926, to remain in effect.	Not included
Article XVII. Provisions of this Agreement not to limit or affect rights of Power Company to use Waters of Lake Tahoe and/or Truckee River for generation of electric power	Section 7.A.6
Article XVIII. Provisions relative to the appointment of Water Administrator and to compilation of data	Not included
Article XIX. Method of giving notice or making request	Not included verbatim, but principle addressed in Section 14.P
Article XX. Provisions relative to time when and conditions under which Agreement becomes operative	Not included
Article XXI. Provisions of Agreement to apply to and bind heirs, administrators, successors and assigns of parties	Not included
Article XXII. Obligations of parties to this Agreement is several	Not included
Article XXIII. Privately Owned Stored Water	Section 5.A.1(d)
Article XXIV. Rights of Non-Signors of Agreement not to be affected hereby	Not included
Article XXV. Miscellaneous	
(A) – (E)	Not included
(F) Lake Tahoe Datum	Section 5.A.1(b)
(G) (1) – (2)	Not included
(3) Pumping Lake Tahoe	Section 5.B.3(b)
Article XXVI. Execution of Agreement in Counterparts	Not included
Article XXVII. Irrigation District Contract authorized by election and confirmed by Court	Not included
Article XXVIII. Member of Congress Clause	Section 14.C

Exhibit C

Relation of Provisions of the
Tahoe-Prosser Exchange Agreement
to the Proposed Negotiated Agreement

Exhibit C: Relation of Provisions of the Tahoe-Prosser Exchange Agreement to the Proposed Negotiated Agreement

This table is intended for informational purposes only—as an aid for finding parallel references between the Tahoe-Prosser Exchange Agreement and proposed Negotiated Agreement— and is not intended to be for any substantive purposes.

Tahoe-Prosser Exchange Agreement	Proposed Negotiated Agreement
1. Construction of Prosser Creek Dam and Reservoir	Not included
2. Exchange of Water	
(a) Maintaining minimum flows from Lake Tahoe	Section 5.B.6 and Section 9.C.2
(b) Release of Tahoe Exchange Water	Section 5.B.6
(c) Tahoe Exchange Water suffers no loss	Section 5.D.5
(d) Daily records	Section 3.B.
(e) Floriston Rates and Reduced Floriston Rates definition	Definitions (40) and (73), respectively
3. Truckee River Agreement not abrogated	Not included
4. Parties to seek amendment to *Truckee River General Electric* Decree	Section 12.A.4(c)
5. Non-discrimination clause	Not included
6. Contingency on appropriation of funds	Not included
7. Member of Congress clause	Section 14.C
8. Contingency on 1915 Decree modification	Section 12.A.4(c)
9. Agreement binding on successors	Not included

Exhibit D

Sample – California Guidelines for Truckee River Reservoir Operations

Part 1– Specific Goals and Objectives for Truckee River Reservoir Operations – Sample Year - 2002

Part 2 – General Goals and Objectives for Truckee River Reservoir Operations

Exhibit D

Sample – California Guidelines for Truckee River Reservoir Operations

Part 1– Specific Goals and Objectives for Truckee River Reservoir Operations – Sample Year - 2002

SAMPLE

CALIFORNIA GUIDELINES
FOR TRUCKEE RIVER RESERVOIR OPERATIONS

FOREWORD

If the Truckee River Operating Agreement (TROA) is signed and becomes effective, California would annually submit Guidelines for Truckee River Reservoir Operations concerning instream flow, reservoir levels, and other environmental objectives in the California portion of the Truckee River Basin. California's TROA representative, with advice and counsel from appropriate State agencies and California Truckee River Basin local interest groups, would be responsible for preparing and submitting these Guidelines. The general content and process for submittal of the Guidelines are included in TROA Sections 9.F and 11.C.2(b), respectively. The Guidelines would be submitted to the TROA Administrator and Scheduling Parties each spring to provide the Administrator the opportunity to encourage inclusion of recommendations in the Guidelines during the subsequent TROA water operations scheduling process.

The purpose of this sample of the California Guidelines is to show what these Guidelines might look like when they are submitted to the TROA Administrator. These Guidelines do not represent a practical plan for current operations without TROA. The Department of Water Resources has prepared this sample in anticipation of TROA being signed for several reasons: (1) California local interests and potential TROA signatories have expressed interest in seeing an example of the Guidelines so they may have a better understanding of what to expect when TROA is operative; (2) during the upcoming TROA EIR/EIS process, information from this sample of the Guidelines would be used to develop criteria for scheduling use of California's Joint Program Fish Credit Water and other reservoir operations in model runs that would help analyze the environmental impacts from TROA operations; and (3) preparation and discussion of this sample of the Guidelines would help in developing an understanding among all parties of the expected type of items that would be addressed in the Guidelines and how they could be presented.

This sample of the Guidelines is based on hydrologic conditions forecasted in the March 25, 2002, United States Bureau of Reclamation, Truckee River Operation Study, which includes anticipated water demands from Nevada water right holders in the Truckee River Basin.

INTRODUCTION

These Guidelines are transmitted to the TROA Administrator and TROA Scheduling Parties for use during the water operations scheduling process. Under varying conditions of water availability and anticipated use, there is often more than one option for operating upstream reservoirs without significant risk of adverse impacts to existing water rights. Section 9.F.2 of TROA calls for the TROA Administrator to encourage the scheduling parties to schedule in accordance with the California Guidelines and to engage in voluntary exchanges and re-storage options to the extent practicable and consistent with the exercise of water rights, assurance of water supplies, operational considerations, the Settlement Act (Public Law 101-618), and TROA. It is anticipated that, given the opportunity, the TROA Scheduling Parties will use these Guidelines to schedule their operations to help meet California’s objectives for reservoir storage and instream flows below the reservoirs.

These Guidelines are divided into two parts. Part 1 is "Specific Goals and Objectives for Truckee River Reservoir Operations – 2002," consisting of operational goals and objectives based on a March forecast of 2002 hydrologic conditions and reservoir storage, anticipated water use, and reservoir operations. Part 2 is "General Goals and Objectives for Truckee River Reservoir Operations," consisting of operational goals and objectives for instream flows and reservoir storage that are general in nature and do not usually change from year to year. These general objectives have been developed and are included here to provide continuing overall guidance to the Administrator and other TROA scheduling parties and to provide a continuing framework within which the annual specific goals objectives are presented.

The TROA Scheduling Parties are encouraged to take the California Guidelines into account during the TROA scheduling process and to schedule and adjust their water operations to help meet California’s goals and objectives. California may revise and resubmit these 2002 Guidelines to the TROA Administrator and Scheduling Parties in response to their comments and recommendations, changes in schedules for reservoir operations, and changes in forecasted hydrologic conditions.

PART 1 – SPECIFIC GOALS AND OBJECTIVES FOR TRUCKEE RIVER RESERVOIR OPERATIONS – SAMPLE YEAR – 2002

Reservoir Storage and Instream Flow Goals and Objectives For 2002

Specific proposals to achieve California's goals for improving instream flows and recreation pools in the Truckee River Basin have been developed based on the March 25, 2002, United States Bureau of Reclamation (USBR) forecast of Truckee River reservoir storages and releases. These proposals are shown in Table 1 and summarized below:

- Alternate releases between Prosser and Stampede, re-storing some of this water in Boca, where it can be released to meet Pyramid Lake fish needs in November and December to: (1) increase the Stampede release to or above the minimum of 45 cfs in July through October, (2) increase the Prosser release above the minimum of 16 cfs in June, and (3) generally even out releases from Stampede and Prosser toward the Preferred Instream Flows.

- Eliminate the predicted spike in releases from Independence Lake in September through consultation with TMWA, releasing water from Independence at a consistent rate over a longer period in July, August and September and re-storing the earlier release as needed to meet TMWA's long-term objectives.

- Increase the predicted below-minimum releases from Donner Lake in July and August toward the minimum of 8 cfs and reduce it an equivalent amount in September and October without allowing the lake to drop below 8,000 acre-feet before the end of August.

Table 2 shows the USBR forecast of Truckee River Basin reservoir storage and releases and corresponding storage and releases due to implementing these current year reservoir storage and instream flow objectives. The corresponding storage levels are computed based on proposed changes in releases.

California also plans to coordinate with the United States and the Pyramid Tribe as soon as practicable to further propose a TROA Section 8.S Exchange. This would increase low releases of water from Lake Tahoe in lieu of high Stampede releases during the Spring Cui-ui run with an equivalent increase in low releases from Stampede in lieu of high Lake Tahoe releases in late Summer and early Fall. If such an exchange can be implemented, California will resubmit these Guidelines to take into account this considerable change in scheduled operations.

Goals for Management of Joint Program Fish Credit Water, Environmental Credit Water, and Additional Environmental Credit Water

As of April 1, 2002, prior schedules indicate that California will have established 6,000 acre-feet of Joint Program Fish Credit Water, of which 3,000 acre-feet is in Lake Tahoe and 3,000 acre-feet is in Stampede Reservoir. California's goal is to use this Credit Water to meet the Reservoir Storage and Instream Flow Goals and Objectives that are not met through proposals made to the TROA Administrator and Scheduling Parties as identified in the previous section and shown in Tables 1 and 2.

A schedule for releases of Joint Program Fish Credit Water is in Table 3. Included in this schedule is an exchange of 3,000 acre-feet of Fish Credit Water from Lake Tahoe to Stampede, as per a Memorandum of Understanding with the U.S and Pyramid Lake Tribe. On a monthly basis, the release, re-storage and exchange schedule for the period of April 2002 through December 2002 is:

April	Release 1,800 acre-feet from Lake Tahoe, accumulating all 1,800 acre-feet in Prosser via an exchange.
May	Release 2,100 acre-feet from Tahoe and 1,500 acre-feet from Stampede, accumulating only 900 acre-feet in Boca and 1,200 acre-feet in Prosser via an exchange.
June	Release 2,100 acre-feet from Tahoe and 1,800 acre-feet from Prosser and 900 acre-feet from Boca, accumulating only 3,300 acre-feet in Stampede via an exchange.
July	Release 600 acre-feet from Prosser and 300 acre-feet from Stampede, accumulating all 300 acre-feet in Independence and 600 acre-feet in Boca via an exchange.
August	Release 600 acre-feet from Prosser, accumulating all 600 acre-feet in Boca via an exchange.
September	Release 600 acre-feet from Stampede, accumulating all 300 acre-feet in Donner and 300 acre-feet in Boca via an exchange.
October	Release 600 acre-feet from Stampede and 300 acre-feet in Donner, accumulating all 900 acre-feet in Boca via an exchange
November	Release 600 acre-feet from Stampede and 300 acre-feet from Independence, accumulating all 900 acre-feet in Boca via an exchange.
December	Release 300 acre-feet from Stampede, accumulating all 300 acre-feet in Boca via an exchange.

Table 4 shows the anticipated result of these releases if scheduled along with implementation of the specific proposals for improving instream flows and recreation pools in Tables 1 and 2. We also anticipate that, after these releases and exchanges are made, 3,000 acre-feet of Fish Credit Water will remain in Stampede, 3,000 acre-feet of Joint Program Fish Credit Water will remain in Boca, and 3,000 acre-feet of Joint Program Fish Credit Water will have been released without being exchanged. meet water quality objectives for the Truckee River.

Consultation between California and Other TROA Parties

As pointed out in the Introduction to these California Guidelines, they are transmitted to the TROA Administrator and Scheduling Parties so they may be used to schedule operations (to the extent practicable and consistent with the exercise of water rights, assurance of water supplies, operational considerations, the Settlement Act and TROA) to help meet California's objectives for preferred instream flows and reservoir-based recreation, to limit or eliminate releases above the maximum instream flows, and to provide ramping of flows. Any questions regarding these specific-year reservoir storage and instream flow goals and objectives, or California's management of Joint Program Fish Credit Water, Environmental Credit Water, or Additional Environmental Credit Water should be directed to California's TROA representative.

Exhibit D

Sample – California Guidelines for Truckee River Reservoir Operations

Part 2 – General Goals and Objectives for Truckee River Reservoir Operations

PART 2 – GENERAL GOALS AND OBJECTIVES FOR TRUCKEE RIVER RESERVOIR OPERATIONS

General Objectives for Instream Flows below Reservoirs

California's general objective for instream flows below reservoirs is that, to the extent possible, they will be maintained between the "Minimum Flows" and the "Maximums Flows" for each reach as shown in Table 5. When possible, the "Preferred Flows" shown in Table 5 should be maintained in as many reaches and for as long a time as is feasible. If options to achieve preferred flows in any given year are limited and a choice is to be made among stream reaches, the desired priority, from highest to lowest, is:

1) Little Truckee River (Stampede Dam to Boca Reservoir);
2) Truckee River from Lake Tahoe to California Border:
3) Little Truckee River (Independence Lake Dam to Stampede Reservoir);
4) Prosser Creek from Prosser Creek Reservoir to the Truckee River; and
5) Donner Creek from Donner Lake Dam to the Truckee River.

Another instream flow objective is to avoid rapid changes in flow rates through "ramping" of reservoir releases. It is best to limit the rate of increase or decrease to the smallest steps feasible. Ramping is most important in the reaches below Lake Tahoe, Donner Lake, Prosser Creek Reservoir, and Stampede Reservoir, and it is more important to ramp releases down slowly (limit the rate of decrease) than ramp releases up slowly. California's recommendations for ramping flows are as follows:

- Increasing flows - Flows should not be increased more than 100% during a 24-hour period; the change during the 24-hour period should occur in a minimum of three, proportional amounts (i.e., one-third the total 24-hour change per 8 hours).

- Decreasing flows - Flows should not be decreased more than 50% during a 24-hour period; the change during the 24-hour period should occur in a minimum of three, proportional amounts (i.e., one-third the total 24-hour change per 8 hours).

One further instream flow objective is to prevent the Truckee River and its tributaries from freezing solid in the winter months. To prevent icing in the stream sections outlined below, the recommended minimum flows in these stream sections during the winter months is for:

- Donner Creek, Donner Lake to the Truckee River – 3 cfs.
- Prosser Creek – To be developed in accordance with TROA Section 9.C.5(d).
- Independence Creek, Independence Lake to the Little Truckee River – 4 cfs.
- Truckee River, Lake Tahoe to Donner Creek – 30 cfs.
- Truckee River, Donner Creek to the Little Truckee River – 50 cfs.

General Objectives for Reservoir Storage

California's general objective for reservoir storage is that they be maintained at or above the "Preferred Minimum Storage" levels shown in Table 6, from the start of the Memorial Day weekend to the end of the Labor Day weekend of each year. This is to maintain maximum reservoir recreation-based opportunities in California reservoirs in the Truckee River Basin

For Donner Lake, every effort should be made to maintain the "Preferred Minimum Storage" of 8,000 acre-feet through the Labor Day weekend, even at the expense of drawing down other reservoirs through exchanges.

If options to achieve the preferred minimum storage in reservoirs other than Donner Lake are limited, and a choice is necessary to maximize recreation opportunities, the preferred order of operations is as follows:

1. If any reservoir drops below the “Minimum Storage” identified in Table 6, releases from that reservoir should be continued until the reservoir reaches the minimum fish pool, in lieu of releases from other reservoirs, to allow higher storages to be maintained in the other reservoirs.

2. Avoid dropping any reservoir below levels that are necessary to protect fish (“Minimum Fish Storage”) specified in Table 6. If it becomes necessary to drop the reservoirs below minimum fish storage levels please consult with California's TROA representative since more specific priorities among reservoirs may have been developed after this writing.

3. Whenever storage in Stampede Reservoir is above the “Preferred Minimum Storage” specified in Table 6, it is preferable to release water from Lake Tahoe or Stampede Reservoir in lieu of releases from Boca or Prosser Creek Reservoirs to meet water demands; so that Boca and Prosser Creek Reservoirs do not drop below their “Preferred Minimum Storages” as specified in Table 6.

4. If the storage in Stampede Reservoir drops below its "Preferred Minimum Storage" specified in Table 6 and a release from Lake Tahoe is not feasible, releases should be made from Prosser Creek Reservoir and Boca Reservoir in lieu of releases from Stampede Reservoir to meet water demands.

Establishing Priorities among Instream Flow and Reservoir Storage Objectives

Instream flow objectives could, at times, conflict with the reservoir storage objectives. The “Specific Goals and Objectives” in Part 1 will, under most circumstances, describe how to best make this choice given existing hydrologic conditions.

The California TROA representative will make recommendations to the TROA Administrator on instream flow needs and reservoir levels to support recreation in consultation with California interests. If there are competing or conflicting demands for instream flows or reservoir-based recreation, prior to making such recommendations, the California TROA representative will consult with potentially affected California interests to assist in determining the best course of action. During the consultation process, until a decision is made, maintenance of instream flows should be given priority. Parties that may be consulted during this examination process include the following:

- Truckee River Basin Water Group
- Placer County, Nevada County, And Sierra County
- Town of Truckee
- Tahoe-Truckee Sanitation Agency
- Local Rafting Interests
- Local Fishery Interests
- Local Water Supply Interests
- Local Recreation Interests
- State of California agencies, including the Departments of Fish and Game, Parks and Recreation, and Water Resources, and the State Water Resources Control Board and Lahontan Regional Water Quality Control Board
- Federal Agencies, including the U.S. Fish and Wildlife Service, U.S. Forest Service, and the U.S. Bureau of Reclamation
- Pyramid Lake Paiute Indian Tribe

Coordinating Municipal and Industrial Storage Objectives with California Guidelines

California M&I Credit Water may be established in Lake Tahoe and other Truckee River Reservoirs as specified in TROA. If and when this occurs, the instream flow and recreation objectives in these Guidelines may be coordinated with M&I storage objectives for this water.

Table 1 - Specific Proposals for Voluntary Operations to Improve Instream Flows and Recreation Pools – 2002

<table>
<tr><th>Problem Statement and Proposed Change to March 2002 USBR Forecast</th><th>Consultation</th><th>Proposed Action to Implement Proposed Change to Forecast</th></tr>
<tr><td rowspan="5">Stampede releases are low in July-Oct while Prosser Releases are high; and Prosser releases are low in June and Nov when Stampede releases are high.
<table>
<tr><th></th><th>Prosser Forecast/Proposed</th><th>Stampede Forecast/Proposed</th></tr>
<tr><td>June</td><td>12/42 cfs</td><td>227/197 cfs</td></tr>
<tr><td>July</td><td>91/66 cfs</td><td>29/69 cfs</td></tr>
<tr><td>Aug</td><td>98/73 cfs</td><td>29/69 cfs</td></tr>
<tr><td>Sept</td><td>72/87 cfs</td><td>30/45 cfs</td></tr>
<tr><td>Oct</td><td>83/88 cfs</td><td>35/45 cfs</td></tr>
<tr><td>Nov</td><td>22/22 cfs</td><td>115/45 cfs</td></tr>
<tr><td>Dec</td><td>30/30 cfs</td><td>57/52 cfs</td></tr>
</table></td><td>Check with USFWS/Tribe & Water Master.</td><td></td></tr>
<tr><td>If the Prosser releases are primarily Uncommitted Water that could be released at a different schedule in coordination with Stampede releases and still meet needs in Nevada.</td><td>Request USFWS/Tribe alternate releases between Prosser and Stampede as proposed, also releasing and re-storing some of this water in Boca, where it can be released to meet downstream needs in Nov and Dec.</td></tr>
<tr><td>If the Prosser releases are primarily Uncommitted Water that can only be released at specific times to meet needs in Nevada.</td><td>Request USFWS/Tribe alternate releases between Prosser and Stampede toward proposed flows to the extent acceptable, also releasing and re-storing some of this water in Boca, where it can be released to meet their needs in Nov and Dec.</td></tr>
<tr><td>If the Prosser releases are primarily T-P-Exchange Water that may be blended with Tahoe and Boca releases on a different schedule.</td><td>Request the Water Master blend T-P-Exchange Water with other Floriston Rate releases toward proposed flows to the extent acceptable.
Request USFWS/Tribe and others exchange Credit Water from Stampede to Prosser to assist in otherwise meeting proposed flows to the extent their needs are still met.</td></tr>
<tr><td>If the Prosser releases are primarily T-P-Exchange Water that must be released as per the current release schedule.</td><td>Request USFWS/Tribe and others exchange Credit Water from Stampede to Prosser toward the proposed flows to the extent their needs are still met.</td></tr>
</table>

Table 1 (continued) - Specific Proposals for Voluntary Operations to Improve Instream Flows and Recreation Pools – 2002

Problem Statement and Proposed Change to March 2002 USBR Forecast	**Consultation**	**Proposed Action to Implement Proposed Change to Forecast**
Very high release from Independence Lake in Sept (monthly average) Forecast/Proposed July 11/19 cfs Aug 5/13 cfs Sept 29/13 cfs Oct 8/8 cfs Nov 5/5 cfs	Check with TMWA.	
	If the Sept release from Independence is needed as an exchange to another reservoir or to meet downstream needs in Nevada.	Request TMWA exchange 960 acre-feet more from Independence Lake at a constant rate in July-Aug to another reservoir (Stampede?) where it can still be used; reducing the release from Independence accordingly in Sept.
	If the Sept release from Independence is scheduled for some other reason.	Request TMWA exchange their water, as stated in the row above, to the extent acceptable.
Donner Lake release (monthly average) is below the minimum (8 cfs) in July-Aug and above the maximum in Sept. Forecast/Proposed June 35/35 cfs July 3/7 cfs Aug 3/7 cfs Sept 27/23 cfs Oct 48/44 cfs Nov 33 /33 cfs	Check with TMWA/TCID (and Donner Lake recreation interests).	
	If the Sept-Oct releases from Donner are needed as an exchange to another reservoir or to meet downstream needs in Nevada.	Request TMWA/TCID exchange 480 acre-feet (or some lesser amount that does not allow the lake to drop below an acceptable end-of-Aug recreation target - assumed to be 8,000 acre-feet here) more from Donner Lake at a constant rate in July-Aug to another reservoir where it can still be used, reducing the Donner release accordingly in Sept-Oct.
	If the Sept-Oct releases from Donner are scheduled for some other reason.	Request TMWA/TCID exchange their water, as stated in the row above, to the extent acceptable.

Table 2 – USBR Forecast* and Proposed Reservoir Storage and Instream Flows to Meet Current-year Objectives with Voluntary Changes to Operations

	Lake Tahoe Elev (FEET)	Truckee River at Tahoe City (CFS)		Donner Lake Storage (TAF)		Donner Lake Release (CFS)		Prosser Reservoir Storage (TAF)		Prosser Reservoir Release (CFS)	
		Forecast	Proposed	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed
Jan-02	6224.3	62 <	NC <	3.6	NC	27	NC	8.3	NC	42 ☺	NC ☺
Feb-02	6224.3	94 ☺	NC ☺	3.8	NC	20	NC	8.8	NC	33 ☺	NC ☺
Mar-02	6224.5	54 <	NC <	4.0	NC	35	NC	9.8	NC	56 ☺	NC ☺
Apr-02	6224.7	71 <	NC <	6.0	NC	56 ☺	NC ☺	11.9	NC	154 >	NC >
May-02	6225.2	68 <	NC <	9.5	NC	69 ☺	NC ☺	18.9	NC	126 ☺	NC ☺
Jun-02	6225.4	72 <	NC <	9.5 ☺	NC ☺	35 ☺	NC ☺	26.8 ☺	25.0 ☺	12 ☺	42 ☺
Jul-02	6225.1	261 ☺	NC ☺	9.2 ☺	8.9 ☺	3 <	7 <	23.5 ☺	23.2 ☺	91 ☺	66 ☺
Aug-02	6224.5	375 ☺	NC ☺	8.6 ☺	8.2 ☺	3 <	7 <	18.0 <	19.2 ☺	98 >	73 >
Sep-02	6224.0	236 ☺	NC ☺	6.9	6.7	27 >	23 >	14.0	14.3	72 >	87 >
Oct-02	6223.7	101 ☺	NC ☺	4.5	NC	48 ☺	44 ☺	9.8	NC	83 ☺	88 ☺
Nov-02	6223.6	52 <	NC <	3.2	NC	33 ☺	NC ☺	9.8	NC	22 <	NC <
Dec-02	6223.6	49 <	NC <	3.2	NC	16	NC	9.8	NC	30 ☺	NC ☺

KEY:
- \> Instream fish flows that exceed maximums
- ☺ Instream fish flows and reservoir storages that are within objective ranges
- < Instream fish flows that are below minimum flows and reservoir storages that are below preferred minimum storages
- NC No Changes Recommended

* The 50 Percent Streamflow and Reservoir Storage Forecast is the "Most Probable" forecast and is generally considered to be the best estimate of anticipated monthly average streamflow and end of the month reservoir storage based upon the outcome of similar situations in the past. There is a 50 percent chance that actual streamflow volume and reservoir storage amounts will be less than this forecast value and a 50 percent chance that it will exceed this value.

Note: Reservoir storage is in thousand acre-feet at the end of the month and releases are in cubic feet per second as a monthly average

Table 2 (Continued)– USBR Forecast* and Proposed Reservoir Storage and Instream Flows to meet Current-year Objectives with Voluntary Changes to Operations

	Independence Lake Storage (TAF)		Independence Creek below Independence Lake (CFS)		Stampede Reservoir Storage (TAF)		Stampede Reservoir Release (CFS)		Boca Reservoir Storage (TAF)		Boca Reservoir Release (CFS)	
	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed	Forecast	Proposed
Jan-02	15.4	NC	5 <	NC <	169.1	NC	54 ☺	NC ☺	8.0	NC	38	NC
Feb-02	15.7	NC	4 ☺	NC ☺	168.8	NC	65 ☺	NC ☺	8.6	NC	67	NC
Mar-02	16.3	NC	5 ☺	NC ☺	166.4	NC	140 ☺	NC ☺	16.4	NC	43	NC
Apr-02	16.4	NC	34 ☺	NC ☺	161.9	NC	346 >	NC >	33.1	NC	76	NC
May-02	17.2	NC	56 >	NC >	179.0	NC	112 ☺	NC ☺	40.2	NC	0	NC
Jun-02	17.1	NC	50 >	NC >	176.3 ☺	178.1 ☺	227 ☺	197 ☺	40.1 ☺	NC ☺	227	197
Jul-02	16.8	16.3	11 ☺	19 ☺	174.8 ☺	174.7 ☺	29 <	69 ☺	34.9 ☺	35.8 ☺	106	127
Aug-02	16.4	15.4	5 ☺	13 ☺	172.5 ☺	170.4 ☺	29 <	69 ☺	32.7 <	34.5 ☺	56	77
Sep-02	14.7	NC	29 >	13 ☺	172.0	168.1	30 <	45 ☺	24.5	28.1	162	151
Oct-02	14.4	NC	8 ☺	NC ☺	172.0	167.5	35 <	45 ☺	15.5	19.9	187	186
Nov-02	14.3	NC	5 <	NC <	167.2	166.9	115 ☺	45 ☺	10.5	10.8	197	NC
Dec-02	14.2	NC	9 ☺	NC ☺	167.2	NC	57 ☺	52 ☺	5.3 <	NC <	141	NC

KEY:
- > Instream fish flows that exceed maximums
- ☺ Instream fish flows and reservoir storages that are within objective ranges
- < Instream fish flows that are below minimum flows and reservoir storages that are below preferred minimum storages
- NC No Changes Recommended

* The 50 Percent Streamflow and Reservoir Storage Forecast is the "Most Probable" forecast and is generally considered to be the best estimate of anticipated monthly average streamflow and end of the month reservoir storage based upon the outcome of similar situations in the past. There is a 50 percent chance that actual streamflow volume and reservoir storage amounts will be less than this forecast value and a 50 percent chance that it will exceed this value.

Note: Reservoir storage is in thousand acre-feet at the end of the month and releases are in cubic feet per second as a monthly average

Table 3. Proposed Average Monthly Release Schedule for JPFCW and FCW*

	Truckee River at Tahoe City (CFS)	Donner Lake Release (CFS)	Prosser Reservoir Release (CFS)	Indep Lake Release (CFS)	Stampede Reservoir Release (CFS)	Boca Reservoir Release (CFS)	
Jan-02							**Jan-02**
Feb-02							**Feb-02**
Mar-02							**Mar-02**
Apr-02	30.0		(30.0)				**Apr-02**
May-02	35.0		(20.0)		25.0	(15.0)	**May-02**
Jun-02	35.0		30.0		(55.0)	15	**Jun-02**
Jul-02			10.0	(5.0)	5.0	(10.0)	**Jul-02**
Aug-02			10.0			(10.0)	**Aug-02**
Sep-02		(5.0)			10.0	(5.0)	**Sep-02**
Oct-02		5.0			10.0	(15.0)	**Oct-02**
Nov-02				5.0	10.0	(15.0)	**Nov-02**
Dec-02					5.0	(5.0)	**Dec-02**

Negative releases (in parenthesis) indicate an exchange or re-storage of water into that reservoir

*Releases of Fish Credit Water are per Memorandum of Understanding with the U.S. and the Pyramid Lake Paiute Indian Tribe

Table 4 - Proposed Reservoir Storage and Instream Flows to meet Current-Year Objectives with Voluntary Changes to Operations and Releases of JPFCW and FCW

	Lake Tahoe Elev (FEET)	Truckee River at Tahoe City (CFS)	Donner Lake Storage (TAF)	Donner Lake Release (CFS)	Prosser Reservoir Storage (TAF)	Prosser Reservoir Release (CFS)	Indep. Lake Storage (TAF)	Indep. Creek Below Indep.	Stampede Res Storage (TAF)	Stampede Res Release (CFS)	Boca Res Storage (TAF)	Boca Res Release (CFS)
Jan-02	6224.3	62 <	3.6	27	8.3	42 ☺	15.4	5 <	169.1	54 ☺	8.0	38
Feb-02	6224.3	94 ☺	3.8	20	8.8	33 ☺	15.7	4 ☺	168.8	65 ☺	8.6	67
Mar-02	6224.5	54 <	4.0	35	9.8	56 ☺	16.3	5 ☺	166.4	140 ☺	16.4	43
Apr-02	6224.7	101 ☺	6.0	56 ☺	13.7	124 ☺	16.4	34 ☺	161.9	346 >	33.1	76
May-02	6225.2	103 ☺	9.5	69 ☺	22.0	106 ☺	17.2	56 >	177.5	137 ☺	41.1	10
Jun-02	6225.3	107 ☺	9.5 ☺	35 ☺	26.2 ☺	72 ☺	17.1	50 >	179.9 ☺	142 ☺	40.1 ☺	157
Jul-02	6225.0	261 ☺	8.9 ☺	7 <	23.8 ☺	76 ☺	16.6	14 ☺	176.2 ☺	69 ☺	36.4 ☺	117
Aug-02	6224.4	375 ☺	8.2 ☺	7 <	19.2 ☺	83 >	15.7	13 ☺	171.9 ☺	69 ☺	35.8 ☺	67
Sep-02	6224.0	236 ☺	7.0	18 ☺	14.3	87 >	15.0	13 ☺	169.0	55 ☺	29.6	156
Oct-02	6223.6	101 ☺	4.5	49 ☺	9.8	88 ☺	14.7	8 ☺	167.8	55 ☺	22.3	181
Nov-02	6223.6	52 <	3.2	33 ☺	9.8	22 <	14.3	10 ☺	166.6	60 ☺	14.2	197
Dec-02	6223.6	49 <	3.2	16	9.8	30 ☺	14.2	9 ☺	166.6	57 ☺	9.0 <	141

KEY:
- > Instream fish flows that exceed maximums
- ☺ Instream fish flows and reservoir storages that are within objective ranges
- < Instream fish flows that are below minimum flows and reservoir storages that are below preferred minimum storages

Note: Reservoir storage is in thousand acre-feet at the end of the month and releases are in cubic feet per second as a monthly average

Table 5 - Instream Flow General Objectives (in cubic feet per second)*

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Minimum flow out of Lake Tahoe	75	75	75	75	75	75	75	75	75	75	75	75
Preferred flow out of Lake Tahoe	300	300	300	300	250	250	300	300	300	300	250	250
Maximum flow out of Lake Tahoe	600	600	600	600	500	500	600	600	600	600	500	500
Min. flow, Truckee R. below Donner Ck.	100	100	100	100	100	100	100	100	100	100	100	100
Pref. flow, Truckee R. below Donner Ck.	300	300	300	300	250	250	300	300	300	300	250	250
Max. flow, Truckee R. below Donner Ck.	600	600	600	600	500	500	600	600	600	600	500	500
Minimum flow, TruckeeR. below Boca	150	150	150	150	150	150	150	150	150	150	150	150
Preferred flow, Truckee R. below Boca	300	300	300	300	250	250	300	300	300	300	250	250
Maximum flow, Truckee R. below Boca	600	600	600	600	500	500	600	600	600	600	500	500
Minimum flow out of Donner Lake	8	8[1]	not appl[1]	not appl[1]	not appl[1]	not appl[1]	8[1,2]	8[2]	8[2]	8[2]	8[2]	8
Preferred flow out of Donner Lake[3]	50	50	not appl[1]	not appl[1]	not appl[1]	not appl[1]	50	50	50	50	10	10
Maximum flow out of Donner Lake	100	100	not appl[1]	not appl[1]	not appl[1]	not appl[1]	100	100	100	100	20	20
Minimum flow out of Prosser[4]	25	25	25	25	25	12	12	12	12	12	12	25
Preferred flow out of Prosser	50	50	50	50	35	35	75	75	75	75	30	30
Maximum flow out of Prosser	100	100	100	100	70	70	150	150	150	150	60	60
Minimum flow out of Independence[5]	7	7	7	7	4	4	8	8	8	8	4	4
Preferred flow out of Independence	20	20	20	20	10	10	20	20	20	20	10	10
Maximum flow out of Independence	40	40	40	40	20	20	40	40	40	40	20	20
Preferred flow into Stampede	90	90	90	90	50	50	90	90	90	90	30	30
Minimum flow out of Stampede	45	45	45	45	45	45	45	45	45	45	45	45
Preferred flow out of Stampede	125	125	125	125	100	100	125	125	125	125	100	100
Maximum flow out of Stampede	250	250	250	250	200	200	250	250	250	250	200	200

1. California Dam Safety Requirements preclude storing water in Donner Lake from November 15 to April 15, which preclude the possibility of controlling releases.
2. The minimum-flow objective for Donner Lake during April through August is reduced to 5 cfs or natural inflow, whichever is less, when the lake is projected to have less than 8,000 acre-feet of storage on Labor Day. Exchanges to meet TROA Enhanced Minimum Flows would be reduced similarly to the extent California is able to obtain a waiver for this under TROA Section 9.C.1(c).
3. As stated in TROA Section 9.F.1(a), preferred instream flows out of Donner during a Dry Season may not be specified; consequently, the flows shown here do not apply during a Dry Season.
4. Since physical constraints prevent releases between 12 cfs and 25 cfs, this is the minimum flow until the dam is modified to allow a minimum flow of 16 cfs throughout the year.
5. These releases from Independence Lake are required to the extent specified in TROA Section 9.C.6(a).

*Developed from Instream Flow Requirements, Truckee River Basin, Lake Tahoe to Nevada (California Department of Fish and Game, 1996)

Table 6 - Reservoir Storage Objectives (in thousands of acre-feet)

Reservoir Storage for Recreation Purposes

- Minimum storage is an absolute minimum in the sense that recreation opportunities do not exist when storage is lower.
- June through August storage's are inclusive of the Memorial Day and Labor Day holiday weekends.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Minimum Storage in Donner Lake[1]	--	--	--	--	--	--	--	--	6.3	6.3	6.3	--
Preferred Min. Storage in Donner Lake	--	--	--	--	--	--	--	--	8	8	8	--
Minimum Storage in Prosser Creek Res.	--	--	--	--	--	--	--	--	11	11	11	--
Preferred Min. Storage in Prosser Creek Res.	--	--	--	--	--	--	--	--	19	19	19	--
Minimum Storage in Stampede Res.	--	--	--	--	--	--	--	--	62	62	62	--
Preferred Min. Storage in Stampede Res.	--	--	--	--	--	--	--	--	127	127	127	--
Minimum Storage in Boca Res.	--	--	--	--	--	--	--	--	22	22	22	--
Preferred Min. Storage in Boca Res.	--	--	--	--	--	--	--	--	33.5	33.5	33.5	--

Reservoir Storage Levels to Protect Reservoir Fisheries

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Minimum Fish Storage - Prosser Creek Res.	5	5	5	5	5	5	5	5	5	5	5	5
Minimum Fish Storage - Stampede Res.	15	15	15	15	15	15	15	15	15	15	15	15
Minimum Fish Storage - Boca Res.	10	10	10	10	10	10	10	10	10	10	10	10
Min. Fish Storage in Independence Lake[2]	--	--	--	--	--	--	7.5	7.5	7.5	7.5	--	--

Other Reservoir Storage Objectives

Exchanges out of Lake Tahoe may be recommended at appropriate times to help reduce the potential for wave-induced erosion, to increase the available habitat for the Tahoe Yellow Cress, and to help meet water quality objectives for the Truckee River.

1 Minimum storage specified in the Donner Lake Indenture Agreement (May 3, 1943), below which releases are not permitted
2 Minimum storage for spawning access to upper Independence Creek for the Independence Lake and Independence Creek population of Lahontan Cutthroat Trout

Exhibit E

Selected Elements of the Report to the Negotiators

Part 1 – Alternatives Considered and Rejected

Part 2 – TROA Components Considered and Rejected During Negotiations

Part 3 – Computer Analysis of Streamflow and Recreational Pool Elements Considered for TROA

Exhibit E

Selected Elements of the Report to the Negotiators

Part 1 – Alternatives Considered and Rejected

Exhibit E: Selected Elements of the Report to the Negotiators

Part 1—ALTERNATIVES CONSIDERED AND REJECTED

To assist the negotiators in developing an operating agreement, numerous potential alternatives were evaluated. In one instance, the *Report to the Negotiators*, which is incorporated by reference and summarized below, was prepared to consider the possible effects of five alternatives against a no action alternative. In other studies, an extensive computer simulation effort was completed, which tested the capacity of a variety of streamflow and recreation pool elements to accomplish their intended purposes without infringing on the water rights of others. The results of this computer analysis are summarized at the end of this section.

The alternatives analyzed in the *Report to the Negotiators* were rejected by the negotiators for numerous reasons, but primarily because each alternative would have compromised *Orr Ditch* Decree water rights, and in many cases, would have been inconsistent with P.L. 101-618. A list of components rejected from further consideration in a draft TROA is given in part 2 of this attachment. As formulated, each alternative included mandatory flow or storage requirements and assumed water would be taken to fulfill those requirements without the permission of rightful water rights owners. For example, computer modeling showed the Streamflow Alternative was likely to provide the least amount of water for Truckee Meadows agricultural and M&I water users because the alternative required the release of waters from storage when it was not usually needed for irrigation or M&I and, when released, those waters could not be diverted for other beneficial uses. In another instance, the Recreational Pools Alternative resulted in benefits accruing to uses without water rights (in the form of higher water levels in reservoirs) at the expense of existing, water-righted, downstream demands. A comparison of simulated shortages in water supplies under each of the action alternatives and no action illustrates the potential adverse impacts on M&I and agricultural water rights (table 1).

Such actions were contradictory to P.L. 101-618, including section 205(a)(2), which requires water to be stored and released from Truckee River reservoirs to satisfy the exercise of water rights in conformance with both the *Orr Ditch* and the *Truckee River General Electric* decrees, except for those rights that are voluntarily relinquished. In addition, the possible adverse effects to water resources under each preliminary alternative were unacceptable to one or more of the negotiating parties.

Recognizing that an agreement was not likely to be concluded if mandatory restrictions interfered with the exercise of existing water rights, the negotiators discarded components of the preliminary alternatives when one or more parties determined that water rights would likely be adversely affected. For example, when an alternative to achieve

Table 1: Computer model results showing number of years (out of 97 years) when water supplies were insufficient to meet M&I or agricultural demand under each of the alternatives (abstracted from tables 4.13 – 4.17 of the *Report to the Negotiators*).

	No Action	Basic TROA	Streamflow	Recreational Pools	Threatened & Endangered Species	California Assured Storage
Truckee Meadows M&I	13	14	17	14	15	16
Truckee Meadows Agricultural	7	10	14	11	14	10
California M&I	11	6	28	4	11	11
Newlands Carson Div.	6	6	8	7	7	7
Newlands Truckee Div.	7	8	12	11	9	8

streamflows requested by California Department of Fish and Game (CDFG) was evaluated, and modeling showed that requested flows could only be achieved by releasing stored water adverse to M&I and agricultural water rights in Nevada, the negotiators realized they would have to examine different flows and explore new ways to make water available for this purpose. This, in turn, lead to negotiations on such topics as exchange procedures, priorities for exchanges, accounting, and procedures for mandatory exchanges.

The negotiators did, however, retain aspects of the preliminary alternatives believed to be desirable and that were acceptable to the affected parties. For example, streamflow and recreational pool targets have been incorporated into draft TROA. Additionally, the negotiators incorporated a component of the preliminary California Assured Storage Alternative and agreed that California could store a portion of its unused surface water allocation in Truckee River reservoirs for M&I purposes. These and numerous other features of the preliminary alternatives identified in the *Report to the Negotiators* have been incorporated into the draft agreement.

A. REPORT

In January 1996, the *Report to the Negotiators* was completed and circulated to all parties participating in TROA negotiations. The document was originally expected to serve as the basis for a draft EIS/EIR for the negotiated settlement. However, during review of the draft document, the TROA EIS/EIR Management Team concluded that numerous issues, whose environmental effects were still indeterminate, were still being negotiated, and it was premature to prepare a draft EIS/EIR. Consequently, the title of the document was modified, and it was distributed only to the negotiating parties. The purpose of completing the *Report to the Negotiators* was threefold - to provide analytical information requested by the negotiators; to emphasize issues raised during public scoping; and to provide the negotiators with additional information on potential impacts of proposals that were being considered.

The *Report to the Negotiators* included a NEPA-style analysis of five potential project alternatives. Even though numerous issues had yet to be resolved through negotiations at the time the *Report to the Negotiators* was completed, an alternative was created to represent some of the basic components of what was at the time thought to represent a TROA. Further, four additional alternatives were created to consider the predominant issues identified during the public scoping process - streamflow, recreational pools, threatened and endangered species, and storage of California water.

In reviewing the potential alternatives identified in the *Report to the Negotiators*, the negotiators recognized a number of important issues. Foremost among these was that water rights were adversely affected by each of the alternatives: frequently M&I water supplies recognized in the *Orr Ditch* decree. As formulated in the *Report to the Negotiators*, the alternatives would have taken water without the consent of the water right holder and precluded the storage and release of water by operations proposed in the alternatives. The potential Basic TROA Alternative had the least adverse impact on water rights, but it, too, created conditions that were adverse to water rights, and in some cases, did not comply with existing law. Recognizing the need to continue negotiations, the alternatives evaluated in the *Report to the Negotiators* were rejected.

The potential environmental impacts of the possible project alternatives were also evaluated using standard EIS/EIR techniques. Environmental resources in the study area were characterized under current conditions and also as projected to occur in the future without a TROA in place (the No Action Alternative). Future resources were also characterized as they might occur if each of the potential alternatives were in place. The results of these efforts were then compared to determine possible environmental impacts attributable to the alternatives. Potential impacts to water supply in the study area were given special attention through an extensive modeling effort to determine possible differences between the alternatives. A description of each alternative and a brief summary of some of the potential environmental impacts identified in the *Report to the Negotiators* are included below.

1. Report - Basic TROA Alternative[1]

a. Description.—This alternative emphasized implementing the requirements of the PSA, i.e., to provide drought relief for Truckee Meadows and enhance spawning flows

[1] The Basic TROA Alternative represented draft TROA as negotiated as of 1995, and is substantially different from the TROA Alternative evaluated in this final EIS/EIR.

for endangered and threatened fish of Pyramid Lake. As part of this alternative, the portion of California's surface water allocation not needed to satisfy projected future water rights would remain in the Truckee River to serve downstream water rights. Existing mandatory minimum streamflows would be supplied according to existing procedures, and credit water stored pursuant to PSA could be exchanged to increase the potential for maintaining streamflows. Preferred streamflows were identified as being desirable but not mandatory for fish resources, and so were merely identified as targets for the Administrator. In addition, storage and releases of credit water could be exchanged between reservoirs to achieve non-mandatory recreational pool storage targets.

b. Environmental Impact Summary.—The Basic TROA Alternative was expected to increase the average volume of water stored in Lake Tahoe, as well as Prosser Creek, Stampede, and Boca Reservoirs. In addition, average flow in the Truckee River during the cui-ui spawning period was higher than conditions without a TROA in place. Although none of the alternatives improved water quality conditions in the Truckee River substantially, overall water quality was best under the Basic TROA and the Threatened and Endangered Species Alternative.

Water supply for M&I use in the Truckee Meadows was lower under this alternative than it was under the No Action Alternative. In contrast, California M&I water supplies were higher than under the No Action Alternative. Agricultural water supplies available to the Truckee Meadows and Carson Division were reduced under the Basic TROA Alternative. Truckee Division agricultural water supplies were the same as under the No Action Alternative.

The Basic TROA Alternative was anticipated to result in little change to conditions affecting biological resources in the study area from those projected for the No Action Alternative. In comparison to the other alternatives, the Basic TROA Alternative created the least favorable conditions the coldwater fish of Pyramid Lake.

Further, this alternative would reduce fall spawning by fish species found in Donner Creek, Independence Creek, Little Truckee River downstream from Stampede Reservoir, and the Truckee River because preferred and minimum streamflows would be met less often during fall months. In contrast, preferred and minimum streamflows were projected to be met much more frequently during the spring months, and spring-spawning fish species in all the streams and tributaries would benefit as a consequence. Riparian habitat in the study area would be inundated more frequently, resulting in a healthier riparian ecosystem and a beneficial effect on the associated biological resources.

The Basic TROA Alternative created more favorable conditions for cui-ui, bald eagles, osprey, and white pelicans than were anticipated under the No Action Alternative, but it appeared to restrict access of spawning LCT to Independence Creek during drought conditions.

The Basic TROA Alternative produced negligible impacts to recreational activities, recreational expenditures, agricultural activities, and cultural resources. Employment and personal income increased slightly in the study area, but no changes to population or air quality conditions in the study area occurred beyond those projected for the No Action Alternative.

2. Report-Streamflow Alternative

a. Description.—The Streamflow Alternative established mandatory minimum and preferred streamflows as identified by CDFG. The mandatory minimum flows were higher than existing minimum flows. By emphasizing streamflows, this alternative responded to issues raised during scoping regarding general well-being of fish and wildlife, stream-based recreation, and water quality in the Truckee River. The alternative also responded to certain endangered species concerns by making spawning flows available for cui-ui.

The reservoirs would be operated to provide those mandatory streamflows by releasing all categories of water (pooled, fish, credit, and privately owned water). No storage credit would be provided to compensate for pooled water released. California's excess surface water-the portion of California's 10,000-acre-foot allocation not used to satisfy existing water rights-would be stored as Secondary Stored Water (referred to as Other Credit Water in TROA) and released to help maintain mandatory streamflows.

b. Environmental Impact Summary.—Model results showed the Streamflow Alternative increased flows in the Truckee River, particularly during the summer months when flows are usually lowest. To sustain higher Truckee River flows, less water was stored in the upstream reservoirs. Average storage volumes for Lake Tahoe, Donner Lake, Independence Lake, Prosser Creek Reservoir, Stampede Reservoir, and Boca Reservoir were lower for this alternative than for any other alternative. In comparison to the other alternatives, environmental analysis indicated that the Streamflow Alternative produced the best water quality conditions for Pyramid Lake.

California M&I water supplies and water supply for M&I use in the Truckee Meadows were lower under this alternative than under the No Action Alternative. Agricultural water supplies available to the Truckee Meadows, Carson Division, and Truckee Division were also reduced in the Streamflow Alternative.

Since this alternative maintained less water in upstream lakes and reservoirs, it provided the least favorable conditions for biological resources at all the lakes and reservoirs except Pyramid Lake. Higher inflows to Pyramid Lake were expected to produce a greater quality and higher quantity of habitat for the coldwater fishery in the lake. At the other lakes and reservoirs, lower water levels were expected to reduce fish spawning success and survival and adversely affect waterfowl access to foraging habitat.

Populations of fall-spawning fish species in Donner Creek and the Truckee River were expected to be reduced because preferred and minimum streamflows were met less often during fall months in those tributaries. Conversely, fall-spawning fish populations in Independence Creek, Little Truckee River, and Prosser Creek were projected to increase because preferred and minimum streamflows were met more frequently.

The Streamflow Alternative created the best streamflow conditions for spring-spawning fish species in the upstream tributaries and the Truckee River, and populations of those species were expected to increase. Riparian habitat in the study area would be inundated more frequently, resulting in a healthier riparian ecosystem and a beneficial effect on the associated biological resources.

Due to its high potential to maintain or recover the cottonwood riparian forest downstream from Derby Diversion Dam, the Streamflow Alternative would provide benefits to a number of endangered, threatened, or sensitive bird species. It did not improve conditions for cui-ui as well as the No Action Alternative, and it appeared to create the least favorable conditions at upstream lakes and reservoirs for eagles and osprey.

The Streamflow Alternative was projected to have some minor adverse impacts on recreational expenditures due to lower water levels in the lakes and reservoirs. Impacts to agricultural activities, employment, and personal income in the study area were minor, and cultural resources, population, and air quality conditions were similar to those for the No Action Alternative.

3. Report-Recreational Pools Alternative

a. Description.—The Recreational Pools Alternative was formulated to respond to the issue of lake- and reservoir-based recreation. It created mandatory storage targets for the Truckee River reservoirs from May through August with the intent of enhancing recreational opportunities during the recreation season. To achieve the mandatory reservoir storage targets, the alternative would limit all releases from storage or natural inflow any time storage was less than or equal to the established target.

b. Environmental Impact Summary.—This alternative was expected to create higher water elevation in Stampede, Boca, and Prosser Reservoirs throughout the year, particularly during the summer recreation season. Correspondingly, the volume of water stored in Lake Tahoe, Donner Lake, and Independence Lake was reduced compared to other alternatives. Truckee River flows were higher in the spring months during cui-ui spawning but lower during the other seasons.

Water supply for M&I use in the Truckee Meadows was lower under this alternative than under the No Action Alternative. By contrast, California M&I water supplies were higher. Agricultural water supplies available to the Truckee Meadows, Carson Division, and Truckee Division were also reduced in the Streamflow Alternative.

The Recreational Pools Alternative was expected to provide benefits to most biological resources, particularly during the summer months when water elevations were higher to serve recreational interests. In comparison to the No Action Alternative, this alternative provided more favorable conditions for algae, aquatic invertebrates, fish, and waterfowl resources at most lakes and reservoirs in the study area.

Populations of fall-spawning fish species were expected to increase in Independence Creek, the Little Truckee River, and Prosser Creek because preferred and minimum streamflows would be met more frequently during fall months in those tributaries. However, populations of those same fish species were expected to be reduced in Donner Creek and the Truckee River because preferred and minimum streamflows were not anticipated to be met as frequently.

Preferred and minimum streamflows were projected to be met much more frequently during the spring months, and populations of spring-spawning fish species in all the streams and tributaries would benefit as a consequence. Riparian habitat in the study area would be inundated more frequently, resulting in a healthier riparian ecosystem and a beneficial effect on associated biological resources.

The Recreational Pools Alternative created less favorable conditions for cui-ui than the No Action Alternative, restricted access to Independence Creek for spawning LCT during drought conditions, and created the least favorable conditions for the white pelican. Of all the alternatives, this alternative created the most favorable conditions for bald eagles and osprey at Stampede and Boca Reservoirs.

The Recreational Pools Alternative was expected to produce negligible impacts to recreational activities, recreational expenditures, agricultural activities, and cultural resources. Employment and personal income increased slightly in the study area, but population and air quality conditions in the study area were similar to those for the No Action Alternative.

4. Report-Threatened and Endangered Species Alternative

***a. Description.*—**This alternative was designed to respond primarily to the issue of endangered and threatened fish species of Pyramid Lake. It established mandatory minimum streamflow requirements that were greater than existing minimum streamflow requirements in order to provide higher flows in the lower Truckee River during the spawning season. To achieve the desired flow targets, all categories of water could be released and exchanged irrespective of whether they could be re-stored or protected from depletion.

***b. Environmental Impact Summary*.—**Model results indicated that flow in the Truckee River during the spring months for the Threatened and Endangered Species

Alternative was substantially higher than for other alternatives. Average storage at Stampede, Boca, and Prosser Reservoirs was greater, while average storage at Donner and Independence Lakes was lower. Storage at Lake Tahoe was higher in the fall and winter months, but lower in the spring and summer. As noted earlier, the Basic TROA and Threatened and Endangered Species Alternatives appear to produce the best overall water quality conditions.

Water supply for M&I use in the Truckee Meadows was lower under this alternative than under the No Action Alternative. California M&I water supplies were similar to those of the No Action Alternative. Agricultural water supplies available to the Truckee Meadows and Carson Division were also reduced in the Streamflow Alternative. Truckee Division agricultural water supplies were similar to those of the No Action Alternative.

This alternative was expected to produce higher flows in the lower Truckee River to respond to the requirements of listed fish species of Pyramid Lake, to the general benefit of biological resources in the lake. In addition, higher water elevations in several lakes and reservoirs would increase the aquatic food base and fish reproductive success compared to the No Action Alternative. Draw downs at these reservoirs were anticipated to occur less frequently than under the No Action Alternative, providing much better foraging and habitat conditions for aquatic resources.

Populations of fall-spawning fish species would be reduced in Donner Creek, Independence Creek, and the Truckee River because preferred and minimum streamflows were projected to be met less often during the fall months in these streams. Populations of these same fish species in Prosser Creek were expected to increase because preferred and minimum streamflows would be met in the creek during fall months.

Preferred and minimum streamflows were met much more frequently during the spring months, and populations of spring-spawning fish species in all the streams and tributaries would increase as a consequence. Riparian habitat in the study area was projected to be inundated more frequently, resulting in a healthier riparian ecosystem and a beneficial effect on the associated biological resources.

The Endangered and Threatened Species Alternative created favorable conditions for cui-ui second only to those expected under the California Assured Storage Alternative. However, it created less favorable conditions for LCT, bald eagles and osprey at Independence Lake, and the white pelican.

The Endangered and Threatened Species Alternative was expected to produce negligible impacts to recreational activities, recreational expenditures, agricultural activities, and cultural resources. Employment and personal income in the study area increased slightly, but population and air quality conditions in the study area were similar to the No Action Alternative.

5. Report-California Assured Storage Alternative

a. Description.—The California Assured Storage Alternative was the State's preliminary proposal to maintain 50,000 acre-feet of carryover storage to serve beneficial uses in California. The State could store as much as 8,800 acre-feet each year in Prosser Creek and Stampede Reservoirs, and any unused portion of that storage could carry over from year to year. Total maximum carryover was set at 50,000 acre-feet.

b. Environmental Impact Summary.—Based on model results, average storage at Lake Tahoe and Stampede, Prosser Creek, and Boca Reservoirs was higher, and average storage in Donner and Independence Lakes was projected to be lower compared to the No Action Alternative. Spring flows in the Truckee River were higher than any of the other alternatives considered in the *Report to the Negotiators*.

Water supply for M&I use in the Truckee Meadows was lower under this alternative than under the No Action Alternative. In contrast, California M&I water supplies were higher. Agricultural water supplies available to the Truckee Meadows, Carson Division, and Truckee Division were also reduced in the Streamflow Alternative.

With more water projected in most of the lakes and reservoirs in the study area, conditions affecting biological resources at the lakes and reservoirs were enhanced - the aquatic food base, reproductive success for fish, and foraging habitat for waterfowl were improved compared to the No Action Alternative.

Populations of fall-spawning fish species in Donner Creek, Independence Creek, the Little Truckee River, and the Truckee River were reduced because preferred and minimum streamflows were met less often in these streams during the fall months. Only in Prosser Creek were populations of these same fish species increased, as preferred and minimum streamflows were anticipated to be met in the creek during the fall months.

Preferred and minimum streamflows were met much more frequently during the spring months, and populations of spring-spawning fish species in all the streams and tributaries were expected to increase. Riparian habitat in the study area was inundated more frequently, resulting in a healthier riparian ecosystem and a beneficial effect on the associated biological resources.

The California Assured Storage Alternative created the most favorable conditions for cui-ui of all the alternatives considered in the *Report to the Negotiators*. It also created better conditions for a number of sensitive bird species than under the No Action Alternative.

The California Assured Storage Alternative was expected to produce negligible impacts to recreational activities, recreational expenditures, agricultural activities, and cultural resources. Employment and personal income in the study area increased slightly, but population and air quality conditions were similar to those for the No Action Alternative.

B. OTHER STUDIES

Following distribution and review of the *Report to the Negotiators*, a number of potential elements were identified that warranted consideration for inclusion into the TROA. These elements focused on maintaining minimum streamflows that were higher than existing minimum flows and maintaining minimum recreation pools in the Truckee River reservoirs. To gain an understanding of how these elements and their variations might affect the exercise of water rights, a technical team completed an extensive computer simulation and analysis effort. The team divided this effort into three tasks:

Develop a list of elements that could enhance streamflows or recreational pools.

Review the list of flow- and pool-exchanging elements and dismiss those that would obviously violate the requirements of Section 205(a)(2) of P.L. 101-618.

Evaluate those elements not dismissed.

More than 100 computer simulations were produced. Results of the simulations were provided to the negotiators for consideration and incorporation into the proposed TROA as they determined appropriate.

The technical team concluded that simply setting higher minimum streamflows, as in the *Report to the Negotiators*, would not achieve the desired results because: (1) water rights would be adversely affected and (2) higher minimum flows would cause too much water to be released during dry periods in some reaches, which would occasionally drop flows to zero as reservoir storage was exhausted. Through analyses of computer simulations, the technical team determined that creating and storing Joint Program Fish Credit Water and exchanging TROA water categories (e.g., Fish Credit Water and Non-Firm M&I Credit Water) among reservoirs could provide substantial benefits for stream- and reservoir-dependent resources by increasing the frequency at which minimum streamflows and recreation pools would be achieved. This led to the development of two sets (tiers) of minimum streamflows that promoted higher minimum streamflows than those that currently exist during wet and normal water years and conservation of M&I water during droughts. The two-tier flow system would be implemented by exchanging or restoring TROA waters among the reservoirs to supply, to the extent possible, the difference between the higher minimum flows and those that currently exist when those higher flows were not already being achieved. In addition, Sierra Pacific and the United States would voluntarily relinquish their rights to restore some of their water to meet the higher minimums under certain conditions. These exchanges and re-storage also increased the frequency of maintaining minimum recreational pools in Prosser Creek, Boca, and Stampede Reservoirs. A detailed description of the computer analysis is provided in part 3 of this attachment.

Exhibit E

Selected Elements of the Report to the Negotiators

Part 2 – TROA Components Considered and Rejected During Negotiations

Exhibit E: Selected Elements of the Report to the Negotiators

Part 2 – TROA COMPONENTS CONSIDERED AND REJECTED DURING NEGOTIATIONS

The following potential components of a TROA were considered by the negotiators and were rejected as being adverse to water rights or non-negotiable by one or more of the negotiating parties:

- Operate Truckee River reservoirs solely for maintaining streamflows
  - Maintaining minimum streamflows that are higher than those that currently exist, including between hydroelectric diversion and return points, for recreation, fish and wildlife resources, water quality, or aesthetics
  - Maintain constant flows (greater than current minimum streamflows) in the Truckee River Basin for lengthy time periods
  - Maintain optimum flows during average or greater water years
  - Meet spawning flow requirements for cui-ui
- Remove institutional constraints, such as the 1935 Truckee River Agreement
- Restrict the rate at which reservoir releases could be changed (increased or decreased)
  - Establish maximum release rates for Truckee River reservoirs
  - Establish maximum rates at which reservoir releases may be changed
- Release Credit, Other Credit Water, Private Water, Floriston Rate Water or Project Water solely for maintaining optimum streamflows, whether or not such releases could be exchanged for a similar release from another reservoir or re-stored downstream

- Restrict reservoir releases so that they do not cause streamflows to be greater than double the optimum streamflow

- Maximize the storage of Fish Credit Water in Stampede Reservoir by reducing the storage of Sierra Pacific M&I Credit Water

- Maintain access for Lahontan cutthroat trout to spawning habitat in Independence Creek by substituting storage release from Lake Tahoe for releases from Independence Lake to prevent water storage in Independence Lake from dropping below 7,500 acre-feet from May through July

- Distribute storage of PSA waters proportionally among the reservoirs to increase recreational opportunities at Truckee River reservoirs

- When water level in Independence Lake would be below the dam's release outlet, maintain minimum streamflows in Independence Creek by pumping water from storage

- Maintain the recreational value of Truckee River reservoirs by prohibiting releases below a certain level during the summer months

- Maintain the recreational value of Prosser Creek Reservoir by not releasing Prosser Project Water until after Labor Day

- Increase the M&I drought relief supply for Reno/Sparks by:

    - Establishing release schedules and exchange criteria for other waters

    - Maximizing M&I Credit Water storage in Stampede Reservoir

- Store California's surface water allocation (in excess of direct diversions) adverse to the storage of PSA waters and Floriston Rate Water

The following potential components of a TROA were considered by the negotiators and were rejected as being beyond the purpose and scope of TROA as directed by P.L. 101-618:

- Acquire water rights to maintain streamflows during drought conditions

- Use *Orr Ditch* Decree Claim Numbers 1 and 2 (agricultural irrigation claims) for cui-ui spawning

- Use Newlands Project water rights acquired for the maintenance of wetlands at Stillwater National Wildlife Refuge for the conservation of cui-ui

- Supplement fish populations in the Truckee River Basin with hatchery-reared fish

- Restore fish habitat in the Truckee River Basin degraded by constructing dams

- Maintain greater Donner Creek flows in the reach between Donner Lake dam and the confluence with Cold Creek by measuring flow immediately downstream from the dam

- Increase reservoir storage for recreation and fish and wildlife resources by increasing the storage conservation pools in Truckee River reservoirs

- Improve water quality in the Truckee River by decreasing the contaminant load and concentration of sewage treatment plant discharge

- Improve water quality in the Truckee River by applying sewage treatment plant effluent to land

- Use artificial means to improve dissolved oxygen levels in the Truckee River

- Increase the M&I drought relief supply for Reno/Sparks by:

    - Dedicating more water from the Truckee River to M&I use

    - Constructing Dog Valley Reservoir or other new reservoirs

    - Increasing water conservation beyond that required by PSA (Water Conservation Plan)

    - Eliminating mandatory minimum streamflows in Truckee River Basin tributaries

    - Pumping Lake Tahoe or Independence Lake

    - Removing all restrictions in the use of Private Water
    - Importing water from other drainages
    - Imposing greater conservation measures on agricultural activities
    - Pumping groundwater from gravel pits near the Truckee River
    - Restricting growth in the Reno/Sparks area
    - Transporting water from Alaska by pipeline or tow ice bergs to nearby pumping areas
    - Eliminating water deliveries to the Newlands Project

- Increase the water supply for threatened and endangered fishes of Pyramid Lake by:
    - Modifying Operating Criteria and Procedures for the Newlands Project
    - Lining water delivery canals in the Newlands Project
    - Allowing conjunctive use of surface and groundwater
- Modify Lake Tahoe storage and release operations as the channel configuration of the Truckee River changes
- Use Truckee River water recouped from amounts previously over diverted to the Newlands Project to improve and maintain streamflow conditions throughout the Truckee River Basin
- Re-draft the contract governing the use of Donner Lake storage to make more water available for streamflow maintenance
- Modify Lake Tahoe's storage limits to allow for more water to be available for stream maintenance

The following potential component of a TROA was considered by the negotiators and rejected as not allowing flexible reservoir management and conjunctive use of water:

- Use Prosser Project Water in Prosser Creek Reservoir for cui-ui before using water from Stampede Reservoir

The following potential components of a TROA were considered by the negotiators and rejected because the negotiators could not reach agreement:

- Increase streamflows to enhance recreation, fish and wildlife resources, and water quality by storing some of the water scheduled for late summer delivery to the Newlands Project in Truckee River reservoirs

- Use Lake Tahoe “Federal water” described in the 1935 Truckee River Agreement for the benefit of threatened and endangered fishes in Pyramid Lake

Exhibit E

Selected Elements of the Report to the Negotiators

Part 3 – Computer Analysis of Streamflow
and Recreational Pool Elements
Considered for TROA

Exhibit E: Selected Elements of the Report to the Negotiators

Part 3—COMPUTER ANALYSIS OF STREAMFLOW AND RECREATIONAL POOL ELEMENTS CONSIDERED FOR TROA

To assist TROA negotiators in developing the operating agreement identified in Section 205(a) of P.L. 101-618, a technical team tested the capacity of potential elements of a TROA to accomplish intended purposes without interfering with the exercise of water rights (unless voluntarily relinquished) and implementation of the Preliminary Settlement Agreement. One of the team's primary tasks was to explore ways to maximize the frequency of achieving minimum stream flow for fish and wildlife that California Department of Fish and Game (CDFG) recently recommended (greater than the minimum stream flows requirements that currently exist) and minimum recreational pools in the Truckee River reservoirs (includes federal reservoirs along with Donner Lake and Independence Lake). The team divided the task into three actions: (1) develop a list of elements that could enhance stream flows and recreational pools; (2) review the list and dismiss elements that would obviously violate there requirements of Section 205(a)(2) of P.L. 101-618; and (3) use computer simulations to evaluate those elements not dismissed above. The team then provided its analyses to the negotiators for discussion and incorporation into the proposed operating agreement as they determined appropriate. The following is an overview of the results provided to the negotiators.

A. ELEMENTS DISMISSED

After a general review of the elements list, the technical team eliminated the following from further consideration because they would have violated existing water rights if implemented or were deemed non-negotiable by the TROA negotiators:

1. Operating Truckee River Reservoirs only for maintaining stream flows

2. Removing institutional constraints, such as the 1935 Truckee River Agreement

3. Restricting the rate at which reservoir releases could be changed (increased or decreased)

4. Releasing Credit Water, Private Water, Pooled, or Project Waters solely for maintaining optimum stream flows for fish and wildlife, whether or not such releases could be exchanged for a similar release from another reservoir or re-stored downstream

5. Restricting reservoir releases when downstream flows exceed twice the optimum stream flows for fish and wildlife

1. Approach

More than 100 computer simulations were generated in these analyses using the same hydrological model and 1901-95 hydrologic data base as in Chapters 3 and 4 of the Draft Environmental Impact Statement/Environmental Impact Report for the Truckee River Operating Agreement, February 1998. Each simulation included monthly flows at eight sites (primarily reservoir releases), water storage in six reservoirs, and the amount of water available in nine water categories. Since the Nevada Public Service Commission requires Sierra Pacific Power Company (Sierra) to have sufficient M&I water reserves to supply the Truckee Meadows service area during an extended drought, impacts to its water supply were simulated with 1901-94 hydrologic data followed by a repeat of the 1987 and 1988 water years, the first years of the recent eight-year drought (hereafter referred to as the 96-year period). The last year of the 96-year period was used as an “indicator year” for the worst case situation for M&I storage.

While these analyses characterized the No Action Alternative the same as in Chapter 3 (DEIS/EIR, February 1998), they varied those elements (storage, release, and exchange) of the TROA Alternative in Chapters 3 and 4 (DEIS/EIR, February 1998) for using different water categories, including Joint Program Fish Credit Water, to achieve various minimum stream flows regimes and minimum recreational pools. These minimum stream flow regimes, minimum recreation pools, and variations in exchanging and re-storing Power Company M&I Credit, Fish Credit Water, Joint Program Fish Credit Water, Floriston Rate Water, Fish Water, Private Water, and Other Credit Water were evaluated in various combinations to identify impacts to stream flows, Sierra’s M&I water, and irrigation water available to the Carson Division of the Newlands Project.

The various water categories were evaluated for their capacity to support the following purposes:

- Maintaining current minimum stream flows, even if such releases cannot be exchanged or re-stored

- Maintaining minimum stream flows greater than those that currently exist, even if such releases cannot be exchanged or re-stored

- Maintaining the difference between current minimum stream flows and those that are larger, but only if such releases can be exchanged or re-stored

- Maintaining the difference between current minimum stream flows and those that are larger, whether or not they can be exchanged or re-stored

- Used as the last water category for maintaining minimum stream flows

- Maintaining preferred stream flows only
- Maintaining minimum recreational pools for Truckee River Reservoirs

CDFG's preferred stream flow regime, as used in Chapters 3 and 4 (DEIS\EIR, February 1998), was also used in these analyses. It is a set of continuous flows considered optimum for selected reaches of the Truckee River and its tributaries. Since it is usually not possible to achieve these stream flows without adversely affecting water rights, the computer simulations maintained the flow nearest the CDFG preferred flow regime (must be greater than mandatory minimum flow) that could be maintained for several months by adjusting scheduled releases (usually by extending the release period) and exchanging water among reservoirs without interfering with water rights.

A number of minimum stream flow regimes were tested in these analyses by comparing the frequency that stream flows recently recommended by CDFG were achieved or exceeded (tables 1 and 2). The current minimum flow regime contains mandatory reservoir releases currently required for certain reservoirs. Since these releases are usually not adequate for supporting self-sustaining fish populations in selected stream reaches, CDFG recently recommended a new set of minimum stream flows (hereafter referred to as CDFG minimum flow regime) that are greater than those that currently exist. The technical team developed a two-tier set of minimum stream flows (two-tier minimum flow regime) to provide greater flexibility for water management and to reduce adverse effects to water rights. This regime is comprised of two sets of minimum stream flows: During "non-dry water years" CDFG minimum flow regime is implemented, while during "dry water years", stream flow targets in CDFG minimum flow regime are reduced by half. The two-tier minimum flow regime was modified further (variations A and B) to allow greater flexibility in reservoir operations.

These analyses tested two sets of minimum recreational pool requirements for Donner Lake, and Prosser Creek, Boca, and Stampede Reservoirs from June through August. The first set only used the minimums associated with priority 1 given in table 3; these were targets, not mandatory limits. The second set used the minimums associated with all three priorities and established criteria for applying them. It emphasized maintaining priority 1 minimums for all four reservoirs. If these levels could not be maintained, storage was released from Stampede in lieu of releases from Prosser or Boca so that minimum pools could be maintained at priority 2 levels. If Stampede storage declined to 65,000 acre-feet, releases were made from Prosser and Boca until priority 3 levels were reached. Priority 3 minimums could not be violated unless releases were required to achieve minimum stream flows.

Use of water categories to support these minimum pools through exchanges and re-storage were evaluated by comparing computer simulations of frequency of achieving or exceeding minimum pools, Sierra's M&I shortage at the end of the 96-year period of analysis, and average annual shortage to the Carson Division of the Newlands Project.

Table 1.—Instream flow regimes (cfs)

				Two-tier	
	CDFG preferred	Current minimum	CDFG minimum	CDFG minimum	50% of CDFG minimum
Truckee River Tahoe to Donner	250	50-70	75	75	37.5
Truckee River Donner to Little Truckee River	300	0	100	100	50
Truckee River Little Truckee River to Stateline	200	0	150	150	75
Donner Lake release[1]	10-50	2-3	[2]8	8	4
Prosser Creek Reservoir release	30-75	5	16	16	8
Independence Lake release	10-20	2	4-8	4-8	2-4
Stampede Reservoir release	100-125	30	45	45	23

[1] From November 15 through April 15, the gates of the dam are held open; therefore, inflow to the lake determines the outflow at the dam, and there is no required flow.
[2] Minimum release from Donner Lake from April through August becomes 5 cfs if the lake is forecasted to contain less than 8,000 acre-feet of water on September 1.

Two sets of comparisons were made: (1) using Joint Program Fish Credit Water as the last water to be used for minimum stream flows versus using such water to maintain minimum recreational pools and readily moving it among the reservoirs as necessary; and (2) using different combinations of the water categories to maintain minimum recreational pools and readily moving it among the reservoirs as necessary (as long as minimum stream flows were maintained and CDFG preferred flow regime was not exceeded) (table 4). Each simulation used variation B of the two-tier minimum flow regime.

2. Results of Streamflow Analysis

a. Minimum Streamflows.—Use of the current minimum flow regime with the No Action Alternative yielded varied results for reservoir releases achieving/exceeding CDFG's minimum stream flow recommendations (as shown in CDFG minimum flow regime) during the period of analysis (table 5). Releases from Prosser Creek Reservoir achieved or exceeded the recommendation at least 75 percent of the time, while releases from Lake Tahoe, Donner Lake, Independence Lake, and Stampede Reservoir achieved or exceeded the standard about 60-70 percent of the time. The frequency of achievement increased somewhat when the current minimum flow regime was used with TROA. CDFG recommended minimum stream flows were achieved or exceeded more frequently downstream from Donner Lake and Independence Lake. Achievement of flows was greatest when the

Table 2.—Variations of two-tier minimum instream flow regime

	A	B
Truckee River Lake Tahoe to Donner Creek confluence	– Normal year: CDFG minimum flows – Dry year: 50% CDFG minimum flows – TROA waters provide amount not achieved with Pooled Water, but must be exchanged	– Normal year: CDFG minimum flows – Dry year: 50% CDFG minimum flows – Pooled Water used in accord with Tahoe/Prosser Exchange Agreement (up to 50-70 cfs) – TROA waters provide amount not achieved with Pooled Water, but must be exchanged
Donner Lake release	– Normal year: CDFG minimum flows – Dry year: 50% CDFG minimum flows – POSW provide different between current minimum and CDFG or 50% CDFG minimums if storage criteria and recreational objectives are not violated and releases are exchanged	– Normal year: CDFG minimum flows – Dry year: 50% CDFG minimum flows – POSW provide different between current minimum and CDFG or 50% CDFG minimums if storage criteria and recreational objectives are not violated and releases are exchanged
Prosser Creek Reservoir release	– Current minimum provided by release of Pooled and Uncommitted Waters – TROA waters provide difference between current minimum and CDFG or 50% CDFG minimums if releases are exchanged	– Current minimum provided by release of Pooled and Uncommitted Waters –If exchange possible: initially, 3 cfs of Uncommitted Water added during dry years and 5cfs during normal years, afterwards, TROA waters provide difference for a total of 8 cfs during dry years and add 6 cfs during normal years
Stampede Reservoir release	– Pooled Waters and Fish Water provide for current minimum – Normal years: TROA Waters provide difference between current and CDFT minimums –Dry years: TROA Waters used for 22.5 cfs if exchange possible	– Fish Water provides for current minimum – Normal years: Fish and TROA Waters proportionally provide difference between current and CDFG minimums –Dry years: If no Fish Water, TROA Waters used for 22.5 cfs if exchange possible
Independence Lake release	– POSW provides for current minimum – POSW provides for difference between current and CDFG or 50% CDFG minimums if restored after release – Minimum flow is 2 cfs when storage below 7,500 acre-feet	– POSW used to meet CDFG or 50% CDFG minimums – not necessary to restore – Minimum flow is 2 cfs when storage below 7,500 acre-feet
Boca Reservoir release	– No mandatory minimum instream flows	– No mandatory minimum instream flows
Truckee River Donner Creek to Stateline	– No mandatory minimum instream flows	– No mandatory minimum instream flows

Table 3.—Minimum recreation pools and maintenance priorities

Priority	Reservoir storage (acre-feet)			
	Donner Lake	Prosser Creek	Boca	Stampede
1	8,000	19,000	33,500	127,000
2	8,000	19,000	26,000	65,000
3	6,300	11,000	22,000	62,000

Table 4.—Combinations of water categories tested for maintenance of minimum recreational pools (indicated by “X”)

Combinations	Joint program Fish Credit Water	Credit Waters, Secondary Storage Water, and California M&I Water	Fish Water	Pooled Water
1	X			
2	X	X		
3	X	X	X	
4	X	X	X	X

CDFG minimum flow regime was used with TROA. In this case, modification of releases from all five reservoirs had substantial beneficial effects on stream flows. All reservoir releases, except Lake Tahoe, achieved or exceeded the recommendations more than 93 percent of the time during the period of analysis.

Table 5.—Frequency reservoir releases equaled or exceeded CDFG’s recommended minimum instream flows

	Lake Tahoe	Donner Lake	Prosser Creek	Independence Lake	Stampede
No Action Alternative	58	70	75	59	64
TROA with current minimum regime	56	82	82	74	59
TROA with CDFG minimum regime	87	94	97	100	100

The creation of Joint Program Fish Credit Water has the potential to enhance stream flows by providing water to supplement the difference between the current and CDFG minimum flow regimes. This was evident in comparing two situations where only the current minimum flow regime was required but Joint Program Fish Credit Water was available to supplement the difference between current and high minimum flows (table 6). There was little difference between reserving Joint Program Fish Credit Water as the last water to be released and reserving it to supplement other releases relative to achievement of preferred stream flows. Both options appeared to substantially increase the frequency reservoir releases achieved or exceeded CDFG minimum stream flow recommendations.

Table 6.—Frequency reservoir releases achieved or exceed CDFG minimum instream flow recommendations with and without Joint Program Fish Credit Water (JPFCW)

	Lake Tahoe	Donner Lake	Prosser Creek	Independence Lake	Stampede
– No JPFCW – Current minimum flow regime	56	79	82	74	71
– JPFCW only used for difference between current and CDFG minimum flow regime	68	79	86	74	84
– JPFCW last water released for minimum instream flows – CDFG minimum flow regime	87	94	97	100	100
– JPFCW only used for preferred flow regime – CDFG minimum flow regime	87	94	97	100	100

Application of the two-tier minimum flow regime and its variations greatly improved reservoir releases for stream maintenance in comparison to using the current minimum flow regime, but improvements were somewhat less than using the CDFG minimum flow regime (tables 5, 6, and 7). Two-tier minimum flow regime variations A and B provided nearly the same results as the two-tier minimum flow regime for Donner Lake, Prosser Creek Reservoir, and Stampede Reservoir, but there was a marked difference in the releases from Lake Tahoe and Independence Lake. Since variation A of the two-tier minimum flow regime would not allow releases greater than those of the current minimum flow regime if they could not be re-stored, releases from Independence Lake achieved or exceeded CDFG recommended minimum flows 13 percent less often than with the two-tier minimum flow regime that required such releases. Variation B of the two-tier minimum flow regime yielded the same frequency as the two-tier minimum flow regime because releases to achieve minimum flows were not required to be re-stored. Variation B, however, modified releases from Lake Tahoe so that the minimum flows were achieved or exceeded 11 percent less often than the two-tier minimum flow regime because it replaced the release requirement of the Tahoe/Prosser Exchange Agreement, thus correcting the adverse impact to Floriston Rate Water caused by two-tier minimum flow regime-variation A.

Table 7.—Frequency reservoir releases achieved or exceeded CDFG minimum flow recommendations with the two-tier minimum instream flow regime and variations A and B

	Lake Tahoe	Donner Lake	Prosser Creek	Independence Lake	Stampede
Two-tier	82	88	91	87	88
Two-tier A	82	87	86	74	88
Two-tier B	73	88	87	86	92

3. Water Rights

A basic issue relative to stream flow maintenance concerned changing reservoir operations to give stream flow maintenance, both preferred and CDFG minimum flow regimes, priority over water rights. This water management strategy was tested by comparing simulations of Truckee River reservoirs operated to maintain stream flows as the top priority with simulations that operated the reservoirs primarily to serve water rights, the current operation. The simulations indicated that during extended droughts (1931-35 and 1988-94) the stream flow priority reduced Carson Division and Sierra's M&I supplies by 7 and 25 percent, respectively, compared to water right priority simulation. Because of adverse impacts to water rights, the question of operating reservoirs primarily for stream flow was eliminated from further consideration. All remaining simulations assumed that Truckee River Reservoirs were operated primarily to serve existing water rights.

Minimum flow regimes listed in tables 1 and 2 had markedly different effects on the Carson Division's irrigation supply and Sierra's M&I supply. Only the CDFG minimum flow regime adversely affected water available for the Carson Division. It reduced the average annual irrigation supply by about 3,000 acre-feet during the indicator year (last year of the 96-year period of analysis) as compared to the other three minimum regimes.

As with impacts to the Carson Division, implementation of CDFG minimum flow regime caused the greatest adverse impacts to M&I supply (table 8). By the indicator year of the 96-year period, the CDFG minimum flow regime had eliminated Sierra's storage and caused a shortage where none existed with any of the other flow regimes. This was caused by the release of M&I water to meet the higher flow requirements of the CDFG minimum flow regime. Though the regime required the release of water from all categories in storage, a substantial contribution was required of M&I Credit Water because it was the largest water category located in Stampede Reservoir during an extended drought.

Table 8.—Storage and shortages (acre-feet) in Sierra's M&I water during last year of 96-year period with different instream flow regimes

	Current minimum	CDFG minimum	Two-tier minimum	Two-tier minimum Variation A
Storage	6,920	0	5,690	3,300
Shortage	0	1,380	0	0

Though the two-tier minimum flow regime required greater minimum stream flows during non-dry years than the current minimum flow regime, the reduction in flow requirements during dry years with the two-tier minimum flow regime allowed nearly the same amount of water to remain in storage at the end of a drought as with the current minimum flow regime. This benefit, however, was adverse to Floriston Rate Water because the two-tier minimum flow regime required more to be released than required by the Tahoe-Prosser Exchange Agreement or to achieve Floriston Rates. This was partly corrected in variation A of the two-tier minimum flow regime by requiring Credit Water to make-up the difference between the current minimum flow regime and the two-tier minimum flow regime-variation A (only if it could be exchanged or re-stored), but at the expensive of Sierra's M&I supplies. Variation A resulted in less M&I storage than with the current and two-tier minimum flow regimes because Credit Water released for minimum flows did not receive sufficient protection from spills and was not always available for it original purpose.

The creation of Joint Program Fish Credit Water caused less Fish Credit Water to be available for maintaining minimum stream flows. As a consequence, more M&I water would have to be released from storage to compensate for the shortfall. The magnitude of this impact on M&I water depended on what Joint Program Fish Credit Water was used for (e.g., preferred or minimum stream flows) and on the minimum stream regime required at the time. For example, at the end of the 96-year period of analysis, 5,220 acre-feet of M&I water was in storage when Joint Program Fish Credit Water was not created, but only 3,370 acre-feet in storage when Joint Program Fish Credit Water was stored and used for making-up the difference between the current minimum flow regime and the CDFG minimum flow regime. This reserve of M&I water was eliminated and a shortage created when the CDFG minimum flow regime was required and Joint Program Fish Credit Water was reserved as either the last water to be used for maintaining minimum stream flows or for supplementing preferred flows. When reserving Joint Program Fish Credit Water as the last to be used for minimum flows, shortage in M&I water increased 600 percent (9,540 acre-feet) over that when Joint Program Fish Credit Water was not created (1,380 acre-feet). Reserving Joint Program Fish Credit Water for preferred stream flow maintenance further aggravated M&I shortage by increasing it 700 percent (11,270 acre-feet) over that when Joint Program Fish Credit Water was not created.

The two-tier minimum flow regime eliminated the adverse effect of Joint Program Fish Credit Water on M&I storage and shortages. With the two-tier minimum flow regime, M&I storage conditions are nearly the same as those without Joint Program Fish Credit Water and the current minimum flow regime. Variation A of the two-tier minimum flow regime, however, only provided about half the storage because M&I Credit Water is relied on more to contribute to minimum flow maintenance.

Results of Recreation Pool Analysis

Use of the second set of minimum recreational pools that included all three priorities (in addition to mandatory minimum recreational pools) in table 3 was eliminated from extensive analysis because of the large potential to adversely impact water rights, and threatened and endangered fishes of Pyramid Lake. The first set of minimums (priority 1) was evaluated thoroughly because of its potential benefit to maintain minimum pools.

TROA increased the opportunities for maintaining priority 1 and 3 minimum pools, except for Donner Lake, when compared to the No Action Alternative (table 9). The increases with TROA were due primarily to exchanges and re-storage of waters for minimum stream flows, and attempts to achieve the minimum recreational pool targets. The low frequency associated with Donner Lake is do to higher minimum stream flow requirement in TROA than in the No Action Alternative.

Table 9.—Frequency priority 1 and 3 minimum recreational pools were achieved or exceeded with TROA (variation A of two-tier minimum flow regime) and the No Action Alternative

		Exceedence frequency (percentage)			Exceedence frequency (percentage)	
Reservoirs	**Priority 1 minimum pools (acre-feet)**	**TROA**	**No Action Alternative**	**Priority 3 minimum pools (acre-feet)**	**TROA**	**No Action Alternative**
Donner Lake	8,000	60	75	6,300	85	100
Prosser Creek	19,000	12	12	11,000	58	40
Stampede	127,000	68	53	62,000	55	47
Boca	33,500	22	13	22,000	95	71

The use of Joint Program Fish Credit Water for minimum recreational pools did not increase the frequency of maintaining priority 1 minimum pools when compared to reserving such water as the last to be used for maintaining minimum stream flows (table 10). Using another water category with Joint Program Fish Credit Water slightly increase the frequency, but using more than one additional water category with Joint Program Fish Credit Water did not increase the occurrence.

Table 10.—Frequency priority 1 minimum recreational pools were achieved or exceeded with exchange/re-storage of difference water category combinations (see table 4)

		Exceedence frequency (percentage)				
	Priority 1 minimum pools (acre-feet)	**Joint Program Fish Credit Water last used for minimum instream flows**	**Comb. 1**	**Comb. 2**	**Comb. 3**	**Comb. 4**
Donner Lake	8,000	60	60	73	73	73
Prosser Creek	19,000	12	15	22	22	29
Stampede	127,000	68	65	63	63	71
Boca	33,500	22	22	29	29	29

Using Joint Program Fish Credit Water for minimum recreational pools, rather than for minimum stream flows, substantially increased (25 percent) Sierra's M&I storage without markedly increasing (less than one percent) the average annual shortage to the Carson Division (table 11). Dedicating other water categories along with Joint Program Fish Credit Water to minimum recreational pool maintenance noticeably decreased (79-94 percent) Sierra's M&I storage and increased (1-9 percent) Carson Division average annual shortage.

Table 11.—Comparison of Sierra's M&I storage and Carson Division shortage with the exchange/re-storage of difference water category combinations

	Sierra storage (acre-feet)	**Carson Division shortages (acre-feet)**
Joint Program Fish Credit Water last used for minimum instream flows	3,650	3,760
Combination 1	4,870	3,770
Combination 2	1,020	3,810
Combination 3	180	3,820
Combination 4	990	4,150

4. Summary

Exchanges and re-storage of Credit Waters among the Truckee River reservoirs and the creation of Joint Program Fish Credit Water enhanced the capacity of a TROA to increase the frequency that reservoir releases achieve or exceed CDFG minimum stream recommendations and that minimum recreational pools are maintained. However, adverse impacts to water rights varied appreciably with the different combinations of exchanges, water categories, minimum stream flow regimes, and minimum recreational pools. For example, requiring reservoir releases to be no less than the CDFG minimum flow regime would greatly enhance stream flows, but would be adverse to water rights and recreational pools. Conversely, requiring reservoir releases to be no less than the current minimum flow regime would not substantially enhance stream flows, but would enhance Sierra's M&I supplies and recreational pools. The best scenario incorporating stream flows, recreational pools, and M&I supplies appears to be the two-tier minimum flow regime-variation B, with Joint Program Fish Credit Water used for maintenance of minimum recreational pools. Implementation of this scenario would require the Department of the Interior and Sierra to voluntary relinquish rights to re-store some of their waters under certain conditions.

Chapter 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides background by describing the study area and discussing the past cumulative effects of historical development on study area resources. It then describes the resources that could potentially be affected by modifying operations of Truckee River reservoirs and the effects of the alternatives on these resources. Affected resources are surface water and groundwater resources, including water quality and sediment and erosion; biological resources, including endangered, threatened, and other special status species; recreation; economic, social, and cultural resources; and Indian trust resources. This chapter also discusses Newlands Project operations, minimum bypass flow requirements for the four hydroelectric diversion dams on the Truckee River, water right change petitions and applications, growth-inducing impacts, environmental justice, unavoidable adverse impacts, the relationship between short-term uses and long-term productivity, and irreversible and irretrievable commitments of resources. (Attachment F provides additional perspective on Donner Lake.) Map 3.1 shows reaches of the Truckee River as they are designated in this document.

BACKGROUND

This section describes the location, geology, and climate of the study area. These factors would not be affected by modifying operations of Truckee River reservoirs but could influence them. This section then discusses the past cumulative effects of historical development on study area resources.

I. Study Area Setting

A. Location

The study area is located in the Great Basin, a 188,000-square-mile region that includes most of Nevada and portions of eastern California and western Utah. Great Basin stream systems drain internally instead of to an ocean. Streams in the Great Basin are generated from snowpack in high mountain ranges and terminate in sink areas that may contain lakes, wetlands, or playas.

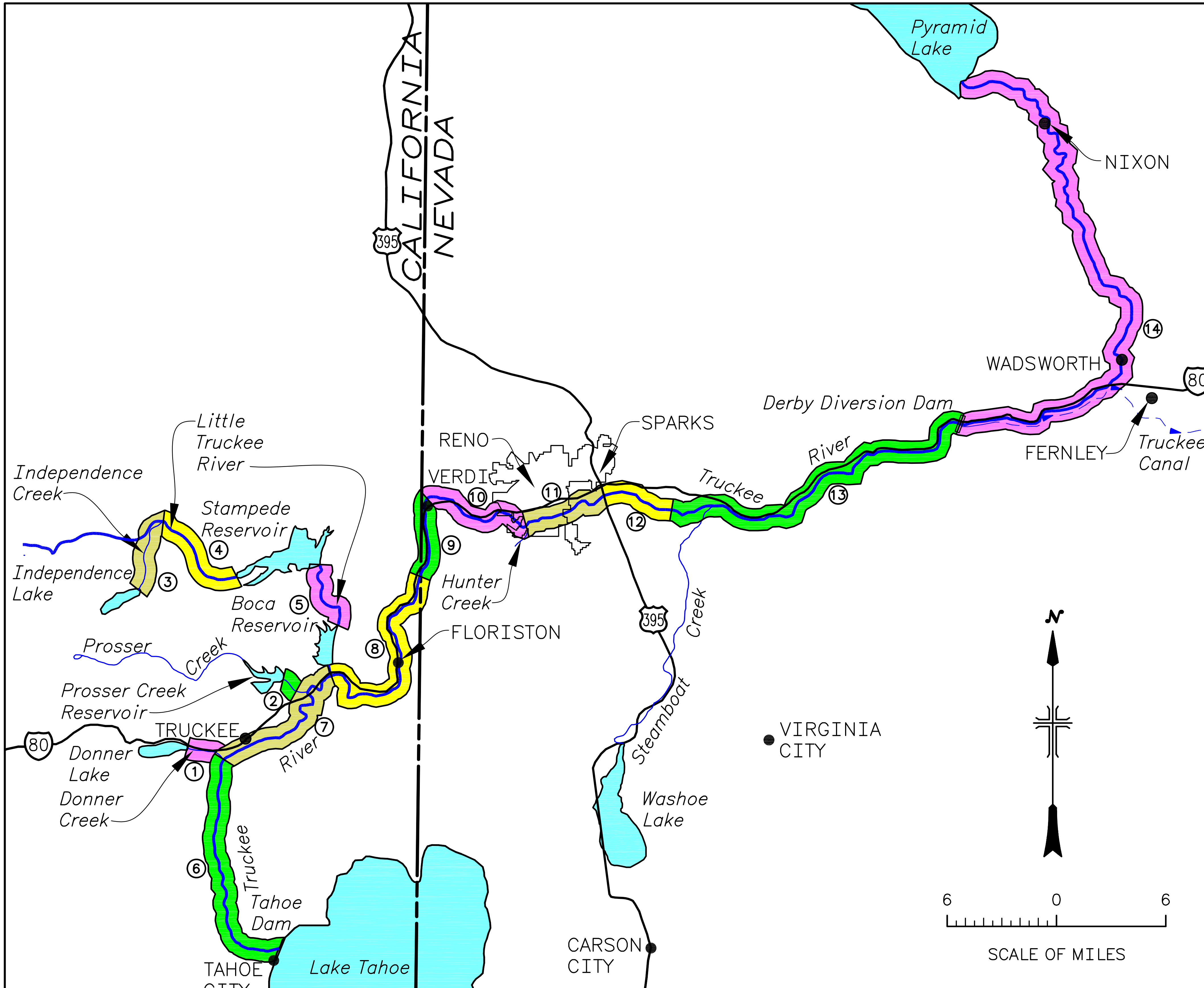
The study area includes the 3,060-square-mile Truckee River basin in east-central California and northwestern Nevada, the Truckee Division of the Newlands Project (i.e., served by the Truckee Canal), Lahontan Reservoir, and 2,200 square miles of the lower Carson River basin in northwestern Nevada. (See location map.)

The Truckee River originates at the outlet of Lake Tahoe at Tahoe City, California, and flows about 120 miles to its terminus in Pyramid Lake, located within the Pyramid Lake Indian Reservation. Truckee River water is diverted at Derby Diversion Dam (located about 36 miles upstream of Pyramid Lake) via the Truckee Canal, according to Operating Criteria and Procedures (OCAP) for the Bureau of Reclamation's (Reclamation) Newlands Project. The Truckee Canal extends about 32 miles through the Truckee Division of the Newlands Project to Lahontan Reservoir, located in the Carson Division of the Newlands Project in the lower Carson River basin. Lahontan Reservoir also captures Carson River inflow. The lower Carson River originates at the outlet of Lahontan Reservoir, flows about 50 miles through Lahontan Valley, and terminates in Carson Sink.

From a hydrologic standpoint and for the purpose of defining the study area, the Truckee River basin includes the area that drains naturally to the Truckee River and its tributaries, and into and including Lake Tahoe (Lake Tahoe basin) and Pyramid Lake. From an administrative standpoint and for the purpose of analysis in this document, the Lake Tahoe basin is treated as distinct from the remainder of the Truckee River basin and data and analysis presented in this document address each separately. The crest of the Sierra Nevada mountain range forms the western boundary of the Truckee River basin, with elevations ranging between 5,000 and 10,000+ feet mean sea level (msl). The California portion of the study area is approximately 760 square miles and contains Lake Tahoe and El Dorado, Toiyabe, and Tahoe National Forests in portions of El Dorado, Nevada, Placer, and Sierra Counties. Population centers are Truckee, South Lake Tahoe, and Tahoe City.

The Nevada portion of the study area includes one-third of the Lake Tahoe basin with its high alpine setting; the remainder is mostly a high desert that drops to an elevation of about 3800 feet near Pyramid Lake. The study area in Nevada includes parts of Churchill, Douglas, Lyon, Pershing, Storey, Carson City (only the rural portion) and Washoe Counties. Communities in the Lake Tahoe basin include Incline Village, Glenbrook, and Stateline. In the Truckee River basin, the Reno-Sparks metropolitan area (Truckee Meadows), located in Washoe County is the principal population center; other centers include Fernley and Fallon, which are included in the study area but are not within the Truckee River basin. Approximately one-half of the study area in Nevada is Federal land, variously managed by Reclamation, Bureau of Land Management, U.S. Fish and Wildlife Service (FWS), and U.S. Navy. Naval Air Station Fallon (NASF) has a major flight training facility near Fallon.

The study area has three Indian reservations. The Reno/Sparks Indian Colony is located in Reno in an urban environment. The Pyramid Lake Indian Reservation surrounds Pyramid Lake and the lower reach of the Truckee River and includes the communities of Sutcliffe, Nixon, and Wadsworth. The Fallon Paiute-Shoshone Indian Reservation is near Fallon and includes lands adjacent to the Newlands Project. Additionally, the Washoe Tribe of Nevada and California holds interests in the Lake Tahoe basin.



EXPLANATION OF REACHES

1. Donner Creek: Donner Lake to Truckee River
2. Prosser Creek: Prosser Creek Reservoir to Truckee River
3. Independence Creek: Independence Lake to the Little Truckee River
4. Little Truckee River: Independence Creek to Stampede Reservoir
5. Little Truckee River: Stampede Reservoir to Boca Reservoir
6. Truckee River: Lake Tahoe to Donner Creek
7. Truckee River: Donner Creek to Little Truckee River Confluence
8. Truckee River: Little Truckee River to State line
9. Truckee River: State line to 3.2 miles downstream (Trophy)
10. Truckee River: 3.2 miles below State line to Hunter Creek (Mayberry)
11. Truckee River: Hunter Creek to U.S. Highway 395 (Oxbow)
12. Truckee River: U.S. Highway 395 to E. McCarran Blvd. (Spice)
13. Truckee River: E. McCarran Blvd. to Derby Diversion Dam (Lockwood)
14. Truckee River: Derby Diversion Dam to Pyramid Lake (Nixon)

FINAL EIS/EIR
TRUCKEE RIVER OPERATING AGREEMENT
CALIFORNIA AND NEVADA

Map 3.1 Reaches of the Truckee River Basin

Wetlands in the vicinity of the Truckee Canal—Massie and Mahala Sloughs and Fernley Wildlife Management Area (WMA)—are supported in part by drainage from the Truckee Division of the Newlands Project. Wetlands in the lower Carson River basin, such as Stillwater National Wildlife Refuge (NWR) and Carson Lake, are remnants of a once-extensive marsh system and are now supported in part by water rights and drain water from the Carson Division of the Newlands Project.

B. Watercourse of the Truckee River

The Truckee River originates at the outlet of Lake Tahoe, which is fed by 63 streams that drain the Lake Tahoe basin. It is one of the world's deepest lakes and is renowned for its clarity. Lake Tahoe has a surface area of 192 square miles and a watershed area of 314 square miles. It has an average water depth of 1027 feet, a maximum depth of 1646 feet, and about 71 miles of shoreline. Lake Tahoe Dam, on the northwestern shore at Tahoe City, controls the top 6.1 feet of the lake as a reservoir to store and release water for Floriston Rates. Floriston Rates, which are prescribed flows in the Truckee River, provide water to serve hydroelectric power generation, municipal and industrial (M&I) use in Truckee Meadows, instream flow, and numerous agricultural water rights. (See location map.)

From Lake Tahoe Dam, the river flows north for about 15 miles to the town of Truckee, where it is joined by Donner Creek. Donner Creek is regulated by a dam on Donner Lake. Truckee Meadows Water Authority (TMWA) and Truckee-Carson Irrigation District (TCID) jointly own storage rights in Donner Lake.

About 1 mile downstream from Truckee, the river passes (and receives subsurface discharge from) the Tahoe-Truckee Sanitation Agency water reclamation facility (TTSA). TTSA serves the Tahoe City Public Utility District, North Tahoe Public Utility District, Alpine Springs County Water District, Squaw Valley Public Service District, Truckee Sanitary District, and Northstar Community Services District.

About one-half mile downstream from TTSA, the river is joined by Martis Creek. Three miles farther downstream, the river is joined by Prosser Creek. These creeks are regulated by the federally-owned Martis Creek and Prosser Creek Reservoirs, respectively.

Three miles downstream from Prosser Creek, the river is joined by its largest tributary, the Little Truckee River. The Little Truckee River is regulated by a dam on Webber Lake (privately owned) and by Stampede and Boca Reservoirs (federally owned). A tributary to the Little Truckee River, Independence Creek, is regulated by a dam on Independence Lake, which is owned by TMWA. About 5 miles downstream from the Little Truckee River confluence, Gray Creek enters the Truckee River; it is notable for discharging large quantities of mud and debris during heavy rains.

About 4 miles downstream from Gray Creek, the river enters Nevada near Farad, California, site of a key U.S. Geological Survey (USGS) stream gauge. Floriston Rates are measured at the Farad gauge. From Farad, the river passes the town of Verdi and flows east about 15 miles to Truckee Meadows. TMWA owns four hydroelectric plants along the Truckee River between the Little Truckee River and Truckee Meadows.

Truckee Meadows is a high desert valley bounded on the west by the Carson Range of the Sierra Nevada, on the east by the Virginia Range, and on the north and south by low hills. The Truckee River flows through downtown Reno, providing a setting for numerous municipal parks. Several small tributaries join the Truckee River in Truckee Meadows, the largest of which, Steamboat Creek, originates at the outlet of Washoe Lake and drains the southern and eastern parts of Truckee Meadows.

On the east side of Truckee Meadows at Vista, the river enters the Truckee River canyon. About 14 miles past Truckee Meadows, the river reaches Sierra Pacific's Tracy-Clark power station cooling ponds. About 4 miles past the ponds, the river reaches Derby Diversion Dam. Twenty miles downstream, the Truckee River enters the Pyramid Lake Indian Reservation and turns north at Wadsworth. The river flows for another 17 miles to Numana Dam, the diversion dam for irrigation on the reservation. About 8 miles downstream from Numana Dam is Marble Bluff Dam, which is designed to reduce erosion along the lower Truckee River. Also at the dam, a fish lock, constructed in 1998, and the Pyramid Lake Fishway aid the migration of Pyramid Lake fishes.[1]

Pyramid Lake, the terminus of the Truckee River, is 30 miles long, 11 miles wide, and covers about 169 square miles at a surface elevation of 3800 feet msl. Immediately east of Pyramid Lake is the bed of Winnemucca Lake, which dried up in 1938.

At Derby Diversion Dam, Truckee River water is diverted to the Newlands Project via the Truckee Canal in accordance with OCAP. The 32-mile canal provides irrigation water to lands near Fernley and Hazen in the Truckee Division and to Lahontan Reservoir for use in the Carson Division, on Fallon Indian Reservation, and on Stillwater NWR, a total of about 60,000 water-righted acres.

C. Geology

The current topography of the study area began to take shape about 25 to 40 million years ago. During that time, a block of granitic rock was tilted up on its east side to form the present-day Sierra Nevada. To the east, great faults broke the earth's surface, and volcanoes discharged lava and ash over much of the landscape. Uplifted, north-trending blocks formed mountain ranges, and downdropped blocks formed valleys.

By about 2 to 3 million years ago, volcanic activity had subsided, the climate was becoming predominantly cool and wet, great glaciers formed to the north, and lakes filled many of the valleys of the Great Basin. At times, the lakes expanded beyond their

[1] Federally endangered cui-ui and threatened Lahontan cutthroat trout (LCT) are collectively referred to as Pyramid Lake fishes.

valleys and coalesced to form huge lakes. One of these lakes was Lake Lahontan, which covered much of northwestern Nevada and a portion of northeastern California. At its maximum stage, about 50,000 years ago, Lake Lahontan occupied about 8,500 square miles. About 10,000 years ago, the climate began to warm, precipitation decreased, and Lake Lahontan receded until only a few remnants of the lake—Walker Lake, Honey Lake, and Pyramid Lake—remain today.

The historical geology continues to have localized influence in the study area. Throughout the Truckee River corridor, the bedrock is variably volcanic, metamorphic, and, in the lower reaches, sedimentary. In the lower Truckee River basin, thick unconsolidated sedimentary deposits exist that have become deeply excised as the elevation of Pyramid Lake declined. Exposed tufa, calcium carbonate deposits that formed below the surface of the lake, provide evidence of a historically higher elevation.

Downstream from Lahontan Reservoir, the geology becomes a complex combination of deposits consisting of organic-rich clays, sands, and gravels. These sediments also contain varying amounts of salts, which is typical in an internally drained basin in which minerals remain after water evaporates.

D. Climate

The climate of the California portion of the study area is characterized by cold, wet winters and short, mild summers. The climate of the Nevada portion of the study area is typical of the Great Basin, with long, dry winters and short, dry summers.

In the Sierra Nevada, precipitation falls almost exclusively as snow from November to April (85 percent of annual precipitation). Most Truckee River runoff results from snow that accumulates on the eastern slope of the Sierra Nevada in the winter and melts in late spring and early summer. Summer thunderstorms are common but produce little precipitation. Lowest annual precipitation recorded at Tahoe City (elevation 6230 feet msl) was 9.34 inches (1976); highest annual precipitation was 66.41 inches (1996). Average annual precipitation is about 32 inches. Highest temperature recorded at Tahoe City was 94 degrees Fahrenheit (°F) (August 1933); lowest recorded temperature was -16 °F (December 1972). Average August temperature is about 61 °F; average January temperature is about 29 °F.

The Sierra Nevada also greatly influences the climate of the Nevada portion of the study area. The prevailing winds are from the west. As the warm, moist air from the Pacific Ocean ascends the western slopes of the Sierra Nevada, the air cools, condensation occurs, and most of the winter moisture falls as snow; but, as the air descends the eastern slope of the Sierra Nevada into Nevada, it warms, and very little precipitation occurs.

Above 5000 feet, precipitation usually falls as snow. Lowest annual precipitation recorded at Reno (elevation 4397 feet) was 1.55 inches (1947); highest annual precipitation was 13.73 inches (1890). Average annual precipitation is about 7.5 inches.

Climate in the Nevada portion of the study area is semiarid to arid, and summers are characterized by clear, warm days and cool nights. Winters are not severe, with temperatures rarely dropping below 0 °F. Highest temperature recorded at Reno was 108 °F (July 2002); lowest temperature on record was -19 °F (January 1890). Average August temperature is about 70 °F; average January temperature is about 33 °F.

The historical hydrology of the study area is characterized by periods of droughts and flooding. Drought is a long period of abnormally dry weather affecting a relatively large area. The two most severe droughts on record occurred from 1928 through 1935 (average annual discharge at Farad of 303,240 acre-feet) and from 1987 through 1994 (average annual discharge at Farad of 286,350 acre-feet). The lowest recorded flow at Farad was 37 cubic feet per second (cfs) in September 1933.

Major flooding events occurred in 1907, 1909, 1928, 1937, 1950, 1955, 1963, 1983, and in January 1997. The “high water year” in the Truckee River basin is 1983, when Truckee River annual discharge recorded at the Farad gauge was 1,769,000 acre-feet (Nevada, 1997a).

E. Public Trust Doctrine

In California, the public trust doctrine has historically been referred to as the public’s right to use California’s waterways to engage in commerce, navigation, and fisheries. More recently, however, the definition of this doctrine has been expanded by the courts to include the use of California’s water resources for environmental preservation and recreation; ecological units for scientific study; open space; environments which provide food and habitats for birds and marine life; and environments which favorably affect the scenery and climate of the area.

II. Past Cumulative Effects

This section describes the cumulative effects that settlement, logging, mining, and irrigation projects have had on the study area’s resources. The discussion focuses on the period beginning with immigration from the eastern United States (about the mid-1800s) until the present. The first subsection provides an overview of past cumulative effects in the study area; subsequent subsections describe the cumulative effects of these changes on individual resources. Chapter 4 provides a discussion of the cumulative effects of future actions on the study area’s resources.

A. Overview

1. Early Exploration and Settlement

Humans have inhabited the Lake Tahoe, Truckee River, and lower Carson River basins for more than 10,000 years. These early people depended on the abundant fish in the Truckee

River, Pyramid Lake, and Stillwater Marsh for survival. In particular, cui-ui, a sucker fish found only in Pyramid Lake and the lower Truckee River, was a staple for people in this region; the Pyramid Lake Paiutes were called “Kuyuidikadi” or “cui-ui eaters.”

Spanish explorers knew of the Truckee and Carson Rivers by the end of the 1700s, and trappers and traders first visited the study area in the late 1820s and early 1830s. The area was not systematically explored until John Charles Fremont, who was exploring the Rocky Mountains and northwest, arrived in 1844 from Oregon Territory with guide Kit Carson. Famed for his role as one of the first (post-Lewis and Clark) government-sponsored explorers, Fremont coined the descriptive term “Great Basin” as the vast stretch of semi-arid land between the Wasatch Mountains and Sierra Nevada. Fremont is also credited with naming Pyramid Lake after a prominent rock formation located near the east-central shore.

Following Fremont’s expedition, more prospectors and settlers traversed the Sierra Nevada to California. With the 1848 discovery of gold at Sutter’s Mill near Sacramento, the number of immigrants increased exponentially. While some established trading posts at river crossings along the Carson, Humboldt, and Truckee Rivers to supply the permanent settlers, most of the early settlers of the 1850s and early 1860s became ranchers or farmers.

2. Comstock Era

The Comstock era began in June 1859 with the discovery of gold near Virginia City, Nevada. Silver, however, eventually became the primary ore mined. As with most large-scale mining discoveries in the 19th century American West, the Comstock Lode precipitated a period of unprecedented growth and settlement. For more than two decades, the development and operation of Virginia City’s mines influenced virtually every aspect of life in the study area.

This increased mining activity necessitated heavy water usage, so water was diverted from the Lake Tahoe and Truckee River basins. Additionally, demands for lumber to supply the mines and railroads led to extensive logging and milling operations. This economic activity adversely affected the environment: it denuded vast forest expanses, eroded barren hillsides, and clogged rivers and streams with sawdust and logging debris, which hampered fish migration and degraded water quality and had long-lasting effects on the study area’s natural and cultural environment.

3. Lumber Era

Of the several industries developed in connection with the Comstock, none was more important or widespread than that of supplying lumber for construction purposes and for fuel. By 1861, there were three lumber mills in the study area that served the needs of settlers and prospectors. Most homes, businesses, mines, and mills were constructed primarily of wood. Lumber eventually could only be obtained from Sierra Nevada forests because the pinyon pines found in the desert mountains of the Virginia Range were quickly exhausted (Galloway, 1947).

Water was key to moving timber or finished lumber. Chutes took logs to Lake Tahoe (and holding ponds) from which they were floated to mills. Water flowing through flumes moved finished lumber, wood, and other materials produced by high mills down the mountains at remarkable speeds (Galloway, 1947). By 1880, there were 10 flumes in Douglas, Ormsby (present-day Carson City), and Washoe Counties (Hinkle and Hinkle, 1987).

As discussed in chapter 1, a private timber crib dam constructed in 1870 at the outlet of Lake Tahoe regulated flows in the Truckee River so that logs could be floated to sawmills in Truckee, California. The dam also was used for milling purposes and to generate hydroelectric power. The estimated value of lumber production for the 20 years before 1890 was $80 million, nearly the production total of all of the Comstock mines.

4. Railroads

In spring 1868, the western leg of the first transcontinental railroad, the Central Pacific, reached the California-Nevada border. Among the towns established during construction were Verdi, Boca, Reno, and Wadsworth (Hinkle and Hinkle, 1987; McLane, 1990). Reno was founded in May 1868 when the Central Pacific auctioned lots for a depot and yard to be used as a distribution point. Central Pacific construction supervisor Charles Crocker named Reno after Jesse C. Reno, a Union general killed during the Civil War.

From the new Reno depot, goods and passengers were delivered to the Comstock by road until the August 1872 completion of Virginia and Truckee Railroad, which linked Reno to Virginia City.

5. Farming and Ranching

Long before the arrival of the U.S. Reclamation Service (USRS), settlers in the study area created irrigation ditches. In 1861, construction began on the Pioneer and Cochran Ditches in Truckee Meadows, which provided water for hay meadows (Nevada, 1997a). As early as 1863, hay ranches were established in Truckee Meadows and Lahontan Valley (Raven, 1990). Settlers in the lower Carson River basin initially fed cattle driven from Texas or California on native hay and sold both the cattle and hay to Comstock residents.

Around that time, rock and brush diversion techniques for irrigation were introduced. These techniques allowed ranchers to water hay pastures, enlarging the areas used and speeding the transition from native grasses to alfalfa, introduced in 1864. By 1866, ranchers began to burn tule thickets and plow up and level the sagebrush areas to enlarge meadows and create irrigated pastures.

In Lahontan Valley, the system of open range and irrigated hay ranching grew, fueled by continuing demand from mining. As demand grew, however, competition for land and water increased as did the frequency of disputes. By the late 1870s, ranchers had fenced off much of the previously open range land (Townley, 1977).

In the 19th century American West, when one boom exhausted itself, another usually took its place. In the 1880s, as Comstock mining waned, the “Beef Bonanza” began; demand for beef at the national and international (mostly England) level was greater than supply. The prosperity from beef production in the 1870s and 1880s spawned other business development, including a flour mill in 1881 and an artesian well cooperative. Valley ranchers entered into contracts with stockmen from other locations to feed their cattle during the winter (Townley, 1977).

Then, during the extremely severe winter of 1889-90, more than one-half of the stock died. This created a ripple effect; creditors liquidated ranches not just in Nevada but throughout the West (Townley, 1977). In the early 1890s, extreme drought followed extreme cold, which diminished grasses on the public lands. Cattle competed with sheep, which had become very popular in the State, and with wild horses for forage. An 1893 bill passed by the Nevada Legislature provided for payment of 25 cents for each wild horse killed on public lands, a source of income to Indians and cowboys alike for decades (Townley, 1977).

6. Early Irrigation and Water Projects

Early settlers selected prime spots along drainages and diverted water for irrigating crops and pastures, with increasing reliance on irrigation. By 1879, increased water use throughout the region, combined with continued expansion of beef production, stimulated plans for water storage and, ultimately, for Reclamation projects (Townley, 1977). At that time, water to irrigate land in the Lahontan Valley was diverted directly from the Carson River, with limited supplies in late summer and fall as river flows declined.

It was not until 1902, however, that the Congress passed the National Reclamation Act, which created the U.S. Reclamation Service (renamed the Bureau of Reclamation in 1923). That act authorized the Federal Government to construct irrigation projects in the West, to reclaim lands for widespread cultivation and settlement (Nevada, 1997a). On March 14, 1903, the Secretary of the Interior (Secretary) selected the Truckee-Carson Project (later renamed Newlands Project) as one of the first five such projects (Townley, 1977).

a. Newlands Project

With the authorization of what is now called the Newlands Project, USRS started to map the Truckee Canyon and selected the location for Derby Diversion Dam—the first USRS facility—completed in 1905. That accomplished, the surveyors moved east to map the route of Truckee Canal and lay out water supply and drainage ditches for 200,000 acres of arable land. In 1904, farmers moved onto various parcels of land; most were in six townships around Fallon, with others near the new town of Fernley. In 1906, the first project water was delivered to 108 ranches.

As USRS supplied water to an increasing number of parcels, it became apparent that the original estimates of available Truckee River flow and Lake Tahoe storage were too high. Thus, USRS decided in 1908 to build a storage reservoir on the Carson River. In February 1911, construction began on Lahontan Reservoir near Fallon. The 1914 completion of Lahontan Dam allowed land entry to resume with what was believed to be sufficient water, and from 1914-17, hundreds of settlers arrived in Lahontan Valley.

Additionally, in 1908, after several changes in ownership, the Truckee River General Electric Company, predecessor to Sierra Pacific, signed an agreement with the Floriston Pulp and Paper Company to establish the first Floriston Rates. Between 1909 and 1913, USRS and the Truckee River General Electric Company replaced the original Lake Tahoe crib dam with a 17-foot vertical gate concrete slab structure. On July 1, 1915, the United States assumed control of the dam under the *Truckee River General Electric* decree.

In 1915 distrust of USRS became so intense that entrymen considered organizing a militia to take control of the Newlands Project. Cooler heads prevailed, however, and, in 1918, TCID was organized with the goal of resolving dissatisfaction and management problems.

On December 31, 1926, a contract between TCID and Reclamation transferred management of the Newlands Project to TCID. This transfer, however, still did not solve water supply problems. In the drought years between 1921 and 1934, TCID purchased water from Donner Lake and occasionally pumped water from Lake Tahoe or Lahontan Reservoir.

In 1935, the Truckee River Agreement (TRA) was executed to modify Floriston Rates. TRA also prohibited removing water from Lake Tahoe for other than sanitary or domestic uses by any means other than gravity with proper approvals (Simonds, 1996).

b. Truckee River Storage Project

By the 1920s, farmers upstream of the Newlands Project who advocated increased storage formed the Washoe County Water Conservation District (WCWCD). The September 1935 appropriation for the Truckee River Storage Project authorized design of Boca Reservoir (Townley, 1977). On February 11, 1937, Reclamation approved the design for the Boca facility and executed a repayment contract with WCWCD. In 1942, Reclamation turned the management of Boca Reservoir over to WCWCD.

In 1943, TCID and Sierra Pacific signed an indenture for water rights from Donner Lake. Currently, TMWA, which jointly owns the storage rights with TCID, manages its water for M&I in Truckee Meadows. TCID manages its water for an occasional lease to TMWA for use in Truckee Meadows or to serve irrigation rights in the Truckee Division.

7. Later Irrigation and Water Projects

In 1962, Reclamation completed Prosser Creek Dam and Reservoir, the first Washoe Project facility. Designed primarily to provide additional flood control storage for Truckee Meadows, the facility is also operated to help achieve Floriston Rates. Today, Prosser Creek Reservoir is operated for the benefit of Pyramid Lake fishes, flood control, and the Tahoe-Prosser Exchange Agreement (TPEA). Another Washoe Project facility, Stampede Dam and Reservoir, is operated for the benefit of Pyramid Lake fishes and for flood control. Stampede Reservoir also provides incidental recreational opportunities. It is the second largest reservoir in the basin and the only Truckee River reservoir with a hydroelectric plant, installed in 1988.

In 1971, the U.S. Army Corps of Engineers (COE) completed Martis Creek Dam and Reservoir for flood control. Because the dam leaks (mostly due to the nature of the valley soils it is built on), it provides only temporary flood storage.

In 1975, Reclamation completed the final Washoe Project facility, Marble Bluff Dam and Pyramid Lake Fishway.

8. OCAP and More Recent History

In 1967, Reclamation established the first Newlands Project OCAP. The 1967 OCAP placed a maximum allowable diversion of 406,000 acre-feet on the Newlands Project, and sought to limit Truckee River diversions to the Carson Division. Under the 1967 OCAP, diversion of Truckee River water solely to generate hydroelectric power at Lahontan Dam and at a generating station on the V Canal was halted to reduce diversions at Derby Diversion Dam. Reduced inflow to Pyramid Lake resulting from upstream diversions and diversions to the Newlands Project since the construction of Derby Diversion Dam had caused the lake elevation to drop nearly 80 feet in about 50 years.

In 1970, the Pyramid Lake Paiute Tribe of Indians (Pyramid Tribe) filed suit against the Secretary claiming the 1967 OCAP allowed water to be wasted within the Newlands Project. The suit sought to improve Newlands Project efficiencies, thus reducing diversions at Derby Diversion Dam and increasing inflow to Pyramid Lake. In 1973, a more restrictive OCAP was implemented to maximize the use of Carson River water and to minimize the use of Truckee River water on the Newlands Project. OCAP was modified again in 1988, and most recently in December 1997 to recognize and respond to developing changes in Newlands Project irrigated acreage and land use.

In 1989, the Pyramid Tribe and Sierra Pacific negotiated the Preliminary Settlement Agreement as Modified by the Ratification Agreement (PSA) to change the operation of

Federal reservoirs and the exercise of water rights of the parties to (1) improve spawning conditions for Pyramid Lake fishes and (2) provide additional M&I water for Truckee Meadows during drought periods.

As described in chapter 1, the Congress enacted Public Law (P.L.) 101-618 in 1990 to provide the direction, authority, and mechanism for resolving a number of disputes over water resources and water rights in the Truckee and Carson River basins. Among other actions, P.L. 101-618 directs negotiation of an operating agreement for Truckee River reservoirs (i.e., the Truckee River Operating Agreement [TROA]).

B. Past Cumulative Effects on Affected Resources

1. Water Resources

a. Surface Water

Before the mid-1800s, Lake Tahoe and Truckee River basin lakes and streams were unregulated. During particularly wet years, Truckee River flows were sufficient to feed Winnemucca Lake, adjacent to Pyramid Lake.

Before irrigation in the lower Carson River basin, the flow path of the unregulated Carson River was more dynamic than today, and the river channel frequently changed course during floods. For example, before 1861, the Carson River entered Carson Lake on the northwest side and exited from the northeast corner, flowing into Carson Sink through Stillwater Slough. Heavy Carson River runoff generally inundated parts of the lower basin in late winter and early spring. These waters accumulated in Lahontan Valley, supporting a complex system of open water and wetlands, including braided river channels, closed oxbows, perennial and ephemeral marshes, and playas (Nevada, 1997a).

Management of the reservoirs and diversions of water from the Truckee River have adversely affected Pyramid Lake. Before the early 1900s, fluctuations in the elevations of Pyramid Lake and Winnemucca Lake were primarily due to natural factors. Completed in 1905 as part of the Newlands Project, Derby Diversion Dam became the largest single diversion structure on the Truckee River. After diversions for the Newlands Project began, elevations began a trend of decline and, by 1938, Winnemucca Lake (previously habitat for cui-ui and the site of a national wildlife refuge) was dry. Pyramid Lake reached its lowest historical elevation (3784 feet) in 1967, 80 feet below its overflow elevation into Lake Winnemucca. Lowered Pyramid Lake elevation and reduced streamflow over the past 98 years have caused formation of the Truckee River delta at Pyramid Lake (COE, 1995).

b. Groundwater

The configuration of the shallow aquifer (0 to 50-foot depth to water) in the Newlands Project area has changed since the introduction of large-scale water projects. In 1904, the table generally sloped away from the Carson River and Stillwater Slough. The aquifer was about 5 feet from ground surface near the river and slough and about 10 feet from the ground surface 1 to 2 miles from the river. From 1916 through 1928, an extensive drainage system was constructed to control the buildup of the shallow aquifer in the Newlands Project area by providing interception and discharge of groundwater to the valley sinks such as Carson Lake and Stillwater Marsh. Currently, there are about 350 miles of drains, 300 miles of irrigation laterals, and 68.5 miles of main canals. The depth to water is more uniform today—5 to 10 feet throughout much of the area—than it was in the past, a result of the continuing contribution from irrigation recharge and canal seepage. Seasonal fluctuation of 1 to 3 feet is common, depending on irrigation delivery, cropping pattern, water supply, and rainfall (USGS, 1993).

2. Water Quality

Surface water quality in the study area has diminished greatly since the mid-1800s, primarily as a result of population increases and industrial practices. Mining, lumbering, sawmills, livestock grazing, water projects, and even the 1960 Winter Olympics severely affected the quality of water in Lake Tahoe, the Truckee River, tributary streams, and Pyramid Lake.

Extensive logging and milling operations throughout the Sierra Nevada quickly and severely degraded the quality of the Truckee River and choked the rivers banks and bed with sawdust, even creating sawdust bars at the river’s terminus at Pyramid Lake, which proved impassable to fish attempting to spawn upstream. Moreover, flumes used to transport logs to the river were lubricated with tallow, dogfish oil, or rancid butter, much of which discharged to the river. Clearcutting of the forests in the basin to supply wood for mining timbers, railroad ties, and other development resulted in discharge of large amounts of sediment to the river, further degrading water quality (Nevada, 1997a).

Reno’s first sewer lines were built around 1868 and consisted of pipes connected with each storefront and then extended down alleys or streets to the Truckee River, where raw sewage poured directly into the river. During the summer when the stream channel frequently dried up, the area was rank with piles of untreated waste awaiting the fall rains to carry the piles away downstream. This condition existed well into the 1900s (Nevada, 1997a).

In 1880, Highland Reservoir began providing municipal and industrial water to the city of Reno. This open, unfiltered water system took water directly from the Truckee River by an open canal which was easily fouled by feedlots and decaying carcasses of range stock. Reno residents often complained that their municipal water “looks thick and nasty, and tastes and smells just as nasty as it looks, having the flavor of rotten wood, dead fish and general staleness” (Townley, 1983). Making matters even worse, a strainer at the reservoir outlet frequently came loose, admitting trout and other fish into the pipes, which, as the pipe diameters through the Reno water distribution network narrowed, subsequently turned them into infamous “Reno chowder” by the time they reached the kitchen sink (Nevada, 1997a).

In 1899, the Floriston Pulp and Paper Company, located at the present-day site of Floriston, California, began operations with the daily discharge of up to 150,000 gallons of acidic waste directly into the Truckee River. By 1903, the Truckee River's water quality had deteriorated to the point where it was reported that the water at the Virginia Street bridge in downtown Reno consisted of a "blend between black and brown with soapy bubbles covering the surface" (Reno Evening Gazette, October 14, 1903). Despite court ordered injunctions and the threat of a Nevada suit filed with the U.S. Supreme Court, discharges continued until late 1930 when the plant ceased operations (Nevada, 1997a).

In 1962, an 8-inch secchi disc and a hydrophotometer test revealed that the disc was discernible in Lake Tahoe at a depth of 136 feet and light was detectable at 500 feet. In 1969, the secchi disc was visible at only 100 feet, equating to an annual 4 percent reduction in clarity (Report of the Lake Tahoe Joint Study Committee, March 1967, and Houghton 1994). By the 1980s, the disc was discernible at a depth of 75 feet (California, 1991). In recent years, clarity has varied. In 2002, the average discernible depth was 78 feet (University of California, Davis, February 25, 2003).

To eliminate the effect of numerous wastewater discharges on the water quality of Lake Tahoe, the Tahoe-Truckee Sanitation Agency was formed in 1972 to create a regional entity for collecting and treating wastewater from communities located along the northern and western shore of Lake Tahoe; Alpine Meadows, Squaw Valley, and Northstar Ski Resorts; and the town of Truckee and its environs (TTSA, 1999). Nutrients and organics were diverted from Lake Tahoe, thus reducing algal growth and improving water clarity.

Tributaries contribute sediments to the Truckee River, particularly during flood events. For example, the Gray Creek watershed is characterized by extremely steep terrain, unstable soil conditions, extensive logging, and overgrazing by livestock. On many occasions, mud flows from Gray Creek have caused the Truckee River to "run red" through Reno. An investigation of the Gray Creek watershed by the U.S. Forest Service (USFS) showed that little could be done to alleviate this periodic flood-related problem due to topographical, hydrological, and biological conditions (Joplin and Fiore, 1995).

Studies performed in 1991 concluded that agricultural runoff along the lower Truckee River approximated nutrient input from the Reno-Sparks sewage treatment plant (COE, 1995).

The Truckee River Water Quality Settlement Agreement (WQSA), signed in October 1996, establishes a joint program to improve water quality by increasing seasonal streamflows in the Truckee River downstream from Truckee Meadows through the purchase and dedication of Truckee River water rights for streamflow. Water associated with the exercise of water rights acquired pursuant to WQSA would be stored, when possible, in Prosser Creek and Stampede Reservoirs, and would be managed by the parties acquiring water rights under WQSA and by the Pyramid Tribe.

3. Sedimentation and Erosion

a. Truckee River Basin

Extensive logging and mining in the 1800s led to erosion of hillsides, causing severe sedimentation in the Truckee River and destabilization of the natural geomorphology. By the late 1800s, more than 60 percent of the mature trees in the Lake Tahoe basin had been cut down, resulting in extensive erosion and sedimentation problems in the tributaries to Lake Tahoe, including the Truckee River in Nevada (Nevada, 1997a).

In 1886, the Reno Reduction Works, an ore processing plant, was established. The mill discharged rock residue into the Truckee River, leading to sediment deposition.

In the lower Truckee River, the Truckee Canal has had profound effects on sedimentation and geomorphology. Pyramid Lake dropped more than 80 feet between 1905 and 1967, which caused a lowering of the base level of the Truckee River. Lowering the base level of the Truckee River resulted in greater sediment loads and an unstable channel downstream from Derby Diversion Dam. The high sediment loads greatly increased the size of the Truckee River delta, and the lowermost reaches of the river became incised. Sedimentation of the delta was so great that the cui-ui's ability to cross the delta to access the river was greatly impeded. Marble Bluff Dam and Pyramid Lake Fishway are designed to reduce erosion along the lower Truckee River and to aid migration of Pyramid Lake fishes, respectively.

The construction of Boca Dam probably resulted in increased sedimentation and erosion on the Little Truckee River. Prosser Creek Dam, Stampede Dam, and Martis Creek Dam have greatly reduced floods on the Truckee River, which has resulted in decreased sedimentation and erosion. However, other factors have offset the benefits of these dams, including the large population increases in Reno and surrounding areas and urbanization, which results in increased runoff, channel degradation, and erosion.

COE stream channel work conducted in the Truckee River in the 1950s, including clearing and straightening, accelerated sedimentation and erosion in many reaches (COE, 1992). The greatest effects occurred in the reach between Wadsworth and Pyramid Lake, where straightening steepened the channel, causing it to be less resistant to high flows. As a result, a 1963 flood caused extensive flooding and erosion.

In 1974, to improve conveyance of Truckee River water in Reno and downstream, COE removed reefs near Vista (Nevada, 1997a), and several wetlands were drained in the eastern portion of Truckee Meadows, resulting in erosion in Steamboat Creek.

In 1992 and 1995, localized rainstorms on Gray Creek resulted in the discharge of extensive quantities of sediment to the Truckee River (Nevada, 1997a). Studies concluded that little could be done to control erosion in the watershed because of topographic, hydrologic, and geologic conditions.

Then in January 1997, a record peak flood flow, the result of a rain-on-snow event, occurred in the Lake Tahoe basin (Rowe et al., 1999). The water elevation of Lake Tahoe rose more than one foot, reaching its highest level since 1917, at elevation 6229.4 feet. The high water level, along with strong winds, resulted in extensive erosion and sedimentation at the lake and in the upper Lake Tahoe basin.

b. Carson River Basin

Development of the Newlands Project and diversion of Truckee River water through the Truckee Canal changed the geomorphology of the lower Carson River. The widely varying hydrologic regime instead became a regulated flow condition with hundreds of miles of irrigation channels.

In 1970, USGS sampled sites in the Carson River basin downstream from the Comstock era mines and identified elevated mercury concentrations in unfiltered river and sediment. High concentrations of mercury also were found in the sediments and fish of Lahontan Reservoir, downstream from the reservoir on the Carson River, and at Stillwater WMA (Nevada, 2003).

In 1990, the U.S. Environmental Protection Agency (EPA) listed the Carson River Mercury Site, which includes approximately 100 miles of the Carson River and Stillwater NWR, on its National Priority List under the Comprehensive Environmental Response, Compensation, and Liability Act (55 Federal Register [FR] 35502-35512, August 30, 1990). Research is ongoing, and minor cleanup of the area has occurred. By 1994, EPA identified that health risks were most evident from fish and wildlife and sediment throughout the Carson River basin, including Lahontan Reservoir, the active channel of the Carson River, Carson Sink, and Stillwater NWR (Nevada, 1997b).

In January 1997, a flood flow in the Carson River peaked at 22,300 cfs (measured at the Fort Churchill gauge). The river carried an estimated 200,000 tons of sediment and 1.5 tons of mercury, representing nearly 33 percent of the total sediment load and 30 percent of the total mercury load estimated to have passed the gauging station during the 9-month sampling period from January through September 1997 (Hoffman and Taylor, 1998).

4. Biological Resources

a. Pre-settlement Conditions

(1) Truckee River Basin

Before the mid-1800's, many portions of the free-flowing Truckee River and its tributaries were bordered by marshes and stands of willows. Marshy lowlands covered the eastern third of Truckee Meadows, which was vegetated with thick stands of grasses, bulrushes, and cattails. A natural rock formation at Vista partially constricted river flow so that high water during the spring runoff inundated an extensive area. Wetlands with dense stands of willows bordered the river, and abundant cottonwoods grew on slightly higher ground (Nevada, 1997a). The river meandered through Truckee Meadows, and islands were covered with thick stands of willows, cottonwoods, currant, and wildflowers (McQuivey, 1996, as cited in Nevada, 1997a). The lower Truckee River had extensive groves of large cottonwoods forming dense thickets (Ridgway, 1877). Historically, 450 acres of palustrine emergent wetlands and 7,700 acres of riparian (both shrub and forest) vegetation occurred along the river downstream from Vista (COE, 1992) in bands up to 2,000 feet wide (COE, 1995).

The Truckee River teemed with fish. Large numbers of Lahontan cutthroat trout (LCT), a fish of "extraordinary size" (Fremont, 1845, as cited in Nevada, 1997a), traveled from Pyramid Lake to the tributaries of Lake Tahoe and Donner Lake to spawn (Gerstung, 1988; Nevada 1995). Cui-ui inhabited both Pyramid Lake and Winnemucca Lake and spawned in the Truckee River, likely hundreds of thousands, up to what is now Wadsworth (Buchanan and Coleman, 1987). Pyramid Lake reached an elevation as high as 3878 feet (Galat et al., 1981) and, in some years, the Truckee River flowed into adjacent Lake Winnemucca.

Bird life was also plentiful and diverse. In 1868, naturalist Robert Ridgway identified 107 species of birds along the Truckee River downstream from Wadsworth (Ammon, 2002a). Thousands of pelicans, gulls, ducks, geese, and other waterfowl used Pyramid Lake (McQuivey, 1996, as cited in Nevada, 1997a), and Lake Winnemucca supported large numbers of waterfowl as well. Duck Lake, located just south of Pyramid Lake, was at times literally covered with mallard, teal, and coots; snipe were found along the shore (McQuivey, 1996, as cited in Nevada, 1997a). Bald eagles nested at Pyramid Lake as late as 1866 (Alcorn, 1988) and at Lake Tahoe.

(2) Carson River Basin

Cottonwoods lined the banks of the Carson River where it entered Carson Lake. The river supported large populations of trout and other fish, and Carson Lake supported fish, mussels, and other aquatic life (Simpson, 1876, as cited in FWS, 1996). In 1862, a flood event changed the river course so that it flowed directly into Carson Sink, and Carson Lake shrank (Nevada, 1997b). The maximum size of the lake and adjacent marsh was about 38,000 acres, with an average of 27,000 acres. Stillwater Marsh and Carson Sink averaged about 120,000 acres.

An estimated 150,000 acres of wetland habitat existed in Carson Lake, Stillwater marshes, and other terminal wetlands in Lahontan Valley between 1845 and 1860 (Kerley et al., 1993). In the late 1800's, Carson Sink was "half shallow lake, half tule swamp" and supported salt grass, sedges, and tules (Nevada, 1997b). There was an abundance of submergent vegetation, bulrush, sedges, and salt grass in Stillwater Marsh and Carson Sink. Freshwater clams and aquatic snails, fish, mink, and river otter were present and used by the native people. Frogs, muskrats, pelicans, curlews, other shorebirds, ducks, geese, and other aquatic birds were abundant (Kerley et al, 1993).

b. Settlement Conditions

Since the 1850s, the Truckee and Carson River basins have been affected by a multitude of competing interests. Man has actively sought and exploited resources in the area—timber, ore, land, water, wildlife, and scenery. The following narrative highlights past cumulative effects that have led to conditions that exist today. Changes associated with lakes and reservoirs and changes along the rivers and streams of the study area are discussed.

(1) Lakes and Reservoirs

(a) Lake Tahoe and Truckee River Basins

With the arrival of settlers in the Truckee River basin, aquatic, wetland, and riparian communities began to change. Reconstruction of dams at Lake Tahoe (1913), Donner Lake (1930s), and Independence Lake (1939) created more aquatic habitat but reduced upland and riparian vegetation adjacent to the natural shoreline (by approximately 1,865 acres at Tahoe, 155 acres at Donner Lake, and more than 50 acres at Independence Lake). These and earlier dams created migration barriers for fish, and operations changed river flow patterns with far-reaching consequences. Loss of riparian vegetation by inundation likely reduced bird and small mammal populations. Inundation of Tahoe yellow cress habitat and impacts from recreation and development resulted in listing of the plant by the State of California in 1982 as endangered and by the State of Nevada as critically endangered. Human disturbance, including timber harvesting and development at and near the lakes, cumulatively have had far-reaching adverse effects on forest and riparian vegetation and associated wildlife.

Construction of Boca (1937), Prosser Creek (1962), Stampede (1970), and Martis Creek (1971) Dams and associated reservoirs further altered the environment, creating additional aquatic habitat at the expense of terrestrial valleys and their associated riparian and stream ecosystems. Losses at the reservoirs were approximately 980 acres of Jeffrey pine forest, sagebrush, and willow/aspen/meadow riparian habitats and about 4.7 miles of stream for Boca Reservoir; 3,450 acres of Jeffrey and lodgepole pine forest, sagebrush, and willow/meadow riparian habitats, 8.7 miles of streams and sloughs of the Little Truckee River, 3.7 miles of Sagehen Creek, and 7.6 miles of tributaries to the Little Truckee River for Stampede Reservoir; 750 acres of sagebrush and riparian habitats, 4 miles of Prosser Creek, 2 miles of Alder Creek, and 1.6 miles of tributaries to Prosser Creek for Prosser Reservoir; and several miles of stream and riparian habitats for Martis Creek Reservoir.

The valleys had historically provided biologically rich areas for riverine and terrestrial wildlife and were likely important movement corridors. Construction of the reservoirs likely adversely affected amphibians, many species of migratory songbirds, waterfowl, water shrews, Sierra Nevada mountain beaver, muskrat, mink, and otter. Although some of these species may use the reservoirs to a limited extent, the reservoirs do not provide quality habitat. Some reservoirs have likely increased habitat for some species of spring and fall migrating waterfowl.

Construction of the reservoirs resulted in a shift in composition of fish communities from river- to lake-oriented. Resource agencies have stocked and continue to stock non-native fish in lakes and reservoirs for recreational fishing in response to depleted native fish populations. In 1887, the first (recorded) Mackinaw (lake) trout (non-native) was introduced into Lake Tahoe (Nevada, 1997a). A non-native invertebrate (*Mysis relictus*) also was stocked in Lake Tahoe from 1963 to 1965 to enhance the prey base for lake trout. These introductions have likely disrupted native communities and increased predation on native fishes, amphibians, and macroinvertebrates (Goldman et al., 1979; Frantz and Cordone, 1970; Panik and Barrett, 1994; Knapp, 1994).

The noxious weed, Eurasian watermilfoil, has become established in shallow waters of Lake Tahoe. This species can form thick underwater stands and dense mats near the water surface (University of Nevada, Reno, no date). It crowds out native plants and modifies aquatic ecosystems. The non-native common mullein has invaded the drawdown areas of several local reservoirs, particularly Stampede Reservoir, and may provide a source of seed to spread to other areas.

Timber harvesting during the Comstock era and, more recently, pesticide use likely have contributed to a decline in raptor populations, particularly osprey, peregrine falcon, and bald eagle, around the lakes. Bald eagles and osprey have recently re-established territories at some of the reservoirs. A self-sustaining population of kokanee (non-native fish) provides a winter food source for bald eagles at Lake Tahoe.

Marinas, residential areas, boat docks, trails, and roads have directly reduced riparian habitat and wetlands around the lakes and reservoirs. In particular, construction of Tahoe Keys Marina reduced the largest Lake Tahoe wetland from an estimated 1,350 acres to approximately 500 acres. This impact likely reduced populations of muskrat; fish; yellow-headed, red-winged, and Brewers blackbirds and other songbirds; rails; and waterfowl. Use of these facilities has increased water consumption, disturbed wildlife, created nonpoint source pollution, and contributed to air pollution (which may degrade water quality).

Cui-ui was listed as endangered in 1967 under a predecessor to the current Endangered Species Act. The lowering of Pyramid Lake’s elevation impeded access to the Truckee River, and flows frequently did not provide suitable conditions for cui-ui spawning and incubation. The original strain of LCT in Pyramid Lake became extirpated by 1944 (FWS, 1995b), due in part to overfishing and pollution, but primarily due to barriers to migration. A different strain of LCT was introduced to the lake in 1950, but dams and weirs prevented migration and lack of habitat in the lower river precluded spawning. Impacts to LCT throughout its range led to its being listed as an endangered species in 1970 (35 FR 13520, August 25, 1970), with reclassification as a threatened species in 1975(40 FR 29863, July 16, 1975). As stated previously, a fish lock at Marble Bluff Dam aids in river access for cui-ui and LCT during their annual spawning migration from Pyramid Lake. Marble Bluff Dam also routes streamflow through the Pyramid Lake Fishway; the fishway provides river access for cui-ui and LCT.

The initial recovery plan for cui-ui was written in 1978; since then there have been three revisions, most recently in 1992. A recovery plan for LCT was written in 1995. Both plans specify recovery criteria for the species and objectives designed to protect them, with the ultimate objective of delisting. In 1982, the U.S. District Court for the District of Nevada ruled that the Secretary must utilize all Project Water stored in Stampede Reservoir for the benefit of the Pyramid Lake fishes until the cui-ui and Lahontan cutthroat trout are no longer threatened or endangered, or until sufficient water for their conservation becomes available from other sources.

Changes to Pyramid Lake have affected other species as well. Several species of aquatic snail in Pyramid Lake have become extinct (LaRivers, 1962). Furthermore, salinity of the lake increased 32 percent between 1933 and 1980; high salinity may substantially reduce species diversity of the crustacean zooplankton community (Galat and Robinson, 1983). Increased flows to the lake in the past few years, however, have reduced salinity levels (Scoppettone, 1999).

The Truckee River delta at Pyramid Lake currently provides some habitat for shorebirds and waterfowl; the lake may have historically supported much larger populations. Winnemucca and Duck Lakes, which supported large waterbird and shorebird populations in the early 20th century, have dried up (Nevada, 1997a).

Adverse cumulative impacts have led to an increased awareness by the public and government agencies of the value of these ecosystems and to programs to restore them. This culminated in the President, at the Lake Tahoe Presidential Forum in 1997, directing his Administration to begin acting on recommendations to improve water quality of Lake Tahoe and restore forest ecosystems. These projects have begun through development and implementation of the Lake Tahoe Environmental Improvement Program (EIP), and include such activities as stream restoration, erosion control, prescribed burns, and retention of large conifers to restore old growth forest or healthy forest characteristics. See Chapter 4, "Cumulative Effects," for future projects under the Lake Tahoe EIP. Forest restoration actions benefit the Truckee River and associated lakes and reservoirs by reducing the potential for catastrophic fire that could indirectly increase discharge of sediment to water bodies.

(b) Carson River Basin

Construction of the Newlands Project altered the natural hydrologic regime in Lahontan Valley, especially the wetlands (FWS, 1995a). Lahontan Reservoir inundated approximately 14,800 acres of sagebrush, saltbrush scrub, cottonwood forest, willow riparian, and marsh habitats, as well as approximately 12 miles of the Carson River. Nesting habitat for herons, egrets, and songbirds, and habitat for other riparian species that existed along the Carson River were inundated.

Islands in Lahontan Reservoir have provided nesting habitat for colonial nesting birds, including California and ring-billed gulls; reservoirs also attracted fish-eating birds such as terns, gulls, and pelicans which do not typically forage in riverine environments. Lahontan Reservoir has been used extensively during waterfowl migrations (Saake, 1994).

(2) Rivers and Tributaries

(a) Truckee River Basin

Dams at Lake Tahoe, Donner Lake, Independence Lake, and on the Little Truckee River, Prosser Creek, and Martis Creek have altered streamflows and flow patterns in the Truckee River and its tributaries.

Some of the greatest effects of dams have been incision of the river channel, narrowing of the flood plain, destabilization of riverbanks, loss of riparian vegetation and wildlife, interruption of migration corridors for spawning native fish, changes in the flow regime, and streamflows inadequate to support native invertebrates and fish. Fish can be trapped and killed by unscreened diversions. Movement of sediment also has been interrupted by dams. Sediment is important in the formation of gravel bars, which are highly productive invertebrate areas and provide habitat for fish spawning and egg incubation. Vegetative growth on point bars helps to narrow and deepen the stream channel, thereby providing cooler water and improving fish habitat.

In 1998, the Nevada State Engineer approved applications by the Pyramid Tribe to appropriate a maximum of 6,000 cfs of unappropriated water of the Truckee River and its tributaries, in part for spawning and conservation of cui-ui and LCT. This water has benefits for other aquatic life as well.

As discussed under “Water Quality,” mining, logging and sawmill operations, and other practices in the late 19th century led to severe degradation of water quality in the study area. Currently, streamflow reductions and alterations, loss of riparian vegetation that shaded the river, discharge of treated sewage effluent, and agricultural runoff promote degraded water quality and increased water temperature in the Truckee River. High seasonal water temperatures in the lower river preclude LCT and other salmonid species and, during summer months, often increase fish mortality. Invertebrate prey species for trout (mayflies, caddisflies, and stoneflies), which are indicators of good water quality, generally decline in the lower reaches of the Truckee River during many years.

Construction of Interstate 80 along the river corridor (1953 to 1979); construction of the Central Pacific Railroad in the 1860s, and later straightening of the corridor by Southern Pacific Railroad; urban development in Truckee, Reno, and Sparks; livestock grazing; construction of bridges; sand and gravel mining; river channel modification by COE for flood control in the 1960s; and clearing of vegetation cumulatively have had adverse effects. These actions eliminated many of the natural meanders of the Truckee River, altered sediment loads that provided fish spawning gravels, eliminated oxbows and wetlands, reduced periodic flooding of wetland vegetation, restricted channel migration, and eliminated an extensive riparian area.

By 1992, approximately 390 acres of palustrine emergent wetlands and 6,680 acres of riparian (both shrub and forest) vegetation that historically occurred along the Truckee River downstream from Vista had been eliminated, a result of clearing for agricultural and urban use, and cutting for firewood. Only about 60 acres of wetland and 1,020 acres of riparian vegetation remain (COE, 1992). Water management altered streamflow patterns to the degree that cottonwood regeneration was all but precluded (COE, 1995). The presence of beaver, thought to have been introduced to the Truckee River basin by USFS in the early 20th century to control erosion at the headwaters (Hall, 1960), and livestock have further reduced cottonwood survival in some areas.

In the early 1980s, FWS began to develop and implement a flow management strategy for the lower Truckee River to benefit cui-ui recovery. That strategy utilized a flow regime (and related selection criteria) to supplement unappropriated water in the lower river with project water in Stampede and Prosser Creek Reservoirs to “maximize occurrence of suitable river stages and lake conditions during spawning runs.” Generally, in years when sufficient water was forecast to be available to promote cui-ui spawning and recruitment, project water would be released as necessary during April through June to assist in achieving prescribed flows. An evaluation tool (“cui-ui model”) was developed to be used in conjunction with the Truckee River Operations Model to evaluate the relative benefits to the cui-ui population of various water management scenarios for the Truckee River basin. The cui-ui model provided the analytical basis for cui-ui in the 1998 draft environmental impact statement/ environmental impact report (DEIS/EIR). FWS has since replaced the cui-ui flow regime, which was a single-species strategy, with an expanded set of flow regimes that is intended to broaden the use of project water and other dedicated waters to provide recovery benefits for both cui-ui and LCT and the riverine habitat upon which they depend.

Water diversions, poor water quality, overfishing, and the loss of wetlands and the cottonwood riparian forest are major factors that have affected native fish and wildlife. In the 1860s, both settlers and Indians were fishing on the Truckee River and at Lake Tahoe for profit and recreation. Immense numbers of LCT were caught and shipped to San Francisco and mining camps (Sigler and Sigler, 1987). Later, canning plants were constructed along the river to process the fish. Between 1873 and 1922, up to 100 tons of LCT were harvested annually from Pyramid Lake and the Truckee River (Townley, 1980, as cited in Nevada, 1997a). Weirs and dams constructed in the river restricted LCT and cui-ui from reaching spawning grounds and facilitated harvest.

In the latter half of the 19th century, the large amounts of sawdust and debris from upstream lumber mills that created the delta at the terminus of the Truckee River further restricted these spawning migrations and contributed to the decline of the LCT population. Construction of the Newlands Project in 1905, which created an additional barrier at Derby Diversion Dam and diverted water from the river to the Lahontan Valley via the Truckee Canal, resulted in an eventual decline of Pyramid Lake.

Rainbow trout were first stocked in the river in California in 1879, brown trout in 1941, and kokanee in 1951. Catfish, rainbow trout, and brook trout were introduced to the Truckee River in Nevada in the 1870s and 1880s and, after 1890, the Truckee River was stocked annually to satisfy the demand of sport fishing (Nevada, 1997a).

A 1972-76 bird study along the lower Truckee River (Klebenow and Oakleaf, 1984) showed that 42 of the 107 species identified by Ridgway in 1877 were not present. A 1992-93 survey rarely detected marsh wren, savanna sparrow, or common yellowthroat, and American bittern and sora were not observed at all (Morrison, 1992a; 1993). Surveys in 1998 found 80 species, but some were non-native and others were not present in Ridgway's time. The net species loss between 1868 and 1998 was 47 percent, and several important habitat types were no longer present or were underrepresented (Ammon, 2002a). Declines in species diversity and abundance had occurred and are probably occurring in the amphibian (Panik and Barrett, 1994) and mammalian communities as well. However, as the result of cottonwood regeneration following favorable conditions in 1983 and 1987, and since restoration of cottonwoods along the lower river was begun in 1995, populations of some species of birds have substantially increased in abundance (Rood et al., 2003).

A major factor that has influenced native fish and wildlife communities is introduction of exotic species (including tamarisk, broad-leaved peppergrass, whitetop, purple loosestrife, Russian thistle, bullfrogs, non-native fishes, and several aquatic invertebrates). Non-native trout and bullfrogs consume young of native fishes and amphibians. Whitetop has overrun native habitats and currently is believed to cover about 12,000 acres along the Truckee River and its tributaries (Donaldson, 1999). Purple loosestrife has been found along approximately 49 miles of the Truckee River downstream from Reno (O'Brien, 1999). Eradication programs are currently being implemented to eliminate whitetop and purple loosestrife. Eurasian water milfoil has been found along 9 miles of the Truckee River downstream from Lake Tahoe and in a pond at Verdi (Donaldson, 1999).

In recent years, attention has focused on enhancing streamflows in the Truckee River, which directly or indirectly would benefit fish and other aquatic life. In 1995, FWS expanded its cooperative effort with the Federal Water Master to manage reservoir releases to promote establishment of cottonwoods along the river, particularly downstream from Derby Diversion Dam. The effort has been successful, and millions of cottonwood seedlings have become established along the lower river (Rood et al., 2003). In 1996, the Truckee River Water Quality Settlement Agreement was signed, which will increase seasonal streamflows in the river and, secondarily, will improve habitat for aquatic life. Also see "Water Quality." Other actions designed to improve conditions for fish have been implemented, including the fish lock at Marble Bluff Fish Facility, which can pass 800,000 cui-ui during a spawning run.

Other efforts include those of The Nature Conservancy to restore reaches of the Truckee River downstream from Vista and the Truckee River Watershed Council, which is assisting others in acquiring funds for restoration projects along the Truckee River and tributaries in California. These ongoing efforts are described in more detail in chapter 4.

Currently, the Pyramid Tribe is implementing a management plan that includes water quality monitoring in the Truckee River, riparian restoration measures along the lower river, and several measures from the Cui-ui Recovery Plan. It has implemented a fencing program to reduce streambank damage from livestock and improve cottonwood regeneration between Wadsworth and Pyramid Lake.

(b) Carson River Basin

During the Comstock era, milling operations in the Virginia Mountain Range and along the Carson River used mercury to process gold and silver ore. As much as 7,500 tons of elemental mercury may have been discarded in mill tailings or discharged to the Carson River or its tributaries (Bailey and Phoenix, 1944). This mercury flushed downstream; mercury has been found in sediment, water, and fish in Lahontan Reservoir, Carson Sink, and Stillwater NWR. (See “Sedimentation and Erosion.”)

Diversion of Carson River water for agriculture reduced and modified the pattern of flow available to Lahontan Valley wetlands; this resulted in drying of marshes at Stillwater NWR, Carson Lake, and Carson Sink (Kelly and Hattori, 1985; Morrison, 1964; Townley, 1977, all as cited in FWS, 1996). Kerley et al. (1993) described changes in local wetland conditions, as summarized here. Wetland acreage in Lahontan Valley has been 10 percent of that documented in 1905. From 1967 to 1986, Carson Lake wetlands averaged 10,000 acres, and Stillwater Marsh wetlands averaged 14,000 acres. During the drought of 1987-1994, wetland acreage dropped to a low of about 2,400 acres (FWS, 1995a). Following the drought, the baseline wetland habitat in Lahontan Valley totaled about 16,600 acres in 1995 and 59,000 acres in 1997 (Henry, 1999).

Since construction of the Newlands Project, wetlands have been partially maintained with drainwater, which can contain contaminants. Sediments from some wetlands contained elevated concentrations of arsenic, lithium, mercury, molybdenum, and zinc. Biological tissues from some wetlands also contained elevated concentrations of materials associated with adverse biological effects on wildlife, particularly migratory birds. In most years, the water discharges were too low to flush these accumulated substances from the wetlands (FWS, 1996). TCID currently operates Lahontan Reservoir with flood flow criteria, and spills and precautionary drawdowns are directed first to wetlands and then to farmland.

Section 206 of P.L. 101-618 authorizes the acquisition of water and water rights for wetlands in Lahontan Valley. In 1990, FWS initiated a series of programs to acquire from willing sellers up to 75,000 acre-feet from the Carson Division and 50,000 acre-feet of additional water from segment 7 of the Carson River, reservoir spills, drainwater, and other sources. As of June 2003, 32,800 acre-feet had been purchased in the Carson Division, 4,300 acre-feet from segment 7 of the Carson River, and 2,900 acre-feet from the Navy. Most purchases have occurred at the edges of the Newlands Project near Stillwater NWR and Carson Lake (Grimes, 2003).

FWS has developed a comprehensive plan to manage Stillwater NWR that focuses on approximating natural habitat conditions as the primary means to conserve and manage refuge wildlife, restore natural biological diversity, and fulfill international treaty obligations with respect to fish and wildlife. The boundary of the refuge would be expanded to include a majority of the lands now within Stillwater WMA and portions of Fallon NWR, as well as land along the lower Carson River and other lands north of the existing refuge (FWS, 2003).

The expansion of agriculture in the valley, made possible by the Newlands Project, has eliminated approximately 74,500 acres of desert salt bush scrub, riparian, and wetland communities, which provided habitat for wildlife, and replaced it with fields of alfalfa and other crops. Agricultural fields provide foraging habitat for some wildlife, however, such as white-faced ibis. Residential housing, subdivisions, and commercial and industrial development have increased in Lahontan Valley in recent years. These developments have eliminated agricultural and wild land, including wetlands and riparian areas, thereby reducing habitat used by wildlife. Fallon NWR (1931), Stillwater WMA (1948), and Stillwater NWR (1991) were established for wildlife in the area.

5. Socio-Economic Environment

Before 1850, the primary economic activities in the Truckee River basin were concentrated in trading posts and stop-off stations for travelers moving west to California and Oregon, although some ranching and farming also occurred. Two events that brought about significant economic development in the area were the discovery of Comstock Lode in 1858 and the development of the intercontinental railroad in the 1860s. These events attracted workers, miners, and entrepreneurs into the area. With the development of mining and the railroad, the demand for lumber and agricultural products greatly increased, which accelerated the growth in the lumber mill and agricultural sectors in the regional economy from 1860 to 1880.

Alfalfa seed, also known as “Chili clover,” was introduced to Truckee Meadows agriculture in 1868. Farmers soon planted it extensively, as it tolerates salt, variable climate, drought, and insects. By the mid-1870’s, it was the staple crop.

When the Comstock fortunes began to fade in the early 1880s, a 20-year depression in Nevada began. Although this depression eventually caused the State’s population to fall by 32 percent, from 62,226 in 1880 to 42,355 by 1900 (Nevada, 1997a), the railroad and agriculture fostered development in Truckee Meadows.

From 1890 to 1920, the demand for agricultural goods increased. To help meet this increased demand, the Newlands Project was constructed to provide additional water for irrigation in Lahontan Valley.

During the 1890s, Floriston Pulp and Paper Company, Truckee River General Electric Company, Washoe Power and Development Company, and Reno Power, Light and

Water Company, were taking water from the Truckee River to produce the newly popular electrical energy (Townley, 1977). It was also around this time that tourism trade began to grow in the Lake Tahoe area. (See "Recreation.")

During the Depression years, gambling was legalized in Nevada, which helped to sustain the local economy. In the latter part of the 1930s, Federal legislation was approved for the development of additional water storage under the Truckee Storage Project.

During World War II, there was considerable economic growth due to the development of military installations, such as a pilot training station near Fallon and a munitions depot near Hawthorne.

The regional economy grew during the 1950s and 1960s, primarily in the mining, gambling, and tourism industries. In the 1970s and 1980s, the tourism grew rapidly, particularly as a result of growth in the ski resort industry in California and further development of gambling in Nevada near Lake Tahoe. This economic growth has led to additional real estate development in the area, particularly in the vacation-home market.

From 1980 to the present, economic trends in the river basin again have been dominated by growth in recreation, tourism, and gambling, as well as growth in the transportation/ warehouse sectors. At the same time, irrigated agriculture production in Truckee Meadows, as well as in the Newlands Project, has decreased.

6. Recreation

Settlers brought their cultural institutions and their need for services, including recreation, which expanded through time. From the time of John Fremont to the present, many factors have contributed to the enhancement and enjoyment of the recreation resources of the study area. The natural beauty of the high Sierra Nevada, with its alpine forests and natural fresh water lakes such as Lake Tahoe, Donner Lake, and Independence Lake, has attracted tourists for more than a hundred years. Construction of roads and railroads into the high country provided improved access, thereby increasing recreational opportunities. Construction of Prosser Creek, Stampede, Boca, and Lahontan Reservoirs to benefit farming/ranching indirectly benefited recreation by providing additional opportunities to picnic, swim, camp, hunt, and fish. Over time, the establishment of city, county, and State parks and private resort development, as well as the incorporation of land into the Federal estate, has enhanced recreation opportunities in the area.

a. Recreational Fishing

While in the Truckee River basin, Fremont benefited from the hospitality of the Paiute Indians by feeding on the "incredibly large" species of LCT, some weighing more than 40 pounds, which was plentiful in Pyramid Lake and the Truckee River (Nevada, 1997a). Although the fish were primarily a source of food for the Paiutes and early settlers and later as a commercial source for both, it can be assumed that because of their size and abundance, they also provided a recreational fishery. California's efforts to maintain the LCT fishery in the Truckee River is well documented.

Settlement in the Truckee-Donner area began in the 1860s, based primarily on logging and railroad construction and operations. Silt loading from timber clearcutting and resultant hillside runoff degraded river water quality and affected native wildlife. It can be assumed that the quality of the recreational fishery declined as the quality of the Truckee River environment declined.

In 1875, because of depleted stocks of native fish in the Truckee River, the California Fish Commission released the first non-native fish species into the Truckee River upstream of the confluence of the Little Truckee River (Nevada, 1997a). The disappearance of LCT upstream of Verdi, Nevada, was recorded in 1880. The California Fish Commission filled the void with McCloud River rainbow trout, Eastern brook trout, and other non-native trout. In early 1880, a fisherman reported an occasional "keeper" (Townley, 1980).

After 1890, game fish were stocked in the Truckee River annually to meet the demands of sport fishing. Nevada's restocking stressed the McCloud River trout and brook trout. Restocking was assisted by the Virginia & Gold Hill Water Company, which annually contributed over 250,000 fry from its Marlette Lake fish hatchery (Nevada, 1997a).

Between 1938 and 1944, the Pyramid Lake strain of LCT in Pyramid Lake was extirpated through a combination of physical impediment to upstream spawning runs, river pollution, sawdust covering spawning gravel, and overfishing (Nevada, 1997a).

Today, fishery management in the region is characterized by a proliferation of public/private/tribal partnerships. In recent years, voters have passed State and county bonds for the outdoors, including the Truckee River. Community-based planning and funding efforts have been focusing on developing the Truckee River within vegetated banks and wetlands rather than concrete and rock lined channels. Unneeded bridge abutments are being removed, old oxbows are being reclaimed, and trees are being planted. Within the river, boulders are being placed with the objective of restoring the river to a more wild condition, which will also provide better habitat for fish and opportunities for anglers.

Restoration efforts could have the effect of returning the Truckee River to a first-class fishing river. The Pyramid Tribe has an extensive fishery program that includes partnerships with Nevada Department of Wildlife (NDOW) and FWS.

b. Tourism and Recreation

Tourism and recreation in the Sierra Nevada always has depended on access. Construction of the transcontinental Central Pacific Railroad in 1868 led to the founding of Truckee, California, and provided a gateway to Lake Tahoe and the surrounding area.

Lake Tahoe's tourism expanded when the Bliss enterprise formed a new corporation, the Lake Tahoe Railway and Transportation Company, obtained a franchise, and in 1889 began construction on a narrow gauge railroad between Tahoe and Truckee. Service was offered three times a day during the summer, and the train and the climb were marvels. With the completion of the railroad, a 170-foot luxury excursion steamer, the Tahoe, was added in 1896. The Bliss corporation then built Tahoe Tavern, for many years a world famous hotel (Hinkle and Hinkle, 1987).

By the dawn of the 20th century, the extensive logging operations at Lake Tahoe had passed out in favor of an economy based on tourism and recreation. In 1931, gaming became legal in Nevada and a new industry was born.

In 1960, Lake Tahoe was given greater visibility when the Winter Olympics were held at Squaw Valley. The Winter Olympics elevated the importance of winter sports in the area to an international level, thus guaranteeing a steady stream of tourists.

Construction of dams and reservoirs between 1929 and 1970 and the subsequent development of associated facilities over time supplemented the recreation opportunities already existing at the many natural lakes in the study area. Demand for recreation in the Truckee area spawned the creation of the Truckee Donner Recreation and Parks District in 1962. Several of the recreation facilities adjacent to Donner Lake are managed by the District in cooperation with California State Parks. Most of the other recreation facilities associated with lakes and reservoirs are managed by USFS cooperating with many other governmental and private entities.

The Truckee River was not embraced by nearby residents, municipalities, and county governments as a recreational resource for the region until the 1970s and 80s. Since that time, a recreational river corridor was conceived, improvements to the river corridor have been made, and many recreational enhancements such as access facilities have been built (Resource Concepts, Inc., 2002).

The January 1997 flood provides an indication of a newly developed respect of the Truckee River as a recreational amenity. COE proposed rebuilding the flood walls that lined the Truckee River, but a task force of residents convened by local governments persuaded COE to rethink past flood control measures. With a sales tax to fund the community's share of the project, the task force developed a plan that would return the river to a more natural state and provide flood protection while enhancing river based recreation (Reno Gazette Journal, 2003). The future of river recreation on the Truckee River can be characterized as being based on private public partnerships and support for restoration, environmental enhancement, and recreational projects.

7. Cultural Resources

Human cultural resources are often transitory. Successive cultures that used similar resources often settled in and used the same locations as those they followed. The result is that remains of earlier settlements were displaced or destroyed, or the context of materials of a particular period lost. The more intensive the settlement or use of the land, the greater the probability of loss of these earlier sites.

Reservoir construction inundated most sites and, in some cases, subjected shoreline sites to wave action, destroying any evidence or context. As transportation infrastructures and economic bases expanded, humans built many cities and towns over previous settlements. Such development and the subsequent increases in human land use can also contribute to site erosion or unauthorized collecting. Large-scale construction and ground disturbance activities associated with mining, logging, and ranching altered the natural environment and earlier sites. Some sites were more ephemeral than camps; many were located in areas of extensive timbering or grazing. Therefore, some sites may have been compromised due to extensive resource consumption by humans and animals alike.

GENERAL METHODS AND ASSUMPTIONS

This section provides an overview of the general methods and assumptions used to evaluate potential effects on study area resources under current conditions, the No Action Alternative (No Action), Local Water Supply Alternative (LWSA), and Truckee River Operating Agreement Alternative (TROA). Specific methods of analysis are presented in the discussions of the effects of the alternatives on individual resources.

I. Comparative Evaluation of Alternatives

In compliance with the National Environmental Policy Act of 1969 (NEPA), this EIS/EIR compares the potential effects (beneficial and adverse) on study area resources under the two action alternatives (LWSA and TROA) to No Action. Additionally, in compliance with the California Environmental Quality Act (CEQA), this EIS/EIR also compares the potential effects on resources under the alternatives (No Action, LWSA, and TROA) to the existing environmental setting, or "current conditions" as referred to in this document. Thus, the potential effects on study area resources under No Action are compared to current conditions, and the potential effects on resources under the action alternatives are compared both to No Action and current conditions.

Under NEPA, mitigation is not required for any adverse effects that may occur under No Action, but may be considered for adverse effects that may occur under the action alternatives. As under NEPA, mitigation is not required under CEQA for any adverse effects that may occur under No Action; however, section 15126.4(a) of the CEQA Guidelines requires a discussion of feasible measures to avoid or substantially reduce significant adverse effects that may occur with the proposed action.

Because resources in the study area are numerous and complex, potential effects on some resources were analyzed using representative indicators selected by the analysts. For example, rather than analyzing all fish populations, certain species were selected to provide a focused analysis of the effects of the alternatives.

For this study, the Truckee River Operations Model (operations model) was used to simulate water management and demands in the Lake Tahoe, Truckee River, and lower Carson River basins. Analysts used simulated hydrologic (i.e., water) results generated by the operations model to identify potential hydrologic differences among current conditions and the alternatives, including No Action. On the basis of these hydrologic differences, analysts then analyzed and compared the potential effects of the alternatives on water and water-related resources in the study area. Computer models such as the operations model are commonly used to simulate operations of a river system, particularly when numerous complex and repetitive tasks must be performed, and they are often used in environmental studies such as this EIS/EIR.

II. Truckee River Operations Model

The Truckee River Operations Model (operations model) is a mass-balance accounting model that adds and subtracts simulated water from the Lake Tahoe, Truckee River, and lower Carson River basins on a monthly basis to calculate stream flows and reservoir storage at specified locations over a specified period of time (in this instance, 100 years). Additions include unregulated runoff, reservoir inflows and releases, tributary inflows, return flows, and effluent return; subtractions include evaporation, diversions, canal losses, and Farad-Derby depletions. Using prescribed water management practices and water demands, the operations model tracks unregulated runoff as it is captured in reservoirs or flows freely in the river. It calculates monthly changes in reservoir storage; reductions attributable to evaporation, spill, and diversion for agriculture and M&I use; and return flows from diversions. These parameters are identified in "Surface Water," in individual sections entitled "Method of Analysis and Operations Model Input."

The operations model was used to simulate water management when the proposed action would be fully implemented. (See "Use of Operations Model in EIS/EIR" and "Study Assumptions" in this section.) Although community planners can forecast future demand for water with some degree of confidence, meteorologists cannot make long-range water resource (i.e., runoff) forecasts with the precision needed to compare the alternatives. It is standard practice, however, for hydrologic models to use the historic record in comparative analysis that simulates future conditions. Using historic runoff data as input, the operations model can simulate the effects each alternative would have had on historic water supplies and related resources on the assumption that future conditions will resemble those of the past. Because runoff data for a particular water year cannot represent long-term environmental conditions when the proposed action would be fully implemented, runoff data for water years 1901–2000 were used so that the alternatives could be analyzed under a range of hydrologic conditions. By holding water demands constant at the future level and assuming that all existing water management facilities are in place, analysis of the alternatives based on operations model results can focus on the variability of water management rather than weather. Because of the long hydrologic record for input, simulations from the operations model produce long-term averages, extremes, and variability that can be useful in making quantitative comparisons among alternatives to determine which best satisfy criteria of interest for water and related resources.

A. Development of Operations Model

In the 1970s, Reclamation initiated development of a computer model as a planning tool to simulate water management and demands within the Truckee River and lower Carson River basins. The computer model was developed to simulate approximate average monthly water yields in response to varying water management practices, not to simulate historic flows. Before 1975, Reclamation staff in Carson City, Nevada, and Denver, Colorado, developed the initial computer model (model) for simulating the complex water management of the Truckee-Carson River system. The computer program and basic data inputs for the model have been continuously refined and updated since 1975.

In the early 1980s, the model used 80 years of runoff data (water years 1901–1980) at key points in the river system to simulate hydrologic conditions under a variety of water management practices. These databases were composed mainly of historical records, but where no historical records existed, runoff data were estimated using correlations to known flows, precipitation-runoff relations, and, when necessary, professional judgment. Though there is no single source of documentation for the model and input databases, documentation exists in the form of informal notes, memoranda by various parties, portions of summaries and analysis of specific simulations, and the collective memory of staffs of the various entities involved in the development of the operations model.

In the mid-1980s, a Technical Advisory Committee (TAC), consisting of representatives of Sierra Pacific, Pyramid Tribe, TCID, State of Nevada, Reclamation, and FWS, was formed to guide the development of the database and revisions to the model. TAC recommended development of a single version of the model that was agreeable to all parties to evaluate OCAP for the Newlands Project, which governs diversion of Truckee River water at Derby Diversion Dam. Reclamation used this version of the model to evaluate alternatives in the Newlands Project Proposed Operating Criteria and Procedures EIS (Reclamation, 1987). Westpac Utilities (a subsidiary of Sierra Pacific) also used it for its 1985 Water Resource Plan studies.

In 1988, consultants to Sierra Pacific modified the model to segregate monthly hydrologic data for Martis Creek Reservoir, Donner Lake, Independence Lake, and Hunter Creek and to describe the relations between water uses along the Truckee River and depletion/accretion of Truckee River flows between the State line and Derby Diversion Dam. The consultants also incorporated various optional operations criteria for the purpose of analyzing water management alternatives (e.g., storage and release of Credit Water) proposed during the negotiation of the 1989 Preliminary Settlement Agreement between Sierra Pacific and the Pyramid Tribe, as modified by the Ratification Agreement by the United States (PSA). In 1994, Sierra Hydrotech, through a Reclamation contract, updated the historic hydrologic data set for water years 1981–1992 and added (1) variable streamflow targets for water quality and fish and wildlife enhancement at specific locations and (2) reservoir storage targets. This version of the model is referred to as the Negotiations Settlement model. A separate model (known as Below Lahontan Reservoir model) was developed to use Lahontan Reservoir release output data from the Negotiations Settlement model to simulate water deliveries to the individual districts of the Carson Division of the Newlands Project and to Lahontan Valley wetlands. FWS used the results of that model in preparing the Water Rights Acquisition Program for Lahontan Valley Wetlands EIS (FWS, 1996).

In 1998, in support of TROA negotiations, Sierra Hydrotech modified the Negotiations Settlement model to facilitate evaluation of water management alternatives. Modifications included updating the historic hydrologic database by adding water years 1993–97 as well as adding Newlands Project and city of Fernley Credit Water operations, 1997 OCAP operations, and Truckee River Water Quality Settlement Agreement provisions. This version of the model, now referred to as the operations model, was used in preparing the Truckee River Operating Agreement Draft EIS/EIR (U.S. Department of the Interior [Interior] and State of California, 1998) and the Truckee River Water Quality Settlement Agreement: Federal Water Rights Acquisition Program EIS (Interior, 2002). In addition, TMWA and consultants to the Pyramid Tribe have used, and continue to use, the operations model for water resources planning.

Sierra Hydrotech modified the operations model in 2001 to assist TROA negotiations in evaluating additional negotiations proposals. These modifications included updating the historic hydrologic database by adding water years 1998-2000, incorporating Truckee River flow regime selection criteria for cui-ui spawning, and refining Newlands Project and city of Fernley Credit Water operations. This version of the operations model was used to evaluate alternatives in the revised DEIS/EIR (Interior and State of California, 2004) and this final EIS/EIR.

B. Use of Operations Model in TROA Negotiations

As early as 1991, the parties to the TROA negotiations, and particularly the five mandatory signatories (Interior, California and Nevada, Pyramid Tribe, and Sierra Pacific (now TMWA)), discussed the need for and potential use of a model to assist in the negotiation process. The most appropriate model available to the negotiators was the model as of 1991 and its subsequent versions (as described above) that is now the operations model used in the current analysis. Because the negotiators recognized that the operations model had limitations (discussed below) and that it was a comparative, rather than a predictive, tool, they decided that it would be selectively used as the primary tool to help inform the negotiators as they considered various alternatives.

TROA has been negotiated by the representatives of the various negotiating parties. When a decision was made to use the operations model in association with the particular provision being negotiated, it was with the knowledge and recognition of the operations model's limitations. (See subsequent section, "Assumptions for Use and Limitations of Operations Model.") The technical representatives of the negotiating parties would review the data generated by the operations model, recognizing the model's limitations and using their extensive knowledge of Truckee River reservoir operations. The technical representatives were then able to provide information and make informed recommendations to their respective negotiators.

The decision-making process of the TROA negotiators has involved many professional disciplines and included use of the operations model. In coming to a decision concerning any provision of the Negotiated Agreement, the negotiators considered their respective parties' goals and objectives for TROA; professional judgment of their respective technical staffs; professional judgment of experienced Truckee River system managers; the historic hydrograph and other records for the system; and the results produced by use of the operations model with consideration of its recognized limitations.

C. Use of Operations Model in EIS/EIR

Current conditions, No Action, and the two action alternatives (1) identify water management options and (2) address water demands (i.e., M&I, agriculture, water quality, hydroelectric power generation, aquatic and riparian habitat) at various points along the Truckee River. How water resources would be managed under each alternative, and how demands would be addressed, are dependent on such variables as the amount and timing of the water supply and the demand. If these supply and demand variables are known and held constant, the capacity of each alternative to achieve its objectives can easily be calculated.

1. Input Data

The future water demand constant used in the operations model is 119,000 acre-feet per year. (Also see Section III, "Study Assumptions.") Local planning agencies and water purveyors have developed a projected growth rate to guide resource management for the next several decades, as presented in attachments C, D, and E. (Also see table 3.3 in "Surface Water" for current annual consumptive water demands in the Truckee River basin in California and Nevada.) On the basis of population projections, TMWA's M&I demand is projected to equal 119,000 acre-feet in the year 2033. Irrigation demand at that future time was then based upon the amount of agricultural water rights assumed to remain active once acquisitions and transfers to satisfy the M&I demands have been completed.

Water management criteria used in the operations model are described in "Surface Water" in Section I.C, "Current Water Management" and in Section II.C, "Reservoir Storage and Releases." These criteria identify specific thresholds for storage, release, and diversion of water that are applied each month and year on the basis of various decrees, agreements, regulations, and criteria, as well as assumed voluntary actions by owners of water rights. In real time (i.e., actual operation), special conditions or extenuating circumstances could modify application of certain operations. For current conditions and No Action, the operations model incorporates current operations. For TROA, the operations model includes most operations that are provided for in the Draft Agreement as fully implemented, required water management facilities as operational, and all water rights identified for new beneficial uses as acquired, transferred, and exercised (i.e., in the year 2033). Examples of Credit Water operations are presented in the Water Resources Appendix. For LWSA, operations different from No Action are included to meet future water demand in the absence of TROA. Proposed operations under LWSA were provided by TMWA. (See chapter 2.)

Data input to the operations model is discussed in "Surface Water," in individual sections entitled "Method of Analysis and Operations Model Input."

2. Operations Model Results

The operations model generates a 100-year data set of simulated riverflows, diversions, and return flows as well as reservoir storage, releases, and spills for current conditions and each alternative:

- End-of-month storage and average monthly releases for Truckee River reservoirs and Donner and Independence Lakes and Lahontan Reservoir
- Average monthly flows at various points in the Truckee River and tributaries

In addition to average values, these data are also expressed in terms of exceedence, which is defined as the likelihood that a value for a certain variable would be equaled or exceeded during the period of analysis. Exceedence is used to describe hydrologic conditions for reservoirs or stream locations. For example, storage associated with 90-percent exceedence would likely be relatively small because it would be equaled or exceeded 90 out of 100 times (90 percent) during the hydrologic period, and would be considered “dry” hydrologic conditions. A 50-percent exceedence would be equaled or exceeded 50 out of 100 times (50 percent) during the hydrologic period, and would be considered “median” hydrologic conditions. A 10-percent exceedence would equate to “wet” hydrologic conditions because it would be equaled or exceeded 10 out of 100 times (10 percent) during the hydrologic period.

In this study, “hydrologic condition” refers only to a specific reservoir storage or release value or amount of flow in a stream reach; it is not necessarily indicative of the magnitude of runoff or total water availability in the basin during a given water year. For most analyses, effects on resources were considered in three hydrologic conditions: wet, median, and dry. Some analyses also considered very wet (5-percent exceedence) or very dry (95-percent exceedence) hydrologic conditions, depending on the resource indicator. Exceptions to the use of these hydrologic conditions are discussed in detail in chapter 3 in “Water Quality,” “Sedimentation and Erosion,” and “Biological Resources.”

Operations model results for each alternative were compared to identify differences among parameters of interest and evaluate potential effects, as discussed previously.

D. Use and Limitations of Operations Model

The operations model was the primary tool used for analyzing and comparing alternatives for this EIS/EIR. Water managers considered the operations model to be the best model available for TROA negotiations and the best analytical tool for this document because it was specific to operations of Truckee and Carson River basin water management facilities, water demands, and schedules. Its use was accepted by all parties involved in the negotiation of TROA and preparation of the EIS/EIR. The operations model is appropriate for comparative analysis of alternatives as required by NEPA and CEQA. No other model available to the negotiators during the entire time TROA was negotiated provided comparable operational capacity or the ready review of simulated results.

Use of the operations model—both in the TROA negotiations and in the preparation of this EIS/EIR—was reasonable, in part, because it incorporates a lengthy historic data record from the Truckee River basin that reflects the variability of basin hydrology. Since the late 19th century, the climate of the study area has been characterized by relatively low average annual precipitation, with extended wet and dry periods punctuated by occasional floods and drought. Thus, precipitation and flows in the study area can vary widely—whether hourly, daily, weekly, monthly, seasonally, annually, or cyclically. This variability is often represented by using historic hydrologic data. Such hydrologic data are valuable in that they illustrate what events are possible and their frequency of occurrence. In general, the longer the hydrologic data record, the more likely it is to represent the potential range of runoff variability and their frequency of occurrence at some future time.

The use of historic hydrologic data has certain caveats. To the casual reader, the use of historic hydrologic data in the operations model could imply outcomes well into this century; however, simulated hydrologic conditions are not absolute values nor predictive of future conditions because long-term weather conditions cannot be accurately forecasted and the complete range of future operations cannot be fully anticipated. However, because the operations model incorporates a set of hydrologic data based upon historic conditions, and basin-wide water demands are based upon documented criteria, procedures, and planning material, operations model results are considered a reasonable and relevant estimate of conditions upon which to analyze and compare the alternatives.

All models have limitations, and the operations model is no exception. One limitation of the operations model is that it produces only average storage and flow results on a monthly time-step, and does not reflect shorter-term fluctuations in reservoir storage or flows. It cannot be used to analyze daily travel time between river reaches, daily or hourly release ramping rates at reservoirs, instantaneous peak flood events, or the effects of emergency operations. Thus, the operations model tends to “smooth out” normal fluctuations that occur on a real-time (e.g. daily or weekly) basis.

Second, the operations model does not account for evapotranspiration or for groundwater/surface water interactions in other than a gross statistical manner.

Third, mass-balance and accounting models, like the operations model, do not replicate historic flows throughout the basin. It was not meant to replicate such flows because the basis of the operations model is current water management and constant water demand for the entire 100-year hydrologic record. It does not lend itself to modeling historic events because demands for water have varied widely in the past, as did operations due to the construction of water management facilities. Also, various decrees and agreements have modified operations over time, particularly as reservoirs were constructed.

Fourth, as discussed previously, the operations model is not predictive as used in this study because it does not incorporate probabilistic projections of future precipitation and runoff. It uses historic runoff and does not determine the occurrence probability of certain events, such as high peak flows.

III. Study Assumptions

In addition to operations, this study is based on numerous assumptions about population level, water demands, period of analysis, and water right transfers; these are described in the following sections. (See "Surface Water" for further discussion of assumptions for water supply and demand used in the operations model.)

A. Population Level and Water Demands

Projections of future demand (2033) on the water supply depend on several factors. The key factor is the larger future urban populations and the related transfer of water rights from irrigated agriculture to M&I use.

The entities responsible for planning for M&I water use and supply in the Lake Tahoe and Truckee River basins provided projections of future population, per capita use rate, and water demand. For Truckee Meadows, these entities are Washoe County and TMWA. For the California and other Nevada portions of the basin, these entities are California Department of Finance, California Department of Water Resources (CDWR), Tahoe Regional Planning Agency (TRPA), Nevada Division of Water Resources (NDWR), city of Fernley, and the Pyramid Tribe. (See attachments C, D, E, and G.)

Population growth in Truckee Meadows was projected to be the same under No Action, LWSA, and TROA. Water demand in Truckee Meadows also was projected to be the same under No Action, LWSA, and TROA; however, sources of water or mechanisms to provide water might differ among the alternatives. (See chapter 2.)

It was assumed that increased M&I demand on the Truckee River under the alternatives would result in additional transfer of water rights from agriculture to M&I use. TMWA's projections of the amount of water rights to be purchased to serve growing M&I demand and the resulting reduction in agriculture also were considered.

The city of Fernley currently is supplied by groundwater sources; all new residential developments are required to provide surface water rights to serve new customers. This trend is expected to continue in the future. The water rights are being purchased from the Truckee Division of the Newlands Project. Fernley is actively pursuing transfer of ownership, purpose, and place of use of these water rights. Population growth and per capita use rates were provided by Fernley and used to establish future water demand.

Descriptions of the alternatives in chapter 2 include projections of surface and ground water usage and conservation. The Economics and Recreation Appendix contains detailed information and discussion of population projections. The Water Resources Appendix addresses future water demand and transfer of ownership, purpose, and place of use of water rights.

B. Period of Analysis

Consistent with provisions of the Negotiated Agreement, this study assumed that TROA would be fully implemented when TMWA's normal water supply for its wholesale and retail service area is equal to 119,000 acre-feet per year. Water planning documents project this condition to occur in the year 2033. If growth rates are higher or lower, TMWA will reach its full use of water earlier or later, respectively, than projected.

C. Water Right Transfers

In order to implement TROA, the following actions would require approval under applicable State law:

- Retention in storage of the consumptive use portion of all or a portion of the water that TROA signatories were entitled to divert from the Truckee River out of Floriston Rate releases, consistent with water rights and storage contracts
- Reduction in Floriston Rates releases to reflect such storage in lieu of diversions
- All water right transfers to change the place or type of use of such storage
- Pyramid Tribe obtaining the right to store Nevada unappropriated water of the Truckee River. (See Pyramid Like Appropriated Water in table 2.2.)

As of July 2007, approximately 4,736 acre-feet of water rights had been acquired to meet water quality goals in the lower Truckee River pursuant to WQSA.

SURFACE WATER

I. Affected Environment

This Affected Environment section describes current conditions for surface water supply, demand, management, and operations. Water categories used in this section and “Environmental Consequences” are defined in chapter 2, table 2.2, and the Glossary. While groundwater is mentioned because of its close relation to surface water and supply, it is described and analyzed in detail in the subsequent “Groundwater” section.

A. Supply

Surface runoff of precipitation is the primary source of water supply in the Truckee and Carson River basins, and total supply varies from year to year. Most of the available Truckee River water supply is generated upstream of the USGS stream gauge at Farad, California. For this analysis, Carson River supply is the discharge measured at the USGS stream gauge near Fort Churchill, Nevada. Most of the supply of the Truckee and Carson Rivers is produced during the spring runoff season (April to July) as the snowpack in the Sierra Nevada melts. As discussed previously, the climate of the Truckee and Carson River basins is characterized by cycles of flood and drought, and precipitation and runoff vary widely from year to year.

Historic annual discharge of the Truckee River at Farad ranges from a high of 1,768,980 acre-feet in 1983 to a low of 133,460 acre-feet in 1931. Average annual discharge at Farad is 561,800 acre-feet. Figure 3.1 shows historic annual discharge at Farad for 1900–2000.

Historic annual discharge of the Carson River near Fort Churchill ranges from a high of 804,600 acre-feet in 1983 to a low of 26,260 acre-feet in 1977. Average annual discharge at Fort Churchill is 276,000 acre-feet. Figure 3.2 shows the historic annual discharge at Fort Churchill for 1912–2000.

1. Lake Tahoe Basin

The Upper Truckee River originates in the Sierra Nevada in northeastern California and discharges to the southern end of Lake Tahoe. Numerous other creeks and streams also flow directly into Lake Tahoe. The drainage area upstream of Lake Tahoe Dam is 506 square miles, of which the lake occupies 192 square miles. Average annual net inflow to Lake Tahoe is 180,400 acre-feet.

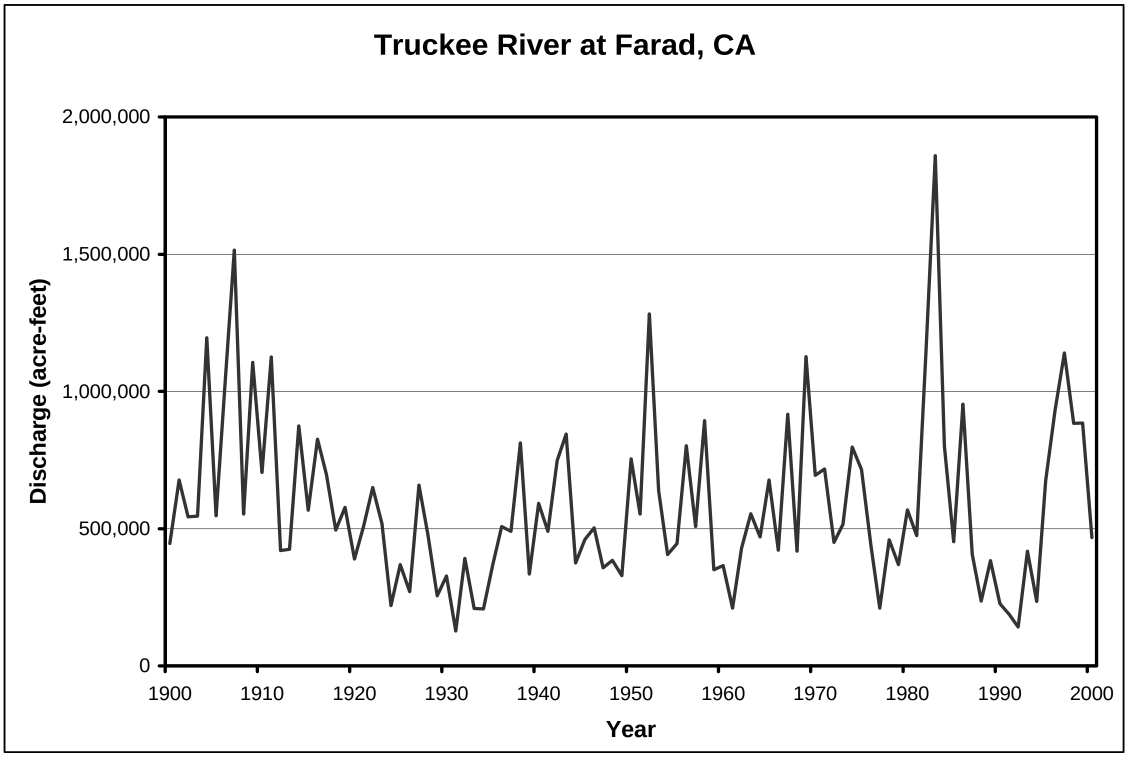


Figure 3.1—Annual discharge at Farad, California, 1900–2000.

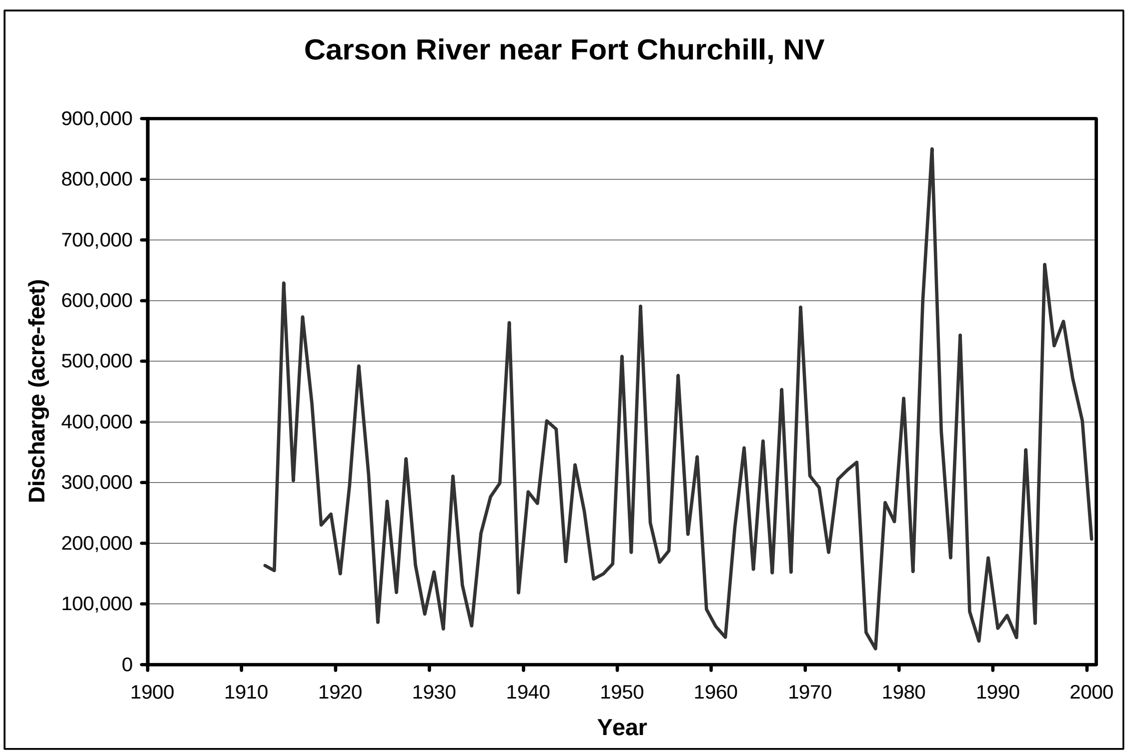


Figure 3.2—Annual discharge near Fort Churchill, Nevada, 1912–2000.

Lake Tahoe outflow is controlled by Lake Tahoe Dam, located near Tahoe City, California, at the natural outlet to the Truckee River. The natural rim of Lake Tahoe, about 400 feet upstream from the dam, is at elevation 6223.0 feet. The dam is operated, to the extent practicable, to avoid exceeding lake elevation of 6229.1 feet. The dam creates 744,600 acre-feet of useable storage between elevation 6223.0 and 6229.1 feet.

2. Truckee River and Major Tributaries

From Lake Tahoe, the Truckee River flows generally north and east through California for about 40 miles and enters Nevada near Farad. The drainage area from Lake Tahoe Dam to Farad is 426 square miles. The main tributaries are Donner, Martis, and Prosser Creeks and the Little Truckee River, all of which are regulated by dams. The unregulated drainage area covers 146 square miles and produces 30 percent of the average annual runoff at Farad.

Donner Creek drains an area of 30 square miles, enters the Truckee River about 14 miles downstream from Lake Tahoe Dam, and discharges an average of 26,300 acre-feet annually. Martis Creek and Prosser Creek join the Truckee River about 7 miles downstream from Donner Creek, with drainage areas of 20 and 50 square miles, respectively. Martis Creek annual discharge averages 19,700 acre-feet and Prosser Creek 64,000 acre-feet.

The Little Truckee River is the largest tributary to the Truckee River, with a drainage area of 173 square miles. It enters the Truckee River about 4 miles upstream of Farad. Tributaries are Independence, Sagehen, and Davies Creeks. Average annual discharge is 135,000 acre-feet.

Downstream from Farad, principal tributaries are Dog Creek and Hunter Creek, which have an average annual discharge of 4,500 and 7,000 acre-feet, respectively.

Within Truckee Meadows, Steamboat Creek drains an area of 130 square miles and contributes about 15,500 acre-feet annually to the Truckee River. Tributaries to Steamboat Creek are Galena, Evans, Thomas, and Whites Creeks. The 600-square-mile drainage area downstream from Truckee Meadows to Pyramid Lake provides only minimal contributions to the Truckee River water supply. Pyramid Lake is the terminus of the Truckee River and covers approximately 110,000 acres.

Table 3.1 presents the historic minimum, average, and maximum annual discharge at key locations in the Truckee River basin.

3. Reservoirs in the Truckee River Basin

Approximately 30 percent of the surface water supply upstream of Farad is regulated by Lake Tahoe; 40 percent is regulated by other Federal and non-Federal reservoirs located in California. The remaining 30 percent is unregulated. In general, the reservoirs store

Table 3.1—Historic Truckee River annual discharge (acre-feet per year)

Location	Period of record	Minimum	Average	Maximum
Truckee River at Tahoe City, CA	1909–2000	109	170,500	832,700
Donner Creek at Donner Lake, CA	1929–2000	5,580	26,330	60,300
Martis Creek near Truckee, CA	1959–2000	4,990	19,700	53,930
Prosser Creek downstream from Prosser Dam, CA	1943–2000	17,690	64,000	154,900
Little Truckee River downstream from Boca Dam, CA	1939–2000	40,250	135,000	340,200
Truckee River at Farad, CA	1909–2000	133,500	561,800	1,769,000
Truckee River at Reno, NV	1907–2000	76,700	509,400	1,701,000
Steamboat Creek at Steamboat, NV	1962–2000	1,390	15,550	83,000
Truckee River at Vista, NV	1900–2000	114,600	603,800	2,017,000
Truckee River downstream from Derby Diversion Dam	1918–2000	4,450	304,000	1,760,000
Truckee River near Nixon, NV	1958–2000	17,500	425,100	1,889,000

Source: USGS Water Data Report NV00-1.

Truckee River surface water in the spring and release it in the summer and early fall, primarily to meet demands in Nevada. Reservoir storage and unregulated runoff determine the water supply available to Nevada.

Donner Lake is located on Donner Creek, on the western edge of the town of Truckee, California. Donner Lake is regulated by a concrete dam constructed 1,200 feet downstream from its natural outlet. The dam is operated to avoid exceeding elevation 5935.8 feet. From November 15 through April 15, dam safety requirements specify that the discharge gates of the dam be held open; reservoir storage during this time is generally 3,000 acre-feet. During a drought condition, permission can be requested from CDWR to allow the gates to be closed in advance of April 15.

Martis Creek Reservoir is located on Martis Creek approximately 2 miles upstream of the confluence with the Truckee River. The reservoir has a capacity of 20,400 acre-feet, used for temporary storage of flood flows. Due to dam safety issues, COE's geotechnical staff monitors seepage whenever storage exceeds 6,000 acre-feet. It is quite probable that COE will not be able to utilize the full 20,400 acre-feet of available flood control storage during a flood event because of these issues.

Prosser Creek Reservoir is located on Prosser Creek about 1.5 miles upstream of the Truckee River and has a capacity of 29,800 acre-feet. Between November 1 and April 10 of the following year, reservoir storage is lowered to 9,800 acre-feet to provide 20,000 acre-feet for flood control.

Independence Lake is located on Independence Creek. An earthfill dam controls the top 28 feet of the lake above the natural outlet, providing a usable reservoir of 17,500 acre-feet. Between November 1 and April 1, dam safety requires flashboards to be removed from two bays in the spillway structure; reservoir storage during this time usually ranges from 13,000 to 15,000 acre-feet.

Stampede Reservoir is located on the Little Truckee River about 8 miles upstream of the Truckee River and 3 miles upstream of Boca Reservoir. The reservoir, which has a storage capacity of 226,500 acre-feet, reserves 22,000 acre-feet of storage between November 1 and April 10 for flood control.

Boca Reservoir, located on the Little Truckee River near its confluence with the Truckee River, has a capacity of approximately 40,900 acre-feet. Flood control storage of 8,000 acre-feet is reserved from November 1 to April 10 of the following year.

4. Truckee Canal/Lahontan Reservoir

A portion of Truckee River flow is diverted at Derby Diversion Dam through the Truckee Canal (1) directly to the Truckee Division of the Newlands Project during the irrigation season and (2) to Lahontan Reservoir to supplement the Carson River water supply to the Carson Division.

Lahontan Reservoir is located on the Carson River about 18 miles west of Fallon, Nevada, and impounds Carson River flow and, in some years, a portion of the Truckee River water diverted to the Truckee Canal. The reservoir has a storage capacity of about 313,000 acre-feet (with flashboards) and drainage area of about 1,799 square miles. Carson River discharge to Lahontan Reservoir (measured at Fort Churchill, Nevada) averaged about 276,000 acre-feet per year for the period 1911–2000. The Carson River terminates in the Carson Sink, east of Fallon, Nevada. Table 3.2 presents the historic annual minimum, average, and maximum discharge at USGS stream gauges stations on the Truckee Canal and Carson River.

Table 3.2—Historic annual Truckee Canal and Carson River annual discharge (acre-feet)

Stream gauge	Period of record	Minimum	Average	Maximum
Truckee Canal near Wadsworth, NV	1967–2000	30,985	161,500	287,500
Carson River near Fort Churchill, NV	1911–2000	26,260	276,000	804,600
Carson River downstream from Lahontan Reservoir	1967–2000	131,400	372,900	771,900

Source: USGS Water Data Report NV00-1.

5. Return Flows

Surface water return flows from irrigation and M&I uses provide water for downstream users. Irrigation return flows generally vary from 25 to 50 percent of the total water applied to the lands. TTSA-treated effluent from North Lake Tahoe, Alpine Meadows, Squaw Valley, Donner, Truckee, and the Martis Creek area percolates to the Truckee River just upstream of Martis Creek. Truckee Meadows Water Reclamation Facility (TMWRF) discharges treated effluent to Steamboat Creek, a tributary to the Truckee River. TMWRF is the largest point source of surface water returns to the river.

Groundwater also comprises a portion of the M&I water supply in the study area. See “Groundwater” for discussion.

B. Current Demands

Consumptive and nonconsumptive demands on the total water supply are described in this section. Current demands are based on documented statistics from the year 2002. These values were used in the revised DEIS/EIR and again in this final EIS/EIR for consistency between the two documents. Water categories are defined in chapter 2, table 2.2, and the Glossary.

1. Consumptive Demands

Consumptive demands are those demands for which all or a portion of the water supply is removed from the system. These demands include agricultural and M&I uses and exports from the Truckee River basin. Table 3.3 summarizes current consumptive demands for the Lake Tahoe and Truckee River basins water in California and Nevada.

Table 3.3—Current (2002) annual consumptive demands for Lake Tahoe and Truckee River basins water (acre-feet)

Agricultural demand in California	
Truckee River basin	1,800
Agricultural demands in Nevada	
Truckee Meadows	40,770
Newlands Project	
Truckee Division	18,520
Carson Division[1]	275,720
Lower Truckee River	12,040
M&I demands in California	
Lake Tahoe basin	18,700
Truckee River basin	8,570
M&I demands in Nevada	
Lake Tahoe basin	9,379
Truckee Meadows (TMWA)	83,140
Washoe County	9,900
Tracy hydroelectric powerplant	1,950
Pyramid Tribe	1,120
Fernley	3,280
Out-of-basin exports in California	
To Sierra Valley	7,000
To South Fork of American River	2,000
To Carson River[2]	4,100
Out-of-basin exports in Nevada	
To Carson River[3]	5,000
To Stead (supplied by TMWA)	1,680

[1] The Carson River supplies a majority of this demand; the Truckee River provides only a supplemental supply.
[2] Sewage effluent from South Tahoe Public Utility District.
[3] Sewage effluent from Incline Village General Improvement District, Douglas County Sewer Improvement District No. 1, and diversions from Marlette Lake.

a. Agriculture

Current average annual agricultural demand in the Truckee Meadows served from the Truckee River is 40,770 acre-feet. Major diversions from the river include Steamboat Canal and Lake, Last Chance, Orr, and Pioneer Ditches.

Downstream from Truckee Meadows are numerous other diversions from the river, including several on the Pyramid Lake Indian Reservation. The largest diversion in this portion of the river is to the Truckee Canal, primarily to support Newlands Project agriculture, to meet an annual demand of 18,520 acre-feet in the Truckee Division and to supplement Carson River flows to meet an annual demand of 275,720 acre-feet in the Carson Division.

The Pyramid Tribe holds water rights with the highest priority date (December 8, 1859), referred to as Claim Nos. 1 and 2 of the *Orr Ditch* decree. Under Claim No. 1, the Pyramid Tribe has the right to divert irrigation water in an amount not to exceed 4.71 acre-feet per acre for 3,130 acres of bottom land (14,742 acre-feet per year). Claim No. 2 gives the right to divert 5.59 acre-feet per acre for 2,745 acres of bench land (15,345 acre-feet per year).

b. M&I

Annual Truckee Meadows M&I demand is 83,140 acre-feet, of which 29,710 acre-feet return to the river. Most of this demand is met with surface water. TMWA holds a right for continuous flows of 40 cfs (28,959 acre-feet per year) for M&I use with a priority junior only to Claim Nos. 1 and 2, as defined in the Truckee River Agreement and incorporated in the *Orr Ditch* decree. In addition, TMWA holds 9,878 acre-feet of Hunter Creek rights and pumps about 14,820 acre-feet groundwater in a normal year and 22,000 acre-feet per year in a drought situation. As of 2002, TMWA held title to, or had leased, 57,170 acre-feet of agricultural water rights for M&I use.

Additional M&I demand in Nevada includes 9,379 acre-feet in the Lake Tahoe basin, which is met by surface water. M&I demands of 1,120 acre-feet on the Pyramid Lake Indian Reservation and 3,280 acre-feet in Fernley currently are met by groundwater.

State of Nevada Permit Nos. 48061 and 48494 allocate the remaining waters of the Nevada portion of the Truckee River to the Pyramid Tribe. Currently this is under appeal. If the Nevada State Engineer’s ruling is upheld, the Nevada portion of the Truckee River and its tributaries would be fully appropriated.

In California, total M&I demand is approximately 27,300 acre-feet per year, with about 18,700 acre-feet in the Lake Tahoe basin and 8,600 acre-feet in the Truckee River basin. In the Truckee River basin, surface water meets about 1,000 acre-feet of the demand and groundwater meets about 7,600 acre-feet. Some of the water is exported out of the Truckee River basin, as shown in table 3.3.

2. Nonconsumptive Demands

Nonconsumptive demands are those in which the water supply provides beneficial uses but is not diminished in quantity for downstream users (table 3.4). In the Truckee River basin, these demands include hydroelectric power generation, flows to provide and maintain fish habitat, and reservoir storage for recreation.

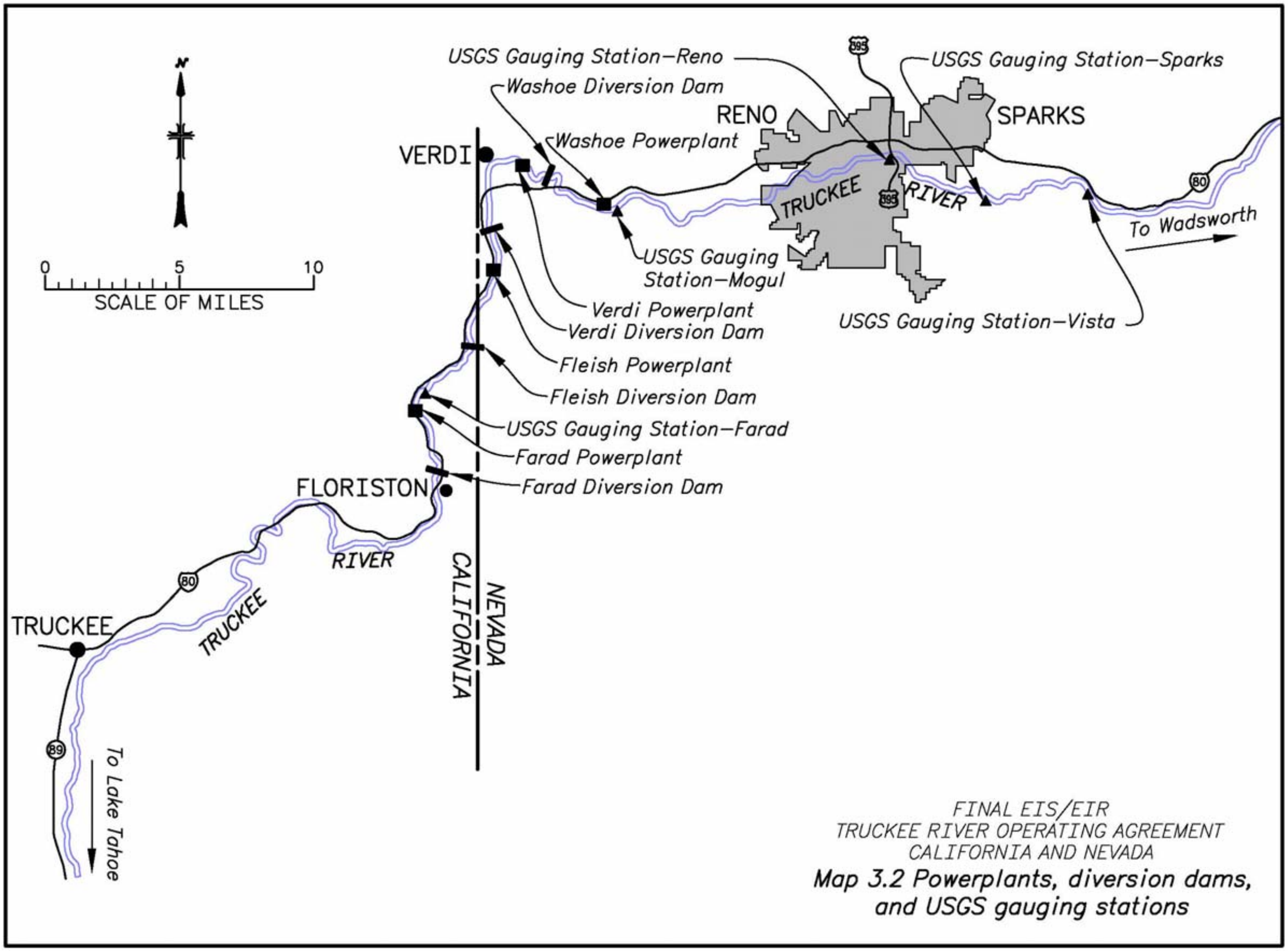
Table 3.4—Current (2002) nonconsumptive water demands (cfs) in the Lake Tahoe and Truckee River basins

Hydroelectric power generation (maximum diversion right) in California	
Farad	400
Hydroelectric power generation (maximum diversion right) in Nevada	
Fleish	327
Verdi	399
Washoe	396
Minimum releases in California	
Lake Tahoe	
October-March	50
April-September	70
Donner Lake	2-3
Prosser Creek Reservoir	5 (or inflow to reservoir if less than 5 cfs)
Independence Lake	2
Stampede Reservoir[1]	30
Boca Reservoir	0
Farad hydroelectric powerplant bypass	150
Minimum flows in Nevada	
Fleish hydroelectric powerplant bypass	50
Verdi hydroelectric powerplant bypass	50
Washoe hydroelectric powerplant bypass	50

[1]The minimum release of 30 cfs from Stampede Reservoir is maintained under an informal agreement between Reclamation and the California Department of Fish and Game.

a. Hydroelectric Power Generation

Four run-of-the-river hydroelectric powerplants are located along the Truckee River between the Little Truckee River and Reno: Farad, Fleish, Verdi, and Washoe (map 3.2). To generate power, water is diverted to flumes (i.e., wooden or earthen canals) that convey the water to the riverside plants, where the water is passed through penstocks and rotating turbines or through bypass spillways; the water is then returned to the river. Historically, stretches of the river between the diversion structure and the point of return frequently were dry during portions of the year. TMWA has agreed to maintain minimum bypass flows of 50 cfs at each of the four hydroelectric powerplant diversion dams; in addition, as a condition of rebuilding the Farad Diversion Dam, SWRCB will



Map 3.2 Powerplants, diversion dams, and USGS gauging stations

require TMWA to maintain at the Farad Diversion Dam a minimum bypass flow of 150 cfs or the Truckee River flow immediately upstream of the diversion dam, whichever is less.[2]

Two hydroelectric powerplants at Stampede Dam have a combined capacity of 3.65 megawatts and a combined delivery rate of 300 cfs. Two hydroelectric powerplants at Lahontan Dam, with a capacity of 6.3 megawatts and delivery rate of 710 cfs, can receive water from the Truckee Canal or Lahontan Reservoir. Another hydroelectric powerplant is located on the V-Line Canal of the Newlands Project. The non-consumptive demands presented in table 3.4 have water rights for diversions. While the United States has an *Alpine* decree right for generating hydroelectric power at Lahontan Reservoir, there is no required diversion to meet hydroelectric power demands and hydroelectric power is to be generated incidental to reservoir releases.

b. Minimum Reservoir Releases

Table 3.4 lists current minimum releases by location. The minimum release of 30 cfs from Stampede Reservoir is maintained under an informal agreement between Reclamation and the California Department of Fish and Game (CDFG).

c. Recreation Storage

In the Truckee River basin, recreational interests are generally served incidental to water rights.

C. Current Water Management

Numerous laws, court decrees, and agreements govern the current operation of reservoirs in the Truckee and Carson River basins. Some of the key operating constraints on the Truckee River are the *Truckee River General Electric* decree; *Orr Ditch* decree which incorporated the TRA; and TPEA. The *Alpine* decree governs the exercise of Carson River basin water rights, and OCAP regulates operations on the Newlands Project.

1. *Truckee River General Electric* Decree

The *Truckee River General Electric* decree set forth the operating constraints for Lake Tahoe, granted Reclamation the right to use Lake Tahoe dam to regulate streamflows and incorporated the original Floriston Rates (later modified by TRA). Floriston Rates provided minimum flows of 500 cfs from March through September and 400 cfs the remainder of the year, as long as water was available in Lake Tahoe. Floriston Rates were intended to provide sufficient streamflow for a pulp and paper mill near Floriston, California, and the four run-of-the-river hydroelectric powerplants. (Initially, Floriston Rates were measured at the Iceland, California, stream gauge.)

[2] It was assumed for this final EIS/EIR that the Farad Diversion Dam has been rebuilt.

2. *Orr Ditch* Decree

The *Orr Ditch* decree was entered by the U.S. District Court for the District of Nevada in 1944 in *United States* v. *Orr Water Ditch Co.*, *et al*., No. A-3 in Equity, an action brought by the United States in 1913 to quiet title to water rights on the Truckee River and storage in Lake Tahoe. The *Orr Ditch* decree adjudicated water rights of the Truckee River in Nevada and established amounts, places and types of use, and priorities of the various rights, including the United States' right to store water in Lake Tahoe. The decree also incorporated the 1935 TRA as binding among Sierra Pacific Power Company (Sierra Pacific), TCID, WCWCD, Interior, and certain other Truckee River water users ("parties of the fifth part"). TRA is an operating agreement that, among other things, provided for reduced Floriston Rates, and for the construction of what is now Boca Reservoir. The *Orr Ditch* decree, 1915 *Truckee River General Electric* decree, and Tahoe-Prosser Exchange Agreement (discussed in the following paragraph) provide the current operational framework and rules for Truckee River reservoirs. The provisions of the *Orr Ditch* decree are administered by the Federal Water Master appointed by the *Orr Ditch* court.

3. Tahoe-Prosser Exchange Agreement

The Tahoe-Prosser Exchange Agreement supplements TRA with additional criteria for operations of Lake Tahoe and Prosser Creek Reservoir. TPEA allows specific streamflow releases to be made from Lake Tahoe when releases are not required to meet Floriston Rates. Minimum releases of 70 cfs from April through September and 50 cfs the remainder of the year are made from Lake Tahoe when storage in Prosser Creek Reservoir is available for an exchange or when an equivalent amount of water in excess of Prosser Creek minimum releases of 5 cfs is available for storage. If inflow to Prosser Creek is less than these releases and no storage is available for exchange, releases from Lake Tahoe are reduced to the amount of inflow stored in Prosser Creek Reservoir.

4. *Alpine* Decree

The *Alpine* decree is the 1980 adjudication of the Carson River water rights and priorities in California and Nevada. Under the decree, waters of the Carson River are fully appropriated.

5. OCAP

OCAP (referred to in TROA as Truckee Canal Diversion Criteria) is a Federal regulation promulgated by the Secretary of the Interior that establishes procedures to define the annual water demand of the Newlands Project and regulates the diversion of water from the Truckee River to meet that demand consistent with the *Alpine* and *Orr Ditch* decrees and the Secretary's trust responsibilities to the Pyramid Tribe. OCAP includes provisions for a maximum annual diversion, implementation of conservation measures to improve project efficiency, and criteria for diverting Truckee River water to the Newlands Project for agricultural use and storage in Lahontan Reservoir.

6. *Carson-Truckee Water Conservancy District* v. *Watt,* 1982

The Federal court ruled that the Secretary must use storage in Stampede Reservoir for the conservation of Pyramid Lake fishes because the Endangered Species Act of 1973, as amended (ESA) took precedence over any obligation to contract for delivery of water for irrigation and M&I uses. This ruling guides current operations of Stampede Reservoir.

7. Interim Storage Agreement

This 1994 agreement among Interior, Sierra Pacific, WCWCD, and the Pyramid Tribe allows Sierra Pacific (now TMWA) to store privately owned water from Independence Lake and Donner Lake in Stampede and Boca Reservoirs; this water would be used to meet domestic and M&I needs in Truckee Meadows during a drought situation. Up to 14,000 acre-feet of privately owned water can be stored; however, any privately owned water in excess of 5,000 acre-feet is converted to Fish Water on September 1 of each year.

8. Truckee River Water Quality Settlement Agreement

The 1996 Truckee River Water Quality Settlement Agreement established a program to improve Truckee River water quality through the purchase and transfer of Truckee River water rights for the purpose of maintaining streamflows. Water associated with WQSA water rights could be stored in Stampede and Prosser Creek Reservoirs and managed by the WQSA parties for water quality and aesthetic purposes.

D. Current Operations

This section describes current operations of reservoirs for flood control, dam safety, minimum releases, storage, and streamflows. These operations were modeled for this study.

1. Flood Control

Martis Creek Reservoir is operated only for flood control purposes. Temporary storage space is required by COE in several of the reservoirs as follows:

- Prosser Creek Reservoir - 20,000 acre-feet by November 1
- Stampede Reservoir - 22,000 acre-feet by November 1
- Boca Reservoir - 8,000 acre-feet by November 1

Stored water may be required to be released to meet these requirements.

Lake Tahoe is operated to limit high-water damage to lakeshore property, and releases to the Truckee River are made to avoid exceeding elevation 6229.1 feet.

Flood waters are stored temporarily in Prosser Creek, Stampede, Boca, and Martis Creek Reservoirs when Truckee River flows at Reno are 6,000 cfs or greater. Even with no releases being made from reservoirs during a flood event, unregulated runoff can exceed that amount.

2. Dam Safety Requirements

To meet dam safety requirements, Donner Lake's two upper gates must remain open from November 15 to April 15 in the following year. Dam safety requirements for Independence Lake require clearing of the spillway prior to the rainy season. In general, storage in Independence Lake is maintained at 14,500 acre-feet during the winter.

3. Minimum and Bypass Flow Requirements

Minimum reservoir releases and hydroelectric powerplant bypass flows are shown in table 3.4. Lake Tahoe minimum releases of 50 cfs October–March and 70 cfs April-September, when release is not required for Floriston Rates, are subject to the availability of water in Prosser Creek Reservoir to exchange.

4. Floriston Rates

Floriston Rates are met by unregulated flows and releases of Project Water. Releases of Tahoe-Prosser Exchange Water stored in Prosser Creek, primarily late in the irrigation season, and Project Water stored in Lake Tahoe and Boca Reservoir are made to meet all or a portion of Floriston Rates when unregulated flows are insufficient to meet Floriston Rates, generally in the following order:

April through October:

When Lake Tahoe elevation is at or below 6225.5 feet, Project Water stored in Lake Tahoe is released first (in anticipation of the reservoir falling below the natural outlet) and then Project Water stored in Boca Reservoir.

When Lake Tahoe elevation is above 6225.5 feet, Project Water stored in Boca Reservoir is released first and then Project Water stored in Lake Tahoe. (The Federal Water Master may vary this to maintain relatively constant flow in the river downstream from Lake Tahoe.)

Tahoe-Prosser Exchange Water stored in Prosser Creek Reservoir is also released in combination with releases from Lake Tahoe and Boca Reservoir for Floriston Rates. Tahoe-Prosser Exchange Water tends to be released later in the season (June through October) and, because its storage may not interfere with flood control requirements, the Federal Water Master strives to release all Tahoe-Prosser Exchange Water before November 1.

November through March:

Boca Reservoir is the main source of water for Floriston Rates, with contributions from Lake Tahoe.

When Floriston Rates cannot be met by unregulated flows and Project Water releases from Lake Tahoe and Prosser Creek and Boca Reservoirs, priority for use of the available water is subject to the *Orr Ditch* decree.

5. Storing Water in Reservoirs

Water may be stored in Donner and Independence Lakes adverse to Floriston Rates. Donner Creek inflow may be stored in Donner Lake after April 15 of each year. Independence Lake has a right to store the first 3,000 acre-feet of Independence Creek inflow each year.

Water cannot be stored in Lake Tahoe or in Prosser Creek, Stampede, or Boca Reservoirs until Floriston Rates are met. When unregulated flows meet or exceed Floriston Rates, Lake Tahoe has the first right to store Project Water. If Floriston Rates are still exceeded, up to 25,000 acre-feet of Project Water may be stored in Boca Reservoir.

After the 25,000 acre-feet of water is stored in Boca Reservoir, another condition must be met before additional Truckee River water may be stored: sufficient water must be available to meet Truckee Canal diversion requirements for the Newlands Project pursuant to OCAP.

An additional 15,850 acre-feet may now be stored to fill Boca Reservoir. After Boca Reservoir fills, Independence Lake has the right to store an additional 14,500 acre-feet of Independence Creek inflow, if available.

Stampede Reservoir has the next right to store up to 126,000 acre-feet, followed by Prosser Creek Reservoir, with a right to store up to 30,000 acre-feet of Project Water. Project Water stored in Prosser Creek Reservoir not needed for the Tahoe-Prosser Exchange and Project Water stored in Stampede Reservoir are used to meet the flow requirements of Pyramid Lake fishes. Prosser Creek Reservoir may store Tahoe-Prosser Exchange Water when appropriate conditions exist.

6. Truckee River Operations for Pyramid Lake Fishes

Project Water stored in Stampede and Prosser Creek Reservoirs for the benefit of Pyramid Lake fishes is currently managed using flow regime criteria developed by FWS based on six hydrologic year types and the amount of Stampede Project Water (and Fish Credit Water under TROA) in storage on March 1 (referred to as the six-flow regime in “Fish in Truckee River and Affected Tributaries”). In addition to biological requirements of fish, flow criteria also incorporate ecosystem considerations, such as establishment and maintenance of willow and cottonwoods. (See “Fish in Truckee River and Affected Tributaries” for a detailed discussion and analysis.) Table 3.5 presents hydrologic year types; table 3.6 presents Stampede Reservoir storage designations.

Table 3.5—Hydrologic year types (based on Stampede Reservoir March through July inflow [acre-feet])

March through July inflow	Hydrologic year type
Greater than 150,000	Wet
Greater than 107,000 and less than or equal to 150,000	Above average
Greater than 76,000 and less than or equal to 107,000	Average
Greater than 52,000 and less than or equal to 76,000	Below average
Greater than 30,000 and less than or equal to 52,000	Dry
Less than 30,000	Critical

Table 3.6—Stampede Reservoir storage designation (based on Fish Water in storage on March 1 [acre-feet])

Fish Water in storage	Storage designation
Greater than 200,000	Full
Greater than 150,000 and less than or equal to 200,000	High
Greater than 100,000 and less than or equal to 150,000	Low
Less than or equal to 100,000	Critical

Using the hydrologic year type and a Stampede Reservoir storage designation, a flow regime is selected, as shown in table 3.7.

Table 3.7—Flow regime selection

Storage designation	Hydrologic year type					
	Wet	Above average	Average	Below average	Dry	Critical
Full	1	1	1	1	3	4
High	1	1	2	2	4	5
Low	1	2	3	4	6	6
Critical	2	3	5	6	6	6

Each flow regime has a set of monthly inflow targets to Pyramid Lake. An appropriate regime is selected each month, from March through July, as the forecast is updated. A single flow regime is selected for operations from August through the following February. Table 3.8 presents the monthly inflow targets for each flow regime.

Table 3.8—Pyramid Lake monthly inflow targets (cfs) for flow regime Nos. 1-6

	1	2	3	4	5	6
January	160	150	120	110	100	90
February	160	150	120	110	100	90
March	290	220	200	160	160	140
April	590	490	420	350	300	200
May	1,000	800	600	530	400	300
June	800	600	500	400	270	170
July	300	300	300	200	150	120
August	200	200	200	200	150	110
September	170	170	120	110	100	100
October	160	150	120	110	100	100
November	160	150	120	110	100	90
December	160	150	120	110	100	90

These inflow targets are modified in years with substantial spring runoff. When both May and June inflow to Pyramid Lake exceeds 1,000 cfs, the August and September inflow targets are set to 300 cfs.

When lower Truckee River flow is below the inflow target, Fish Water is released from Prosser Creek and/or Stampede Reservoirs to supplement the flow.

See chapter 2 for discussions of operations under No Action, LWSA, and TROA.

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect reservoir storage and releases and the quality, quantity, timing, and duration of flows. For this analysis, the effects of changes in storage and flows were evaluated using the following parameters:

- Total end-of-month storage for the following reservoirs in wet, median, and dry hydrologic conditions (i.e., 10-, 50-, and 90-percent probabilities of exceedence, respectively)
  - Lake Tahoe
  - Donner Lake
  - Prosser Creek Reservoir
  - Independence Lake
  - Stampede Reservoir
  - Boca Reservoir
- Individual end-of-month storage and average monthly releases in wet, median, and dry hydrologic conditions for all of the above reservoirs, as well as for Lahontan Reservoir
- Average monthly Truckee River flows in wet, median, and dry hydrologic conditions for the following locations:
  - Farad, California
  - Vista, Nevada
- Pyramid Lake inflow (average monthly Truckee River flows at Nixon, Nevada) in wet, median, and dry hydrologic conditions and comparison of simulated lake elevations
- Exercise of water rights to meet the following demands in the minimum supply year:
  - Agriculture
    - Truckee Meadows
    - Newlands Project
      - Truckee Division
      - Carson Division
    - Lower Truckee River

The minimum supply year (or minimum annual water supply) is defined as the calendar year with the least supply to serve water rights over the 100-year period of analysis.

- M&I
  - Lake Tahoe
  - Truckee River in California
  - Truckee Meadows
  - Fernley
  - Lower Truckee River

Operations model results are presented for 10-, 50-, and 90-percent probabilities of exceedence, and these monthly results are summarized and analyzed in this section. Complete operations model output is contained in the Water Resources Appendix.

B. Summary of Effects

The effects on surface water are summarized in tables 3.9 (reservoir storage and releases), 3.10 (Truckee River flows), 3.11 (Pyramid Lake), and 3.12 (exercise of water rights).

The total amount of water stored in Truckee River reservoirs and Donner and Independence Lakes—and that is available for release—is an indicator of the water supply that can meet consumptive and nonconsumptive demands. Operations model results show that, under TROA, the total amount of water stored is greater than under No Action, LWSA, or current conditions, primarily in Stampede, Boca, and Prosser Creek Reservoirs.

Each alternative includes target releases for environmental and recreational benefits. In dry hydrologic conditions, operations model results show that flows in Independence Creek, Little Truckee River, and Prosser Creek are appreciably greater under TROA than under the other alternatives because of greater minimum flow releases and the ability to exchange Credit Water among the reservoirs. In addition, in dry hydrologic conditions, Truckee River flow through and downstream from Truckee Meadows is greater under all alternatives than under current conditions because of the greater amount of storage from Credit Waters available for release.

In Truckee Meadows, agricultural demand is not met in all years under current conditions and the alternatives.

For the Newlands Project, it is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes. Under current conditions and the three alternatives, Carson Division demands are met in wet, median, and dry hydrologic conditions; they are not met in hydrologic conditions with less than a 10 percent probability of exceedence (i.e., in drier than dry hydrologic conditions) under any of the alternatives.

Table 3.9—Summary of effects on end-of-month reservoir storage (acre-feet) and average monthly releases

Location	Current conditions	No Action	LWSA	TROA
Total	Wet: 946,300 Median: 790,000 Dry: 64,000	Slightly less than under current conditions	Similar to No Action	Much greater than under No Action or current conditions
Lake Tahoe	Wet: 672,900 Median: 557,100 Dry: 52,600	Slightly less storage and similar releases as under current conditions	Similar storage and releases as under No Action	Similar storage and much greater May-June releases and less August-January releases than under No Action or current conditions
Donner Lake	Wet: 6,500 Median: 5,800 Dry: 5,100	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Similar storage, except slightly less storage in July and August than under No Action or current conditions; slightly greater June-August releases, less September releases, and greater October releases than under No Action or current conditions
Prosser Creek Reservoir	Wet: 18,800	Wet: similar storage and releases as under current conditions	Similar to No Action in all three hydrologic conditions	Wet: similar storage and releases as under No Action or current conditions
	Median: 14,400	Median: greater August-September storage; less May-July releases; much greater October releases than under current conditions		Median: greater May-September storage; less May-July releases and much greater September-October releases than under than under No Action or current conditions
	Dry: 3,100	Dry: much greater January-December storage; less May-July releases; greater October releases than under current conditions		Dry: much greater January-December storage; less May releases; greater August-October releases than under No Action or current conditions

Table 3.9—Summary of effects on end-of-month reservoir storage and average monthly releases (acre-feet, unless noted) – continued

Location	Current conditions	No Action	LWSA	TROA
Independence Lake	Wet: 15,700	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Wet: similar storage and releases as under No Action or current conditions, except less releases in September
	Median: 15,600			Median: similar storage and releases as under No Action or current conditions, except greater February and August releases and less March and September releases
	Dry: 15,000			Dry: in general, slightly less January-December storage; slightly greater June-September releases; similar October-May releases as under No Action or current conditions
Stampede Reservoir	Wet: 212,900	Wet: slightly greater August-September storage and similar releases as under current conditions	Similar storage and releases as under No Action	Wet: greater May-September storage and greater September-November releases than under No Action or current conditions
	Median: 181,200	Median: similar January-December storage and lower August-September releases than under current conditions		Median: much greater January-December storage; less November-July releases and much greater September-October releases than under No Action or current conditions
	Dry: 22,000	Dry: similar January-December storage and greater March and July releases than under current conditions		Dry: much greater January-December storage and releases than under No Action or current conditions

Table 3.9—Summary of effects on end-of-month reservoir storage and average monthly releases (acre-feet, unless noted) – continued

Location	Current conditions	No Action	LWSA	TROA
Boca Reservoir	Wet: 34,500	Similar storage and releases as under current conditions	Similar storage and releases as under No Action	Wet: less August and greater October-December storage than under No Action or current conditions
	Median: 20,300			Median: greater August-March storage than under No Action or current conditions
	Dry: 3,400			Dry: greater January-December storage than under No Action or current conditions
Lahontan Reservoir	Wet: 277,300	Wet: slightly greater September-February storage; similar releases as under current conditions	Similar to No Action	Similar to No Action
	Median: 160,500	Median and dry: less January-December storage; less April-September releases than under current conditions		
	Dry: 99,100			

Table 3.10—Summary of effects on average monthly Truckee River flows (cfs)

Location	Current conditions	No Action	LWSA	TROA
Farad	Wet: 1,420			Wet: greater December-June flows than under No Action or current conditions and less August-September flows than under No Action or current conditions
	Median: 650	Slightly less than under current conditions	Similar to No Action	Median: less November-February flows than under No Action or current conditions and less July-September flows than under No Action or current conditions
	Dry: 430			In general, in dry to very dry hydrologic conditions: greater July-September flows than under No Action or current conditions and less November-June flows than under No Action or current conditions
Vista	Wet: 1,460			Wet: slightly greater December-June flows than under No Action or current conditions
	Median: 640	Generally slightly less than under current conditions	Similar to No Action	Median: less November-February flows than under No Action or current conditions
	Dry: 400			Dry: greater July-October flows than under No Action or current conditions

Table 3.11—Summary of effects on Pyramid Lake

<table>
<tr><th>Location</th><th>Current conditions</th><th>No Action</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Pyramid Lake</td><td>Ending elevation: 49 feet higher by the end of 100-year period of analysis
Ending storage: 28,430,000 acre-feet
Average inflow: 496,720 acre-feet per year</td><td>Ending elevation, storage, and inflow less than under current conditions</td><td>Ending elevation, storage, and inflow less than under No Action or current conditions</td><td>Ending elevation, storage, and inflow greater than under No Action or current conditions</td></tr>
<tr><td rowspan="3">Nixon (Pyramid Lake inflow)</td><td>Wet: 1,410 cfs</td><td>Wet: Generally slightly less flows than under current conditions</td><td rowspan="3">Similar to No Action</td><td>Wet: slightly greater December-June flows than under No Action or current conditions</td></tr>
<tr><td>Median: 600 cfs</td><td rowspan="2">Median to dry: greater August-September flows than under current conditions</td><td>Median: less November-February flows than under No Action or current conditions and similar to slightly greater July-October flows than under No Action or current conditions</td></tr>
<tr><td>Dry: 150 cfs</td><td>Dry: slightly greater August-October flows than under No Action or current conditions</td></tr>
</table>

Table 3.12—Summary of effects on exercise of water rights to meet demands

Location	Current Conditions	No Action	LWSA	TROA
Agricultural				
Truckee Meadows	Demand of 40,770 acre-feet per year and 21.3 percent of demand met in minimum supply year	Much less demand and a greater percent of demand met in minimum supply year than under current conditions	Same demand as under No Action and a greater percent of demand met in minimum supply year than under current conditions	Much less demand than under No Action or current conditions and greater percent of demand met in minimum supply year than under No Action or current conditions
Newlands Project Truckee Division	Demand of 18,520 acre-feet per year and 51.5 percent of demand met in minimum supply year	No demand; water rights acquired by TMWA and Fernley	Same as under No Action	Same as under No Action, i.e., no demand; water rights acquired by TMWA and Fernley
Newlands Project Carson Division	Demand of 275,720 acre-feet per year and 47.2 percent of demand met in minimum supply year	Slightly less demand and less percent of demand met in minimum supply year than under current conditions	Same demand and slightly less percent of demand met in minimum supply year than under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions	Same demand and similar percent of demand met in the minimum supply year as under No Action; slightly less demand and less percent of demand met in minimum supply year than under current conditions
Lower Truckee River	Demand of 12,040 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
M&I				
Lake Tahoe California	Demand of 18,700 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions

Table 3.12—Summary of effects on exercise of water rights to meet demands – continued

Demand	Current Conditions	No Action	LWSA	TROA
Lake Tahoe Nevada	Demand of 11,000 acre-feet year and 100 percent of demand met in minimum supply year	Same demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., same demand and same percent of demand met in minimum supply year as under current conditions
Truckee River California	Demand of 8,570 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions
Truckee Meadows	Demand of 83,140 acre-feet per year and 100 percent of demand met in minimum supply year	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply insufficient to meet demand of 119,000 acre-feet in all drought years	Supply sufficient to meet demand of 119,000 acre-feet in all drought years
Fernley	Demand of 3,280 acre-feet per year and 100 percent of demand met in minimum supply year by groundwater	Much greater demand and less percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and less percent of demand met in minimum supply year as under current conditions
Lower Truckee River	Demand of 1,120 acre-feet per year and 100 percent of demand met in minimum supply year	Much greater demand and same percent of demand met in minimum supply year as under current conditions	Same as under No Action	Same as under No Action, i.e., much greater demand and same percent of demand met in minimum supply year as under current conditions

In California, M&I demands in the Lake Tahoe and Truckee River basins are met under current conditions and the alternatives. In Nevada, M&I demand in the Lake Tahoe basin is met under current conditions and the alternatives. Truckee Meadows M&I demand is met under current conditions. In the minimum supply year, Truckee Meadows M&I supply under TROA is greater than under No Action or LWSA; M&I water supply during the drought periods is greater under TROA than under No Action and LWSA in all years. Fernley M&I demand is met by groundwater under current conditions. A portion of Fernley future M&I demand is met by transfer of Truckee Division agricultural water rights. In the minimum supply year, M&I supply is the same under all alternatives. Lower Truckee River agricultural and M&I demands are met under all alternatives.

C. Reservoir Storage and Releases

1. Method of Analysis and Operations Model Input

This section describes the method used to calculate reservoir storage and releases and the supply and demand assumptions used in the operations model. Subsequent sections provide information on the effects of the various alternatives on reservoir operations and resulting streamflows. For a description of the operations model, see Section II, “Truckee River Operations Model,” in “General Methods and Assumptions.”

a. Method

Parameters identified in the Surface Water section were used to identify indicators analyzed in the subsequent resource sections. Parameters related to beneficial uses (e.g., exercise of water rights, minimum flows, recreation storage thresholds) and unique resources (e.g., special status species, fish, and riparian habitat) provide an analytical basis for this document.

Operations model results for reservoir storage and releases and flows in wet, median, and dry hydrologic conditions under No Action, LWSA, and TROA were compared to the results for modeled current conditions. Operations model results under LWSA and TROA also were compared to results under No Action. In addition, operations model results were analyzed to identify the causes of any differences between the alternatives and current conditions. See Section I, “Comparative Evaluation of Alternatives” in “General Methods and Assumptions” for further explanation.

Tables in the Water Resources Appendix (Exhibits 6-11) present reservoir storage and elevation and average monthly releases for each reservoir under current conditions, No Action, LWSA, and TROA, as generated by the operations model. The operations model input files, a description of what they represent, and output summary files are contained in the Water Resources Appendix, Exhibits 4 and 5. The output files also are included in the Water Resources Appendix.

b. Input Assumptions

See Section II, “Truckee River Operations Model,” and Section III, “Study Assumptions,” in “General Methods and Assumptions” for a description of model input assumptions.

(1) Water Supply

For current conditions, No Action, LWSA, and TROA, the operations model uses 100 years of historic hydrologic data for the period October 1900 to September 2000 to calculate the availability of water supply to meet demands. Historic flows (from gauging station records), historic reservoir elevations, local area evaporation and precipitation records, and estimated flows (when gauging station records were not available) were used to generate basic water supply data. Input values for initial reservoir storage were calculated by averaging the historic end-of-September storage for the period 1993–2002. This period is recent and represents a wide range of hydrologic conditions.

The operations model does not perform any operations calculations for demands in the Lake Tahoe basin. The effects of water demands were incorporated into the monthly net inflow data for Lake Tahoe and were assumed to be met with no shortages. Lake Tahoe inflow was developed assuming California demands of 23,000 acre-feet and Nevada demands of 11,000 acre-feet annually in the Lake Tahoe basin. (The current estimate of annual use is 18,700 acre-feet in California and 11,000 acre-feet in Nevada.) Because current demands are less than future demands, Lake Tahoe inflow was increased by 1,400 acre-feet per year in the current conditions simulation to account for less consumptive use in the Lake Tahoe basin.

(2) Water Demand

Table 3.13 presents annual consumptive demands in the study area that were included as input to the operations model.

(a) Current Conditions Modeled Demands

Current conditions modeled demands were based on 2002 data. Currently, M&I demands for the Pyramid Tribe and Fernley are met by groundwater and are not modeled. Return flows from irrigation, river losses, and local inflow in Truckee Meadows were based on another computer model, the Truckee Meadows model, which estimates the net effects of urbanization on these parameters. Estimated average annual return flows from TMWRF are 29,710 acre-feet per year. Minimum reservoir releases, hydroelectric powerplant bypass flows, and hydroelectric powerplant demands are shown in table 3.4. No recreational pool or water quality targets are modeled for current conditions. All operations discussed previously in “Current Operations” are modeled.

(b) No Action Modeled Demands

The operations model uses estimates of future demands for water based on population and water use projections made by water resource planning entities in California and Nevada: Washoe County, TMWA, TRPA, California Department of Finance, CDWR, NDWR, Fernley, and the Pyramid Tribe.

Under No Action, no additional storage facilities would be constructed to provide a drought supply for Truckee Meadows M&I demand. In drought years under No Action, the groundwater would be operated conjunctively to supplement available surface water.

In its 1995–2015 Water Resources Plan, Sierra Pacific (1994) evaluated a number of options to provide a reliable water supply for Truckee Meadows, including 18 alternative local reservoir projects, but it did not include construction of a new storage reservoir.

Table 3.13—Operations model input for annual consumptive demands (acre-feet) in study area

Location	Current conditions	No Action	LWSA	TROA
Agricultural demand in California				
Truckee River basin	1,800	2,100	2,100	2,100
Agricultural demands in Nevada				
Truckee Meadows	40,770	21,500	21,500	4,860
Newlands Project: Truckee Division	18,520	[1]0	[1]0	[1]0
Newlands Project: Carson Division[2]	275,720	268,870	268,870	268,870
Lower Truckee River	12,040	17,900	17,900	17,900
M&I demands in California				
Lake Tahoe basin	18,700	23,000	23,000	23,000
Truckee River basin	8,570	20,600	20,600	20,600
M&I demands in Nevada				
Lake Tahoe basin	[3]11,000	11,000	11,000	11,000
Truckee Meadows (TMWA) Normal[4]	83,140	119,000	119,000	119,000
Truckee Meadows (TMWA) Drought	83,140	107,300	109,200	113,720
Tracy hydroelectric powerplant[5]	1,950	3,500	3,500	3,500
Washoe County[6]	9,900	21,750	21,750	21,750
Fernley	[7]0	[8]6,800	[8]6,800	[8]6,800
Pyramid Lake Indian Reservation	[9]0	[10]16,380	[10]16,380	[10]16,380
Out-of-basin exports in California				
To Sierra Valley	7,000	7,000	7,000	7,000
To South Fork of American River	2,000	2,000	2,000	2,000
To Carson River[11]	4,100	4,700	4,700	4,700
Out-of-basin exports in Nevada				
To Carson River[12]	5,000	6,500	6,500	6,500
To Stead (supplied by TMWA)	1,680	1,680	1,680	1,680

[1] Assumes all Truckee Division water rights are acquired and transferred for WQSA and local M&I, although some agricultural rights are likely to remain in the future.
[2] The Carson River supplies a majority of this demand; the Truckee River provides only a supplemental supply.
[3] This was the assumed demand when the operations model was run; recent information indicates it is 9,379 acre-feet.
[4] TMWA's normal water supplies, as defined in the Negotiated Agreement, are the water sources that TMWA ordinarily uses in the absence of a drought to meet its customer M&I demands.
[5] Modeled as depletion (i.e., no return flows).
[6] Washoe County is served through groundwater or the consumptive use of tributary rights and is only indirectly input into the model in the Truckee Meadows depletions.
[7] Current demand of 3,280 acre-feet supplied by local groundwater sources.
[8] Transfer of 6,800 acre-feet of Truckee Division agricultural water rights would provide a portion of the future Fernley demand of 29,500 acre-feet; the source of the 22,700-acre-foot difference is neither identified nor modeled.
[9] Current demand of 1,120 acre-feet supplied by local groundwater sources.
[10] Includes portions of full exercise of Claim Nos. 1 and 2 of the *Orr Ditch* decree. See attachment G.
[11] Sewage effluent from South Tahoe Public Utility District.
[12] Sewage effluent from Incline Village General Improvement District, Douglas County Sewer Improvement District No. 1, and diversions from Marlette Lake.

Because TMWA has not proposed construction of a reservoir and a facility is not proposed under No Action, LWSA, or TROA, this study did not analyze a new reservoir component.

(i) Consumptive Demands

aa. Agriculture

In the future, surface water would continue to meet agricultural demand in the Truckee River basin. Agricultural demand in the Truckee River basin in California is projected to increase by 300 acre-feet. Agricultural demand in the Truckee River basin in Nevada is projected to decrease from 40,770 acre-feet per year under current conditions to 21,500 acre-feet per year under No Action as a result of urbanization. Agricultural demand in the Truckee Division is projected to decrease from 18,520 acre-feet per year under current conditions to 0 acre-feet per year in the future. The cities of Reno and Sparks, Washoe County, and the Federal Government are projected to acquire approximately 10,300 acre-feet of agricultural surface water rights from the Truckee Division and 2,400 acre-feet from the Truckee River basin for water quality purposes, pursuant to WQSA.

Fernley is projected to acquire for M&I use agricultural water rights from the Truckee Division not acquired for WQSA, and TMWA is projected to acquire for M&I use agricultural surface water rights in the Truckee River basin.

Future Carson Division demand is projected to be less than current because of the purchase of water rights under the Water Rights Acquisition Program for Stillwater National Wildlife Refuge (WRAP). Water rights currently being purchased under WRAP (bottom and bench land with respective duties of 3.5 and 4.5 acre-feet per acre per year) are transferred to the wetlands at 2.99 acre-feet per acre per year. The operations model assumes that, under current conditions, 21,300 acre-feet of water rights are dedicated to the wetlands and that, under the alternatives, FWS would continue to purchase and transfer (at the reduced rated of 2.99 acre-feet per acre per year) an additional 41,600 acre-feet of water rights to the wetlands by 2033. As a result, the Carson Division demand decreases from 275,720 acre-feet under current conditions to 268,870 acre-feet under the alternatives. The goal of WRAP is to transfer 125,000 acre-feet of water to the wetlands, 60,000 to 64,000 acre-feet of which would be purchased Carson Division water rights. The additional water is assumed to be provided by 19,700 acre-feet of drainage; 9,700 acre-feet of spills and 33,600 acre-feet comprised of upstream Carson River water rights, groundwater, Navy conservation, and other sources.

Lower Truckee River agricultural demand is expected to increase from the current 12,040 to 17,900 acre-feet per year; demand would be through the exercise of Claim Nos. 1 and 2 of the *Orr Ditch* decree and other water rights.

bb. M&I

In California, total M&I demand is projected to increase from 27,270 to 43,600 acre-feet per year; groundwater is expected to primarily meet the increased demand. Demand in the Lake Tahoe basin is expected to increase from 18,700 to 23,000 acre-feet per year, while demand in the Truckee River basin is expected to increase from 8,570 to 20,600 acre-feet per year. The surface water component of the Truckee River basin demand is projected to remain at 1,000 acre-feet per year.

Exports of water from the Truckee River basin are projected to be greater than under current conditions (6,500 acre-feet compared to 5,000 acre-feet).

In Nevada, M&I demand in the Lake Tahoe basin is expected to remain at 11,000 acre-feet per year. Total Nevada M&I demand in the Truckee River basin is projected to increase from approximately 99,400 to 190,100 acre-feet per year because of population increases, primarily in Truckee Meadows. In Truckee Meadows, M&I demand is projected to increase from 83,140 to 119,000 acre-feet per year. To meet the increased demand, TMWA is expected to acquire additional Truckee Meadows agricultural water rights, for a total of 83,030 acre-feet of surface water rights.

Groundwater would be operated conjunctively with other supplies to meet M&I demands. As modeled, when less than a full water supply is available (in dry years), conservation measures are implemented and surface water supplies are supplemented by additional groundwater pumping.

Tracy hydroelectric powerplant demand is projected to increase from 1,950 to 3,500 acre-feet per year. Fernley M&I demand is projected to increase from 3,610 to 29,500 acre-feet per year, and the Pyramid Tribe's demand is projected to increase from 1,120 to 16,380 acre-feet per year. Transfer of 6,800 acre-feet of Truckee Division agricultural water rights would provide a portion of the future Fernley demand of 29,500 acre-feet; the source of the 22,700-acre-foot difference is neither identified nor modeled.

(ii) Nonconsumptive Demands

As previously discussed, the cities of Reno and Sparks, Washoe County, and the Federal Government are expected to acquire agricultural surface water rights from the Truckee River basin for water quality purposes, pursuant to WQSA. Also, under TROA, the cities of Reno and Sparks and Washoe County agree to provide an additional 6,700 acre-feet of existing Truckee Meadows water rights.

As of March 2006, approximately 4,470 acre-feet of surface water rights had been acquired in the Truckee Division pursuant to WQSA. On the basis of water rights available, current pricing, and inflation for the duration of the program, it is estimated that a total of 10,311 acre-feet in the Truckee Division, 1,500 to 2,000 acre-feet of *Orr Ditch* water rights between Vista and Wadsworth, and 900 acre-feet in the Truckee Meadows could be purchased under WQSA. The basis of this estimate is presented in the Water Resources Appendix, Exhibit 17. These water rights would be used to improve Truckee River water quality by increasing flows from June through September to meet flow targets and, consequently, enhancing the river's capacity to assimilate nutrients. Water quality flow targets at Sparks and Nixon are shown in chapter 2.

Minimum and hydroelectric power bypass flows and recreational pool targets would be the same as under current conditions. Pyramid Lake fish flows would be selected using the same criteria as under current conditions.

(c) LWSA Modeled Demands

Total consumptive and nonconsumptive demands under LWSA would be the same as under No Action, except that California's Truckee River M&I surface water component would increase from 1,000 acre-feet per year under No Action to 2,200 acre-feet per year under LWSA, and the groundwater component would decrease by 1,200 acre-feet per year. For modeling purposes, California's additional surface water demand is assumed to be diverted from the Truckee River just downstream from the confluence with Donner Creek. TMWA would exercise its water rights to provide an additional 1,000 acre-feet per year to groundwater recharge; under LWSA, groundwater pumping under drought conditions would be 26,500 acre-feet compared to 22,000 acre-feet per year under No Action. As under No Action, the operations model assumes that conservation measures would be implemented only in dry years. Modeled operations are the same as under No Action.

(d) TROA Modeled Demands

Flood control and dam safety requirements and existing water rights would be served as under current operations. Under TROA, signatories would have the opportunity to store and exchange Credit Water. See the Water Resources Appendix, Exhibit 16, for a detailed discussion of Credit Water operations and examples of operations model calculations.

The operations model uses similar demands for TROA as for No Action, as follows.

(i) Consumptive Demands

aa. Agriculture

As shown in table 3.13, the operations model assumes that, under TROA, agricultural demand in the Truckee River basin in California is the same as under LWSA and that agricultural demands in the lower Truckee River and the Newlands Project are the same as under No Action. However, under TROA, TMWA is expected to acquire and transfer more Truckee Meadows agricultural water rights to M&I use than under the No Action. Because TROA would require 1.11 acre-feet of water rights for every acre-foot of new service commitment (versus 1 acre-foot per acre-foot of commitments under No Action and LWSA), TMWA projects that a total of 93,550 acre-feet of agricultural rights would be acquired. The remaining 0.11 acre-foot would be used to accumulate TMWA M&I Credit Water. (See page 6 of attachment C for detailed explanation.)

bb. M&I

Under TROA, future populations in the Lake Tahoe and Truckee River basins in California are projected to be the same as under No Action. P.L. 101-618 limits Lake Tahoe basin water use by both California and Nevada to 23,000 and 11,000 acre-feet per year, respectively. See Section III, "Study Assumptions," in "General Methods and Assumptions" for more information about the development of population projections.

The operations model assumes that under TROA, total Nevada M&I demand during a normal water year[3] in the Truckee River basin is the same as under No Action. See table 3.13. TMWA's demand in Truckee Meadows is projected to be 119,000 acre-feet per year, securing a total of 93,550 acre-feet of Truckee Meadows agricultural water rights. Under TROA, storage of surplus TMWA diversion rights and TMWA Private Water released from Donner and Independence Lakes is required to provide drought supplies.

TMWA may store an unlimited amount of TMWA M&I Credit Water before April 1. In a drought year, this water may be used to meet M&I demand.

In a non-drought year, TMWA would be permitted to store up to a maximum 20,000 acre-feet on April 1 as Non-Firm TMWA M&I Credit Water when TMWA's normal year demand is 119,000 acre-feet and California's depletion in the Truckee River basin is 16,000 acre-feet per year. Under TROA, the operations model assumes a California depletion of 11,610 acre-feet per year. (See detailed computations in the Water Resources Appendix, Exhibit 18.) This depletion limits the Non-Firm TMWA M&I Credit Water to 16,630 acre-feet per year when TMWA's normal year demand is 119,000 acre-feet. Under TROA (and as modeled) TMWA would be permitted to store a maximum of 12,000 acre-feet as Firm TMWA M&I Credit Water. TMWA Emergency Credit Water of 7,500 acre-feet also would be established.

The operations model uses TMWA M&I Credit Water conjunctively with other supplies to meet demands in drought situation. TMWA would be required to implement conservation measures in a drought situation. If TMWA's normal water supplies and releases of Private Water from Donner Lake are not sufficient to meet these reduced demands and Independence Private Water is less than 7,500 acre-feet, then Non-Firm TMWA M&I Credit Water, followed by Firm TMWA M&I Credit Water, could be released. When a drought situation exists, Non-Firm TMWA M&I Credit Water in excess of the base amount would be retained for use later in that year.

The operations model assumes that Fernley and Pyramid Lake Indian Reservation M&I demands under TROA are the same as under No Action. Under both No Action and TROA, Fernley is assumed to purchase surface water rights in the Truckee Division. Fernley would have an opportunity to store any excess surface water rights as Credit Water under TROA. Because no terms for storage have been agreed to, however, the operations model includes no such Credit Waters and exercises all acquired Fernley water rights to meet immediate demands. (A separate analysis considered the potential effects of Fernley storage as well as the potential effects of TMWA's acquisition of TCID's portion of Donner Lake storage. See Section H, "Optional Scenarios.")

The operations model assumes that California and Nevada M&I demands in the Lake Tahoe basin and California M&I demand on the Truckee River under TROA are the same as under No Action. The operations model assumes that under TROA, California is

[3] TMWA's normal water supplies, as defined in the Negotiated Agreement, are the water sources that TMWA ordinarily uses in the absence of a drought to meet its customer M&I demands.

allowed to store as much as 8,000 acre-feet each year as California M&I Credit Water to supply its M&I surface water diversions later in the year. The storage is accumulated in Lake Tahoe by reducing releases that would otherwise be made and allocating water associated with a water right from the Truckee River downstream from Lake Tahoe to replace the water that would otherwise have been released from Lake Tahoe. By exchange, California water stored in Lake Tahoe may be transferred to another Truckee River reservoir, but only a maximum of 3,000 acre-feet of the 8,000 total could be held outside of Lake Tahoe. Accumulation of California M&I Credit Water is further restricted in the operations model to no more than 25 percent of the annual entitlement in any one month. TROA would allow new facilities to be built in California, but space for California M&I Credit Water in Federal reservoirs would be reduced for any amount over 2,500 acre-feet. The operations model does not simulate operation of any new California storage facilities. Exports from the Truckee River basin are projected to be the same as under No Action. TROA also would allow imported water to be stored as Credit Water. The operations model does not simulate any specific import proposal.

(ii) Nonconsumptive Demands

The operations model assumes that, under TROA, nonconsumptive demands on the Truckee River for hydroelectric power generation, lower Truckee River flows, and minimum reservoir releases, except from Independence Lake and Prosser Creek Reservoir, are the same as under No Action. In addition, the operations model incorporates new minimum releases from Independence Lake and Prosser Creek Reservoir, revised hydroelectric powerplant bypass requirements, preferred and enhanced minimum flow targets, and recreational pool targets. Revised minimum Prosser Creek Reservoir releases are 5 cfs, and Independence Lake minimum releases are computed using the criteria discussed in chapter 2. All hydroelectric powerplant diversion dams on the Truckee River are modeled to bypass a minimum of 50 cfs, or total streamflow immediately upstream of the diversion dam, whichever is less. Additionally, up to 150 cfs of fish water can be bypassed from May through September, for a total bypass of 200 cfs, and up to 50 cfs of fish water can by bypassed from October through April, for a total bypass of 150 cfs. A detailed discussion of this operation is presented in "Minimum Bypass Flow Requirements for TMWA's Hydroelectric Diversion Dams on the Truckee River."

The operations model uses seasonal forecasts to select reservoir releases when flows greater than the minimum can be maintained. These releases do not include Floriston Rate Water unless it is being released for the exercise of *Orr Ditch* decree water rights. Releases are selected with a "most desirable" target[4] based upon preferred flows established by CDFG and incorporated in the Sample California Guidelines (Exhibit D of the attachment to chapter 2). Although California Guidelines are not mandatory, the

[4] The most desirable target is the largest flow that can be maintained between minimum and preferred flow targets during a certain period and at a certain location without interfering with water rights of others. This flow is also adjusted according to streamflows, reservoir storage, and other environmental objective priorities established in California Guidelines.

Administrator would encourage signatory parties to TROA to consider the guidelines in their scheduling consistent with their water rights and provisions of TROA. Therefore, the operations model uses the preferred releases presented in table 3.14.

Table 3.14—Preferred reservoir releases used in the operations model (cfs)

Reservoir	Oct–Jan	Feb–Mar	Apr–Jul	Aug–Sep
Lake Tahoe	250	150	300	150
Donner Lake	50	20	50	10
Prosser Creek Reservoir	50	35	75	30
Independence Lake	20	10	20	10
Stampede Reservoir	125	100	125	100
Boca Reservoir	N/A	N/A	N/A	N/A

The operations model procedure for establishing most desirable targets varies by month, as follows:

- *October through January*: Release targets are adjusted to equal minimum flows.
- *February through May*: The capacity to make releases between the minimum and preferred through June is calculated; the release targets are adjusted each month based on the updated forecast.
- *June*: Release targets are the minimums because operations provide releases greater than the minimums.
- *July through September*: Release targets are based on scheduled release through October in conjunction with the minimum and preferred flows.

The operations model uses the recreational pool targets for May through August that are based on Sample California Guidelines, as presented in table 3.15, as targets.

Table 3.15—Recreational pool targets (acre-feet) used in the operations model

Lake Tahoe	None
Donner Lake	8,800
Prosser Creek Reservoir	19,000
Independence Lake	10,500
Stampede Reservoir	127,000
Boca Reservoir	33,500

California has the option under TROA to exercise additional surface water rights, which may be used to accumulate California M&I Credit Water. For this analysis, it was assumed that California would increase diversion demand by 1,200 acre-feet and exercise an additional 300 acre-feet of rights per year to establish California M&I Credit storage Up to 8,000 acre-feet could be stored at any time. California water stored in Lake Tahoe may be exchanged to another Truckee River reservoir.

Under TROA, a portion of Fish Credit Water would be designated as Joint Program Fish Credit Water (JPFCW). The total amount of JPFCW in storage at any time in the Truckee River reservoirs cannot exceed 20,000 acre-feet. In the operations model, JPFCW is transferred among reservoirs with an objective of maintaining recreation pools. When no other supplies are available, JPFCW is used to maintain minimum releases.

Some of the operations provided for under TROA are not modeled because projects have not been identified, approvals have not been secured, or implementation would depend on uncertain environmental variables. Such operations include:

- Storage of imported water in Truckee River reservoirs as Other Credit Water
- Water-related emergencies
- Maintenance of a dam or other water or power facility
- Pumping of Sparks Marina Lake
- Release of water for removal of ice from hydropower facilities and Highland Ditch
- Pumping of Lake Tahoe or Independence Lake
- Construction of a new water storage facility
- Transfer of *Sierra Valley* decree water rights to Truckee River basin
- Additional California Environmental Credit Water
- Use of water for snowmaking
- Storage and release of Other Credit Water
- Design of water wells in the Truckee River basin in California

2. Model Results and Evaluation of Effects

Water stored in and released from reservoirs are indicators of the water supply to meet demands and serve a number of beneficial uses. Total end-of-month reservoir storage, individual end-of-month reservoir storage, and average monthly reservoir releases are presented as shown in table 3.16.

Table 3.16—Figures showing reservoir storages and releases

Storage facility	Storage	Releases
Total	Figure 3.3	N/A
Lake Tahoe	Figure 3.4	Figure 3.5
Donner Lake	Figure 3.6	Figure 3.7
Prosser Creek Reservoir	Figure 3.8	Figure 3.9
Independence Lake	Figure 3.10	Figure 3.11
Stampede Reservoir	Figure 3.12	Figure 3.13
Boca Reservoir	Figure 3.14	N/A
Lahontan Reservoir	Figure 3.15	Figure 3.16

Figures listed in table 3.16 are reproduced in larger format in the Water Resources Appendix, Exhibit 19.

a. Current Conditions

(1) Total Reservoir Storage

Operations model results show that, under current conditions, total reservoir storage is fairly constant from October through February, when flood control criteria may restrict storage. The reservoirs fill from March through June with spring runoff and snowmelt; releases to meet water demands are made year-round but are greatest from June through September. In wet hydrologic conditions, total end-of-month reservoir storage ranges from a minimum of approximately 871,000 acre-feet in November to a maximum of 1,056,000 acre-feet in July. In median and dry hydrologic conditions, minimum storage occurs in December and maximum storage normally occurs in June. Storage ranges from 689,000 to 951,000 acre-feet in median hydrologic conditions and 29,000 to 148,000 acre-feet in dry hydrologic conditions. See figure 3.3.

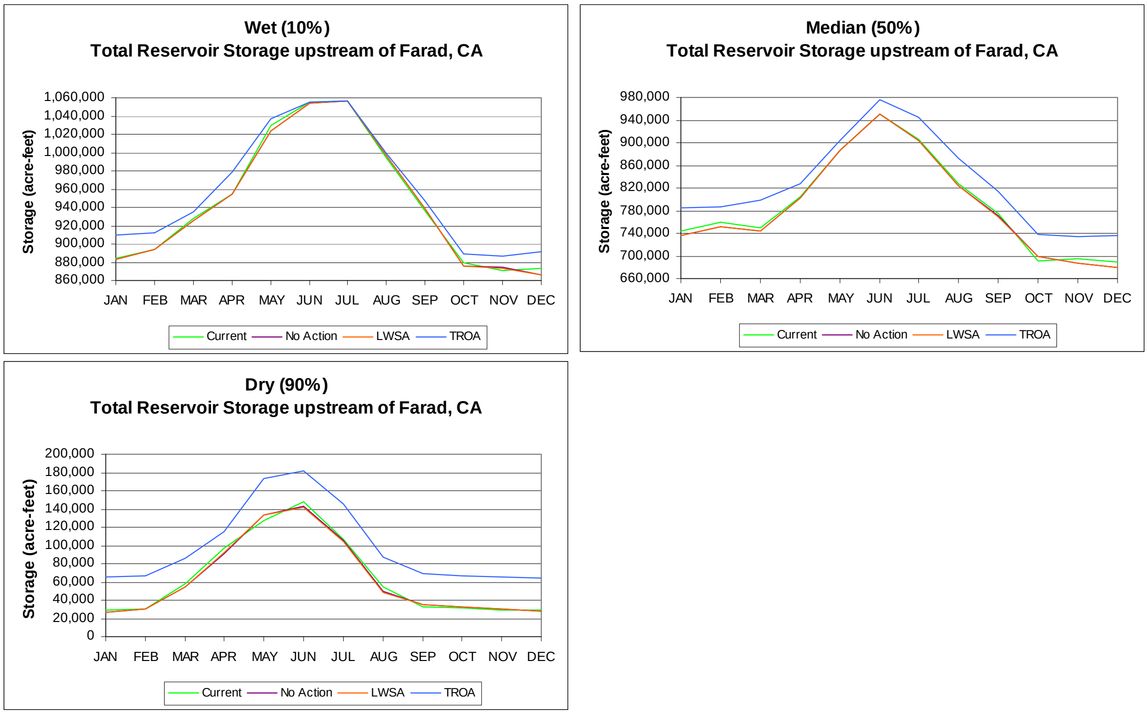


Figure 3.3—Operations model results for total end-of-month reservoir storage.

(2) Lake Tahoe

Lake Tahoe accounts for about 70 percent of the total reservoir storage space in the Truckee River system. Operations model results show that, under current conditions, Lake Tahoe storage ranges widely, from a maximum of 732,000 acre-feet in wet hydrologic conditions to a minimum of –30,700 acre-feet in dry hydrologic conditions (figure 3.4). (Note: Negative storage indicates the lake is below its natural rim elevation of 6223 feet; releases cannot be made when storage is negative.)

Lake Tahoe releases are shown in figure 3.5. In wet hydrologic conditions, releases are made during the winter to ensure that lake does not exceed elevation 6229.1 feet (storage of 732,000 acre-feet) and during the summer to meet streamflow requirements. The maximum monthly release is 3,030 cfs, and the minimum is 0 cfs.

(3) Donner Lake

Operations model results show that, under current conditions, Donner Lake storage available to TCID and TMWA ranges from a maximum of 9,500 acre-feet from May to August in wet hydrologic conditions to a minimum of 2,890 acre-feet from November through February in dry hydrologic conditions (figure 3.6). In May, Donner Lake fills in both wet and median hydrologic conditions. Storage available to TCID and TMWA reaches only 8,300 acre-feet in dry hydrologic conditions.

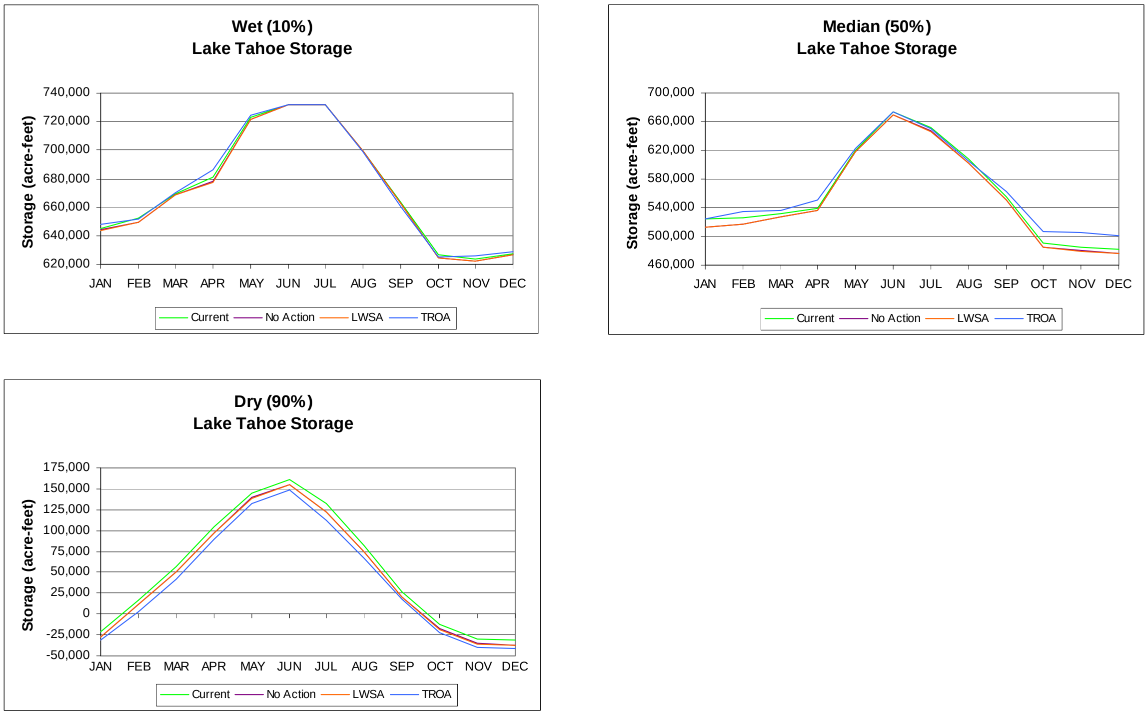


Figure 3.4—Operations model results for Lake Tahoe end-of-month storage.

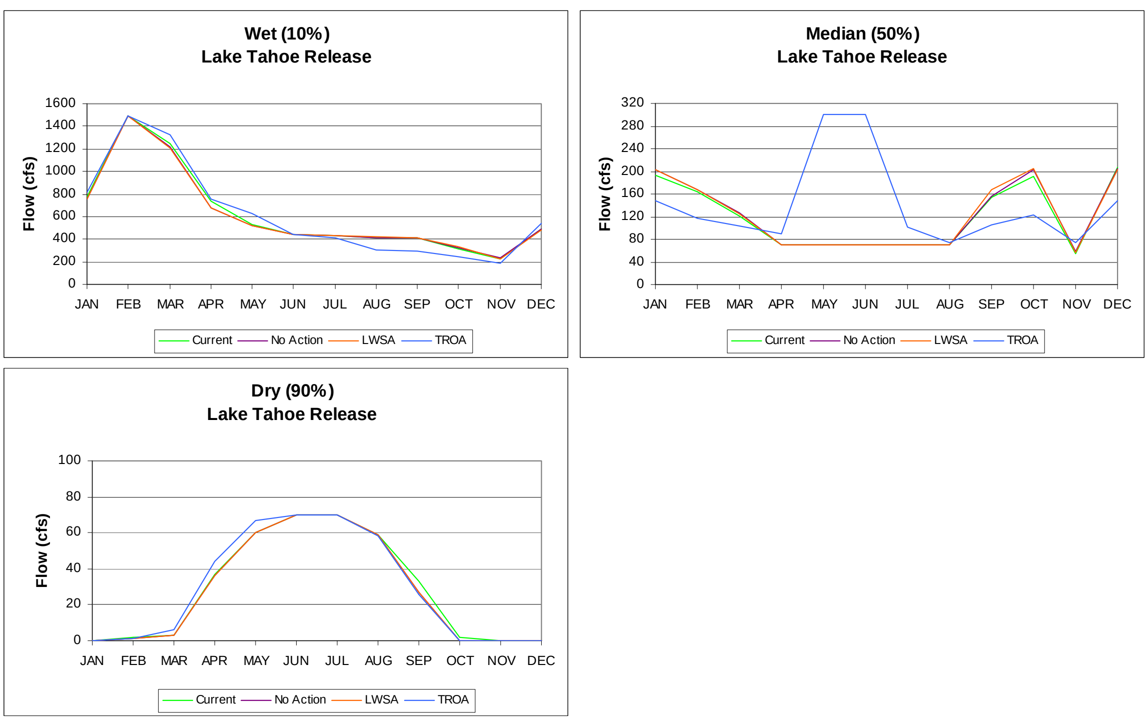


Figure 3.5—Operations model results for Lake Tahoe average monthly releases.

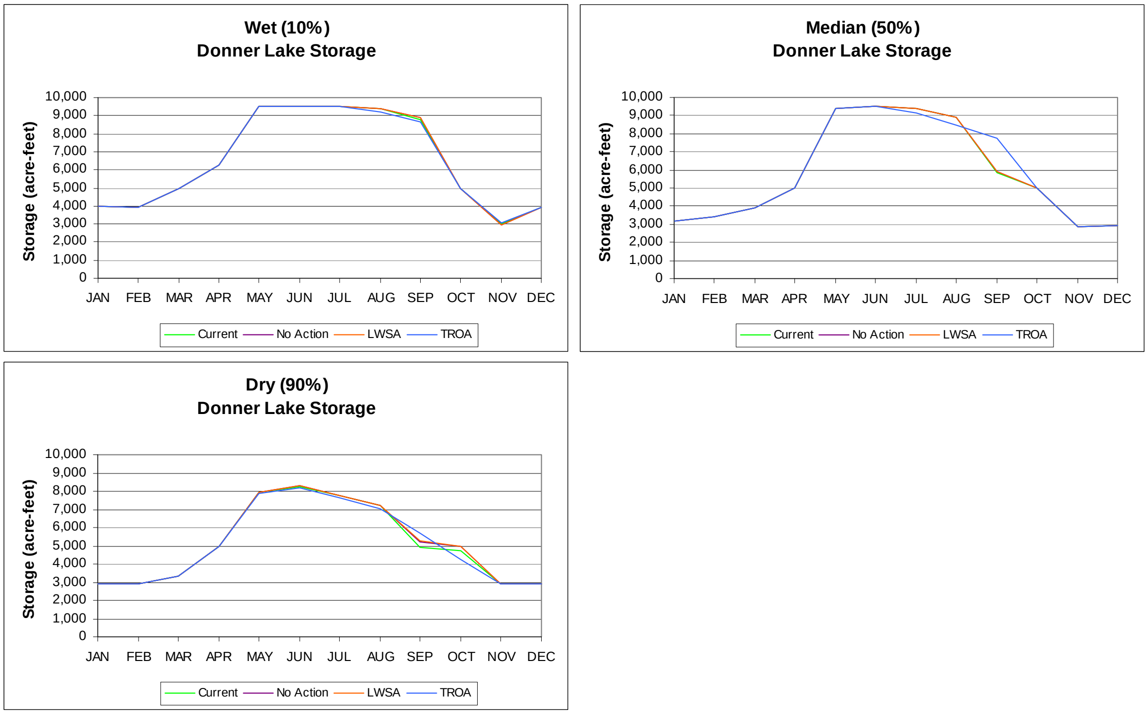


Figure 3.6—Operations model results for Donner Lake end-of-month storage.

Operations model results show a similar pattern of releases in median and dry hydrologic conditions (figure 3.7); releases are restricted to minimums from July through August to maintain storage for releases to meet demands in September and to meet the Donner Lake Indenture minimum elevation. A maximum average monthly release of 140 cfs occurs from May through June in wet hydrologic conditions, and a minimum of 2 cfs occurs from June through August in dry hydrologic conditions. The “spike” in October and November releases is the result of evacuating storage by opening the two lower gates by November 15. Gravity releases at or below this storage are not possible. In wet hydrologic conditions, reservoir storage from December through February is about 4,000 acre-feet because even though the gates are open, the outlet is restricted and inflows are greater than the outlet’s capacity to make releases.

(4) Prosser Creek Reservoir

Operations model results show that, under current conditions, Prosser Creek Reservoir storage ranges from a maximum of 29,800 acre-feet in June in wet hydrologic conditions to a minimum of 1,600 acre-feet from July through February in dry hydrologic conditions

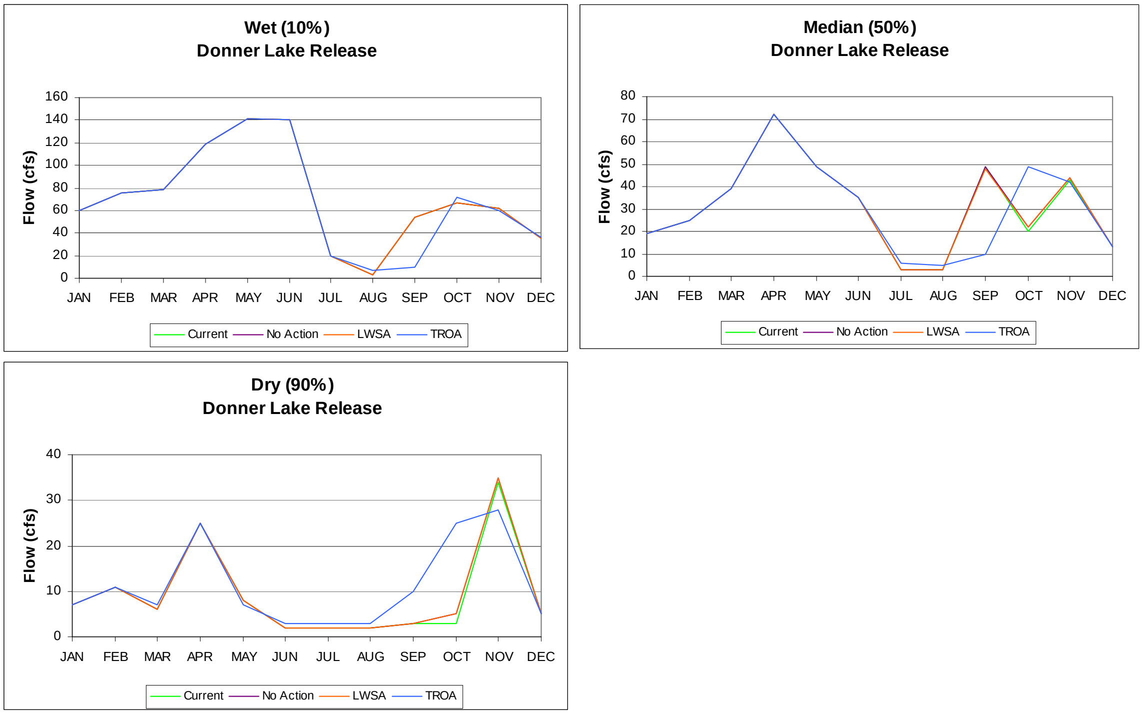


Figure 3.7—Operations model results for Donner Lake average monthly releases.

(figure 3.8). In wet and median hydrologic conditions, the reservoir stores water in excess of Floriston Rate requirements and subject to TPEA from April through June. Storage declines from June through October as releases are made to meet demands and as TPEA water is released to meet Floriston Rates. Releases are made to lower storage to 9,800 acre-feet from October through March to meet flood control requirements. In dry hydrologic conditions, reservoir storage reaches a maximum of 9,000 acre-feet. Storage in median and dry hydrologic conditions is 76 and 16 percent of that in wet hydrologic conditions, respectively.

Generally, water is passed through Prosser Creek Reservoir from March through June to meet Floriston Rates and Newlands Project demands. Project Water is released to enhance spawning of Pyramid Lake fishes from June through October; Tahoe-Prosser Exchange Water is released from June through August. In wet hydrologic conditions, maximum releases are 500 cfs in May; in dry hydrologic conditions, maximum releases are 50 cfs. Minimum releases are made from July through the following February in dry hydrologic conditions as storage approaches minimum. See figure 3.9.

(5) Independence Lake

Operations model results show that, under current conditions, Independence Lake storage ranges from a maximum of 17,200 acre-feet from June through August in wet hydrologic conditions to a minimum of 13,800 acre-feet in dry hydrologic conditions, November to

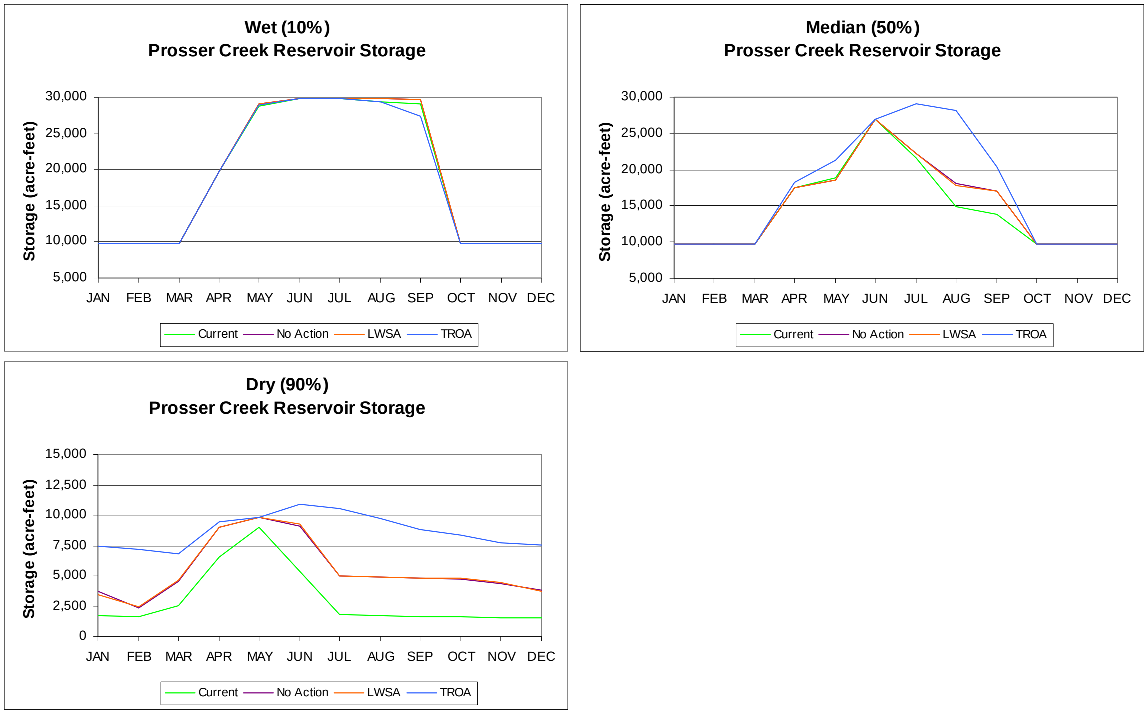


Figure 3.8—Operations model results for Prosser Creek Reservoir end-of-month storage.

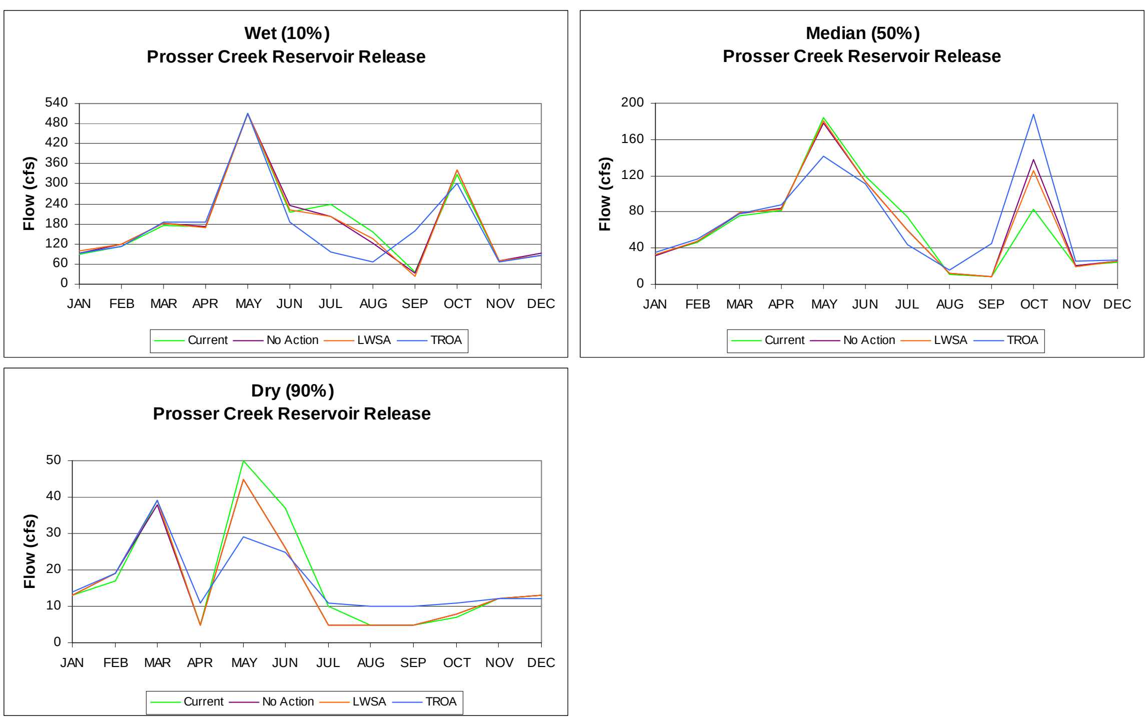


Figure 3.9—Operations model results for Prosser Creek Reservoir average monthly releases.

January (figure 3.10). Operations model results show similar storage and release patterns in all hydrologic conditions. Flashboards must be removed from two of the bays in the spillway structure between November 1 and April 1 of the following year; in general, storage in Independence Lake is maintained at 14,500 acre-feet during the winter. The reservoir fills from April through June, and releases are generally equal to inflow until August. Storage in median and dry hydrologic conditions is 99 and 95 percent of that in wet hydrologic conditions, respectively. Independence Lake storage tends to be held in reserve to meet Truckee Meadows M&I demand in water-short years.

Releases to meet Truckee Meadows M&I demand are normally made from August through October. A maximum of 105 cfs is released in June in wet hydrologic conditions, and a minimum of 2 cfs is released from July through September in dry hydrologic conditions. Minimum flows are met in all months. Figure 3.11 shows Independence Lake releases.

(6) Stampede Reservoir

Operations model results show that, under current conditions, storage ranges from a maximum of 226,500 acre-feet in July in wet hydrologic conditions to a minimum of 12,900 acre-feet in December and January in dry hydrologic conditions (figure 3.12). In all three hydrologic conditions, the reservoir stores between March and May. Flow targets are set for the lower Truckee River for each month of the year based on reservoir storage and forecast seasonal reservoir inflow. When these targets are not met, releases are made to increase flows in the lower Truckee River to meet the targets. In wet hydrologic conditions, releases are made from October to March to avoid exceeding maximum reservoir storage of 204,500 acre-feet. Storage in median and dry hydrologic conditions is 85 and 10 percent of that in wet hydrologic conditions, respectively.

Generally, releases are made from March through July to pass through water for Floriston Rates and to enhance Pyramid Lake fish spawning in the lower Truckee River. As noted previously, lower Truckee River flow targets for the remainder of the year are met with Stampede Reservoir release of Project Water when necessary. Maximum releases of 900 cfs are made in May in wet hydrologic conditions, and minimum releases of 30 cfs are made from August through the following February in dry hydrologic conditions. Figure 3.13 shows Stampede Reservoir releases.

(7) Boca Reservoir

Operations model results show that Boca Reservoir storage ranges from a maximum of 40,900 acre-feet from May through July in wet hydrologic conditions to no storage from December through the following March in dry hydrologic conditions (figure 3.14). Generally, water is stored from November to May. Releases are made to meet Floriston Rates and to pass Stampede Reservoir releases from March through September. Storage in median and dry hydrologic conditions is 59 and 10 percent of that in wet hydrologic conditions, respectively.

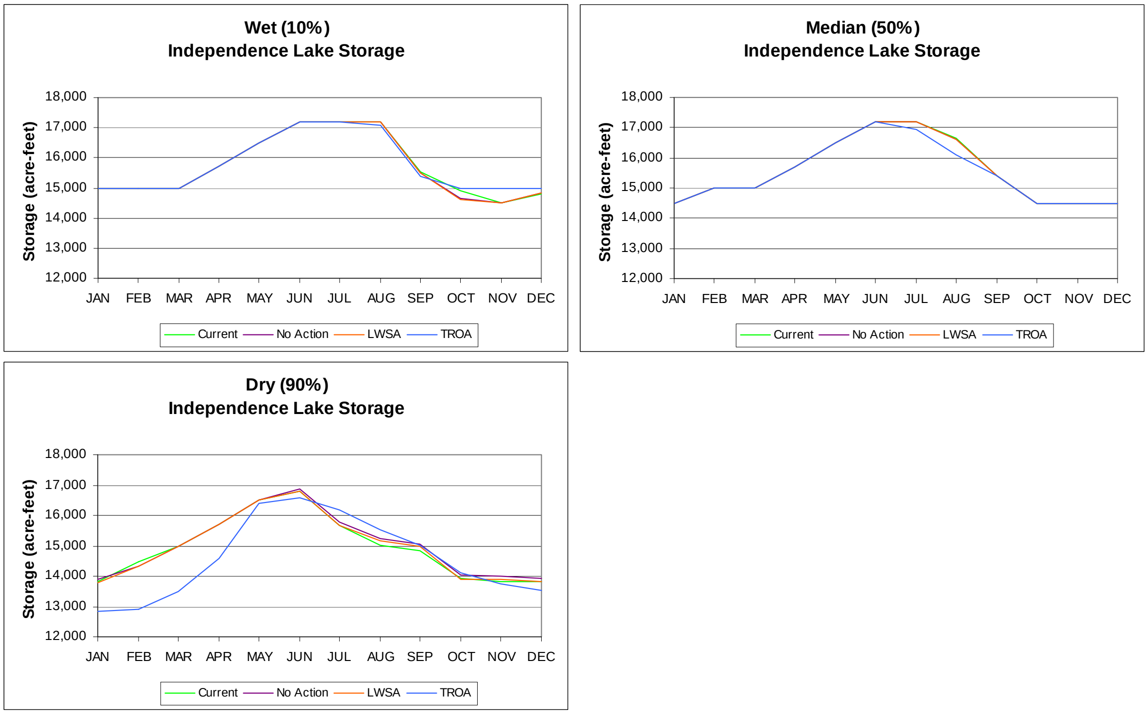


Figure 3.10—Operations model results for Independence Lake end-of-month storage.

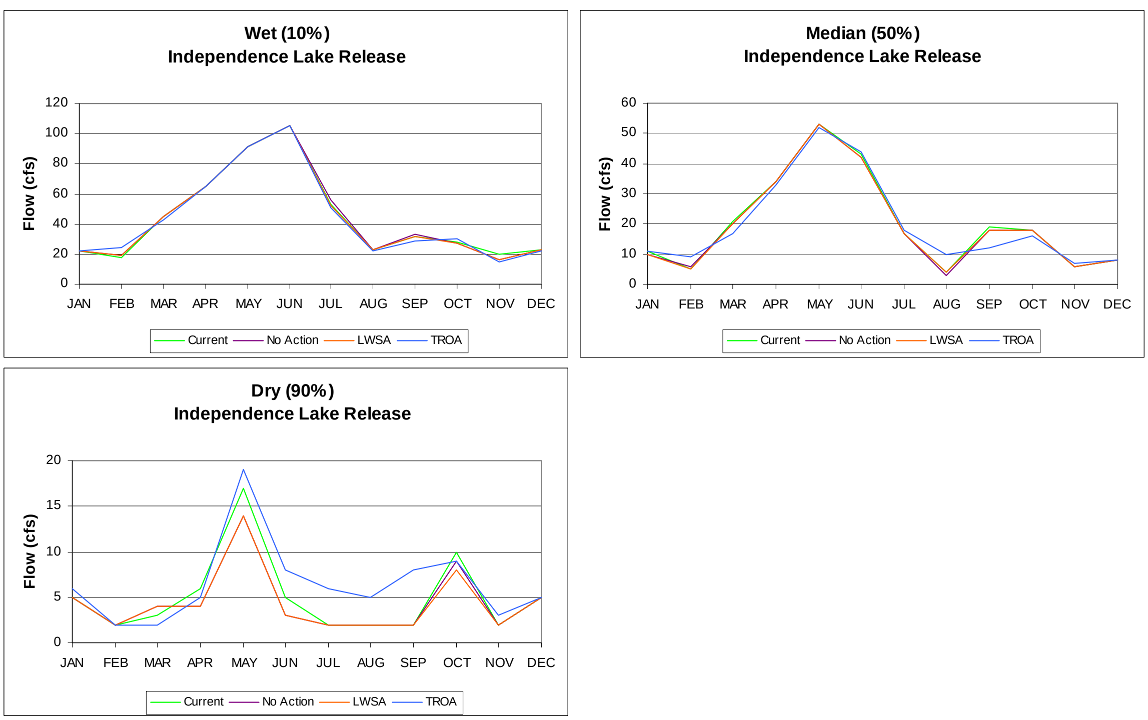


Figure 3.11—Operations model results for Independence Lake average monthly releases.

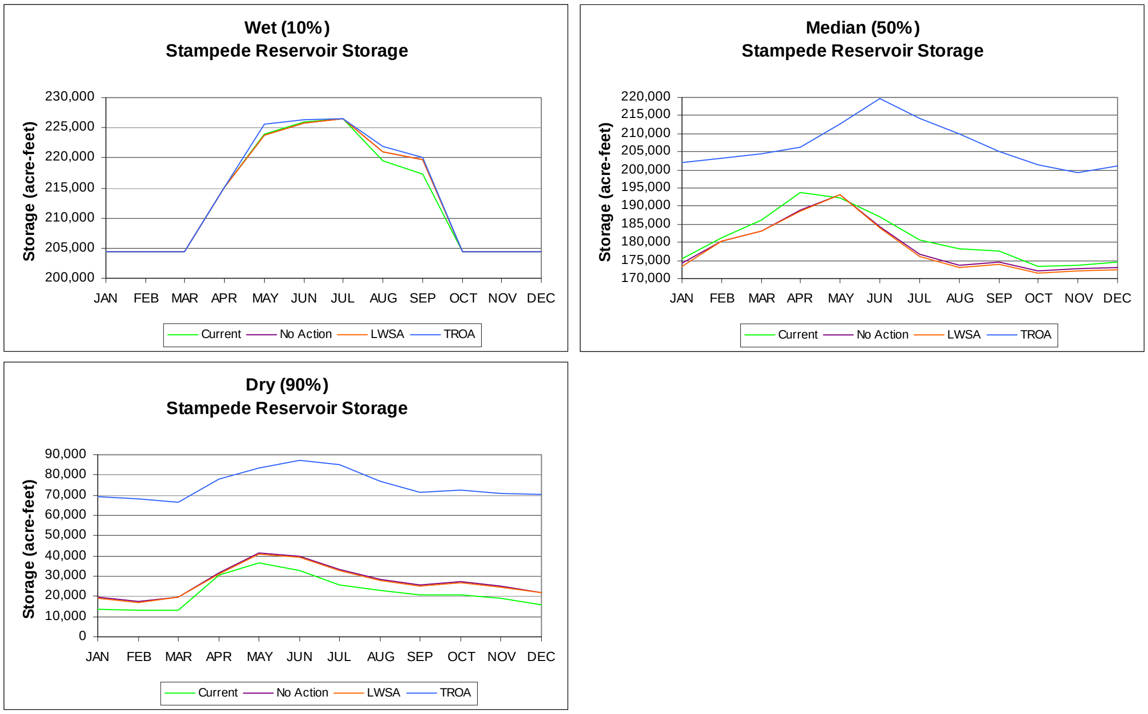


Figure 3.12—Operations model results for Stampede Reservoir end-of-month storage.

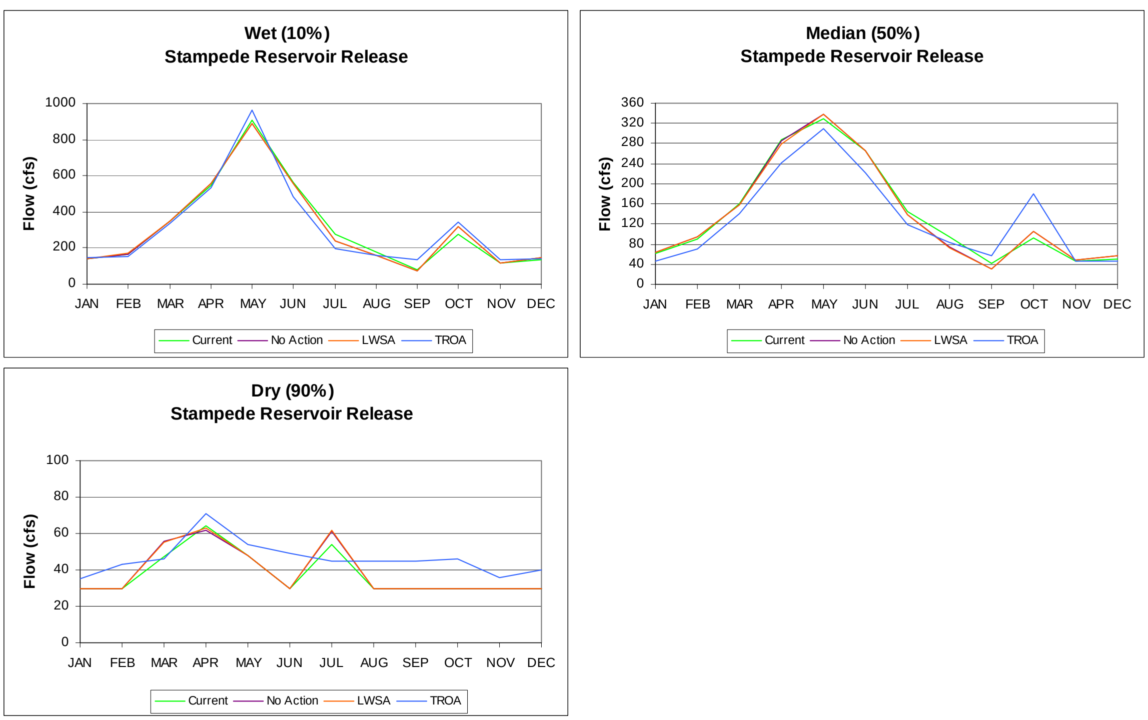


Figure 3.13—Operations model results for Stampede Reservoir average monthly releases.

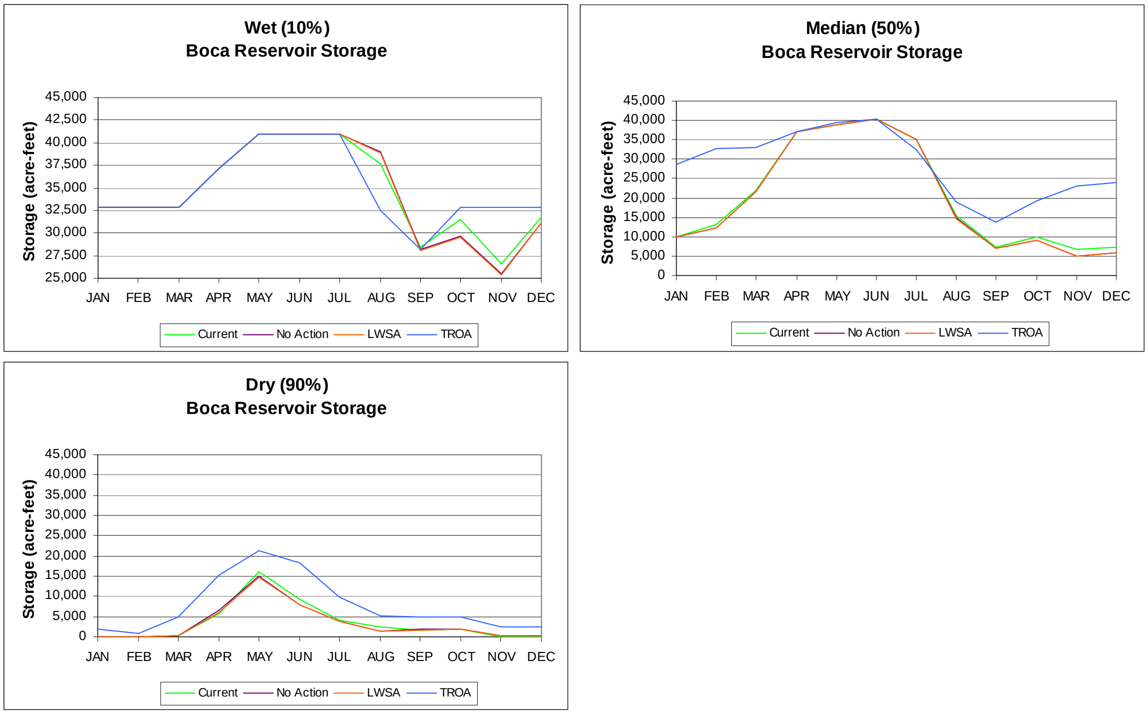


Figure 3.14—Operations model results for Boca Reservoir end-of-month storage.

Releases from Boca Reservoir are highly variable because of Stampede Project Water operations and cannot be characterized for wet, median, and dry hydrologic conditions. Probabilities of exceedence values for Boca Reservoir releases are not indicative of the hydrologic conditions and were not evaluated as such.

(8) Lahontan Reservoir

Reservoir storage patterns at Lahontan Reservoir are very similar in all hydrologic conditions (figure 3.15). Maximum storage in wet hydrologic conditions is 316,900 acre-feet; minimum storage in dry hydrologic conditions is 31,200 acre-feet. Storage in median and dry hydrologic conditions is 58 and 36 percent of that in wet hydrologic conditions, respectively.

In wet hydrologic conditions, releases are made from February through June to avoid downstream flooding and from July to November to meet downstream demands. In median and dry hydrologic conditions, releases are made from March through November to meet Carson Division demands. In all three hydrologic conditions, Carson Division demands are met, and the release pattern is the same in median and dry hydrologic conditions. No releases are made from December to February. Figure 3.16 shows Lahontan Reservoir releases.

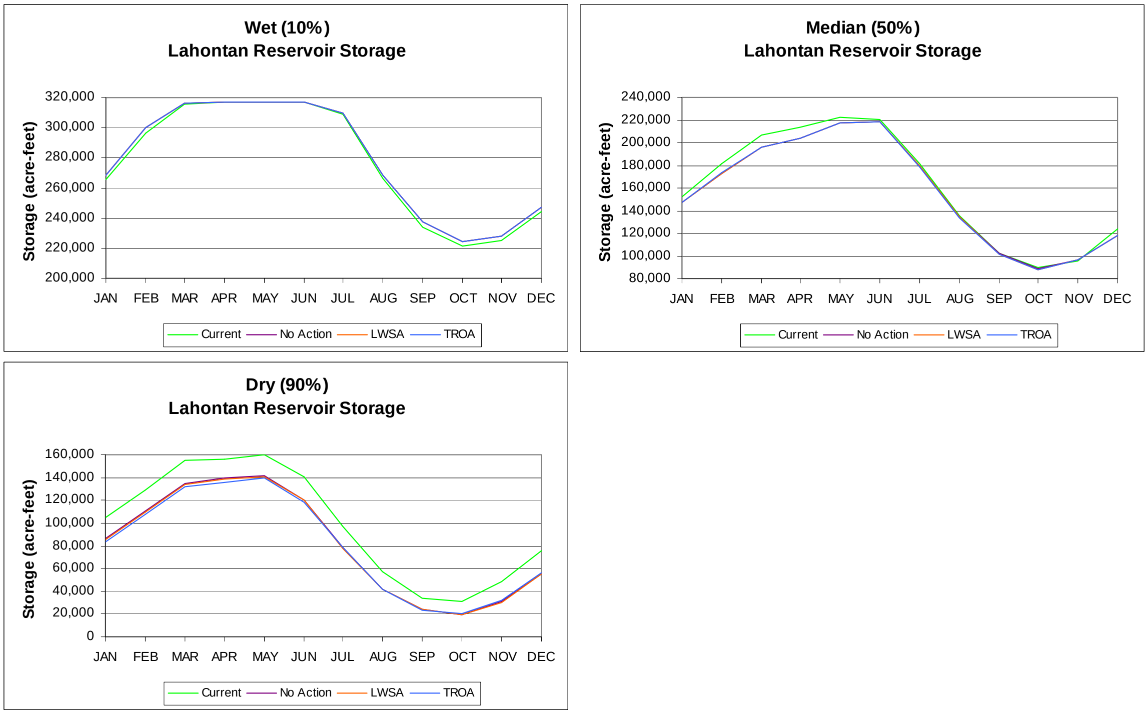


Figure 3.15—Operations model results for Lahontan Reservoir end-of-month storage.

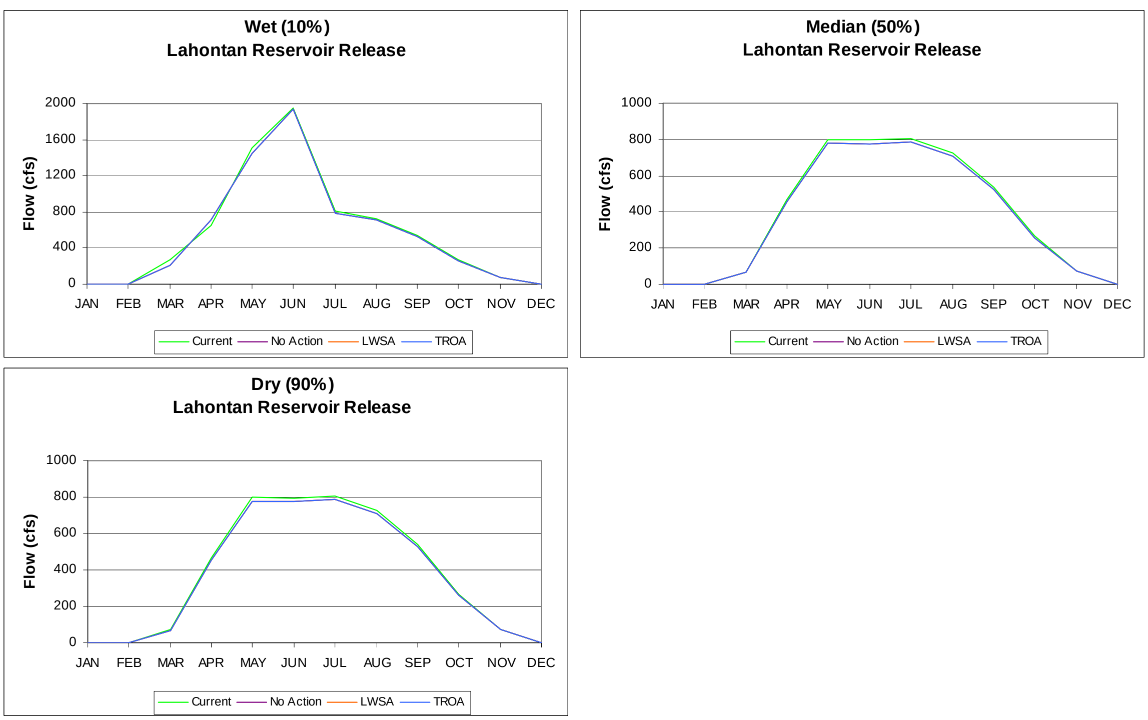


Figure 3.16—Operations model results for Lahontan Reservoir average monthly releases.

b. No Action

(1) Total Reservoir Storage

Operations model results show that total end-of-month reservoir storage under No Action is slightly (less than 1 percent) less than under current conditions. See figure 3.3. The difference is attributable to greater demands in the future for M&I water in the Lake Tahoe and Truckee River basins.

(2) Lake Tahoe

Operations model results show that, under No Action, Lake Tahoe storage is about 5,000 acre-feet less than under current conditions (less than 1 percent of total reservoir storage capacity), which is attributable to greater future demand for M&I water in the Lake Tahoe basin. See figure 3.4.

Lake Tahoe releases under No Action are slightly (2 percent) greater in median hydrologic conditions than under current conditions because of slightly greater releases from Lake Tahoe to meet Floriston Rates from September through March. The greatest releases (about 1,500 cfs) occur in February and March in wet hydrologic conditions when a large portion of the snowpack melts rapidly. Releases from Lake Tahoe under No Action are slightly less (2 to 14 cfs, or 1 to 2.5 percent) in wet and dry hydrologic conditions than under current conditions because of greater demand in the Lake Tahoe basin. In dry hydrologic conditions, minimum releases are only available to be made from May through July. As under current conditions, when Lake Tahoe elevation falls below its natural rim, no releases can be made. See figure 3.5.

(3) Donner Lake

Donner Lake storage and releases are similar under No Action and current conditions. See figures 3.6 and 3.7.

(4) Prosser Creek Reservoir

Operations model results show that Prosser Creek Reservoir storage generally is the same under No Action and current conditions from October through July in wet and median hydrologic conditions. In August and September, storage in median hydrologic conditions under No Action is about 3,000 acre-feet greater than under current conditions. In dry hydrologic conditions, storage is double that under current conditions, which reflects greater Newlands Project demand under current conditions. See figure 3.8.

Release patterns are similar under No Action and current conditions, except May through July releases are less and October releases in median to dry hydrologic conditions are greater. See figure 3.9. Releases are less because Newlands Project demand is less; greater October releases reflect greater storage in September and the requirement to lower reservoir storage to meet dam safety requirements in mid-November.

(5) Independence Lake

Operations model results show similar Independence Lake storage and releases under No Action and current conditions. See figures 3.10 and 3.11.

(6) Stampede Reservoir

In wet hydrologic conditions, under No Action, Stampede Reservoir storage in August and September is slightly greater than under current conditions; storage in median and dry hydrologic conditions is similar to that under current conditions. See figure 3.12. Stampede Reservoir releases shift slightly from July through September under No Action. In drier hydrologic conditions, releases are slightly greater than under current conditions; in wet to median hydrologic conditions, releases are slightly less than under current conditions. See figure 3.13. The shift in storage and release patterns results from additional water flowing to Pyramid Lake (Water Quality Water) and from the difference in Newlands Project demand.

(7) Boca Reservoir

Boca Reservoir operations under No Action are the same as under current conditions, and storage and release patterns are very similar. See figure 3.14.

(8) Lahontan Reservoir

Operations model results show that Lahontan Reservoir storage under No Action is about 5,400 acre-feet less (3 percent) than under current conditions.

In wet hydrologic conditions, storage under No Action is about 1 percent greater than under current conditions because less Carson Division demand reduces the draw on storage. In median hydrologic conditions, storage is 4,400 acre-feet less (3 percent) than under current conditions. In dry hydrologic conditions, storage is greater under current conditions than No Action with a maximum difference of 20,000 acre-feet.

Operations model results show that Lahontan Reservoir releases (made from March through November) meet Carson Division demands about 90 percent of the time.

No releases are made, and the reservoir stores inflow, from December through the following February. In general, releases under No Action are about 3 percent less than under current conditions because demand is less.

The differences between No Action and current conditions are a result of (1) reduced diversions from the Truckee River because of reduced future Newlands Project demand; (2) greater demands in the future in the Lake Tahoe and Truckee River basins, reducing the availability of water supplies to downstream water rights holders; and (3) full exercise of Claim Nos. 1 and 2 of the *Orr Ditch* decree.

c. LWSA

(1) Total Reservoir Storage

Operations model results show that total end-of-month reservoir storage is similar under LWSA and No Action in wet, median, and dry hydrologic conditions. When compared to current conditions, the difference is less than 1 percent overall. See figure 3.3.

(2) Lake Tahoe, Donner Lake, Prosser Creek Reservoir, Independence Lake, Stampede Reservoir, and Boca Reservoir

Storage is slightly less under LWSA in all hydrologic conditions than under No Action because of the exercise of TMWA's water rights to provide 1,000 acre-feet in winter months to the increased groundwater recharge program and greater surface water demand in California. The greatest difference in storage at any reservoir is 700 acre-feet less in Stampede Reservoir in median hydrologic conditions. As shown in figures 3.4 through 3.14, operations model results show no difference in storage and release patterns between No Action and LWSA. Differences in storage and releases between LWSA and current conditions are similar to those differences between LWSA and No Action.

(3) Lahontan Reservoir

Operation model results show that Lahontan Reservoir storage under LWSA is the same as under No Action in wet hydrologic conditions, 100 acre-feet less in median hydrologic conditions, and 300 acre-feet less in dry hydrologic conditions. See figure 3.15. These differences are the result of the exercise of TMWA's water rights to provide 1,000 acre-feet in winter months to the increased groundwater recharge program and greater surface water demand in California. Storage under LWSA is 1 percent greater in wet hydrologic conditions, 3 percent less in median hydrologic conditions, and 18 percent less in dry hydrologic conditions than under current conditions.

Releases under LWSA are the same as under No Action in all three hydrologic conditions and 3 percent less than under current conditions (figure 3.16).

d. TROA

Operations model results show that total end-of-month reservoir storage under TROA is greater than under No Action, LWSA, and current conditions. More storage is held primarily in Prosser Creek, Stampede, and Boca Reservoirs as the result of storage of Credit Waters (which includes Joint Program Fish Credit Water).

(1) Total Reservoir Storage

Total end-of-month reservoir storage under TROA is about 1 percent greater in wet hydrologic conditions and 5 percent greater in median hydrologic conditions than under No Action or current conditions. See figure 3.3. In dry hydrologic conditions, the total reservoir storage is much greater: 56 percent greater than under No Action and 53 percent greater than under current conditions. As a result, recreational and environmental objectives would be met frequently.

(2) Lake Tahoe

Operations model results show that, under TROA, Lake Tahoe storage in wet hydrologic conditions is slightly less (1,000 acre-feet) than under No Action or current conditions because Credit Water would be exchanged to another reservoir to protect it from spilling when possible. Approximately 2,000 acre-feet more is stored under TROA in median hydrologic conditions than under No Action because Credit Water is more secure in Lake Tahoe. In dry hydrologic conditions, Lake Tahoe storage under TROA is 9 percent less than under No Action and 15 percent less than under current conditions. See figure 3.4.

Less storage in dry hydrologic conditions results primarily from two provisions under TROA. One provision relates to the exchange of Floriston Rate Water from Lake Tahoe to Stampede Reservoir and the associated increase in release from Lake Tahoe designated to flow to Pyramid Lake. Occasionally, this extra release from Lake Tahoe coincides with a season when Floriston Rates are supplied from Lake Tahoe storage before they are supplied from Boca Reservoir storage. Operations model results show that Lake Tahoe storage drops so low shortly thereafter that the minimum releases cannot be maintained. In such case, the Lake Tahoe release (in exchange for Stampede Reservoir storage) under TROA is greater than the release under No Action. Thus, storage under TROA is less than under No Action.

The other provision relates to when Lake Tahoe is the first reservoir used to supply Floriston Rates: releases are greater under TROA than under No Action because Credit Water is stored in Lake Tahoe. Therefore, releases of Floriston Rate water under TROA are higher than under No Action, and, consequently, less Tahoe Floriston Rate Water is stored. When inflow in a subsequent month is sufficient to reduce Floriston Rate Water demand on Lake Tahoe, Credit Water is released from storage. Then, in subsequent months (as Lake Tahoe drops to its rim elevation), storage and releases are less than under No Action. The result of these two provisions is to allow slightly more Floriston Rate water to be released in dry hydrologic conditions. Both of these provisions are subject to the approval of the Administrator.

Under TROA, Lake Tahoe releases are slightly greater (2 percent) than under No Action and current conditions in wet and median hydrologic conditions. In median hydrologic conditions, greater April through July releases offset less releases the remainder of the year. In dry hydrologic conditions, Lake Tahoe releases under TROA are 2.5 percent less than under No Action and 5 percent less than under current conditions. See figure 3.5.

Operations model results show that October through January releases from Lake Tahoe under TROA are generally less than under No Action and current conditions. The greatest difference occurs in October; the difference is less in each succeeding month. In October, establishment of credit storage in Lake Tahoe under TROA results in less releases, and, during October, Floriston Rate demand is partially supplied by releases from Stampede Reservoir. These October releases from Stampede Reservoir result from previous (calendar year) exchange of Lake Tahoe Floriston Rate storage into Stampede Reservoir.

February through March releases under TROA are about the same as under either No Action or current conditions. Under TROA, flows are maintained at 75 cfs about 10 percent more often than under No Action or current conditions because of the opportunity to make additional releases using Credit Water stored in Lake Tahoe. These additional releases are made when the releases can be matched by an accumulation of storage in another reservoir. Under TROA, releases are less than the 50 cfs minimum slightly more often due to less Lake Tahoe storage.

April through July releases in wet and median hydrologic conditions under TROA are greater than under No Action and current conditions. Operations model results show these greater releases occur most dramatically in median hydrologic conditions, primarily because Credit Water is released to (1) support spawning of cui-ui, (2) provide the 75 cfs enhanced minimum releases, and (3) exchange Floriston Rate Water from Lake Tahoe into Stampede Reservoir. In wet and median hydrologic conditions, preferred flows for enhancing recreational and environmental uses are met. Note that this release of Credit Water from Lake Tahoe and the exchange into Stampede Reservoir reduces releases from Stampede Reservoir.

August through September releases under TROA generally are less than under No Action and current conditions. Releases are less primarily because of (1) less releases associated with establishment of Credit Water storage under TROA and (2) less Lake Tahoe releases of Floriston Rate Water because, under TROA, this is the period when Lake Tahoe Floriston Rate Water exchanged to Stampede Reservoir during the spring months begins to be released from Stampede Reservoir. Under TROA, releases are slightly greater than under No Action 10 to 15 percent of the time because of enhanced minimum releases of 75 cfs compared to the minimum releases of 70 cfs.

(3) Donner Lake

From June through August, Donner Lake storage under TROA is slightly less (0-400 acre-feet) than under No Action or current conditions as a result of greater minimum release requirements under TROA.

In September, storage under TROA is greater in median (1,600 acre-feet more) and dry (800 acre-feet more) hydrologic conditions than under current conditions. Under TROA, August through September releases are patterned after the California Guidelines and are more uniform than under the No Action or current conditions. As a result, under TROA, August releases tend to be greater and September releases tend to be less than under the other alternatives. In other months, storage under TROA is the same as under No Action or current conditions. Average annual storage in wet, median, and dry hydrologic conditions is similar under TROA, No Action, and current conditions. See figure 3.6

October releases under TROA tend to be greater than under No Action or current conditions, primarily because of (1) releases from Donner Lake to establish TMWA M&I Credit Water in other Truckee River reservoirs and (2) California Guidelines preferred releases to meet target flows downstream from Donner Lake are greater.

November through May releases are similar under TROA, No Action, and current conditions. Releases from mid-November through early April are unregulated.

Under TROA, June releases are greater than under No Action or current conditions approximately 35 percent of the time and July releases are greater than under No Action or current conditions approximately 85 percent of the time. This is because of greater flow targets.

August releases under TROA are greater in wet, median, and dry hydrologic conditions than under No Action and current conditions because of greater flow targets under TROA.

September releases in dry hydrologic conditions under TROA are greater than No Action or current conditions. In median to wet hydrologic conditions, releases under TROA are less than under No Action or current conditions because water is released to meet the preferred releases of 10 cfs. See figure 3.7.

(4) Prosser Creek Reservoir

Prosser Creek Reservoir storage under TROA is greater than under No Action or current conditions because TROA includes numerous categories of water storage and considers recreational pool targets. The combination of storing Credit Waters and Project Water to help achieve recreational pool targets provides greater August storage than any other alternative. See figure 3.8.

In wet hydrologic conditions, storage under TROA is essentially the same as under No Action or current conditions.

In median hydrologic conditions, from August through September, storage under TROA is up to 10,000 acre-feet greater (55 percent more) than under No Action and up to 13,000 acre-feet greater than under current conditions. Overall, storage under TROA is 13 percent greater than under No Action and 17 percent greater than under current conditions.

In dry hydrologic conditions, storage under TROA is 60 percent greater than under No Action and 180 percent greater than under current conditions. This dramatically greater storage would provide substantial benefits. Storage of Credit Waters would provide the opportunity to meet demands and to enhance recreation by keeping the reservoir much higher. Operations model results show that the recreational pool target of 19,000 acre-feet is achieved 70 percent of the time.

September through October releases from Prosser Creek Reservoir under TROA are greater than under No Action or current conditions because August storage is greater under TROA, and storage in excess of 9,800 acre-feet must be released by the end of October. In median and dry hydrologic conditions, October releases under TROA are at least 50 percent greater than under No Action or current conditions.

November through April releases are similar under TROA, No Action, and current conditions because of flood control operations.

May through July releases under TROA tend to be much less than under No Action or current conditions because Credit Waters are accumulating, resulting in less releases. In wet, median, and dry hydrologic conditions, releases under TROA are less than under the other alternatives because of operations to meet recreational pool targets.

August releases under TROA generally are greater than under No Action or current conditions. August releases are patterned after the California Guidelines' preferred minimum releases and under TROA are more uniform than under No Action or current conditions. See figure 3.9.

(5) Independence Lake

Independence Lake storage under TROA is similar in wet and median hydrologic conditions and slightly less than under No Action or current conditions primarily because, under TROA, releases are made to satisfy much greater minimum streamflows and for re-storage as TMWA M&I Credit Water in a downstream reservoir. See figure 3.10. Operations model results show that this release for re-storage tends to be greater in August under TROA.

June through September releases in dry hydrologic conditions under TROA are greater than under No Action or current conditions because California Guidelines' preferred releases (to meet target flows downstream from Independence Lake) are greater.

October through January releases are about the same under TROA, No Action, and current conditions. The lowest flows tend to be slightly greater under TROA because of greater minimum flow targets and because more water is withdrawn from Independence Reservoir for re-storage in other reservoirs.

February releases are slightly greater and March releases under TROA are slightly less than under No Action or current conditions because of preferred releases to meet flow targets downstream from Independence Lake.

April through July releases under TROA are about the same as under No Action or current conditions. Under TROA, releases are sometimes greater because of greater streamflow objectives.

Under TROA, August releases are greater in dry and median hydrologic conditions than under No Action or current conditions. For example, releases in August are at least 8 cfs about 80 percent of the time under TROA but only about 40 percent of the time under No Action or current conditions. Under TROA, August through September releases are patterned after the California Guidelines and are more uniform than under the No Action or current conditions. As a result, August releases under TROA tend to be greater and September releases tend to be less than under the other alternatives. See figure 3.11.

(6) Stampede Reservoir

Operations model results show that Stampede Reservoir storage under TROA is generally greater than under No Action or current conditions in wet, median, and dry hydrologic conditions. See figure 3.12. When storage is greater than 210,000 acre-feet, storage is similar under TROA, No Action, and current conditions. When storage is less than 210,000 acre-feet (about 75 percent of the time), storage under TROA is generally 30,000 to 50,000 acre-feet greater than under No Action or current conditions. In dry hydrologic conditions, storage is as much as 87,000 acre-feet under TROA, compared to only 40,000 acre-feet under No Action and 33,000 acre-feet under current conditions. Minimum storage in Stampede Reservoir under TROA is about 9,000 acre-feet, compared to about 4,600 acre-feet under No Action or current conditions.

Stampede Reservoir storage is greater under TROA because of Credit Water and exchange of Lake Tahoe Floriston Rate Water. Release of Lake Tahoe Floriston Rate Water extends from August into October. Under TROA, the annual storage right for Stampede Reservoir is assumed to be 226,500 acre-feet.

Under TROA, October through January releases provide more frequent and more sustained releases at the rate of the enhanced minimum release (45 cfs). In addition, operations model results show that TROA provides greater releases to supply Floriston Rate Water using the Lake Tahoe Floriston Rate Water exchanged into Stampede Reservoir and provides greater release or spill during October to pull the storage down to the flood control pool. Under TROA, operations model results show that reservoir storage must be released or spilled in more years to provide the required flood control space.

February through March releases under TROA generally are less than under No Action or current conditions because Credit Waters are being accumulated at this time except for 10 percent of the time when the enhanced minimum releases provided during dry hydrologic conditions and about 5 percent of the time when releases are greater than under the other alternatives as the result of Credit Water storage causing spills.

April through July releases under TROA differ from those under other alternatives because of the maintenance of 45 cfs enhanced minimum release and use of an exchange with Lake Tahoe Floriston Rate Water, which limits release to about 125 cfs, the preferred release.

Generally, August through September releases under TROA are the same as or greater than under No Action or current conditions because of the following operations:

- Maintain the 45 cfs enhanced minimum release
- Release exchanged Lake Tahoe Floriston Rate Water
- Provide flood control space by the end of October

See figure 3.13.

(7) Boca Reservoir

Most of the time, Boca Reservoir storage under TROA is greater than under No Action or current conditions (figures 3.14). Storage of Credit Water and Project Water, as well as water released from Stampede Reservoir to meet enhanced and preferred minimum releases, can be re-stored in Boca Reservoir. As discussed previously, releases from Boca Reservoir are not necessarily indicative of hydrologic conditions and were not analyzed.

(8) Lahontan Reservoir

Because *Orr Ditch* decree water rights would be more fully exercised by senior water rights holders to create Credit Water, operations model results show that Lahontan Reservoir storage under TROA is slightly less than under No Action. Storage is also less than under current conditions because of fewer Carson Division demands in the future, which reduces the Lahontan Reservoir OCAP storage targets. Carson Division demands are met in wet, median, and dry hydrologic conditions. See figures 3.15 and 3.16.

D. Flows

1. Method of Analysis and Operations Model Input

Model operations and inputs are the same as for "Reservoirs." Monthly average Truckee River flows at Farad and Vista, generated from the operations model, were compared in wet, median, and dry hydrologic conditions for current conditions, No Action, LWSA, and TROA.

2. Model Results and Evaluation of Effects

Average monthly flows in wet, median, and dry hydrologic conditions under current conditions, No Action, LWSA, and TROA at each location are presented in figure 3.17 (Truckee River at Farad, California) and figure 3.18 (Truckee River at Vista, Nevada).

a. Current Conditions

Table 3.17 presents average annual Truckee River flows at Farad and Vista in wet, median, and dry hydrologic conditions.

The Water Resources Appendix, Exhibits 9-11, shows modeled average monthly flows at all locations (in tables), as well as monthly, seasonal, and annual exceedence frequency curves.

(1) Truckee River Flows at Farad

Flows at Farad represent the combined releases from Lake Tahoe, Donner Lake, Martis Creek Reservoir, Prosser Creek Reservoir, and Boca Reservoir added to the uncontrolled runoff of the Truckee River between Lake Tahoe and Farad. This reach indicates the quantity of water available for use in Nevada.

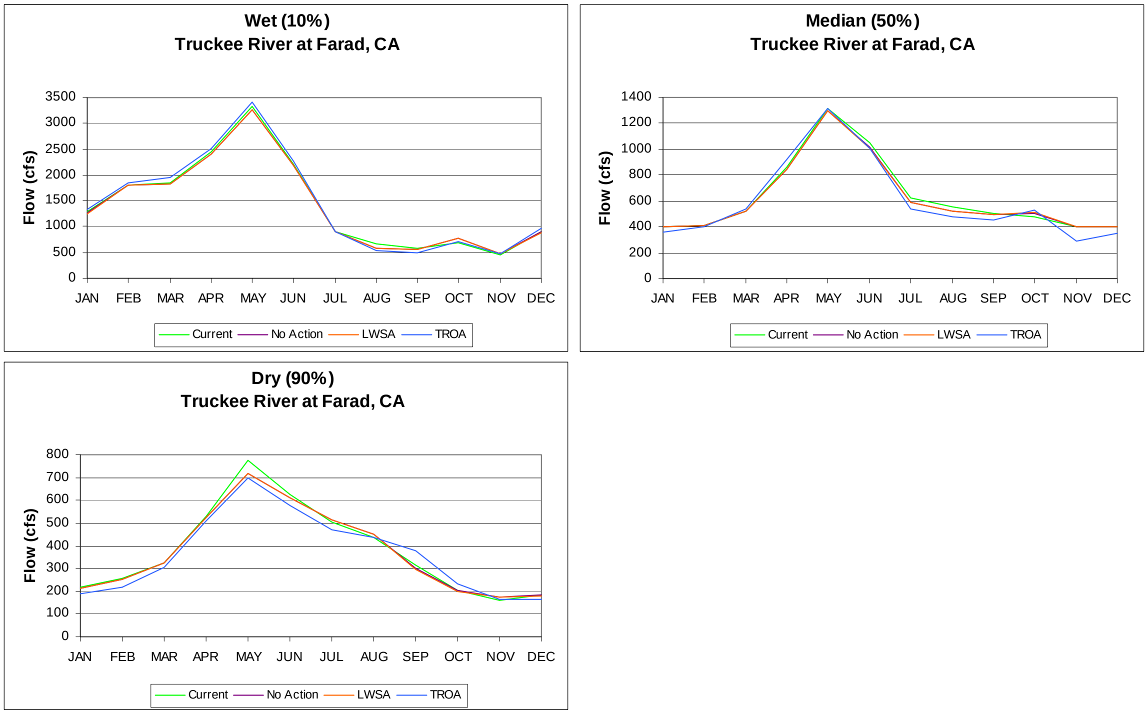


Figure 3.17—Operations model results for average monthly Truckee River flows at Farad.

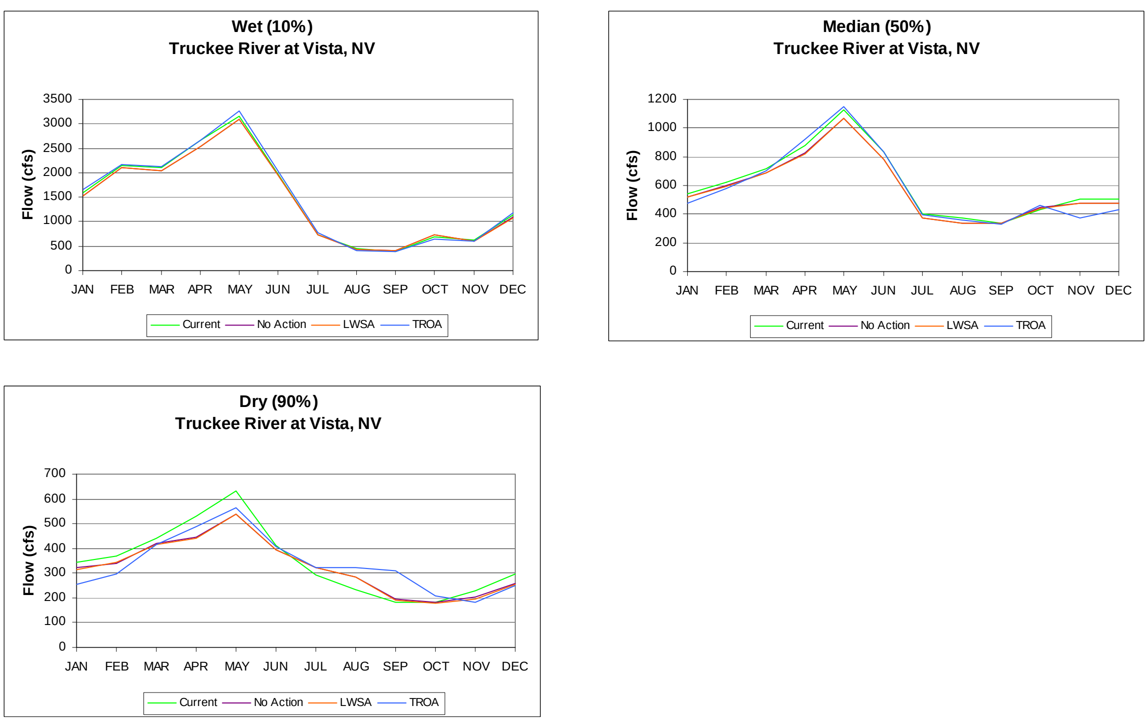


Figure 3.18—Operations model results for average monthly Truckee River flows at Vista.

Table 3.17—Average annual Truckee River flows (cfs) in wet, median, and dry hydrologic conditions at Farad and Vista

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Farad				
Wet	1,427	1,412	1,411	1,450
Median	657	641	641	628
Dry	429	424	423	421
Vista				
Wet	1,458	1,427	1,425	1,480
Median	642	614	612	621
Dry	398	382	381	392

Operations model results show that Floriston Rates are achieved in all months in wet and median hydrologic conditions under current conditions. In dry hydrologic conditions, Floriston Rates are not achieved from August through February. In these months, flow represents the natural runoff (i.e., the amount of water which would have been available if there were no reservoirs) because the reservoirs have little or no stored water available for release. Maximum flow is 3,323 cfs in May in wet hydrologic conditions; minimum flow is 162 cfs in November in dry hydrologic conditions. See figure 3.17.

(2) Truckee River Flows at Vista

Flows at Vista indicate the water supply available to the Truckee Canal or Pyramid Lake. Flows at Vista are very similar to flows at Farad (figure 3.18). In wet hydrologic conditions, flows at Vista are generally greater than at Farad because of the addition of natural runoff downstream from Farad. In median and dry hydrologic conditions, flows are less than at Farad from May through October because of the exercise of agricultural and M&I water rights. Flows are greater than at Farad from November through the following April. Average annual flows at Vista are the same as at Farad. Vista flows are 93 percent of Farad flows in dry hydrologic conditions, but average 102 percent and 97 percent of these flows in wet and median hydrologic conditions, respectively. Maximum flows in wet hydrologic conditions are 3,158 cfs in May; minimum monthly flows in dry hydrologic conditions are 181 cfs in September.

b. No Action

Comparison of average seasonal flows at various locations in the Truckee River basin indicates the availability of water to meet flow targets and support environmental and recreational uses. As shown in table 3.16, in general, flows under No Action are less under than under current conditions because of greater future demands in California and Nevada.

(1) Truckee River Flows at Farad

Operations model results show that Floriston Rates are achieved in all months in wet and median hydrologic conditions under No Action. In dry hydrologic conditions, Floriston Rates are not achieved from August through the following February because Lake Tahoe is at or near its natural rim***;*** thus little to no stored water is available to be released for Floriston Rates. See figure 3.17.

Maximum flows are 3,269 cfs in May in wet hydrologic conditions, and minimum flows are 175 cfs in November in dry hydrologic conditions. Average annual flows are about 99 percent of those under current conditions. Average annual flows are slightly less because of increased demand in the Lake Tahoe basin and Truckee River basin in California. In general, flows at Farad are slightly less than under current conditions, except in drier hydrologic conditions from June through September, when Water Quality Credit Water is available for release.

(2) Truckee River Flows at Vista

Operations model results show that in dry hydrologic conditions, under No Action, July through August flows at Vista are somewhat greater (more than 13 cfs) than under current because of the release of Water Quality Credit Water to improve water quality in the river from Truckee Meadows to Pyramid Lake. See figure 3.18.

Maximum flows are 3,092 cfs in May in wet hydrologic conditions, and minimum flows are 181 cfs in October in dry hydrologic conditions. Average annual flows are about 98 percent of those under current conditions. Flows from Farad to Vista flows are slightly less because of greater future demand in Truckee Meadows.

c. LWSA

Operations model results show that Truckee River flows at Farad and Vista in wet, median, and dry hydrologic conditions under LWSA are about the same as under No Action. See figures 3.17 and 3.18.

d. TROA

(1) Truckee River Flows at Farad

Flows at Farad under TROA are 3 percent greater in wet hydrologic conditions and 2 percent less in median and dry hydrologic conditions than under No Action; flows are 2 percent greater in wet hydrologic conditions and 2 percent less in median and dry hydrologic conditions than under current conditions. Flows are greater under TROA in wet hydrologic conditions because of greater spills from February through June, and flows are less in median and dry hydrologic conditions because of storage of Credit Water from October through March. Average annual flows at Farad under TROA are 99 percent of those under No Action and 98 percent of those under current conditions. See figure 3.17.

Maximum flows are 3,409 cfs in May in wet hydrologic conditions, or 4 percent greater than under No Action and 3 percent greater than under current conditions. Minimum flows are 165 cfs in November in dry hydrologic conditions.

(2) Truckee River Flows at Vista

Generally, under TROA, Truckee River flows at Vista under TROA are 2 percent greater than under No Action and 1 percent less than under current conditions. See figure 3.19. Maximum flows are 3,270 cfs in wet hydrologic conditions, or 7 percent greater than under No Action and 4 percent greater than under current conditions. Minimum flows under TROA in dry hydrologic conditions are 1 percent greater than under No Action or current conditions.

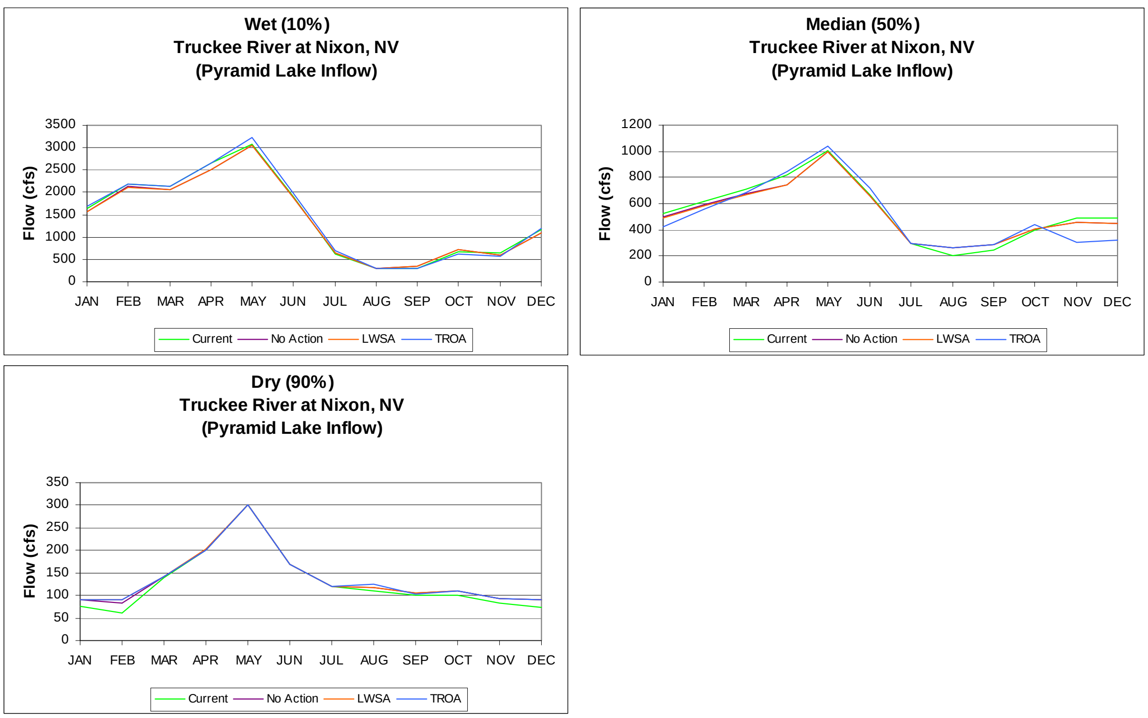


Figure 3.19—Operations model results for Truckee River flows at Nixon.

October through January flows generally under TROA are slightly less than under No Action or current conditions, primarily because of the accumulation of Credit Waters.

February through March flows under TROA, No Action, and current conditions follow the same pattern as October through January flows; flows generally are less under TROA in median and dry hydrologic conditions because of the accumulation of Credit Waters. In wet hydrologic conditions, flows are greater under TROA because more Credit Water is in storage, which causes more frequent spills.

In wet hydrologic conditions, April through July flows under TROA are greater than under No Action or current conditions because more Credit Water is in storage, which causes more frequent spills. In median and dry hydrologic conditions, flows under TROA are about the same as under No Action. Flows under TROA are generally less than under current conditions in median hydrologic conditions.

About 50 percent of the time, August through September flows under TROA are slightly less than under No Action or current conditions in higher flow situations. Under No Action and current conditions, there is very little opportunity for storing this surplus water during these months. Thus, under No Action, the surplus water remains in the Truckee River and flows into Pyramid Lake. Under TROA, such surplus water frequently can be stored in Truckee River reservoirs.

E. Pyramid Lake

1. Method of Analysis and Operations Model Input

Model operations and inputs are the same as for "Reservoirs." Pyramid Lake monthly average inflow (evaluated at Nixon), generated from the operations model, was compared in wet, median, and dry hydrologic conditions for current conditions, No Action, LWSA, and TROA. Simulated Pyramid Lake elevations also were compared.

2. Model Results and Evaluation of Effects

Monthly average Pyramid Lake inflow in wet, median, and dry hydrologic conditions for current conditions and the alternatives are presented in figure 3.19. The difference between current conditions and the alternatives in operations model results for the elevation of Pyramid Lake at the end of the period of analysis is presented in figure 3.20.

a. Current Conditions

Table 3.18 presents Pyramid Lake average annual inflow in wet, median, and dry hydrologic conditions.

Table 3.18—Pyramid Lake average annual inflow at Nixon (cfs) in wet, median, and dry hydrologic conditions

Hydrologic condition	Current	No Action	LWSA	TROA
Wet	1,412	1,396	1,394	1,452
Median	580	563	561	566
Dry	146	151	151	162

The Water Resources Appendix, Exhibits 9-11, shows modeled average monthly flow at Nixon, as well as monthly, seasonal, and annual exceedence frequency curves.

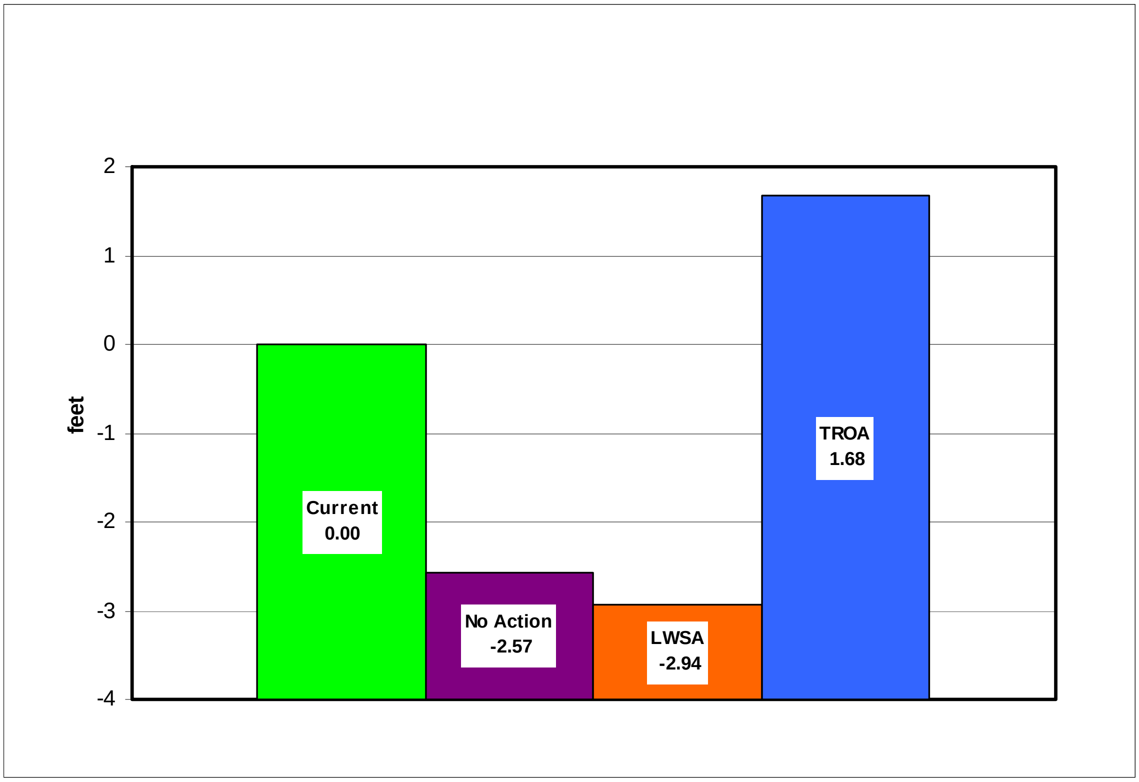


Figure 3.20—Difference between current conditions and alternatives in operations model results for the elevation of Pyramid Lake at the end of the period of analysis.

(1) Pyramid Lake Inflow (Truckee River Flows at Nixon)

Truckee River flow at Nixon represents inflow to Pyramid Lake. Operations model results show that the flow pattern at Nixon is similar to that at Vista, but quantity is reduced by diversions to the Truckee Canal and agricultural uses in the lower Truckee River during the irrigation season from April through September (figure 3.19). Flows at Nixon are 37 percent of flows at Vista in dry hydrologic conditions, but average 97 percent and 91 percent of flows at Vista in wet and median hydrologic conditions, respectively.

In general, flows increase from November through the following May. Increases from October through February result primarily from precipitation and runoff. Increases from March through May are caused by a combination of uncontrolled spring runoff and Stampede Reservoir releases for Pyramid Lake fishes. Flows decrease from June through September as the result of a decrease in natural flows and, to some extent, reservoir releases. The Pyramid Lake inflow target decreases in these months under the six-flow regime operation, so releases from Stampede and Prosser Creek Reservoirs are reduced. Maximum flows are 3,089 cfs in May in wet hydrologic conditions; minimum flows are 62 cfs in February in dry hydrologic conditions.

See “Biological Resources” for analysis and discussion of the six-flow regime effect on Pyramid Lake inflow.

(2) Pyramid Lake Elevation

Under current conditions, operations model results show that the simulated elevation of Pyramid Lake is 49 feet higher by the end of the 100-year period of analysis. Figure 3.20 presents operations model results for current conditions and the alternatives.

b. No Action

Comparison of average seasonal flows at various locations in the Truckee River basin indicates the availability of water to meet flow targets and support environmental and recreational uses. As shown in table 3.18, in general, flows under No Action are less than under current conditions because of greater future demands in California and Nevada.

(1) Pyramid Lake Inflow (Truckee River Flows at Nixon)

Operations model results show that, under No Action, June through September Truckee River flows at Nixon are somewhat greater than under current conditions in dry hydrologic conditions because of Water Quality Water releases. See figure 3.19. Maximum flows are 3,055 cfs in May in wet hydrologic conditions. Minimum flows are 83 cfs in February in dry hydrologic conditions. Average annual flows are about 98 percent of those under current conditions.

See “Biological Resources” for analysis and discussion of the six-flow regime effects on Pyramid Lake inflow.

(2) Pyramid Lake Elevation

Operations model results indicate that, under No Action, the elevation of Pyramid Lake at the end of the period of analysis is about 2.5 feet lower than under current conditions because of greater future demands in California and Nevada. See figure 3.20.

c. LWSA

Operations model results indicate that, under LWSA, the elevation of Pyramid Lake at the end of the period of analysis is about 3 feet lower than under current conditions because of greater future demands in California and Nevada. See figure 3.20.

d. TROA

(1) Pyramid Lake Inflow (Truckee River Flows at Nixon)

Average annual inflow to Pyramid Lake (Truckee River flows at Nixon) under TROA is 2 percent and 1 percent greater than under No Action and current conditions, respectively. In wet hydrologic conditions, flows under TROA are 4 percent greater than under No Action and 3 percent greater than under current conditions. In median hydrologic conditions, flows under TROA are generally 1 percent greater than under No Action and 2 percent less than under current conditions. Maximum flows are 3,231 cfs in May in wet hydrologic conditions, and minimum flows are 90 cfs in February in dry hydrologic conditions. See figure 3.19.

October through January flow patterns at Nixon are similar to those at Vista. Under median and dry hydrologic conditions, flows under TROA are generally less than or equal to flows under No Action or current conditions. The maximum inflow target from October through January is 160 cfs. See table 3.8.

When Pyramid Lake inflow is between 160 cfs and 700 cfs, inflow under TROA is likely to be less than under the other alternatives because of opportunities to store Credit Water. Under TROA, February through March flows are slightly greater in low-flow conditions than under No Action or current conditions because of greater supply. Flows are slightly less under TROA in median hydrologic conditions because of the opportunity to store surplus Truckee River flow.

April-through-July flows are nearly the same under all alternatives. Inflow tends to be slightly greater during extreme low flows under TROA because more water is available from reservoir storage. Also, inflow tends to be greater under TROA in high-flow periods because of greater reservoir spills.

August through September flows under TROA are generally similar or greater than under either No Action or current conditions because more water is available from storage under TROA.

(2) Pyramid Lake Elevation

Operations model results indicate that, under TROA, the elevation of Pyramid Lake at the end of the period of analysis is higher than under No Action or current conditions because of greater average annual inflow of approximately 11,000 and 4,000 acre-feet, respectively. As shown in figure 3.20, operations model results indicate that, under TROA, the elevation of Pyramid Lake at the end of the period of analysis is 4.25 feet higher than under No Action and 1.68 feet higher than under current conditions.

F. Exercise of Water Rights to Meet Demands

1. Method of Analysis

Currently, the Truckee River water supply available for diversion does not satisfy all water rights demands in every year. Variable water rights acquisition and transfers in the future do not allow a direct comparison of the effectiveness of future operations in satisfying the exercise of water rights. Therefore, operations model results were analyzed to determine the percentage of water righted demand that was met in the “minimum supply year.” As part of this analysis, the minimum supply year (or minimum annual water supply) is defined as the calendar year with the least supply to serve water rights over the 100-year period of analysis. Agricultural demands were analyzed for Truckee Meadows, Truckee and Carson Divisions of the Newlands Project, and the lower Truckee River basin; M&I demands were analyzed for the Lake Tahoe basin, Truckee River basin in California and Nevada, and Truckee Meadows. Additionally, Section 205(a) of P.L. 101-618 requires that TROA must carry out the terms, conditions, and contingencies of PSA, one of the purposes of which is to provide additional M&I water for the Reno-Sparks metropolitan area (i.e., Truckee Meadows) during drought; an analysis is included to illustrate the extent to which each condition and alternative contributes to the Truckee Meadows M&I water supply during two drought periods, modeled calendar years 31-35 and 90-94 (that relate to recent historic droughts).

2. Model Results and Evaluation of Effects

Supplies and demands in California are discussed in the narrative. Table 3.19 presents operations model results for Nevada agricultural and M&I minimum annual water supply available and the percentage of water rights demands met by the exercise of water rights in the minimum supply year. Table 3.20 presents operations model results for total M&I water supply available for Truckee Meadows during the modeled calendar years 31-35 and 90-94.

a. Current Conditions

Operations model results show that, under current conditions, water rights cannot be fully served to meet both current agricultural and M&I demands in all years. Agricultural and M&I demands in the Truckee River basin in Nevada are met primarily from surface water sources, subject to the variability of supply.

(1) Agriculture

Truckee Meadows and Newlands Project agricultural demands are served by surface water supplies; supplies are not adequate to fully serve these rights in drought years.

Annual agriculture shortages for Truckee Meadows, the Truckee Division, and the Carson Division are shown in figures 3.21, 3.22, and 3.23. Shortages for the Truckee Division are shown only for current conditions (figure 3.22) because it is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes.

(a) Truckee Meadows

As shown in table 3.19, operations model results show that in the minimum supply year, 21.4 percent of demand is met in Truckee Meadows. Shortages occur in 14 of the 100 years of analysis.

(b) Truckee Division

Operations model results show that 51.5 percent of demand is met in the Truckee Division. Shortages occur in 9 years of the 100 years of analysis.

(c) Carson Division

Operation model results show that 47.2 percent of demand is met in the Carson Division. Shortages occur in 9 years of the 100 years of analysis.

Table 3.19—Annual demand in Nevada and annual average and minimum agricultural and M&I supplies (acre-feet per year, except where noted)

	Current conditions	No Action	LWSA	TROA
Truckee Meadows				
Agriculture				
Water rights demand	40,770	21,500	21,500	4,860
Average supply	39,170	20,720	20,720	4,690
Minimum supply	8,710	6,510	6,520	1,640
Demand met in minimum supply year	21.4%	30.3%	30.3%	33.7%
M&I				
Water rights demand	83,140	119,000	119,000	119,000
Average supply	83,140	118,410	118,670	118,260
Minimum supply	83,140	108,420	112,690	113,720
Demand met in minimum supply year	100%	91.1%	94.7%	95.6%
Newlands Project – Truckee Division				
Agriculture				
Water rights demand	18,520	0	0	0
Average supply	18,070	N/A	N/A	N/A
Minimum supply	9,530	0	0	0
Demand met in minimum supply year	51.5%	N/A	N/A	N/A
Fernley M&I				
Water rights demand	[1]0	[2]6,800	[2]6,800	[2]6,800
Average supply	0	6,600	6,600	6,600
Minimum supply	0	3,600	3,600	3,600
Demand met in minimum supply year	0	52.9%	52.9%	52.9%
Newlands Project – Carson Division				
Agriculture				
Water rights demand	275,720	268,870	268,870	268,870
Average supply	269,410	260,720	260,610	260,690
Minimum supply	130,070	110,580	109,760	110,790
Demand met in minimum supply year	47.2%	41.1%	40.8%	41.2%
Lower Truckee River (including Pyramid Tribe)				
Agriculture				
Water rights demand	12,040	17,900	17,900	17,900
Average supply	12,040	17,900	17,900	17,900
Minimum supply	12,040	17,900	17,900	17,900
Demand met in minimum supply year	100%	100%	100%	100%
M&I				
Water rights demand	0	16,380	16,380	16,380
Average supply	0	16,380	16,380	16,380
Minimum supply	0	16,380	16,380	16,380
Demand met in minimum supply year	N/A	100%	100%	100%

[1] Current demand of 3,280 acre-feet supplied by local groundwater sources.
[2] Transfer of 6,800 acre-feet of Truckee Division agricultural water rights would provide a portion of the future demand of 29,500 acre-feet; supply for the additional 22,700 acre-feet has not been identified and was not modeled.

Table 3.20—Total M&I water supply available (acre-feet) to the Truckee Meadows service area (current year water deliveries plus end-of-November Stampede Reservoir storage) for the two drought periods (calendar years 31–35 and 90–94) under current conditions and the alternatives (normal year demand in parentheses); supplies less than normal year demand are shown in bold, and greatest supply for the calendar year is shown in *bold italics*

Calendar year	Current conditions[1] (83,100)	No Action[2] (119,000)	LWSA[3] (119,000)	TROA[4] (119,000)
31	97,700	121,800	125,600	***152,300***
32	104,300	141,300	140,800	***168,700***
33	103,700	136,500	137,900	***166,900***
34	96,100	120,100	124,100	***149,900***
35	105,000	137,000	136,800	***164,300***
90	103,100	135,700	137,900	***171,100***
91	100,700	130,900	132,600	***152,400***
92	85,700	**109,600**	**113,800**	***124,500***
93	102,800	138,700	138,300	***144,600***
94	91,200	**107,200**	121,500	***126,800***

[1] Maximum annual groundwater pumping for normal and dry year is 14,820 and 22,000 acre-feet, respectively.
[2] Maximum annual groundwater pumping for normal and dry year is 12,570 and 22,000 acre-feet, respectively.
[3] Maximum annual groundwater pumping for normal and dry year is 12,570 and 26,500 acre-feet, respectively.
[4] Maximum annual groundwater pumping for normal and dry year is 12,570 and 15,950 acre-feet, respectively.

(d) Lower Truckee River Basin

Agricultural demand in the lower Truckee River basin is met 100 percent of the time under current conditions because the Pyramid Tribe holds water rights with the highest priority date.

(2) M&I

(a) Lake Tahoe Basin

M&I demands in the Lake Tahoe basin in California and Nevada are met by surface water and groundwater in all years.

(b) Truckee River Basin in California

M&I demand in the Truckee River basin in California is met primarily by groundwater and is assumed to be met in all years.

(c) Truckee Meadows

Current Truckee Meadows M&I supply is reliable because of TMWA's ability to supplement the surface water supply with groundwater supplies and Private Water stored in Donner and Independence Lakes. Under current conditions, supplies are adequate to meet demand, in part because of TMWA's water rights acquisition program. TMWA has acquired more water rights than it currently requires to meet demand. No shortages occur under current conditions, even during the two recent historical droughts as shown in table 3.20.

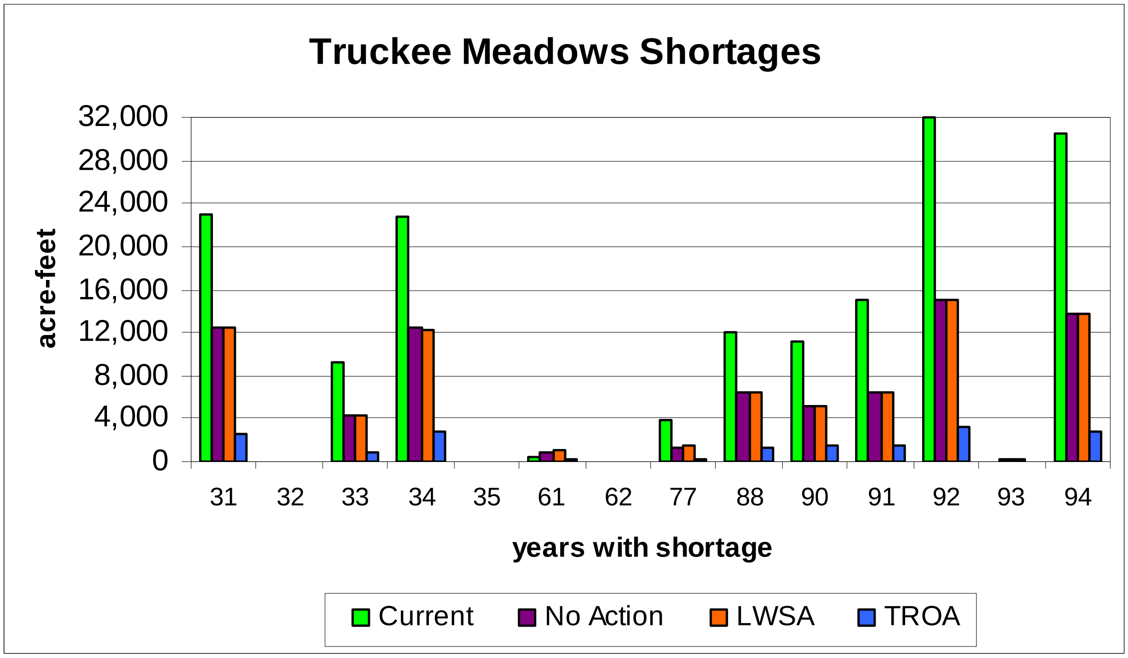


Figure 3.21—Operations model results for Truckee Meadows agricultural shortages.

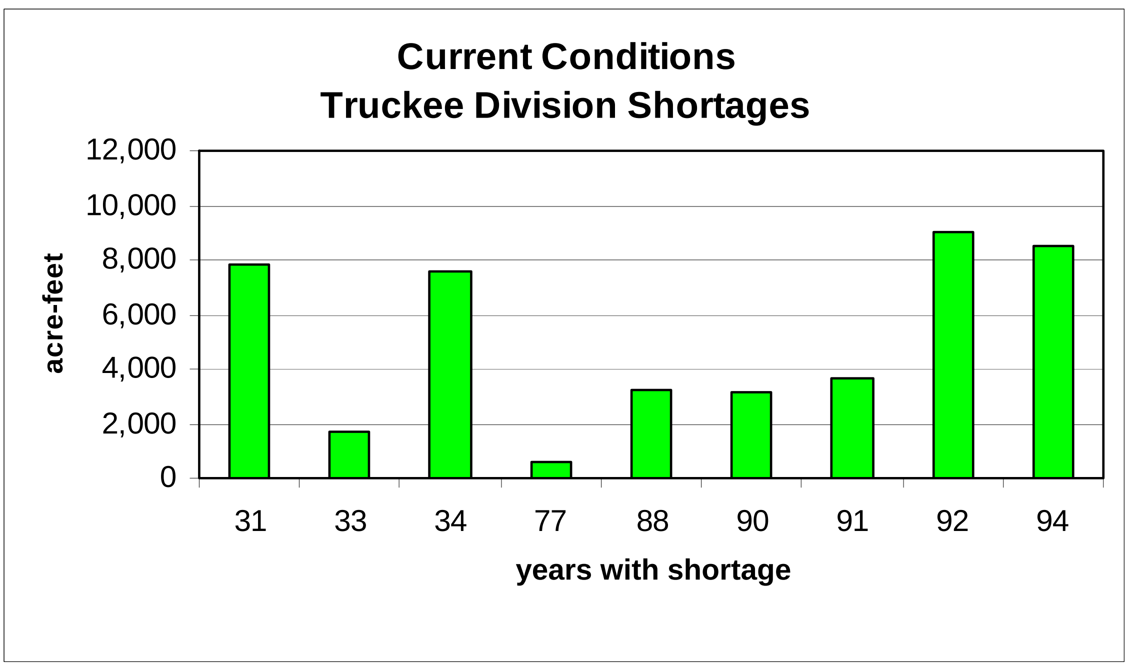


Figure 3.22—Operations model results for current conditions Truckee Division agricultural shortages. (It is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes.)

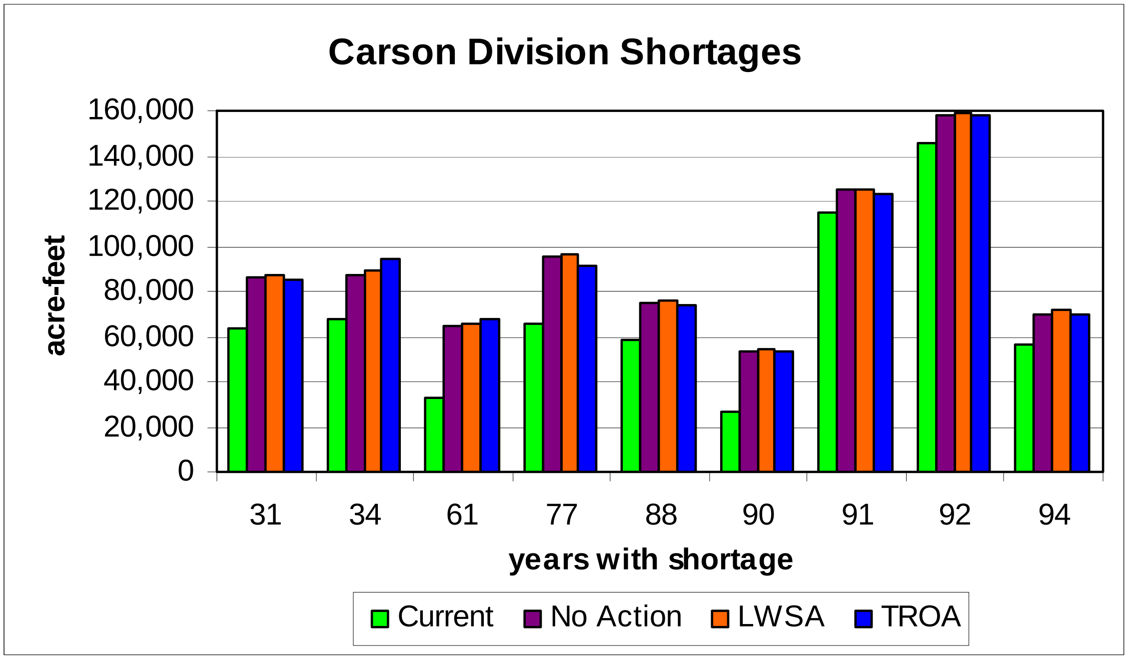


Figure 3.23—Operations model results for Carson Division agricultural shortages.

(d) Lower Truckee River Basin

M&I demand in the lower Truckee River basin is met 100 percent of the time under current conditions because the Pyramid Tribe holds water rights with the highest priority date.

b. No Action

(1) Agriculture

(a) Truckee Meadows

As shown in table 3.19, operations model results show that in the minimum supply year, 30.3 percent of the agricultural demand in Truckee Meadows is met under No Action, compared to 21.4 percent under current conditions because fewer water rights would be required to be served under No Action. Shortages occur in 10 of the 100 years of analysis under current conditions. Under No Action, shortages occur in 14 years of the analysis.

(b) Truckee Division

It is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes.

(c) Carson Division

Operations model results show that in the minimum supply year, 41.1 percent of the agricultural demand in the Carson Division is met under No Action, or 6.2 percent less than under current conditions, primarily because of future development in California, increased demands in Truckee Meadows, and full exercise of the Pyramid Tribe's Truckee River water rights. Shortages occur in 9 of the 100 years of analysis, and are generally greater than under current conditions. See figure 3.23.

Newlands Project supplies from the Truckee River under No Action are less than under current conditions for the following reasons:

- Carson Division demand is less as a result of WRAP
- California and Nevada water use in the Lake Tahoe basin is greater, thus less water is available to Truckee River users
- California water use from the Truckee River basin is greater, thus less water is available to Nevada
- Use of *Orr Ditch* decree water rights (including Claim Nos. 1 and 2) is greater, thus the proportionate supply to lower priority water rights is less
- Use of reservoir storage in Independence and Donner Lakes is greater, thus less water is available for direct diversion from the Truckee River

(d) Lower Truckee River basin

Agricultural demand in the lower Truckee River basin is met 100 percent of the time under both current conditions and No Action because the Pyramid Tribe holds water rights with the highest priority date.

(2) M&I

(a) Lake Tahoe Basin

The surface water supply is sufficient to satisfy the M&I demand in the Lake Tahoe basin in California and Nevada under current conditions as well as under No Action.

(b) Truckee River Basin in California

The surface water supply is sufficient to satisfy the M&I demand in the Truckee River basin in California under current conditions. Under No Action, the surface water supply is sufficient to meet M&I demand because California has a high priority to divert water from surface flows for M&I purposes.

(c) Truckee Meadows

As discussed previously, Truckee Meadows M&I water demand is projected to be greater in the future. The M&I surface water supply under No Action also would be greater than under current conditions because agricultural water rights would be acquired and transferred to M&I use, and TMWA would more fully exercise its existing water rights. Under No Action, the water supply is not sufficient in all years to meet the greater M&I demand. Operations model results show that, in the minimum supply year, 91.1 percent of the 119,000-acre-foot demand is met under No Action (table 3.19).

Conservation measures would be implemented to reduce demand in water-short years. As shown in table 3.20, the M&I water supply is sufficient to meet demand during the calendar year 31–35 drought but falls short in two of the years during the calendar year 90–94 drought.

(d) Lower Truckee River Basin

M&I demand in the lower Truckee River basin is met 100 percent of the time under both current conditions and No Action because the Pyramid Tribe holds water rights with the highest priority date.

c. LWSA

(1) Agriculture

(a) Truckee Meadows

Operations model results show that agricultural demands in Truckee Meadows under LWSA are met to the same degree as under No Action. The differences between LWSA and current conditions are the same as the differences between No Action and current conditions.

(b) Truckee Division

It is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes.

(c) Carson Division

As shown in table 3.19, operations model results show that in the minimum supply year, 40.8 percent of the Carson Division demand is met under LWSA, or about .3 percent less than under No Action and 6.4 percent less than under current conditions. Differences are caused by greater exercise of TMWA water rights for the increased groundwater recharge program. Shortages occur in 9 of the 100 years of analysis, the same as under No Action, and are generally greater than under current conditions. See figure 3.23.

(d) Lower Truckee River Basin

M&I demand in the lower Truckee River basin is met 100 percent of the time under both current conditions, No Action, and LWSA because the Pyramid Tribe holds water rights with the highest priority date.

(2) M&I

(a) Lake Tahoe and Truckee River Basins in California

Under LWSA, the M&I water supply for the Lake Tahoe and Truckee River basins is the same as under No Action. Differences between LWSA and current conditions are the same as between No Action and current conditions. Under LWSA, a greater amount of surface water is diverted, but this greater diversion is offset by decreased groundwater use for no net change in California demands.

(b) Truckee Meadows

Truckee Meadows M&I demand under LWSA is the same as under No Action, except TMWA would exercise its water rights to provide an additional 1,000 acre-feet in winter months for an increased groundwater recharge program. Under LWSA, the average water supply is slightly greater than under No Action because of greater groundwater pumping. Operations model results show that, in the minimum supply year, 94.7 percent of the 119,000-acre-foot demand is met, compared to 91.1 percent under No Action (table 3.19). Conservation measures would be implemented but perhaps to a lesser degree than under No Action. As shown in table 3.20, the M&I water supply during the drought periods is similar to that under No Action and sufficient to meet demand during the calendar year 31–35 drought but falls short in only one of the years during the calendar year 90–94 drought; groundwater pumping, however, is likely to be greater than under No Action.

(c) Lower Truckee River Basin

M&I demand in the lower Truckee River basin is met 100 percent of the time under LWSA, No Action, and current conditions because the Pyramid Tribe holds water rights with the highest priority date.

d. TROA

(1) Agriculture

(a) Truckee Meadows

As shown in table 3.19, operations model results show that 33.7 percent of the agricultural demand in Truckee Meadows is met in the minimum supply year under TROA, compared to 30.3 percent under No Action and 21.4 percent under current conditions. As previously discussed, demand under TROA is much less than under current conditions because of TMWA's water rights acquisition program. Shortages occur in 13 of the 100 years of analysis. See figure 3.21.

(b) Truckee Division

It is assumed that, in the future, all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes.

(c) Carson Division

During the most severe drought, agricultural demand in the Carson Division is met to a similar degree under TROA and No Action. The water supply under TROA is slightly less (30 acre-feet) than under No Action. Timing of Truckee River supplies results in a minimal decrease in diversions to the Newlands Project in some years. A total of 41.2 percent of the demand is met in the minimum supply year, compared to 41.1 percent under No Action (about 200 acre-feet more) and 47.2 percent under current conditions. Shortages occur in 9 of the 100 years of analysis, the same as under No Action, and are generally greater than under current conditions. See figure 3.23.

(d) Lower Truckee River Basin

As under No Action and current conditions, agricultural demand in the lower Truckee River basin is met 100 percent of the time under TROA because the Pyramid Tribe's most senior water priority ensures that its agricultural water demand is satisfied.

(2) M&I

(a) Lake Tahoe Basin

Sufficient water supplies are available under TROA, No Action, and current conditions to meet M&I demand in the Lake Tahoe basin in California and Nevada.

(b) Truckee River Basin in California

The surface water supply is sufficient to meet current and future California M&I demand for surface water in the Truckee River basin.

(c) Truckee Meadows

Truckee Meadows M&I demand under TROA is the same as under No Action. The average water supply is slightly less than under No Action because of the requirement for water conservation. Operations model results show that, under TROA, 95.6 percent of the 119,000-acre-foot demand is met in the minimum supply year, compared to 91.1 percent under No Action. The benefits of water conservation and credit storage under TROA are shown clearly in table 3.20: M&I water supply during the drought periods is greater than under No Action (and LWSA) in all years and is sufficient to meet demand during both the calendar year 31–35 and 90–94 droughts; also, groundwater pumping is likely to be less than under No Action (and LWSA). Table 3.20 illustrates that TROA would satisfy the requirement under the Settlement Act to provide additional M&I water for Truckee Meadows during drought situations.

(d) Lower Truckee River Basin

M&I demand in the lower Truckee River basin is met 100 percent of the time under TROA, No Action, and current conditions because the Pyramid Tribe holds water rights with the highest priority date.

G. Optional Scenarios

TROA was modeled using the water demands, credit storage options, and distribution of water rights "most likely" to occur in the future (2033) based on the Negotiated Agreement. Two additional scenarios were analyzed to provide perspective on the effects of potential future Truckee River operations under TROA: (1) Fernley Municipal Credit Water (Fernley scenario) and (2) Donner Storage Right (Donner-TMWA scenario). Under the Fernley scenario, it was assumed that Fernley would store a portion of the water associated with surface water rights acquired from the Truckee Division. Under the Donner-TMWA scenario, it was assumed that TMWA would acquire TCID's portion of the Donner Lake storage right to increase TMWA's M&I water supply.

1. Method of Analysis

The same method of analysis was used for the optional scenarios as for the alternatives. Operations model input assumptions were the same as for TROA, except for the following:

> **Fernley Scenario:** The operations model assumes that of the 6,800 acre-feet of acquired surface water rights, 5,100 acre-feet would be used to meet M&I demand in normal years; the remaining 1,700 acre-feet would be stored as Fernley Municipal Credit Water up to a total of 10,000 acre-feet. Releases would be made to meet Fernley M&I demand when the exercise of Fernley surface water rights could not meet the 5,100 acre-feet of M&I demand.
>
> **Donner-TMWA Scenario**: Donner Lake would be operated to meet TMWA's M&I demand from total reservoir storage.

2. Model Results and Evaluation of Effects

Operations model results for each scenario were compared to operations model results for TROA. Figures 3.24, 3.25, and 3.26 show end-of-month reservoir storage and average monthly releases under the Fernley scenario in wet, median, and dry hydrologic conditions, respectively. Figures 3.27, 3.28, and 3.29 show end-of-month reservoir storage and average monthly releases under the Donner-TMWA scenario in wet, median, and dry hydrologic conditions, respectively.

a. Fernley Scenario

Operations model results show that average total reservoir storage is slightly greater under this scenario because of the storage of Fernley Municipal Credit Water (figures 3.24, 3.25 and 3.26) by the following amounts:

Wet hydrologic conditions	220 acre-feet
Median hydrologic conditions	580 acre-feet
Dry hydrologic conditions	840 acre-feet

In general, operations model results show very little difference between this scenario and TROA in wet and median hydrologic conditions. In dry hydrologic conditions, storage in all reservoirs, except Donner Lake, is slightly greater under the Fernley scenario than under TROA. Storage in Independence Lake and Prosser Creek Reservoir is greater because releases are slightly less. Stampede Reservoir releases are slightly greater and may account for the greater storage in Boca Reservoir. Greater Lake Tahoe and Stampede Reservoir storage in dry hydrologic conditions is the result of storage of Fernley Municipal Credit Water. In wet hydrologic conditions, the slightly greater total reservoir storage is held in Lake Tahoe. The additional storage is held in Stampede Reservoir from October through November and in Lake Tahoe the remainder of the year in median hydrologic conditions.

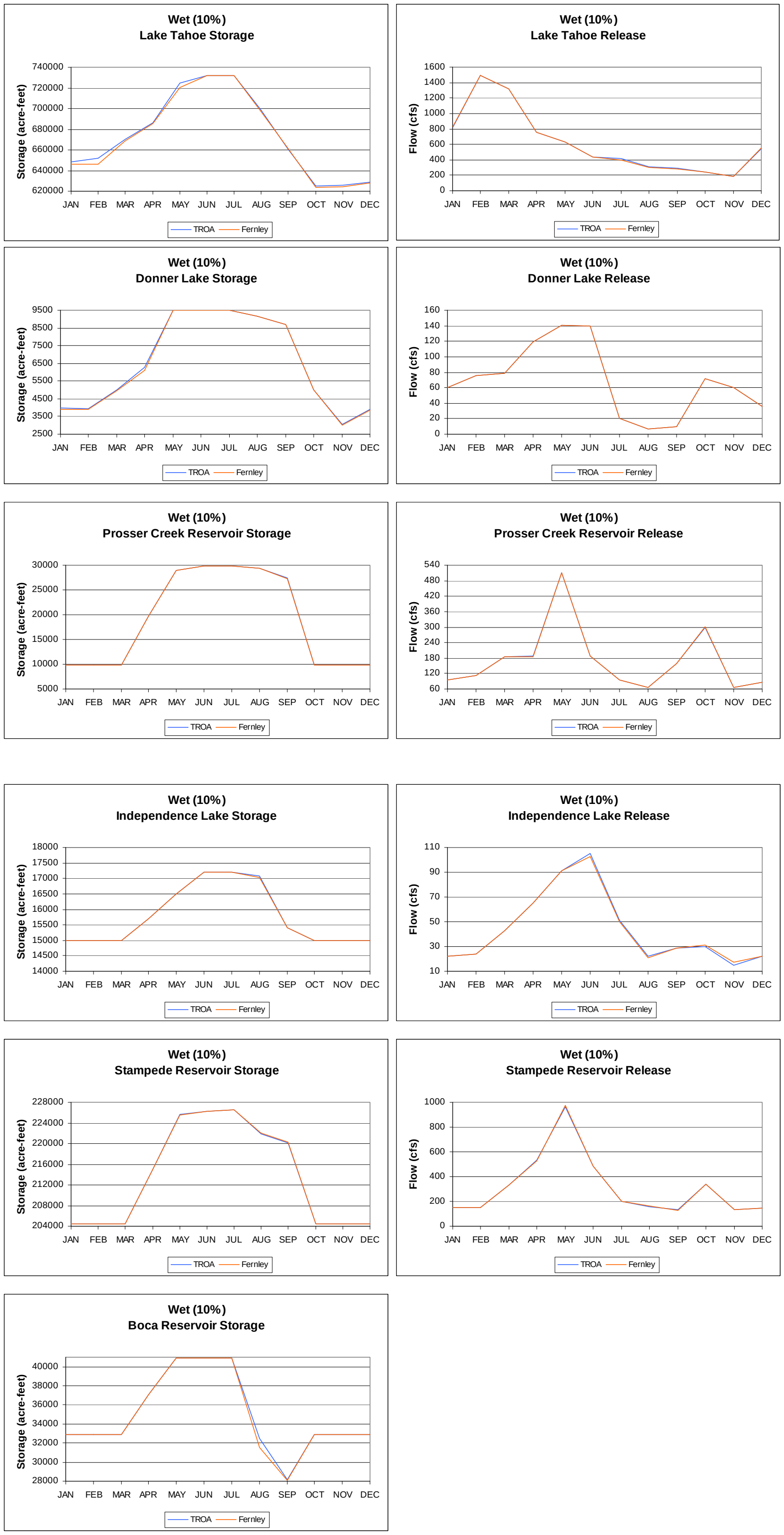


Figure 3.24—Fernley scenario: Operations model results for end-of-month reservoir storage and average monthly releases in wet hydrologic conditions.

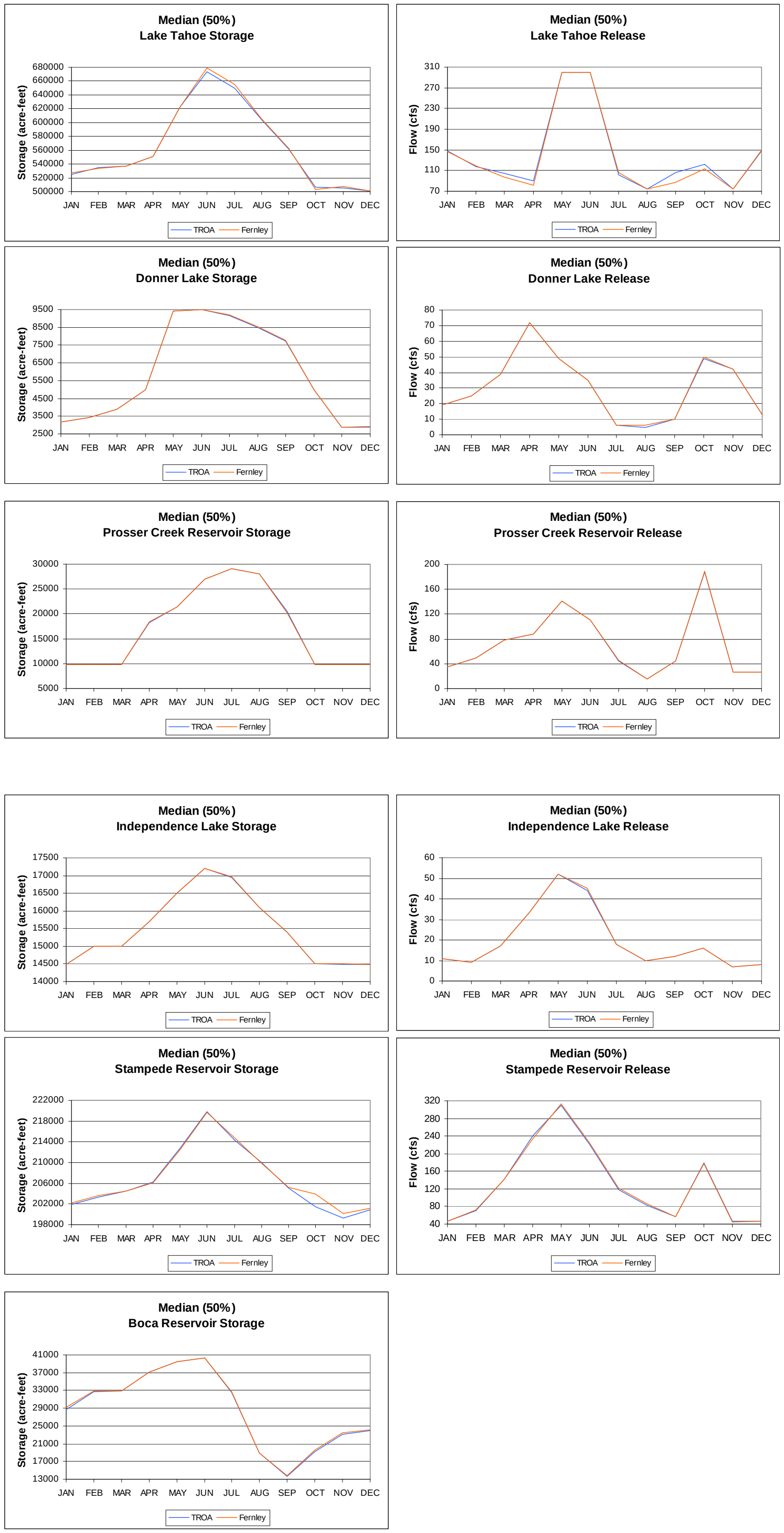


Figure 3.25—Fernley scenario: Operations model results for end-of-month reservoir storage and average monthly releases in median hydrologic conditions.

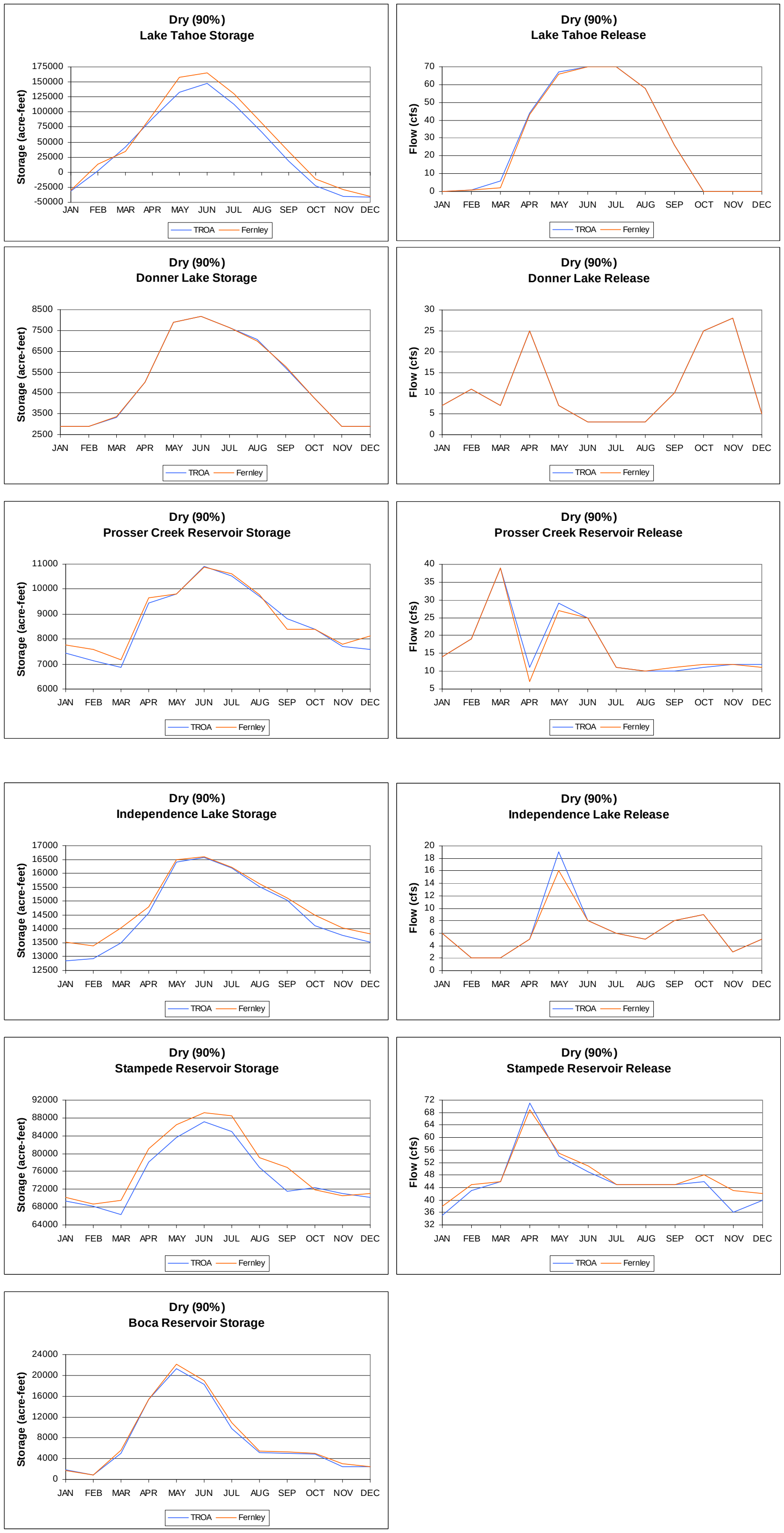


Figure 3.26—Fernley scenario: Operations model results for end-of-month reservoir storage and average monthly releases in dry hydrologic conditions.

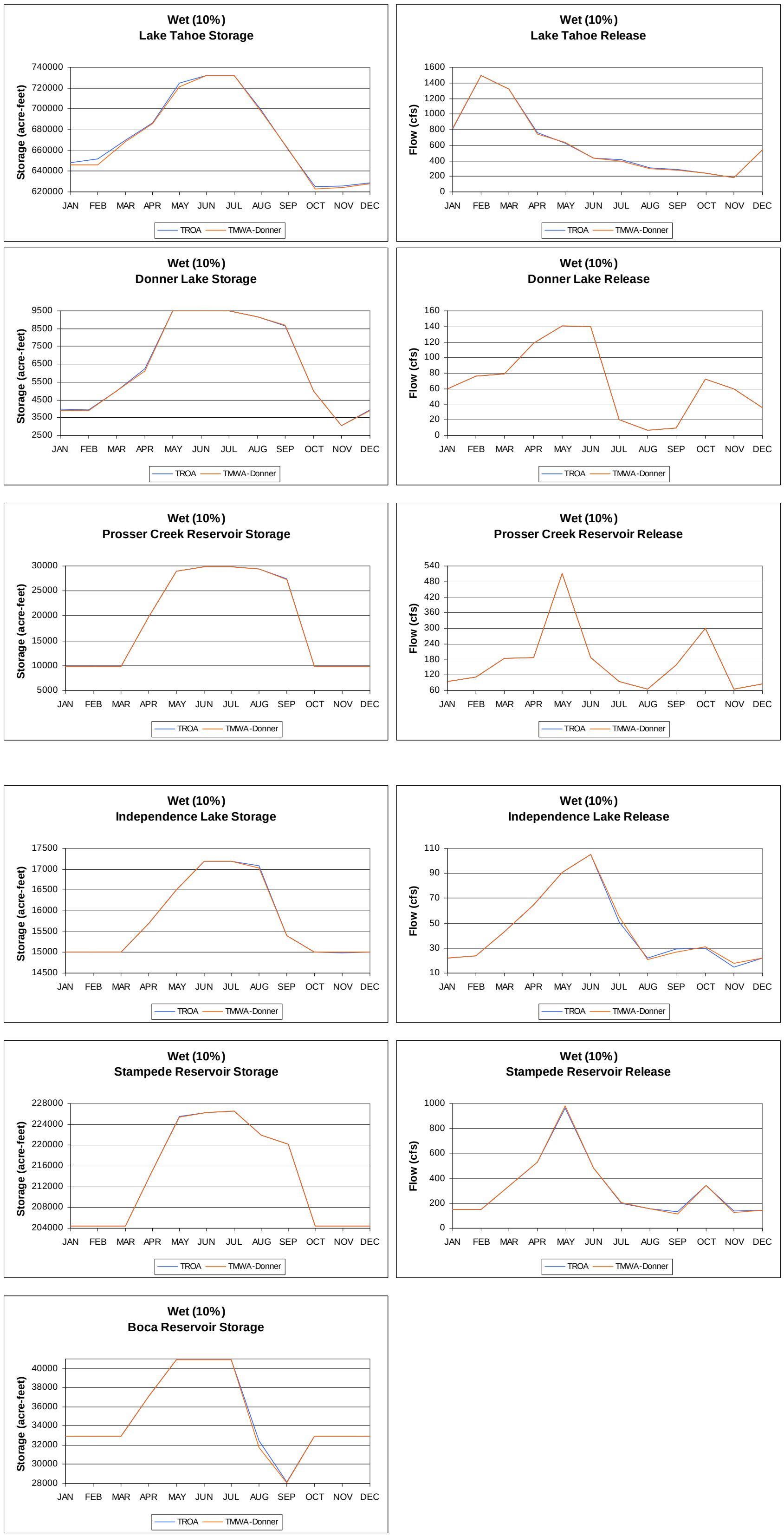


Figure 3.27—Donner-TMWA scenario: Operations model results for end-of-month reservoir storage and average monthly releases in wet hydrologic conditions.

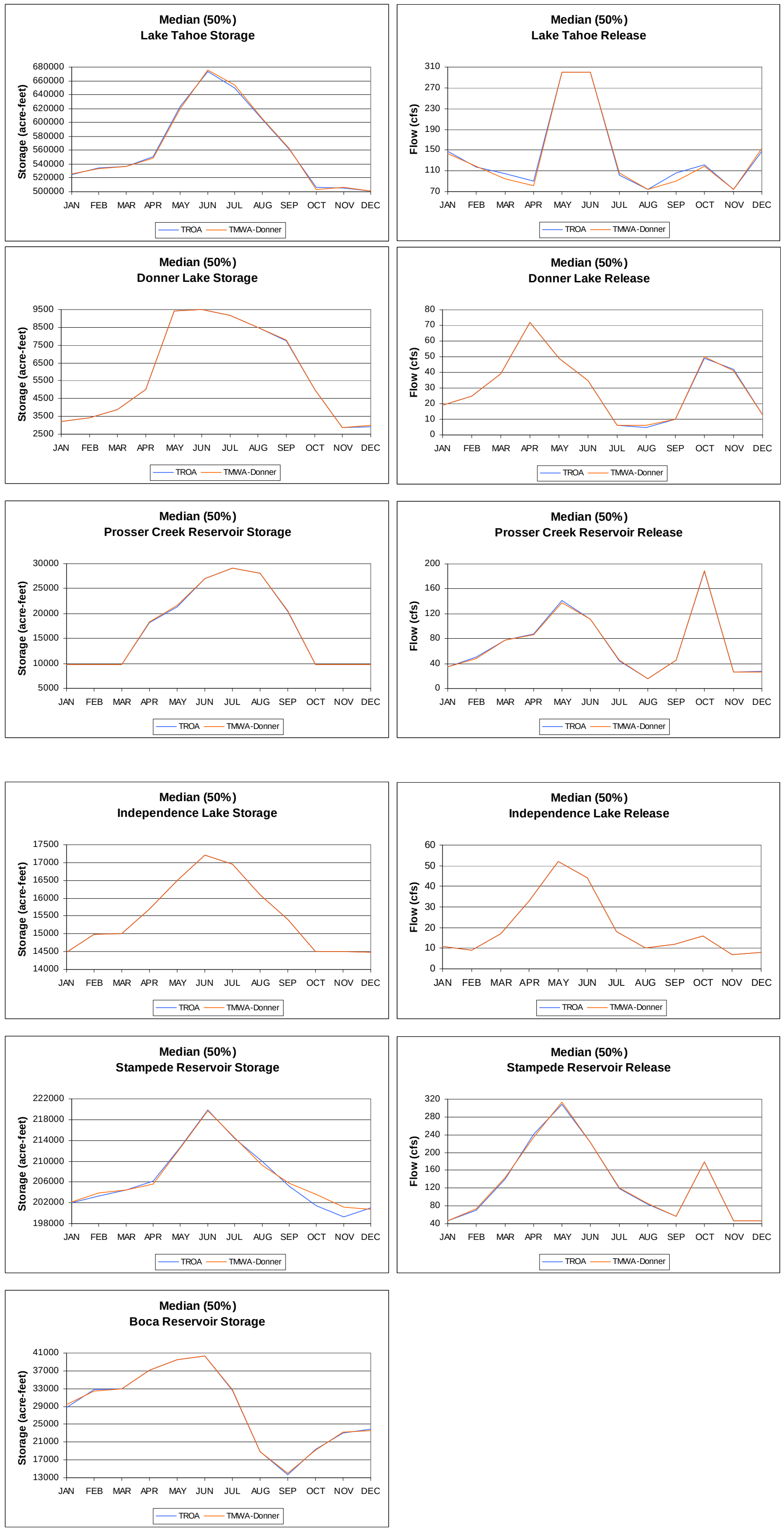


Figure 3.28—Donner-TMWA scenario: Operations model results for end-of-month reservoir storage and average monthly releases in median hydrologic conditions.

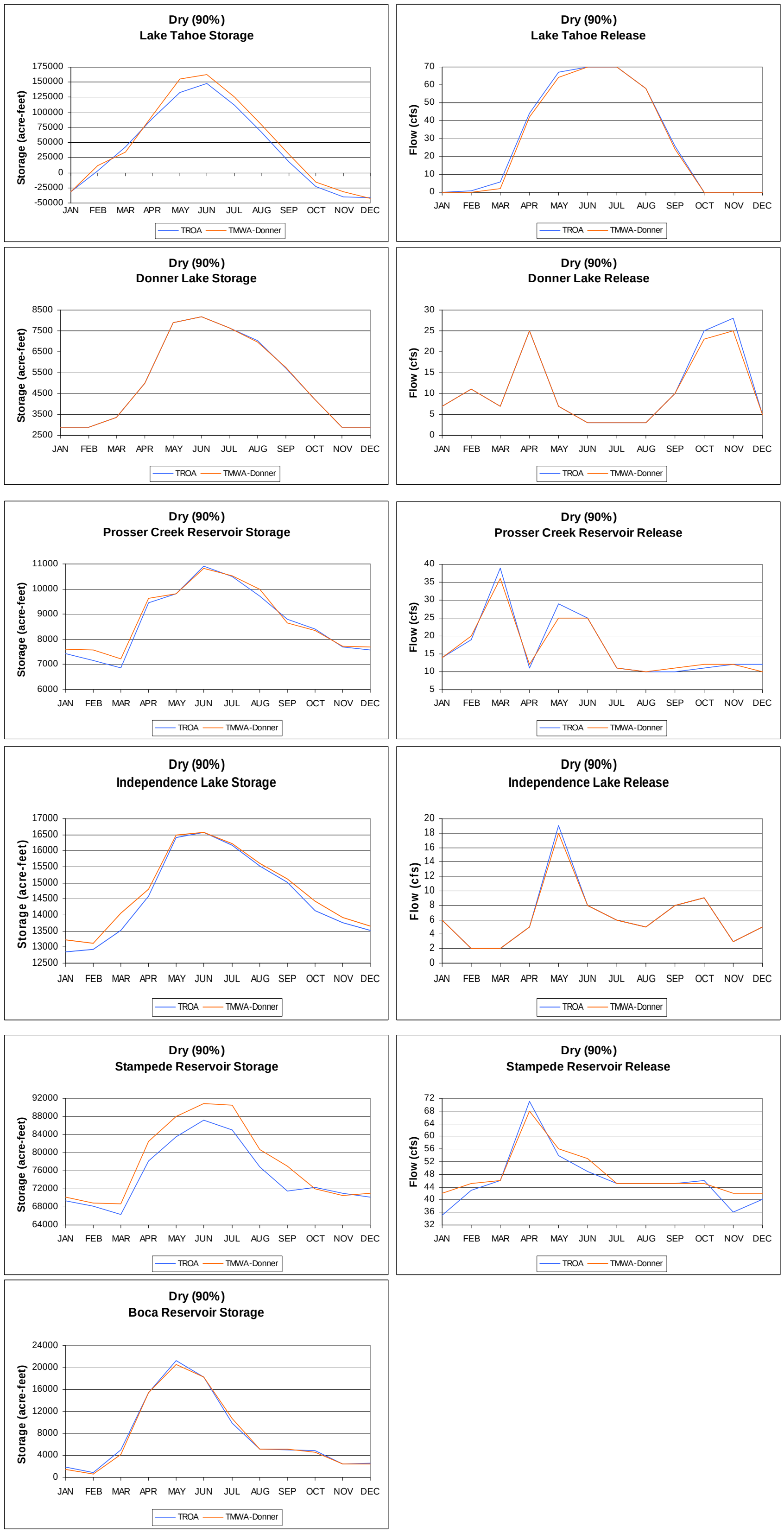


Figure 3.29—Donner-TMWA scenario: Operations model results for end-of-month reservoir storage and average monthly releases in dry hydrologic conditions.

Operations model results show that average annual flow at Farad and Vista is the same under this scenario as under TROA. Flow at Nixon is greater under this scenario because some of the unused portion of Fernley's M&I stored water is either spilled or converted to Fish Credit Water and flows to Pyramid Lake. The flow at Nixon under the Fernley scenario is 694 cfs (2 cfs greater than under TROA) resulting in an additional 1,550 acre-feet per year of inflow to Pyramid Lake.

Agricultural and M&I demands are met to the same degree under this scenario and TROA, except for Carson Division demands. Under the Fernley scenario, the Truckee Canal diverts slightly more water to Lahontan Reservoir and reduces the average annual shortage by 10 acre-feet because of a difference in the timing of Truckee River flows.

Overall, reservoir storage is greater in dry hydrologic conditions and inflow to Pyramid Lake is greater under the Fernley scenario than under TROA. No adverse effects were identified.

b. Donner-TMWA Scenario

Operations model results show that, under the Donner-TMWA scenario, total reservoir storage is slightly less in wet and median hydrologic conditions than under TROA because Truckee River diversions to the Newlands Project are slightly greater. Total reservoir storage is slightly greater under the Donner-TMWA scenario than under TROA in dry hydrologic conditions because of additional storage of TMWA M&I Credit Water (figures 3.27, 3.28 and 3.29). The differences are as follows:

Wet hydrologic conditions	-420 acre-feet
Median hydrologic conditions	-70 acre-feet
Dry hydrologic conditions	930 acre-feet

In dry hydrologic conditions, storage in each reservoir, except Donner Lake and Boca Reservoir, is slightly greater. Storage in Independence Lake is slightly greater, and releases are less because Independence Lake is not used to meet M&I demand as frequently. Storage in Lake Tahoe and Stampede Reservoir is greater in dry hydrologic conditions because of the storage of TMWA M&I Credit Water. On average, under the Donner-TMWA scenario, there is 2,120 acre-feet more TMWA M&I Credit Water than under TROA.

Average annual flows at Farad, Vista, and Nixon under the Donner-TMWA scenario are the same as under TROA.

Agricultural and M&I demands are met to the same degree under the Donner-TMWA scenario and TROA, except for the Carson Division. Under the Donner-TMWA scenario, the Truckee Canal diverts 120 acre-feet per year less water to Lahontan Reservoir. Carson Division average annual shortage is 80 acre-feet per year greater, caused by the loss of the Donner Lake supply.

Under the Donner-TMWA scenario, reservoir storage is slightly greater in dry hydrologic conditions, and supply to the Carson Division is slightly less than under TROA.

H. Sensitivity Scenarios

Following publication of the revised DEIS/EIR, the following additional model runs were made to evaluate the range of opportunities for Credit Water operations under TROA: (1) expanded Newlands credit water storage and (2) implementation of TROA with current conditions.

1. Expanded Newlands Credit Water Storage

a. Method of Analysis and Operations Model Input Assumptions

The method of analysis used for this sensitivity scenario was the same as that used for the alternatives. In addition to No Action and TROA as modeled in the main analysis—i.e., Newlands credit water was not incorporated, and incorporated, respectively—this scenario includes No Action *with* Newlands credit water (NAC) and TROA with *expanded* storage of credit water (TROA-EC).

Operations model input assumptions for NAC and TROA-EC for management of Newlands credit water were as follows:

- Release of Newlands credit water (from Truckee River reservoirs) is restricted to months when total Lahontan Reservoir storage will not exceed the Lahontan Reservoir storage target.
- Under TROA-EC, when Newlands credit water must be reduced because the total of Newlands credit water plus Lahontan Reservoir storage exceeds the storage target or it is the end of the irrigation season, the water is converted to Project Water or Credit Water. Whether the water is converted to Project Water or Credit Water depends on what would have been stored had Newlands credit water not been established; under NAC it is converted to water for cui-ui recovery.
- Under TROA-EC, Newlands credit water can be accumulated adverse to Floriston Rates; under NAC, it cannot be accumulated adverse to Floriston Rates.
- Newlands credit water spills before other waters.
- Newlands credit water may be established when Newlands credit water plus Lahontan Reservoir storage do not exceed the storage targets.
- Newlands credit water is not considered to be Project Water.

- Establishment of Newlands credit water is junior to that of other types of water.
- Under TROA-EC, Newlands credit water may be established in any Truckee River reservoir (Lake Tahoe or Prosser Creek, Stampede or Boca Reservoirs); under NAC, it may only be established in Stampede Reservoir.
- Under TROA-EC, from April through September, Newlands credit water may be exchanged among the Truckee River reservoirs; under NAC, it remains in Stampede Reservoir.
- Under NAC, Newlands credit water is released as needed for the Newlands Project; under TROA, it is released after July 1 to the extent the following limits are not exceeded:

Lake Tahoe	600 cfs
Prosser	150 cfs
Stampede	250 cfs
Farad	600 cfs

- Under TROA-EC, Newlands credit water may be released and diverted as early as April to the extent that the following limits are not exceeded:
  - For April through July:

Lake Tahoe	800 cfs
Prosser	300 cfs
Stampede	600 cfs
Farad	1000 cfs

  - For August through October:

Lake Tahoe	600 cfs
Prosser	120 cfs
Stampede	400 cfs
Farad	700 cfs

b. Model Results and Evaluation of Effects

Reservoir storage and releases and flows at Farad and Nixon in wet, median, and dry hydrologic conditions are shown in the Water Resources Appendix, Exhibit 20. Newlands Project shortages for the Carson Division are shown in figure 3.30. Exhibit 21 in the Water Resources Appendix shows operations model results for Lake Tahoe and Stampede

Reservoir releases and Farad flows for the example of storing a large amount of Newlands credit water.

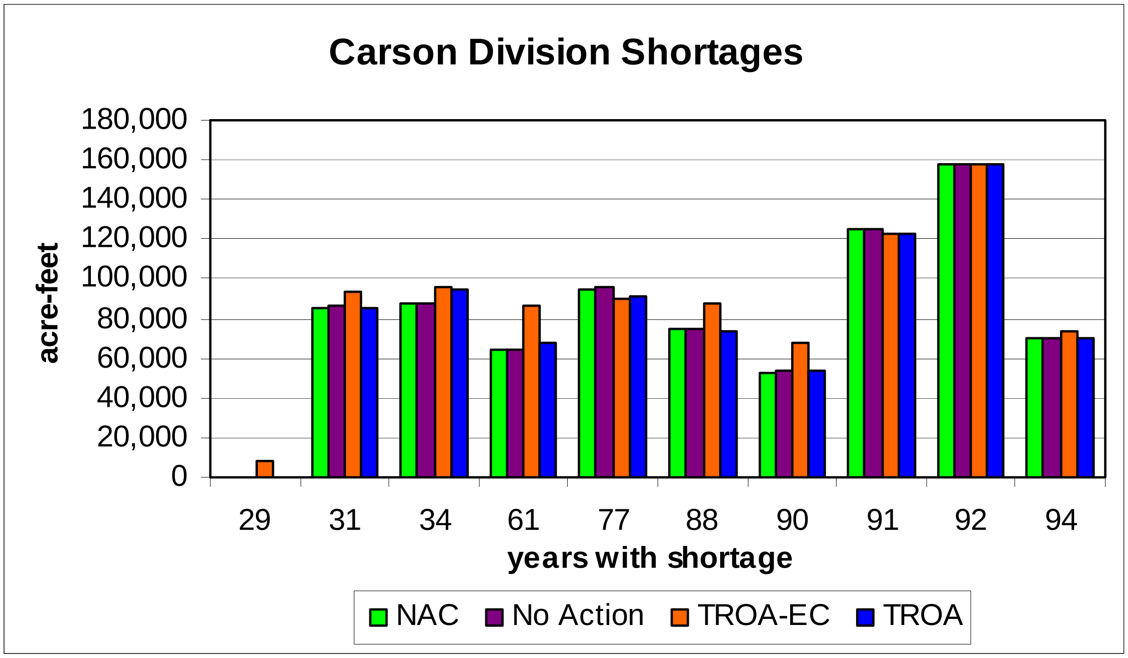


Figure 3.30—Expanded Newlands credit water scenario: Operations model results for Carson Division shortages.

Operations model results show that, under TROA, Newlands credit water is created in 21 years with a maximum storage of 1,300 acre-feet. Under TROA-EC, Newlands credit water is stored in 41 of the 100 years of analysis, with an average storage of 18,000 acre-feet and a maximum storage of 45,000 acre-feet. Under NAC, Newlands credit water is stored in 13 of the 100 years of analysis, with an average storage of 10,000 acre-feet and a maximum storage of 38,000 acre-feet. The fundamental difference between TROA and TROA-EC and NAC is that under TROA, there are more opportunities to establish Newlands credit water (e.g., it can be established adverse to Floriston rates and in other Truckee River reservoirs) and exchange Newlands credit water between reservoirs. For example, under TROA, Newlands credit water could be established or exchanged into Lake Tahoe when Stampede Reservoir is at or near capacity, which is not an option under No Action or NAC. Under NAC, it is possible to store a similar amount as under TROA through an exchange involving reducing diversions to the Truckee Canal, allowing the amount of water which could have been diverted to the Truckee Canal to flow to Pyramid Lake, and converting Fish Water in Stampede Reservoir in the amount of the diversion foregone to Newlands credit water.

In general, operations model results show that in median and dry hydrologic conditions there is more storage in Stampede Reservoir under TROA-EC than under TROA and less storage in Lahontan Reservoir when Newlands credit water is stored from December through June. The effect on Lahontan Reservoir storage may extend into the fall and, possibly, following years because, unlike current conditions, OCAP storage targets are less likely to be exceeded with the Newlands credit water operation and carryover storage is less likely to be available. This carryover storage may remain in Truckee River reservoirs (Newlands credit water converts to Fish Credit Water at the end of the irrigation season), resulting in greater storage in Stampede Reservoir and less storage in Lahontan Reservoir.

Operations model results show that average storage in Stampede Reservoir is greater under both NAC (1,000 acre-feet/year) and TROA-EC (4,000 acre-feet/year) than under No Action and TROA, respectively, because of the additional availability of Newlands credit water. Operations model results also show that flows at Farad and Nixon in dry hydrologic conditions in the late summer are not affected because Newlands credit water is only stored when an average-to-above-average flow year is forecast.

Because less water is diverted to Lahontan Reservoir under Newlands credit water operations, average Lahontan Reservoir storage is less and inflow to Pyramid Lake is greater than under either No Action or TROA. Pyramid Lake inflow is 1,330 acre-feet per year greater, and Lahontan Reservoir storage is 5,000 acre-feet per year less under TROA-EC storage than under TROA. Pyramid Lake inflow is 80 acre-feet per year greater, and Lahontan Reservoir storage is 1,000 acre-feet per year less under NAC than under No Action.

Operations model results show that Carson Division shortages (figure 3.30) occur in the same 9 years and are of similar magnitude for the respective years under TROA, No Action, and NAC. Under TROA-EC, One additional shortage year (of 8,000 acre-feet) occurs under TROA-EC, and in the other 9 shortage years, shortages are the same in one year and greater in the other eight years (differences ranging from 1,000 to 18,000 acre-feet) compared to TROA. Greater shortages occur under TROA-EC because less carryover storage is available in Lahontan Reservoir.

An additional analysis focused on those years in which a large amount of Newlands credit water is stored. Figure 3.31 shows data from the 10 years with the greatest storage (an annual average of approximately 35,000 acre-feet) of Newlands credit water and averages the storage in and releases from Lake Tahoe and Stampede Reservoir, storage in Lahontan Reservoir, and flows at Farad for these years. At Lake Tahoe and Stampede Reservoir, storage of a large block of Newlands credit water results in greater storage and smaller reservoir releases from December through the spring runoff under TROA-EC than under No Action and TROA. After the spring runoff, releases are greater under TROA-EC due to the release of Newlands credit water. Farad flow, corresponding to upstream water availability, is less from December through the spring runoff and greater during the summer than under No Action or TROA. Storage of Newlands credit water in Truckee River reservoirs results in less Lahontan Reservoir storage during the summer

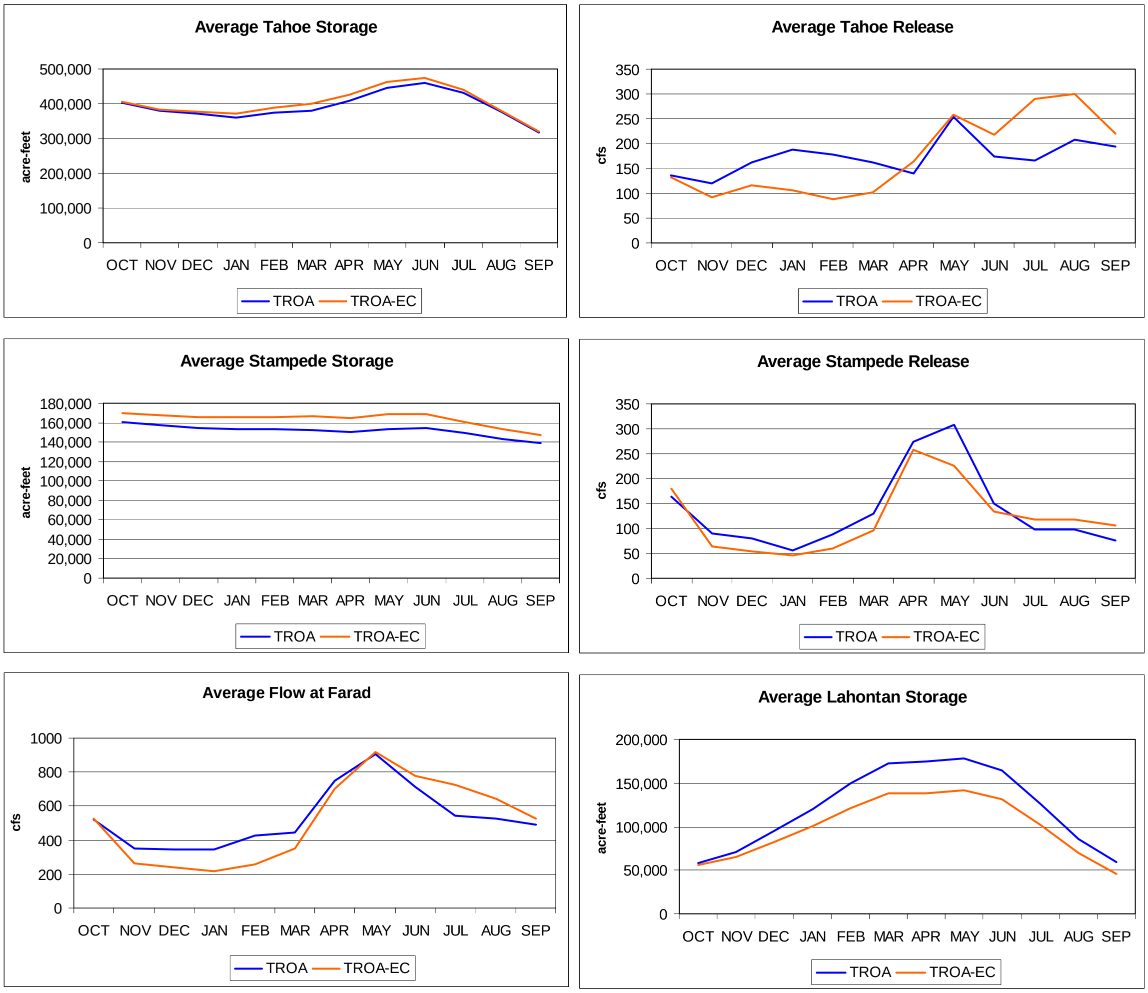


Figure 3.31—Expanded Newlands credit water scenario: Operations model results for selected parameters for years with the 10 largest amounts of Newlands credit water stored.

months than under TROA. Effects on Lahontan Reservoir under NAC would be similar to those under TROA-EC if 35,000 acre-feet of Newlands credit water were stored, except Lake Tahoe would not be affected because Newlands credit water is only stored in Stampede Reservoir under NAC.

Shortages are likely to be greater under expanded credit storage operations because the end-of-June Lahontan Reservoir storage objective is less likely to be exceeded; as a result, the amount of carryover storage (i.e., water in excess of the November storage target) is likely to be less. Shortages do not occur in years when credit storage operations are implemented, however, and the effects of shortages are exacerbated only to the extent that carryover potential is diminished. Real-time operations will likely vary seasonally and annually depending on water availability and coordination of scheduling.

2. Implementation of TROA with Current Conditions

This scenario was modeled to evaluate the potential differences between implementation of TROA with current conditions and full implementation of TROA in the future, with emphasis on Truckee River flows and diversions to the Newlands Project.

a. Method of Analysis and Model Input Assumptions

The same methods of analysis were used as described for the analysis of “Reservoir Storage and Releases,” “Flows,” and “Exercise of Water Rights to Meet Demand,” except this scenario compared the differences in operations model results between current conditions and current conditions with TROA (CCT) (i.e., current condition runs) to the differences between No Action and TROA (i.e., future condition runs). This comparison provides perspective on the effects of demographic change over time.

Current conditions, No Action, and TROA are the same as described previously. For this scenario, consumptive demands are the same as those for current conditions; assumptions for minimum flows, preferred and enhanced minimum flow targets, hydroelectric power bypass requirements, and recreational pool targets are the same as those for TROA, except for the following:

- As under current conditions, there is no California M&I Credit Water because all demands are met, and annual California M&I demand from Truckee River surface water is 2,800 acre-feet, leaving 7,200 acre-feet of Joint Program Water for use by California.

- For the 6,700 acre-feet of Truckee Meadows water rights to be provided by Reno, Sparks, and Washoe County for Water Quality Water under TROA, it is assumed that 4,900 acre-feet would be acquired from direct irrigation rights and 1,800 acre-feet from lands receiving treated sewage effluent. This acquisition reduces the diversion from the Truckee River to Truckee Meadows irrigation by 8,310 acre-feet (4,900 acre-feet of irrigation plus 3,410 acre-feet of losses), from 40,770 acre-feet to 32,460 acre-feet. It is also assumed 4,900 acre-feet of sewage effluent (the return flow from the wastewater groundwater component) is land-applied, reducing the annual discharge from TMWRF from 29,710 acre-feet to 24,810 acre-feet.

b. Model Results and Evaluation of Effects

Reservoir storage and releases in wet, median, and dry hydrologic conditions for current conditions, CCT, No Action, and TROA are shown in the Water Resources Appendix, Exhibit 22. Operations model results for Truckee Division and Carson Division shortages are shown in figure 3.32 and figure 3.33.

Operations model results for CCT and TROA are very similar except for (1) Truckee River flows from Farad to Derby Diversion Dam, (2) Newlands Project diversions (Truckee Division and Carson Division), and (3) inflow to Pyramid Lake.

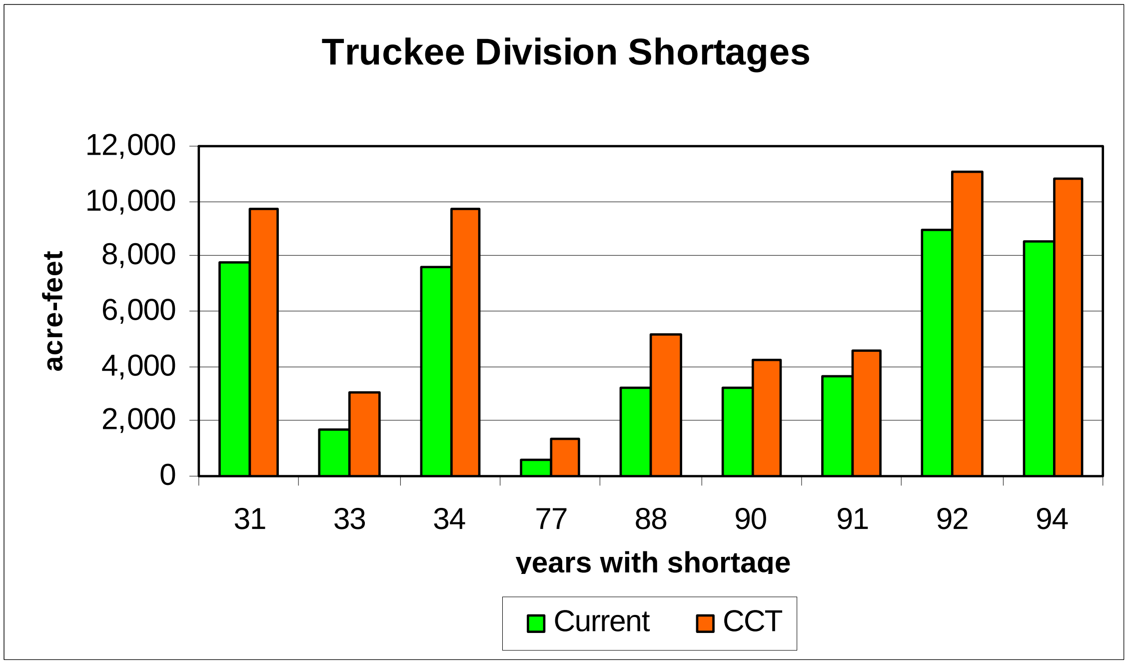


Figure 3.32—Implementation of TROA with current conditions scenario: Operations model results for Truckee Division shortages.

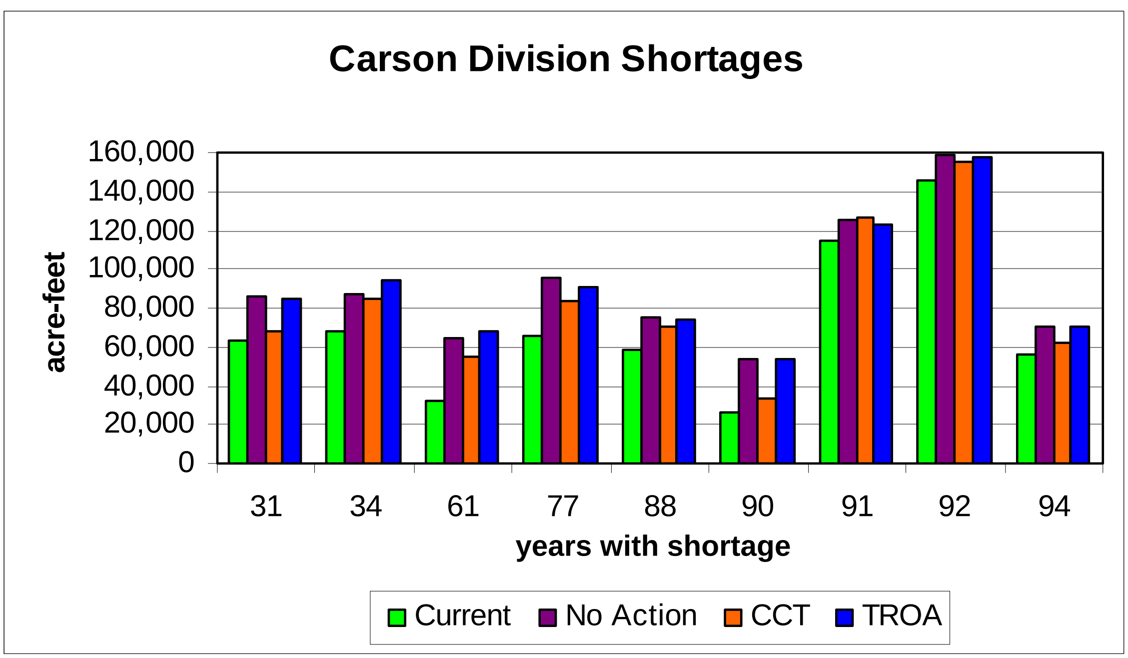


Figure 3.33—Implementation of TROA with current conditions scenario: Operations model results for Carson Division shortages.

Differences in Truckee River flows between Farad and Derby in August and September vary between the current and future condition runs. In dry hydrologic conditions, Truckee River flows at Vista are slightly less under CCT than under current conditions. Under TROA, flows at Vista are greater than under No Action because of the availability of more Water Quality Credit Water and Fish Credit Water, exercise of Claim Nos. 1 and 2 of the *Orr Ditch* decree, and less irrigation use in Truckee Meadows and the Newlands Project. Under CCT, flows at Vista are less because only 6,700 acre-feet of Water Quality Water is assumed to be provided; Claim No. 2 is not being exercised; less Fish Credit Water is available; and more irrigation demand is assumed in Truckee Meadows and the Newlands Project. In addition, under CCT, less water is available at Vista than under current conditions because 6,700 acre-feet of sewage effluent is land-applied instead of discharged directly to the Truckee River. In dry hydrologic conditions, the 6,700 acre-feet of sewage effluent is still land-applied, while only a portion of the water associated with the 6,700 acre-feet of water rights purchased as a condition of TROA is available for use. As a result, flows at Vista are slightly less under CCT than under current conditions.

Operations model results presented in figures 3.32 and 3.33 show the years when shortages occur in the Truckee and Carson Divisions of the Newlands Project. No Truckee Division results are shown for the alternatives because, in the future, it is assumed that all Truckee Division water rights would be acquired for Fernley M&I and water quality improvement purposes. Greater shortages occur under CCT than under current conditions because upstream water right owners are able to store water which, without TROA, they might be unable to divert and, so, the water would continue to flow. In other words, water that previously may have been available for diversion to the Newlands Project may no longer be available because, under TROA, upstream parties can exercise their water rights more effectively and fully.

Operations model results show that Carson Division shortages are slightly greater under CCT than under current condition. The difference in shortages is greater for current condition, because, although TMWA's irrigation rights are assumed to be the same, TROA initially (under CCT) allows more efficient use of upstream water rights, thus reducing water availability downstream. TROA provides that TMWA purchase 1.11 acre-feet of water rights for each acre-foot of new service commitment and use the savings from a water meter retrofit program for drought supply. Once fully implemented, more Truckee Meadows irrigation water rights would be purchased under TROA than No Action. A reduction in irrigation delivery under TROA would reduce depletions (by reducing canal losses) and increase water availability downstream (including to the Newlands Project) compared to No Action.

Operations model results indicate that, under TROA, the elevation of Pyramid Lake at the end of the period of analysis is approximately 2.5 feet higher than under No Action, about 1.5 feet higher than under current conditions, and about 1 foot higher than under CCT. See figure 3.34.

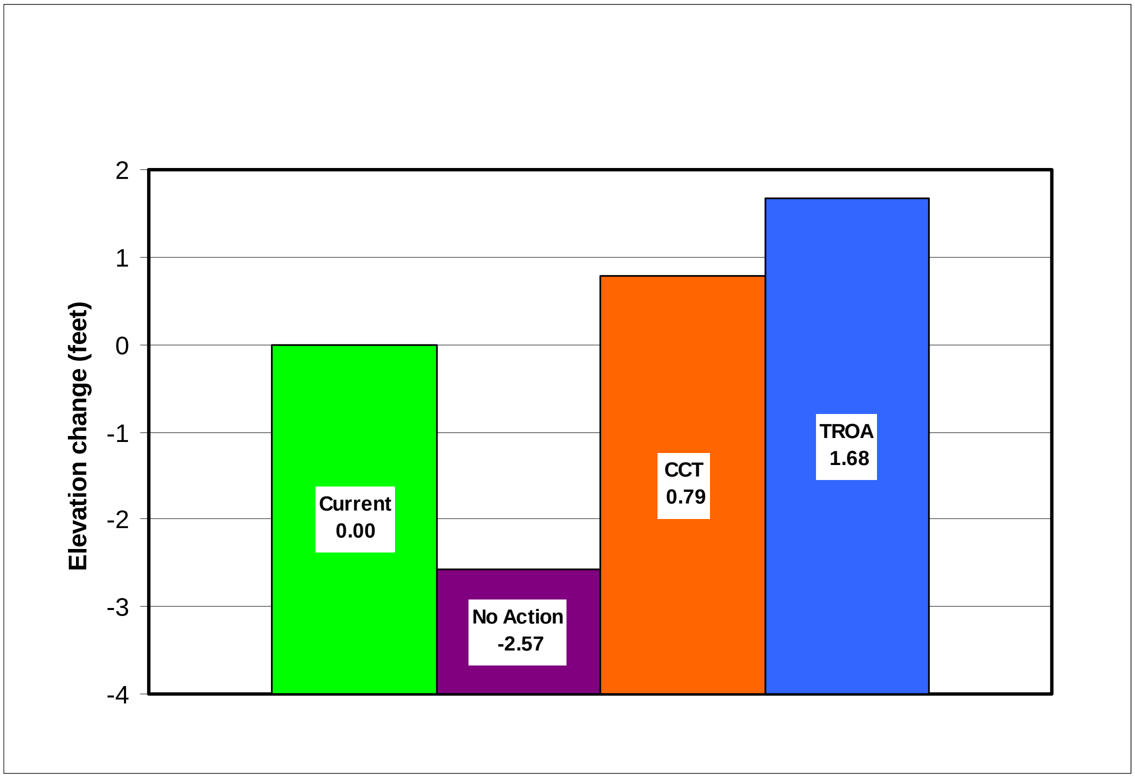


Figure 3.34—Difference between current conditions and No Action, CCT, and TROA in operations model results for the elevation of Pyramid Lake at the end of the period of analysis.

As discussed previously, programs under TROA assumed to produce additional inflow—the 1.11 acre-feet of water rights for each acre-foot of commitment by TMWA, the water meter retrofit program in Truckee Meadows dedicated to drought storage, as well as the Water Quality Credit Water program—are not fully implemented under CCT.

I. Credit Waters Not Modeled

Because of their speculative nature, California Environmental Credit Water, Additional California Environmental Credit Water, and Other Credit Water were not included in the operations model. It is possible, however, to characterize the use of these credit waters across a range of reasonably foreseeable scenarios. In each case, an uncertain amount of additional water, limited by the constraints in TROA, would be stored in upstream reservoirs for some period of time. Consequently, more water would be stored in the upstream reservoirs at various times under TROA than without TROA. Additional water in the reservoirs translates into additional recreational opportunity in those reservoirs. While flow in a portion of the Truckee River (and possibly a tributary) would be less when water is being stored, it would be greater when the water is released.

In the case of the two categories of California Environmental Credit Water, California specifically sought to reserve such storage opportunities during the TROA negotiations to improve flows within California for fish. Releases of that water would continue past the State line, thus also benefiting fish in Nevada. Also, California would use this water specifically for environmental purposes, and the uses are non-consumptive except for a small share of evaporation (which minimizes total flow impacts in Nevada). California would have the right and responsibility for optimizing the trade-offs and timing among storing its water rights versus letting the water flow to improve streamflows, retaining water in the reservoirs for recreation, and releasing water to increase streamflows. California M&I water storage could substitute for some diversions of surface water or use of groundwater in the basin for M&I use and, while in storage, would enhance recreational opportunity to a limited extent. (This category is limited to 3,000 acre-feet in most reservoirs, so the effect would be small). California Environmental Credit Water, together with California M&I Credit Water, could be stored up to a total of 8,000 acre-feet, of which 3,000 acre-feet may be stored in Truckee River reservoirs other than Lake Tahoe. Additional California Environmental Credit Water could be stored—up to 10,000 acre-feet at any one time. They were not modeled or analyzed in the EIS/EIR because their establishment is contingent on the purchase of water rights and the prospects for their future use are uncertain.

Other Credit Water, also addressed in the negotiated TROA, would be the lowest priority Credit Water managed pursuant to TROA. There are no proposals or assumptions for its use, and it was not included in model operations.

The establishment, storage, and release of each of these Credit Water categories may require further analysis under NEPA and/or CEQA. It is possible that some of these Credit Waters may never be used, but California assumes that Credit Water could be expected to be used for M&I storage.

GROUNDWATER

I. Affected Environment

This section provides an overview of groundwater supplies and demand in the study area.

In the California portion of the Truckee River basin, there is no regulatory limit on the right to pump groundwater. Under TROA, groundwater pumping would be limited to 32,000 acre-feet per year, less whatever surface water is diverted. (Under P.L. 101-618, surface water use currently is limited to 10,000 acre-feet per year.) In California's Martis Valley basin, the largest portion of the Truckee River basin in California, estimated groundwater recharge is about 34,600 acre-feet per year (Nimbus, 2001). Groundwater levels in wells adjacent to the Truckee River are higher than the river, which indicates that groundwater is moving into the river (Nimbus, 2001). In this setting, changes in riverflows would have very little effect on adjacent groundwater levels.

Although low-yield, private wells serve individual residences throughout the Truckee River basin, most groundwater pumping occurs in Truckee Meadows, where municipal water purveyors, such as TMWA, operate production wells to supplement the surface water supply. TMWA has 33 production wells, 22 of which are fitted for pumping and recharge (TMWA, 2003). Estimated groundwater recharge in Truckee Meadows is 29,000 acre-feet per year and comes from infiltration of precipitation (mainly snowmelt); return flows from surface water supplies used for irrigation; and seepage from ditches, canals, and streambeds. The total permitted, certificated, and vested groundwater rights recognized in Truckee Meadows by the State Engineer's Office are 79,765 acre-feet per year, or about 50,000 acre-feet per year more than the perennial yield. TMWA holds certificated and permitted groundwater rights in Truckee Meadows to divert up to 41,811 acre-feet per year.

In the Newlands Project, where the introduction of irrigation to Lahontan Valley resulted in substantial recharge of the shallow aquifer from canal seepage and irrigation losses, numerous domestic wells pump water from the shallow aquifer (USGS, 1993). Truckee River water is diverted into the Truckee Canal at Derby Diversion Dam for irrigation in the Truckee Division and for delivery to Lahontan Reservoir. Newlands Project OCAP has been promulgated to meet project irrigation requirements consistent with the *Orr Ditch* and *Alpine* decrees while minimizing use of Truckee River water and maximizing use of Carson River water for project purposes. Generally, diversion of Truckee River water to the Truckee Division varies directly with demand; diversion to the Carson Division depends in large part on Carson River inflow to Lahontan Reservoir.

In 1996, USGS estimated as many as 4,500 domestic wells could pump water from the shallow aquifer around the Fallon area. The Churchill County Assessor database shows that, as of April 2005, 4,814 wells were in use in the county. Because the wells generally are shallow (less than 150 feet deep), they are dependent on surface water recharge, primarily from canal seepage and irrigation losses. No measurement of the shallow aquifer recharge is available. However, estimated groundwater recharge for the Fallon area is 56 percent from canal seepage, 37 percent from irrigation losses, 5 percent from precipitation, and 2 percent from Newlands Project drains (USGS, 2000). Similarly, between Fallon and Stillwater WMA, estimated recharge is 47 percent from canal seepage, 40 percent from irrigation losses, 5 percent from precipitation, and 8 percent from Newlands Project drains. These estimates provide a relative degree of recharge that can be expected near irrigation facilities in this area.

Groundwater use in the Newlands Project could be affected by changes (decreases or increases) in the amount of water conveyed in canals and laterals. Current water rights programs involving the Newlands Project, including WQSA, WRAP, and Assembly Bill 380, would result in a reduction of irrigated acreage. NEPA compliance activities have been completed on these programs. For this analysis, future changes in the disposition and exercise of Truckee Division and Carson Division water rights were assumed to be implemented independent of TROA. Thus, water rights acquisition programs under the alternatives were assumed to be identical, and canal deliveries under the alternatives would be less than under current conditions.

Truckee Division irrigation is dependent on diversions from the Truckee Canal. Recharge of the local aquifer near the Truckee Canal is influenced by seepage losses from the canal. The general estimate of all losses from canals, spills, and on-farm irrigation losses is 64 percent of the diversion supply (CH2M Hill, 1973). Changes in canal seepage related to changes Truckee Canal flows could affect recharge of the local aquifer.

Water deliveries from Lahontan Reservoir to the Carson Division (that would support canal seepage and irrigation) are similar under all alternatives. The most recent study on the influence of changing irrigation practices is a modeling effort by USGS, which provides an indication of the order of magnitude of change expected in the shallow aquifer. USGS Water Resources Investigation Report 99-4191, prepared in cooperation with Reclamation, *Conceptual Evaluation of Ground-Water Flow and Simulated Effects of Changing Irrigation Practices on the Shallow Aquifer in the Fallon and Stillwater Areas, Churchill County, Nevada*, indicates changes for various irrigation and seepage reductions. The range of water level decline for the various scenarios modeled, including reductions in irrigated acreage, shows maximums between 2.6 and 10.3 feet. It should be noted that for this EIS/EIR, changes to irrigation and seepage losses are expected to occur between current conditions and No Action, and not between No Action and LWSA or TROA. For this reason, no further groundwater analysis for the Carson Division was required.

II. Environmental Consequences

A. Introduction

The operations model does not incorporate groundwater dynamics and it does not address the number of wells, their locations, amounts of groundwater recharged, or any surface water-groundwater interface. Therefore, a qualitative analysis was conducted to evaluate the effects of modifying operations of Truckee River reservoirs on groundwater using the following indicators:

- Recharge of the shallow aquifer adjacent to the Truckee River, as assessed estimated stream losses in the Oxbow reach of the Truckee River (Hunter Creek to Highway 395, shown on map 3.1)

- Recharge of the shallow aquifer in Truckee Meadows, as assessed by transfer of agricultural water rights to M&I use in the future and projected groundwater pumping

- Recharge of the shallow aquifer near the Truckee Canal, as assessed by average annual diversions to the Truckee Canal at Derby Diversion Dam, the resulting Truckee Canal inflow to Lahontan Reservoir, Lahontan Reservoir storage and releases to the Carson Division, and estimated losses from the Truckee Canal

- Groundwater pumping in the Truckee River basin in California and Truckee Meadows in Nevada

B. Summary of Effects

Operations model results show no major differences in Truckee River flows through Truckee Meadows among the alternatives; therefore, recharge of the shallow aquifer adjacent to the Oxbow reach would not be affected. Effects on recharge of the shallow aquifer in Truckee Meadows and establishment of a new groundwater equilibrium would vary slightly among the alternatives and depend upon many local factors, such as the amount of groundwater pumping, recharge, and the localized groundwater flow gradients. In the Truckee Division, total diversions into the Truckee Canal and, therefore, seepage losses from the Truckee Canal, would be similar under all alternatives. With criteria established for new well construction in California under TROA, assumed limitations on groundwater use, and development of surface water drought supplies, TROA likely would have the least effect on future groundwater resources among the alternatives. Table 3.21 summarizes the effects of the alternatives on groundwater.

Table 3.21—Summary of effects on groundwater

Indicator	Current conditions	No Action	LWSA	TROA
Recharge of aquifer adjacent to Truckee River in the Oxbow reach	Not quantified	Slightly less than under current conditions	Same as under No Action	Slightly more than under No Action; same as under current conditions
Recharge of the shallow aquifer in Truckee Meadows	Not quantified	Slightly less than under current conditions	Same as under No Action	Less than under No Action; much less than under current conditions
Recharge of shallow aquifer near Truckee Canal due to seepage losses	Not quantified	Much less than under current conditions	Slightly less than under No Action; much less than under current conditions	Slightly more than under No Action; much less than under current conditions
Groundwater pumping in the Truckee River basin in California (acre-feet per year)	7,750	19,600	18,400	Less than under No Action; much more than under current conditions
Groundwater pumping in Truckee Meadows	15,350 acre-feet average annual modeled pumping	Less than under current conditions	Slightly more than under No Action; less than current conditions	Less than under No Action; less than under current conditions

C. Recharge of the Shallow Aquifer Adjacent to the Truckee River in the Oxbow Reach

1. Method of Analysis

The Truckee River can have a component of seepage losses to the adjacent shallow aquifer, although some reaches, where the river channel is incised in rock or dense soils, have no (or very little) seepage. Conversely, some reaches of the Truckee River receive groundwater flow, or are "gaining," when the water level of the adjacent shallow aquifer is higher than that of the river channel.

For this analysis, the Oxbow reach of the Truckee River was used to compare flows and the associated potential for recharge (i.e., stream losses) of the adjacent shallow aquifer. The Oxbow reach was selected because it provides a setting where the river water level interacts with the adjacent water table (groundwater levels). Estimated stream losses are representative of water that becomes groundwater (i.e., "recharges the aquifer") when the adjacent shallow aquifer is both connected to the stream and has water elevations lower than the stream.

Flows in the Oxbow reach were generated from the operations model for current conditions and the alternatives in wet, median, and dry hydrologic conditions, and potential annual stream losses were estimated from these flows. Estimated stream losses were calculated simply as a percent of flows applied to the monthly flows.

This shallow aquifer is complex, with abrupt vertical and horizontal changes in lithology,[5] and estimating changes to it on the basis Truckee River flows is difficult (USGS, 1986). River and aquifer interactions also are complex, but have been simplified to the assumption that less water in the river means less water available to provide aquifer recharge through stream losses (USGS, 1986).

2. Threshold of Significance

Because insufficient information is available to determine a numeric threshold significance, this analysis provides a subjective assessment of the relative differences in stream losses among alternatives.

3. Model Results

Table 3.22 compares average annual stream losses in the Oxbow reach of the Truckee River in wet, median, and dry hydrologic conditions. Stream losses were estimated from average monthly flows generated from the operations model.

Table 3.22—Comparison of potential annual stream losses estimated from average monthly flows, in Oxbow reach of the Truckee River

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Wet	Not modeled	4 percent less than under current conditions	Same as under No Action	4 percent more than under No Action; same as under current conditions
Median	Not modeled	6 percent less than under current conditions	Same as under No Action	Same as under No Action
Dry	Not modeled	5 percent less than under current conditions	1 percent less than under No Action; 6 percent less than under current conditions	1 percent more than under No Action; 4 percent less than under current conditions

[5] Structure and composition of sediments and rock formations.

4. Evaluation of Effects

a. No Action

Analysis shows average annual stream losses under No Action are 4 to 6 percent less than under current conditions. These differences are very small and are not expected to affect recharge of the adjacent shallow aquifer.

b. LWSA

Average annual stream losses under LWSA could be 1 percent less than under No Action and 4 to 6 percent less than under current conditions. These differences are very small and are not expected to affect recharge of the adjacent shallow aquifer. Similarly, considering the change in flow depth, no discernible change is expected in stream losses.

c. TROA

Overall, in wet, median, and dry hydrologic conditions, potential stream losses to the adjacent aquifer under TROA range from 6 percent less to 5 percent more than under No Action or current conditions. These differences are very small and are not expected to affect recharge of the adjacent shallow aquifer. The monthly flow pattern under TROA could result in some small, short-term changes compared to No Action and current conditions; however, the local aquifer response is not immediate and depends upon other variables. The short-term changes would be a result of differences in monthly flows rather than total annual flows.

Flow depth under TROA is 2 percent shallower to 1 percent deeper than under No Action or current conditions. Because of the many natural variables within the stream/aquifer setting, the estimated differences in stream losses are not expected to result in any measurable change to the adjacent shallow aquifer.

5. Mitigation

No mitigation would be required because no significant adverse effects have been identified under any of the alternatives.

D. Recharge of the Shallow Aquifer in Truckee Meadows

1. Method of Analysis

This analysis evaluated the effects of transferring agricultural water rights to M&I use in Truckee Meadows. The effects on recharge of the shallow aquifer can be described only in general terms because of many variables, such as location of irrigated fields, number of existing wells, type of aquifer, depth of wells, types of crops, and variations in soils and aquifer material.

2. Threshold of Significance

Because of the many variables associated with the transfer of agricultural water rights in Truckee Meadows, this analysis provides a subjective assessment of their effects on recharge of the shallow aquifer.

3. Model Results

Currently, TMWA has accumulated 57,170 acre-feet of former irrigation water rights. Under No Action and LWSA, it is anticipated that developers would provide an additional 25,860 acre-feet. Due to the 1.11:1.00 ratio applied to water rights transferred under TROA, an additional 10,520 acre-feet is assumed to be transferred under TROA. Because of these transfers, less water would be applied to croplands and less water would pass through the crop rootzone to recharge the shallow aquifer. The operations model includes the irrigation diversions to Truckee Meadows. Average annual irrigation diversions under No Action and the LWSA are 20,720 acre-feet. Under TROA, the average annual irrigation diversion is 4,690 acre-feet, or 16,030 acre-feet less than under No Action or LWSA.

4. Evaluation of Effects

While the magnitude of the impacts cannot be determined given the available data on groundwater irrigation relationships and because the pattern of water rights acquisitions is not known at this time, some generalizations were made. To estimate the change in the amount of water expected to recharge the shallow aquifer as a result of these water rights transfers, an estimate of the portion of the water applied as irrigation is needed. Cohen (1964) estimated that about 25 percent of the water diverted for irrigation recharges the shallow aquifer. This estimate may not be exact, but it can be used to illustrate the relative differences between alternatives on recharge of the shallow aquifer due to irrigation changes. Variability in irrigation locations, irrigated crops, water use efficiencies, soils and field layouts, and other factors make it difficult to calculate total aquifer recharge or changes in depth to water. Similarly, other factors related to land use changes, such as the reduction of natural infiltration attributable to buildings and paving, extent and efficiency of lawn and landscape watering, and storm water control projects, compound the difficulty of predicting a future change in depth to groundwater.

Depending on the location and the proximity of irrigated land conversion, some localized effects could occur. The average irrigation diversion for the period of record is 20,720 acre-feet under No Action and LWSA and 4,690 acre-feet under TROA. If the lost irrigation recharge is contiguous and localized to an area of 5180 acres, (an estimate based on diversion of 20,720 acre-feet and 4 acre-feet per acre crop demand), then the recharge loss would be 0.77 feet per acre ((16030*.25)/5180). Assuming an aquifer specific yield of 20 percent, this 0.77-foot depth change of water would result in a water table decline of 3.85 feet for the year. This is an order of magnitude type of estimate, and the number of years it would continue until new water level equilibrium would be established cannot be predicted. However, at some depth and time, a new equilibrium would be established that would balance the aquifer recharge from the remaining irrigated land, pumping and recharge operations, and the changed land uses in regards to runoff, lawn watering, precipitation, etc. Because the irrigated land area is not a contiguous block of 5,180 acres, the surrounding area would likely have a moderating influence on the underlying water table depth changes.

From another point of view, 57,170 acre-feet of irrigation water rights already have been transferred under current conditions. A total of 83,030 acre-feet of water rights are expected to be transferred under No Action and LWSA; an additional 10,520 acre-feet (93,550 acre-feet) are expected to be transferred under TROA, or 13 percent more than under the other alternatives. This difference is not expected to substantially affect local recharge of the shallow aquifer in Truckee Meadows.

5. Mitigation

No mitigation would be required because recharge of the shallow aquifer in Truckee Meadows would not be significantly affected under any of the alternatives.

E. Recharge of the Shallow Aquifer near the Truckee Canal

Recharge of the local shallow aquifer near the Truckee Canal is influenced by seepage losses from the canal. The rate of seepage losses from the Truckee Canal and the recharge of the local shallow aquifer have been investigated by others (USGS, 2000). Estimated canal seepage losses have been reported in the range of 0.8 to 4.0 cfs per mile of canal. Changes in canal seepage losses related to changes in flows in the Truckee Canal would affect recharge of the local aquifer.

1. Method of Analysis

Seepage losses are dependent upon Truckee Canal flows; therefore, this indicator was evaluated by comparing modeled average annual diversions to the Truckee Canal at Derby Diversion Dam and Truckee Canal inflow to Lahontan Reservoir, as well as Truckee Canal seepage losses calculated as a component of *total* Truckee Canal losses incorporated in the operations model. These losses are a combination of seepage, evaporation, and spills. For this analysis, these losses were assumed to contribute entirely to aquifer recharge. The actual effect of canal losses would be expected to be less than described here. Evaluation of specific aquifer effects are subjective because of the variability in aquifer geology, locations of irrigated lands, and the degree to which an irrigation water right has been used.

2. Threshold of Significance

This analysis provides a subjective assessment of the relative differences in Truckee Canal flows that could affect recharge of the shallow aquifer near the Truckee Canal. No new data were collected; significance was determined on the basis of existing reports and model outputs.

3. Model Results

Table 3.23 presents operations model results for average annual diversions to the Truckee Canal at Derby Diversion Dam, the resulting Truckee Canal inflow to Lahontan Reservoir, and Lahontan Reservoir storage and releases to the Carson Division.

Table 3.23—Parameters associated with Truckee Canal operations (in average annual acre-feet)

Parameter	Current Conditions	No Action	LWSA	TROA
Diversion to Truckee Canal (at Derby Diversion Dam)	86,400	51,810	51,670	51,780
Truckee Canal inflow to Lahontan Reservoir	52,870	43,840	43,720	43,750
Lahontan Reservoir storage (end-of-June)	231,590	225,280	225,150	224,820
Lahontan Reservoir releases	311,620	303,400	303,290	303,360

Table 3.24 presents Truckee Canal modeled losses in years of high, median, and low diversions from the Truckee River.

Table 3.24—Average annual Truckee Canal losses (acre-feet)

Diversion	Current conditions	No Action	LWSA	TROA
High	29,300	22,420	22,340	22,790
Median	12,670	3,490	3,490	3,590
Low	7,980	150	150	150

4. Evaluation of Effects

Operations model results for the parameters shown in table 3.23 differ only slightly among TROA and the other alternatives; slightly less water is provided under TROA than under No Action because senior Truckee River water rights are more able to be fully exercised to create Credit Water.

Operations model results show that, with median diversion, Truckee Canal losses are about 9,000 acre-feet per year less under each of the alternatives than under current conditions (table 3.24). Assuming that (1) all losses recharge the shallow aquifer—which is not the case due to evaporation and operational spills—and (2) losses occurs over the full length of the canal (about 32 miles total), then recharge of the shallow aquifer would be 285 acre-feet per mile less under the alternatives than under current conditions. This recharge rate would not be the same for every mile of the canal because some areas would have greater losses than others, which would create variability in the depth of the adjacent shallow aquifer. Detailed geology and localized seepage losses estimates are not available, so only generalized estimates were made. Canal seepage losses also may travel away from the canal mostly in one direction (i.e., may not travel away from the canal equally in both directions), which would double the assumed effects on the local shallow aquifer or water table.

Therefore, considering the potential shallow aquifer recharge at the canal, calculated losses, and assumed aquifer characteristics, a decline of the shallow aquifer of 3.5 to 7.0 feet was calculated at the canal at the end of one year. This loss of recharge when compared to current conditions would cause the aquifer to continue to decline until other recharge and inflows create a new dynamic equilibrium.

Relative differences in shallow aquifer recharge resulting from changes in the amount of land that would receive irrigation water can be estimated from the acreages associated with irrigation and the amount of water applied. However, variability in cropping pattern, water use efficiencies, soils and field layouts and other factors, make it difficult to estimate recharge. The deliveries of irrigation water to the lands along the Truckee Canal are expected to cease under all alternatives; that is, 18,070 acre-feet less would be diverted for the land in the future. To estimate the effect on shallow aquifer recharge, irrigation losses were assumed to be 25 percent of the diverted water and about 3,900 acres of irrigated lands were assumed to be served. USGS (1996) estimated 3,000 acres near Fernley and 900 acres in the Carson Desert were irrigated. On the basis of these assumptions, shallow aquifer recharge is about 1.2 acre-feet of water per acre of land served. Assuming that soil specific yield is 20 percent, and that the 3,900 irrigated acres are contiguous, these 1.2 acre-feet of water would require an aquifer saturation depth of 6 feet. However, this saturation depth could be affected by many other factors, including the number of wells that pump groundwater and other recharge sources. In combination with the estimated reduction in seepage losses, the shallow aquifer near the canal could decline an estimated 9.5 to 13 feet. In general terms, this is the same order of magnitude estimated by USGS (2000) in its computer model.

5. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

F. Groundwater Pumping in the Truckee River Basin in California

Groundwater pumping can affect the depth to water in shallow aquifers. The response of the aquifer depends, in part, on the depth and rate of pumping and the hydraulic properties of the aquifer at each well. Generally, greater pumping of the shallow aquifer lowers the water level. Conversely, continued aquifer recharge projects tend to raise the water level.

1. Method of Analysis

This indicator was evaluated by comparing average annual groundwater pumping in the Truckee River basin in California, as incorporated in the operations model, under current conditions and the alternatives.

2. Threshold of Significance

Because insufficient information is available to determine a numeric threshold significance, this analysis provides a subjective assessment of the relative differences among alternatives.

3. Model Input

As shown in table 3.25, the operations model assumed the following average annual M&I groundwater pumping in the Truckee River basin in California (in acre-feet). (See attachment D.)

Table 3.25—Average annual M&I groundwater pumping in Truckee River basin in California

Alternative	Acre-feet
Current conditions	7,573
No Action	19,600
LWSA	18,400
TROA	18,400

4. Evaluation of Effects

Average annual groundwater pumping in the Truckee River basin in California is expected to increase from 7,570 acre-feet under current conditions to 19,600 acre-feet under No Action (an increase of 12,030 acre-feet per year) to meet future demand. It is not known where this increased pumping would occur. Water budgets presented in *Groundwater Availability in the Martis Valley Groundwater Basin and Placer Counties, California* (Nimbus, 2001) show that the average annual groundwater recharge in the Martis Valley basin in California is about 34,600 acre-feet per year, at the current pumping rate of 7,570 acre-feet per year, while about 17,640 acre-feet flows out of the area. Therefore, if increased groundwater pumping were to occur in the Martis Valley basin, groundwater discharge from the area could be reduced to about 5,610 acre-feet. Despite this fairly large reduction, outflow still would occur, demonstrating the aquifer’s capacity to handle this increased pumping. Groundwater pumping under LWSA and TROA is expected to increase slightly less than under No Action (18,400 acre-feet for an increase of 10,830 acre-feet a year), so effects on groundwater recharge in the Truckee River basin in California also should be slightly less than under No Action.

Increased groundwater pumping could affect the depth to water in local shallow aquifers. Also, depending upon the location of future wells and the timing of pumping, potential effects on local streams could range from minor increases in stream losses to changing stream reaches from gaining to losing. As discussed in chapter 2, Article Ten of the Agreement provides regulations for new well construction and location. The objective of Article Ten is to minimize the effect of groundwater pumping on surface water resources by establishing setback distances from streams, rivers, and ponds. Other requirements, such as well construction and seal methods, are included to help minimize effects on the surface water resources. With the implementation of TROA, increased groundwater pumping in the Truckee River basin in California should have limited effect on streams.

5. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

G. Groundwater Pumping in Truckee Meadows

Groundwater is a component of the water supply for many communities, and pumping from TMWA's 33 wells (29 are located within Truckee Meadows). These wells typically provide between 15 and 20 percent of annual net water production for TMWA (TMWA, 2003). Depending upon the availability of water, many of these wells also recharge the local aquifer to store water for future withdrawal.

As discussed for the Truckee River basin in California, groundwater pumping can affect the depth to water in shallow aquifers. The response of the aquifer depends, in part, on the depth and rate of pumping and the hydraulic properties of the aquifer at each pumping site. Generally, greater pumping of the shallow aquifer lowers the water level. Conversely, continued aquifer recharge projects tend to raise the water level.

1. Method of Analysis

The operations model includes groundwater use as a part of each of the alternatives. Nevada imposes limits on the amount of groundwater that can be withdrawn based on individual water rights for each well. This indicator was evaluated by comparing average annual groundwater pumping in Truckee Meadows, as incorporated in the operations model, and the maximum allowable amount of groundwater that can be pumped per year in drought conditions under current conditions and the alternatives.

2. Threshold of Significance

Because insufficient information is available to determine a numeric threshold significance, this analysis provides a subjective assessment of the relative differences among alternatives.

3. Model Results

Table 3.26 presents modeled average annual M&I groundwater pumping and maximum annual M&I groundwater pumping in drought conditions in Truckee Meadows.

Table 3.26—M&I groundwater pumping in Truckee Meadows (acre-feet/year)

Parameter	Current conditions	No Action	LWSA	TROA
Average (operations model results)	15,350	13,310	13,590	12,810
Drought conditions (maximum limit)	22,000	22,000	26,500	15,950

4. Evaluation of Effects

As shown in table 3.26, TROA is much less reliant on groundwater pumping than the other alternatives. The operations model shows the average annual groundwater pumping is 12,810 acre-feet under TROA, compared to 13,310 and 15,350 acre-feet under No Action and current conditions, respectively. Maximum annual groundwater pumping in drought conditions under TROA is 15,950 acre-feet compared to 22,000 acre-feet under both No Action and current conditions. LWSA includes a specific component to provide for 1,000 acre-feet per year of additional recharge in normal water years to offset the greater pumping in drought conditions (26,500 acre-feet per year compared to 22,000 acre-feet per year under No Action and current conditions). Groundwater recharge is also a part of the current conditions and is expected to continue under the alternatives, as TMWA has 28 of its existing wells fitted for aquifer recharge functions. Considering the combination of pumping, recharge, and the relative degree of similarity of these alternatives, it is difficult to identify significant overall aquifer impact; however, because TROA has the lowest groundwater pumping requirements, it likely would have the least effect on future groundwater resources among the alternatives.

5. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

WATER QUALITY

I. Affected Environment

This section provides an overview of water quality in the study area and describes aspects of water quality that could be affected by modifying operations of Truckee River reservoirs.

Bender (1995) summarized historical Truckee River water quality data (through 1992) for the Truckee River basin from Lake Tahoe to Pyramid Lake; several data bases, which include many water quality parameters, were assessed separately. The following overview of water quality is based on data and water quality modeling for the Truckee River.

As the Truckee River flows from Lake Tahoe to Pyramid Lake, pollutants, including nutrients and total dissolved solids (TDS or organic and inorganic material in solution with water) resulting from natural erosion of the watershed and from the effects of humans, enter the river and degrade the water quality. Additionally, water is diverted for agricultural and M&I uses and is returned to the river in diminished quantity and quality. Available data did not reveal any major sources of contamination other than erosion of the watershed, agricultural runoff, and wastewater treatment plant discharges.

Metals in the Truckee River and its tributaries are not a major concern, although some concentrations are excessive on rare occasions. For example, historical data indicate that cadmium, lead, manganese, nickel, and thallium concentrations occasionally exceeded State and Federal standards. While silver and zinc concentrations were occasionally elevated in fish and invertebrate tissues, available tissue data did not reveal any excessive bioaccumulation. Naturally occurring radioactive materials are not a major concern because of low concentrations and localized occurrence.

A. Truckee River Basin: Lake Tahoe to Reno

Lake Tahoe is considered a pristine water resource. Water quality issues at Lake Tahoe are being studied and addressed by interstate agencies. Because it has been designated an Outstanding Natural Resource (ONR) under the Clean Water Act (1972 Federal Water Pollution Control Act), no man-induced degradation of Lake Tahoe's water quality is allowed. California has designated Lake Tahoe as "water of extraordinary ecological or esthetic value;" Nevada has not similarly designated Lake Tahoe.

From Lake Tahoe to Reno, the Truckee River basin is relatively pristine, with few contaminants and nutrients. Low dissolved oxygen (DO) concentration, which is harmful to fish, does not occur in this reach because of high reaeration (steep, turbulent) and low organic oxygen demand.

The primary water quality concern for the reach from Lake Tahoe to Reno is the potential for warm water temperature downstream from the discharges of TTSA and TMWR, particularly during periods of low flow. TTSA, which serves the town of Truckee and part of the community around Lake Tahoe, is located just upstream of the confluence of Martis Creek and the Truckee River. TMWRF is located just downstream from Reno. In warm weather, low flows, warm reservoir releases, and warm drainage return flows can cause the Truckee River to warm to temperatures that are detrimental to aquatic resources, including fish. For example, these conditions resulted in a fish kill downstream from the State line during the summer of 1994.

Historical data indicate that temperatures between the State line and Reno occasionally exceed acute (instantaneous exposure) and chronic (prolonged exposure) limits for trout during July and August (Bender, 1995). When Prosser Creek Reservoir or Boca Reservoir elevation is high, cool water can be released to lower the temperature in the mainstem Truckee River; however, when reservoir elevation is low, releases are warmer.

Lakes and reservoirs between Lake Tahoe and Reno appear to have no major water quality problems, although thermal stagnation due to minimal flushing and long residence time of bottom waters can result in low concentrations of DO in the bottom layers of Prosser Creek, Stampede, and Boca Reservoirs. However, bottom water aerates quickly once released, thereby increasing DO concentrations to near saturation.

B. Truckee River Basin: Reno to Pyramid Lake

From Reno to Pyramid Lake, the primary water quality concerns are warm temperatures and low DO concentrations. In warm weather, temperatures gradually increase downstream, especially in the flatter reach downstream from Reno, where flow velocities are slower. Warm temperatures and slower velocities allow algae attached to the river bottom to accumulate, increasing organic matter. Decay of organic matter, such as dead algae, can result in low concentrations of DO. (See “Exceedences of Temperature and Dissolved Oxygen Standards.”) Nutrients, which are abundant downstream from TTSA and TMWRF, help stimulate excessive algal growth in the Truckee River. Excessive algal growth downstream from Derby Diversion Dam also causes low DO concentrations.

TDS concentrations in the Truckee River also increase downstream and are a concern because Pyramid Lake is a terminal saline lake. Both temperature and salinity affect density stratification of the water layers of Pyramid Lake. Long periods of stratification lead to oxygen-deficient bottom waters, which stress cold water organisms. Below-average freshwater flows and high evaporation rates increase TDS concentrations in the surface waters of Pyramid Lake and can facilitate early turnover by increased mixing which replenishes oxygen-deficient bottom waters. Above-average freshwater inflow can dilute the salinity of surface waters so that mixing of Pyramid Lake during winter might be physically impossible due to density differences. However, a steady decline in the elevation of Pyramid Lake would also reduce the probability of mixing events.

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect lake and reservoir storage and elevations and the quantity, timing, and duration of flows. These changes could result in daily, seasonal, and annual changes in Truckee River water quality and loadings to Pyramid Lake.

This analysis evaluated the effects of changes in reservoir storage and water elevations and flows on water quality using the following indicators:

- Truckee River flows in August (irrigation month) and October (non-irrigation month) at three locations: (1) upstream of TTSA, (2) downstream from TMWRF, and (3) the inflow point to Pyramid Lake in wet, median, dry, and very dry hydrologic conditions (10-, 50-, 90-, and 95-percent exceedences).

- Annual total of days that Nevada water temperature standards are exceeded downstream from Reno. (Exceedence of standards does not imply a violation, which is an enforcement term, but rather denotes temperatures outside the range of desired criteria.)

- Annual total of days that Nevada DO standards are exceeded downstream from Reno. (Again, exceedence of standards does not imply a violation, but rather denotes DO outside the range of desired criteria.)

- TDS loadings to Pyramid Lake.

- Total nitrogen loadings to Pyramid Lake.

- Total phosphorus loadings to Pyramid Lake.

Truckee River flow is the most important indicator because it dilutes poor quality water and ties directly to reservoir operations.

TDS, nitrogen, and phosphorus (nutrient) loadings to Pyramid Lake were chosen as indicators because loadings are the output of the Dynamic Stream Simulation and Assessment Model with temperature (DSSAMt) and the input to the Pyramid Lake water quality model. Loading to Pyramid Lake is the linkage between watershed/riverine drainage modeling and the Pyramid Lake modeling.

The Truckee River transports nutrients from California to Nevada. However, interstate total maximum daily load (TMDL) issues are outside the scope of this water quality analysis. See Chapter 4, “Cumulative Effects,” for a discussion of TMDL issues.

B. Summary of Effects

Overall, under TROA, water stored in Truckee River reservoirs in wet and median years would be used to improve riverine water quality in dry years, the most critical periods for aquatic resources, including fish. In the Truckee River basin from Lake Tahoe to Reno, based on a review of historical data and best professional judgment, and when compared to appropriate California, Nevada, and Federal water quality standards, there would be no significant adverse effect on water quality under TROA. California water quality standards were used in the analysis of effects on water quality from Lake Tahoe to the State line, and Nevada water quality standards were used in the analysis of effects on water quality from the State line to Pyramid Lake. In the Truckee River basin from Reno to Pyramid Lake, under TROA, water quality standards would be met more often in representative dry years and the same or occasionally less often in representative median years than under No Action or current conditions. For example, under TROA, Truckee River TDS standards in the reaches downstream from Reno may be met less often in wet years, and more TDS may be delivered to Pyramid Lake in median years because of greater flows. However, when considering several water quality indicators, such as DO, temperature and TDS, the total water quality benefits realized in dry years under TROA would outweigh occasional adverse effects in median years and wet years. In general, greater inflow to Pyramid Lake and the resulting higher elevation and greater volume under TROA would be favorable for water quality. There are few water quality problems in representative wet years.

Table 3.27 presents Truckee River Operations Model results for average monthly (based on 100 years of record) flows in two representative months at three representative river locations in wet, median, dry, and very dry hydrologic conditions. Operations model results show that flows at the three locations are the same or nearly the same under No Action, LWSA, and TROA as under current conditions, except in dry and very dry hydrologic conditions. In dry and very dry hydrologic conditions, flows downstream from Reno and into Pyramid Lake under TROA are greater than under No Action or current conditions. In very dry hydrologic conditions, flows downstream from Reno are greater under TROA than under No Action. Under TROA, flows are adequate to dilute wastewater downstream from both TTSA and TMWRF discharge points to acceptable levels. Flows under LWSA are nearly the same as under No Action.

Table 3.28 summarizes DSSAMt results for other indicators of water quality in representative wet, median, and dry years. (See the Water Quality Appendix for definitions of representative wet, median, and dry years.) These representative years (1986—wet; 1989—median; and 1992—dry) were chosen based on recent operations rather than a long-term record. Overall, DSSAMt results show that Truckee River water quality under TROA would be better than under No Action, as shown by the number of days Nevada temperature and DO standards are exceeded downstream from Reno. These temperature and DO indicators are the most telling indicators of water quality in this reach.

Table 3.27—Truckee River average monthly flows (cfs) for selected months and reaches

Hydrologic condition	Current conditions	No Action	LWSA	TROA
August flows upstream of TTSA				
Wet	442	441	442	329
Median	110	112	112	116
Dry	68	67	66	68
Very dry	26	24	24	22
August flows downstream from TMWRF				
Wet	456	422	422	401
Median	370	339	338	360
Dry	242	288	288	323
Very dry	85	141	141	196
August flows into Pyramid Lake				
Wet	300	300	300	300
Median	200	264	265	262
Dry	109	110	110	122
Very dry	27	79	79	110
October flows upstream of TTSA				
Wet	340	347	348	309
Median	260	270	271	202
Dry	23	29	31	41
Very dry	5	12	14	21
October flows downstream from TMWRF				
Wet	683	729	729	651
Median	434	460	460	452
Dry	182	180	177	207
Very dry	63	79	79	114
October flows into Pyramid Lake				
Wet	674	711	710	631
Median	396	429	429	432
Dry	100	109	109	104
Very dry	25	35	35	56

Table 3.28—Summary of modeled exceedences of Nevada temperature (T) and DO standards

Representative year	Current conditions	No Action	LWSA	TROA
Days T standards exceeded Lockwood-Derby				
Wet	32	32	32	29
Median	28	32	27	28
Dry	85	120	119	87
Days DO standards exceeded Lockwood-Derby				
Wet	0	0	0	0
Median	0	0	0	0
Dry	109	42	39	3

Table 3.29 summarizes DSSAMt results for TDS, total nitrogen, and total phosphorus loadings to Pyramid Lake. These mass loadings were derived by multiplying concentration by flow. Results show that, under TROA, loadings to Pyramid Lake are greater than under No Action or current conditions in representative median and dry years. Results also show greater differences in water quality *among* representative wet, median, and dry years than between No Action and TROA. As shown in table 3.29, the majority of loading to Pyramid Lake occurs in representative wet years; however, the cumulative loadings (i.e., total combined loadings in representative wet, median, and dry years) to Pyramid Lake themselves differ little (less than 10 percent) between the alternatives and current conditions. Greater loading indicates that, cumulatively, more flow would reach Pyramid Lake under TROA.

Table 3.29—Summary of loadings to Pyramid Lake

Representative year	Current conditions	No Action	LWSA	TROA
TDS loading to Pyramid Lake (100,000 kilograms)				
Wet	1,243	1,238	1,237	1,222
Median	355	346	345	353
Dry	143	119	120	177
Total nitrogen loading to Pyramid Lake (1,000 kilograms)				
Wet	358	368	365	344
Median	65	67	67	70
Dry	12	11	11	20
Total phosphorus loading to Pyramid Lake (1,000 kilograms)				
Wet	40	41	41	39
Median	7	7	7	7
Dry	1.6	1.4	1.4	3.1

Under TROA, water stored in wet and median years would be used during warm periods in dry years, the times with the greatest water quality concerns. Therefore, water quality typically would be better under TROA in representative dry years than under No Action or current conditions.

Tables 3.27, 3.28, and 3.29 summarize a large amount of information for purposes of comparing alternatives. Detailed modeling information for all locations and reaches, for shorter periods of time, for wet, median, and dry hydrologic conditions, and for many water quality constituents are provided by Brock and Caupp (2004a-h) in two volumes for each alternative. The Water Quality Appendix provides additional information, including summary tables of the water quality simulations (DSSAMt tables 1 through 12) and fish water temperature simulations (DSSAMt tables 13 through 24).

C. Overview of Methods of Analysis

Two methods were used to analyze water quality: (1) a historical data analysis of the entire Truckee River system, and (2) a computer modeling analysis (DSSAMt) of the Truckee River from just downstream from the California-Nevada State line to Pyramid Lake**.** The historical data analysis was used to identify water quality concerns throughout the Truckee River basin. Historical data were compared to appropriate California, Nevada, and Federal water quality standards; the following section summarizes water quality standards for both California and Nevada waters affected by TROA. Because DSSAMt addresses water quality downstream from the California-Nevada State line (i.e., in Nevada), it was used to quantitatively compare riverine water quality under current conditions and the alternatives only to Nevada water quality standards. The reach from Reno to Derby Diversion Dam, the flatter river reach, has marginal or degraded water quality and was the focus of the modeling, as discussed further in this section. Brock et al. (2004) provide a complete model formulation and program description. Brock and Caupp (1997, 1998a, 1998b) also provide a complete description of water quality standards and model calibration, verification, performance, input sensitivity, and simulated river temperatures and water quality. The Water Quality Appendix references these documents and also includes summary statistics for DSSAMt calibration and verification.

Upstream and tributary flows and DSSAMt input boundary conditions were derived from Watershed Analysis Risk Management Framework (WARMF) model output. To correspond with flows and operations used for current conditions, flow inputs for the WARMF model were developed from operations model output, while land use changes were used to predict changes in nonpoint sources. Land use from 1999 was used for current conditions, and predicted land use in 2020 was used for the alternatives.

The effect of biological nitrogen removal (BNR) at TTSA was modeled for both current conditions and the alternatives. BNR is environmentally superior to the previous anion exchange technology and has the ability to minimize TDS and chloride increases in the Truckee River while achieving target nitrogen concentrations. These upgrades will greatly reduce the salt loads reaching Nevada and, ultimately, Pyramid Lake. However, nitrate loadings from TTSA would increase by the year 2033 because of a projected maximum 7-day average municipal wastewater flow increase under current conditions of 7.4 million gallons per day to 9.6 million gallons per day under the alternatives. (Also, see “Total Dissolved Solids and Nutrient Loadings to Pyramid Lake.”)

Point source loadings for TMWRF were derived for current and a realistic future wastewater treatment process. Because of increases in population or development and corresponding increases in wastewater discharges with the existing wastewater treatment plant operations and future streamflows, the modeled TMWRF total nitrogen mass loadings were consistently projected to exceed permitted values. A major component of the total nitrogen is organic nitrogen, which is not readily bioavailable and likely does not substantially add to algal biomass or result in low DO. Therefore, model results show that “total” nitrogen standards are exceeded frequently; however, DO standards are exceeded infrequently, especially under TROA.

The analysis assumed that cities and counties will attempt to meet future Truckee River water quality objectives by constructing additional treatment facilities, providing additional dilution water, or by spreading wastewater over agricultural lands with makeup water provided to the Truckee River. TMWRF managers have recognized the total nitrogen and organic nitrogen issues and are studying cost-effective approaches. DSSAMt assumed that State and local governments would implement sufficient mechanisms as populations grow to treat wastewater and limit urban runoff to maintain adequate riverine water quality, including storm water best management practices and total maximum daily loads. Under section 303(d) of the Clean Water Act, States, territories and authorized tribes are required to develop a list of water quality limited segments. Waters on the “303(d) list” are considered impaired, i.e., they do not meet water quality standards, even after installation of the minimum required levels of pollution controls. The law requires that these jurisdictions establish priority rankings for waters on the 303(d) lists and develop action plans, called TMDLs, to improve water quality.

Nevada’s 303(d) list of impaired water bodies includes the Truckee River reach from Reno (East McCarran Boulevard) to Derby Diversion Dam. Existing TMDLs for total nitrogen, total phosphorus, and TDS were established in 1993 at Lockwood, which is downstream from discharges from TMWRF. This study emphasized evaluation of water quality in the Lockwood to Derby Diversion Dam reach. Temperature and DO in the Lockwood to Derby Diversion Dam reach are the most important indicators of water quality in this critical reach. Also see “Sedimentation and Erosion.”

DSSAMt simulates hourly changes in 26 water quality parameters for 105 subreaches of the Truckee River. Automated plots and tables of summarized information were generated for analysis. Results include data on all indicators of water quality except Truckee River flows.

Inputs to DSSAMt included flows generated from the operations model, actual meteorological data, actual water quality data, initial and boundary water quality conditions derived from WARMF, and Nevada water quality standards and preferred temperatures. Flows generated from the operations model and actual air temperature data were used to predict water temperature and DO concentrations and loadings to Pyramid Lake.

Truckee River flows were generated from the operations model for wet, median, dry, and very dry hydrologic conditions in representative months at representative locations.

These indicators and the methods of analysis are appropriate for assessing potentially significant effects on water quality. However, no certain correlation exists between the indicators and all other water quality constituents. Therefore, 9 years of data were used to calibrate and verify the temperature and water quality components of DSSAMt to reduce the uncertainty of analysis.

D. Summary of Pertinent Water Quality Standards for California Waters

The term “water quality standards” is defined in regulations that implement the Clean Water Act:

> Water quality standards are provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water, and serve the purposes of the act (40 Code of Federal Regulations [CFR] 130.2(d) and 131.3(i)).

Thus, water quality standards must contain at least two critical components: (1) the designation of beneficial uses of water (contained in the Water Quality Appendix) and (2) the establishment of water quality criteria designed to protect those uses.

In California, the Water Quality Control Plans contain the State’s water quality standards because these plans set forth beneficial uses of water of the State and water quality objectives (the “criteria” under the Clean Water Act) to protect those uses. One critical difference between the State and Federal programs is that while the Clean Water Act focuses on surface water resources, the term “waters of the state” under the Porter-Cologne Act includes both surface water and groundwater. Therefore, California has water quality standards applicable to groundwater as well as to surface water. The Porter-Cologne Water Quality Control Act is found in Division 7 of the California Water Code.

California's water quality standards include designated beneficial uses and narrative and numerical water quality objectives. Twelve different beneficial uses apply to Lake Tahoe, and fourteen apply to the Truckee River; a similar variety of uses has been designated for tributary waters. In particular, all surface waters of these basins are designated for municipal and domestic supply (MUN) use, and all lakes and streams of the Truckee River basin are designated for “Rare, Threatened, or Endangered Species” use in recognition of the proposed reintroduction of the LCT to its original range. Beneficial uses would not change under the alternatives. Beneficial uses of surface water in the California portion of the study area (Lake Tahoe, Little Truckee, and Truckee River basins) include the following:

- Municipal and domestic supply
- Agricultural supply
- Ground water recharge
- Freshwater replenishment
- Water contact and non-contact recreation
- Cold freshwater habitat
- Wildlife habitat
- Hydroelectric power generation (Truckee River and Little Truckee River basins only)
- Rare, threatened, or endangered species
- Migration of aquatic organisms
- Spawning, reproduction, and development
- Water quality enhancement
- Flood peak attenuation/flood water storage
- Industrial service supply (Truckee River basin only)
- Navigation (Lake Tahoe and Truckee River basins only)
- Commercial and sportfishing (Little Truckee River and Truckee River basins only)
- Preservation of biological habitats of special significance (Lake Tahoe basin only)

Beneficial uses of groundwater in California include the following:

- Municipal and domestic supply
- Agricultural supply
- Industrial service supply

Applicable water quality objectives include region-wide objectives for parameters such as un-ionized ammonia, dissolved oxygen, taste and odor, pH, and pesticides. State drinking water maximum contaminant levels for chemical constituents (including “priority pollutants”) and radioactivity apply to all waters designated MUN.

Waterbody-specific objectives have been adopted for constituents such as nutrients, TDS, and chloride. Most of these objectives have been set at monitored or modeled historic natural background levels, which generally reflect much higher quality than that needed to protect MUN use. The aquatic life uses of the Lake Tahoe and Truckee River basins reflect oligotrophic (low productivity) or nutrient poor conditions, and stringent nutrient objectives are needed to prevent eutrophication or nutrient rich conditions. Objectives for Lake Tahoe include the clarity and phytoplankton primary productivity levels measured between 1968 and 1971. Revised wastewater discharge requirements for the Truckee River downstream from TTSA leach fields are mass loading limitations and reflect effects of natural background quality. While less-than-natural quality is allowed downstream from TTSA as a result of findings under the State nondegradation policy in 1980, TTSA will evaluate nitrogen removal if objectionable levels of periphyton (attached algae) occur in this reach in the future.

The Lahontan Basin Plan includes a regionwide narrative nondegradation objective which implements California State Water Resources Control Board (SWRCB) Resolution 68-16. This resolution provides that the quality of high-quality waters cannot be lowered unless findings are made that the degradation is of maximum benefit to the people of the State and that it will not reasonably affect present and anticipated beneficial uses. If degradation is permitted, quality cannot be lowered to less than levels required by water quality standards. The basin plan also includes a separate regionwide nondegradation objective for wetland communities and populations, which, among other things, provides, “All wetlands shall be free from activities that would substantially impair the biological community as it naturally occurs due to physical, chemical, and hydrologic processes.”

For stream segments and water bodies that are not listed under section 303(d) (total maximum daily loads and individual water quality-based effluent limitations) of the Clean Water Act, Federal antidegradation regulations provide that where lowering of water quality is permitted in exchange for socioeconomic benefits, beneficial uses must still be fully protected.

California water quality goals were used to identify potential water quality issues in the reaches of the Truckee River and tributaries located in California. Recent California water quality goals are summarized by Marshack (2003).

E. Summary of Pertinent Water Quality Standards for Nevada Waters

The Nevada Administrative Code (NAC), Chapter 445A.118-445A.225 contains the State's water quality standards. NAC contains two types of water quality standards, narrative and numeric. The narrative standards are applicable to all surface waters of the state and consist mostly of statements requiring water to be "free from" various pollutants including those that are toxic. The numeric standards for conventional pollutants are broken down into two types: class and water body specific. For the class waters, criteria for various pollutants are designed to protect the beneficial uses of classes of water, from A to D; with class A being the highest quality. The water bodies belonging to these classes are named in the regulations.

For major water bodies in Nevada, site-specific numeric standards have been developed. These standards include both criteria designed to protect the beneficial uses and antidegradation requirements. The antidegradation is addressed through the establishment of "requirements to maintain existing higher quality" (RMHQ). RMHQs are set when existing water quality (as evidenced by the monitoring data) for individual parameters is higher than the criteria necessary to protect the beneficial uses. This system of directly linking antidegradation to water quality standards provides a manageable means for implementing antidegradation through the permit program and other programs. The Truckee River has site-specific standards, and these were incorporated into DSSAMt (Nevada, 2004).

Beneficial uses in the Lake Tahoe and Truckee and Carson River basins in Nevada include the following: irrigation; watering of livestock; contact and non-contact recreation; industrial supply; municipal and/or domestic supply; propagation of wildlife; propagation of aquatic life; enhancement of water quality (Lake Tahoe basin only); and water of extraordinary ecological or aesthetic value (Lake Tahoe basin only). Nevada State standards do not apply to Tribal lands.

F. Truckee River Flows

The most important indicator of Truckee River water quality is flow, which affects all aspects of water quality, including dilution of water reclamation facility discharges. Low flows result in warming of the river and in stagnant water, while high flows flush nutrients, organics, sediments, and poor quality water downstream.

1. Method of Analysis

Flows vary according to time of year, river location, and hydrologic condition. Flows (generated from the operations model) were compared in two representative months at three representative river locations in wet, median, dry, and very dry hydrologic conditions (10-, 50-, 90-, and 95-percent exceedences).

August was selected as the low-flow irrigation month and October as the low-flow non-irrigation month. Three river locations were evaluated: (1) upstream of TTSA, (2) downstream from TMWRF, and (3) the inflow point to Pyramid Lake. The first location incorporates the dilution downstream from the water reclamation facility in California. The second location incorporates the dilution just downstream from the major metropolitan Reno/Sparks area with warm temperatures and the reach with a DO "sag" due to decaying organics and algal growth from nutrients. Loadings to Pyramid Lake were calculated at the inflow point.

2. Threshold of Significance

In general, a 10-percent or greater difference in flows between the alternatives and current conditions or between the action alternatives and No Action was considered significant. The combination of errors in factors such as instrumentation, flow data collection, data processing, and computation have a 5- to 10-percent margin of error. However, relative differences among model results are more accurate and have less than a 5-percent margin of error.

3. Model Results

Table 3.27 presents operations model results for August and October flows at the three locations in wet, median, dry, and very dry hydrologic conditions.

4. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, flows at the three locations are similar or greater than under current conditions, except upstream of TTSA in August in very dry hydrologic conditions, when flows may be 8 percent less (24 cfs compared to 26 cfs). This difference is insignificant because it is within the margin of error of the model results.

Under No Action, flows downstream from TTSA should be sufficient during October in very dry hydrologic conditions to prevent poor water quality in California.

b. LWSA

Overall, water quality under LWSA would be about the same as under No Action and better than under current conditions, as shown by flow statistics. Greater flows than under current conditions would provide greater dilution of pollutants and increased habitat for biota.

c. TROA

Overall, operations model results show that water quality under TROA would be better than under No Action or current conditions because flows are greater and flow timing is more favorable. For example, flows downstream from TTSA in October in very dry hydrologic conditions are 21 cfs under TROA compared to 12 cfs under No Action, thereby providing additional dilution water for wastewater discharges. Also, TROA would provide the flexibility to rapidly flush the river to improve water quality.

G. Compliance with Nevada Water Temperature and Dissolved Oxygen Standards

Truckee River water temperature is an important indicator of river water quality because it directly affects fish reproduction, growth, and survival. Warmer temperatures may stimulate production of biota, including algae, and decrease concentrations of DO, another important indicator of water quality. Extremely warm temperatures are detrimental to fish and biota.

Dissolved oxygen is required for respiration by aerobic life forms, such as fish, and for decay of organic matter, such as dead algae. Because the rate of biochemical reactions that use oxygen increases with increasing temperature, low DO concentrations in the Truckee River tend to be more critical in warm summer months. The problem is compounded in the summer because flows are usually less and DO saturation is less at higher temperatures. Therefore, the total possible quantity of oxygen available in the water is also less.

1. Method of Analysis

Truckee River water temperature and DO concentrations vary according to reach and calendar year. Therefore, temperature and DO concentrations for the Truckee River reach from Lockwood to Derby Diversion Dam (generated from DSSAMt) were evaluated. This reach is downstream from two major tributaries, North Truckee Drain and Steamboat Creek, which contribute urban runoff and return flows from TMWRF. Lockwood is downstream from Reno (map 3.1), a major source of pollutants and organics, and in this reach, water quality constituents are completely mixed from bank to bank.

2. Threshold of Significance

An effect was considered significant if Nevada standards were exceeded 5 days or more annually. Exceedence of a standard for as little as 1 hour was counted as 1 day, even though biota, in general, can tolerate poor water quality for such a brief period.

3. Model Results

Table 3.28 presents DSSAMt results for the annual total days that Nevada temperature and DO standards are exceeded in this reach in representative wet, median, and dry years.

4. Evaluation of Effects

a. No Action

DSSAMt results show that Nevada temperature standards are exceeded significantly in this reach in representative dry years under current conditions and No Action, although temperature standards under No Action are exceeded more often than under current conditions. Temperature standards also are exceeded in representative wet and median years under current conditions and No Action.

DSSAMt results also show that Nevada DO standards are exceeded significantly in this reach in representative dry years under current conditions and No Action. DO standards are exceeded infrequently in representative wet and median years. DO standards under No Action are exceeded less often than under current conditions, although low DO occurs in representative median and dry years under current conditions and No Action. (See Water Quality Appendix DSSAMt tables 1 through 12.)

b. LWSA

DSSAMt results show that water quality under LWSA is about the same as under No Action and better than under current conditions, as indicated by the number of days that Nevada temperature and DO standards are exceeded (table 3.28). In representative dry years, water temperatures are slightly cooler and DO concentrations under LWSA are slightly greater than under No Action. However, compared to current conditions, temperatures in representative dry years are warmer and standards are met less often.

c. TROA

Overall, DSSAMt results show that, under TROA, Truckee River water quality is “significantly” better than under No Action or current conditions, as shown by the number of days that Nevada State temperature and DO standards are exceeded (table 3.28), especially in representative dry years.

In representative dry years, under TROA, temperatures downstream from Reno are cooler and DO concentrations are greater than under No Action. In representative dry years, the greater flows push nutrients downstream quickly. As a result, standards are met more often. DSSAMt results show that, under TROA, Nevada State temperature standards are exceeded about as often in representative dry years as under current conditions.

DO standards are met more often in representative dry years under both TROA and No Action than under current conditions. As under No Action and LWSA, DO standards downstream from Reno are met more often under TROA than under current conditions, which is likely partly due to implementation of WQSA. However, under TROA, DO standards are almost never exceeded downstream from Reno in representative dry years, partially because WQSA would be enhanced under TROA. Therefore, in representative dry years, DO and overall water quality under TROA would be "significantly" better than under No Action or current conditions in most reaches of the Truckee River downstream from Reno.

H. Total Dissolved Solids and Nutrient Loadings to Pyramid Lake

Total dissolved solid, total nitrogen, and total phosphorus loadings to Pyramid Lake are indicators of Pyramid Lake water quality and indirect indicators of Truckee River quality.

Overall, DSSAMt results show that, under TROA, greater flow and, therefore, slightly more TDS, reaches Pyramid Lake. Therefore, the elevation of Pyramid Lake is higher and, thus, its volume is greater than under No Action or current conditions. Total nitrogen and phosphorus loadings under TROA are about the same as under No Action or current conditions.

In general, most loadings to Pyramid Lake occur during large runoff events in representative wet years. In these years, concentrations are typically low and Nevada standards are not exceeded often. In representative dry years, loadings to Pyramid Lake are minimal, but standards in the lower Truckee River are exceeded frequently under both current conditions and the alternatives because of low Truckee River flows and large diversions.

Total dissolved solids concentrations generally increase downstream and are an overall indicator of water quality degradation due to repeated water use. Likewise, the maximum TDS standards for river reaches increase downstream. Therefore, TDS standards are sometimes exceeded more frequently just downstream from where high TDS loadings from Steamboat Creek, North Truckee Drain, Helms Gravel Pit, and TMWRF discharge into the Truckee River. During low flows, TDS in the Truckee River downstream from Derby Diversion Dam frequently exceeds Nevada standards. High inflows contribute high TDS loadings to Pyramid Lake. Low flows, evaporation, and groundwater inflows with high concentrations result in high TDS concentrations in the lower Truckee River. Greater inflows of relatively fresh water to Pyramid Lake decrease TDS by dilution. Evaporation and less inflows to Pyramid Lake tends to increase TDS.

The concerns of the Pyramid Tribe about compliance with the TDS standard have been relieved primarily due to recently installed BNR technology at TTSA, which replaced anion exchange technology. Anion exchange added total dissolved solids (salts) to the Truckee River. BNR does not add TDS and ultimately reduces the TDS concentrations discharged to Pyramid Lake, thereby addressing the Tribe's concerns. BNR was modeled for both current conditions and the alternatives. However, the loading from TTSA is comparably smaller than the loading from TMWRF and the Reno-Sparks metropolitan nonpoint sources.

Nutrients, such as nitrogen and phosphorus, are essential to the growth of algae and other plants and organisms in the Truckee River and Pyramid Lake. Thus, large nutrient loadings can stimulate excess algal growth and, consequently, organic matter decay. A majority of the total nitrogen reaching Pyramid Lake is organic nitrogen, which is not readily bioavailable for attached algae in the Truckee River. Once the organic nitrogen reaches Pyramid Lake, it has time to decay and can be used by green algae. Blue-green algae can produce excessive mats and reduce DO by respiration. At low nitrogen levels, blue-green algae can fix atmospheric nitrogen and grow more efficiently than the green algae, which become nitrogen-limited during summer and fall. Overall, more algal biomass due to more nutrient loading causes more decayable matter and less DO at the sediment water interface. The annual Pyramid Lake water quality model was run to determine if loading differences have a significant impact on Pyramid Lake water quality. Results of this model show little difference in Pyramid Lake water quality between the action alternatives and No Action or between any of the alternatives and current conditions.

1. Method of Analysis

The WARMF model used current and projected future land use to determine loadings from point and nonpoint sources. Output from the WARMF model was used as input to DSSAMt. TDS, total phosphorus, and total nitrogen loadings at the mouth of the Truckee River were used as water quality indicators and as partial input to the Pyramid Lake water quality model.

2. Threshold of Significance

In general, a 10-percent or greater difference in combined loadings between the alternatives and current conditions or between the action alternatives and No Action was considered significant. Model results have a 5- to 10-percent margin of error largely due to flow measurement errors of about 5 to 10 percent.

3. Model Results

Table 3.29 presents DSSAMt results for annual total TDS, total nitrogen, and total phosphorus loadings to Pyramid Lake in representative wet, median, and dry years.

4. Evaluation of Effects

a. No Action

Overall, DSSAMt model results show that Pyramid Lake water quality under No Action would be the same or slightly better than under current conditions. Specifically, under No Action, water quality may be the same in representative wet and median years and slightly better in representative dry years than under current conditions, as shown by TDS, total nitrogen, and total phosphorus loadings to Pyramid Lake. Slightly less TDS would be transported to Pyramid Lake under No Action in representative median and dry years.

b. LWSA

Loadings to Pyramid Lake under LWSA are about the same under No Action. Therefore, the effects on Pyramid Lake water quality also are expected to be about the same.

c. TROA

Overall, in representative wet years, Pyramid Lake water quality under TROA would be the same as or better than under No Action, as shown by TDS, total nitrogen, and total phosphorus loadings to Pyramid Lake. In representative median and dry years, operations model results show that, under TROA, flows to Pyramid Lake are greater than under No Action, resulting in slightly greater TDS loading to Pyramid Lake. However, the benefits of the greater flows and a higher Pyramid Lake elevation would outweigh the adverse effects of greater TDS. Loadings under TROA are similar to those under current conditions.

5. Mitigation

No mitigation for water quality would be required because no significant adverse effects would occur under TROA.

SEDIMENTATION AND EROSION

I. Affected Environment

This section describes those aspects of sedimentation and erosion in the study area that could be affected by modifying operations of Truckee River reservoirs or that are of interest to the public or private agencies. Specifically, this section discusses shoreline erosion at Lake Tahoe, stream channel erosion and sediment transport in the Truckee River, and Truckee River delta formation at Pyramid Lake.

A. Shoreline Erosion at Lake Tahoe

As stated previously in "Water Quality," Lake Tahoe has been designated as an ONR under the Clean Water Act and, as such, no man-induced degradation of its water quality is allowed. Under the Clean Water Act, Lake Tahoe is "303(d)-listed" because of loss of clarity (or transparency) due to excessive nitrogen, phosphorus, and sedimentation/ siltation. These parameters were investigated to identify total maximum daily loads to Lake Tahoe for each. SWRCB also adopted Resolution 68-16, which establishes a nondegradation policy for the protection of water quality, where waters are designated as high quality water, including Lake Tahoe (SWRCB, 1994). It is considered an oligotrophic (low productivity) lake; that is, it still has relatively low concentrations of nitrogen and phosphorus.

Suspended sediment directly and indirectly affects Lake Tahoe water quality because the sediments carry nutrients into the lake. Reuter and Miller (2000) found that approximately 450 to 900 metric tons of sediment are introduced to the lake each year. Adams (2003) documented historic shoreline erosion using geographic information system (GIS) analysis. The total surface area of the eroded shoreline was estimated to be 32,000 square meters, or 429,000 metric tons, eroded between 1938 and 1998, an average of about 7,150 metric tons per year. This estimate of historical shoreline erosion is far more accurate than the amount predicted by Reuter and Miller (2000), because it was based on measurements of shoreline erosion from repeat aerial photography rather than a reasonable guess of the potential erosion rates.

Shoreline erosion is a result of many factors, including wave action, material properties of the shoreline, climate, and fluctuating water elevation. More specifically, shoreline erosion is typically caused by waves breaking at the base of easily eroded bluffs when the water elevation is high. Both the direct impact of waves on the bluffs and the onrush of waves up the beach are capable of erosion and sediment transport. When the water elevation is low, wave energy is expended on the beach and long-term shoreline erosion is reduced. (See the Sedimentation and Erosion Appendix for a detailed discussion.)

1. Wave Action

The main mechanism of shoreline erosion is wave action caused by winds. Wave action is most damaging when (1) waves are high, (2) the water is high, i.e., between elevations 6227.0 and 6229.1 feet, the maximum managed elevation, (3) nearshore slope is steep, and (4) shoreline sediments are unconsolidated.

Another factor that affects wave action is runup, defined as the rush of water up a slope due to the breaking of a wave. Runup varies directly with wave height and inversely with foreshore slope. For gentle slopes, runup is greater because water moves further up the shore, reaching materials that otherwise would be undisturbed. The slope of the offshore lake bottom also affects wave action. The gentler the slope, the sooner the wave intersects the lake bottom, and the farther from shore the wave will break. In that case, wave energy is dissipated further from shore and has less effect on backshore erosion.

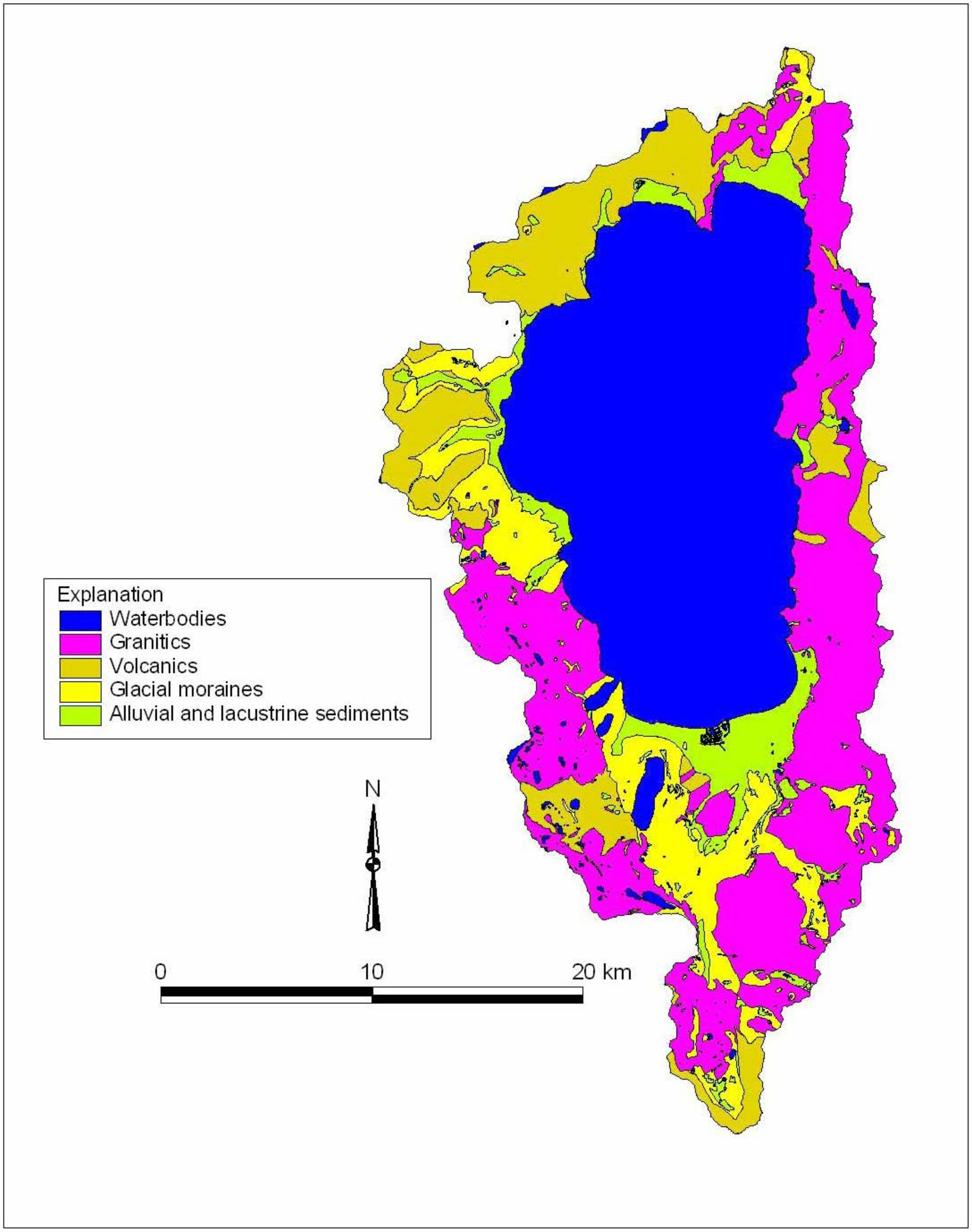
2. Material Properties of Shoreline

The eastern shore of Lake Tahoe contains granitic bedrock. The south shore consists mainly of glacial outwash, and the west shore is predominantly glacial moraines, outwash and lake deposits, although granitic bedrock is found at Rubicon Point. The north shore is comprised of volcanic rocks with some granites and many areas of alluvial and lake deposits. Thus, the south, west, and north shores are erodible (map 3.3).

Orme (1972) thought that 16 percent of the Lake Tahoe shoreline is eroding. Osborne et al. (1985) concluded that (1) the principal sediment source of the major sand beaches at Lake Tahoe is the backshore erosion of lake and glacial outwash and (2) the major sediment source for the gravel and cobble is also erosion of the backshore areas and possibly nearshore erosion of lakebed deposits, moraines, and volcanic rocks. Sand is delivered to smaller beaches by weathering of granite bedrock and boulders.

Unconsolidated sediments that may contribute to lake degradation have three predominant sources: (1) foreshore, (2) backshore, and (3) nearshore. Foreshore is the zone of lake elevation fluctuation, or the area between high and low water surface elevations. At Lake Tahoe, the zone of fluctuation is between elevation 6229.1 and 6223.0 feet (a height of 6.1 feet). Backshore, where the water meets the land, is the zone of instability. The lakeward limit of the backshore is the high water elevation. Nearshore is the zone that extends from the low water elevation of 6223.0 feet down 30 feet to a lake bed elevation of 6193.0 feet (TRPA, 1995).

Unconsolidated sediments (of which sand and finer grained particles are the most easily transported) in the foreshore and nearshore can become entrained because of wave action. These sediments either can be deposited on the shore or can drift out into the lake. Such movement of sediments into the lake is not considered in the evaluation. Sediment in the foreshore is continually exposed to wave action in the normal operating range of Lake



Map 3.3—Generalized geology map of Lake Tahoe (Adams, 2003).

Tahoe (elevation 6223.0 to 6229.1 feet). That is, sediment continually moves back and forth between the lake and the shore at all lake elevations. These movements are the same regardless of operations (Adams, 2003).

Sediments from the backshore could erode and move into the lake if its elevation were comparatively higher. Such erosion could be possible when the elevation of the lake is between 6227 and 6229.1 feet. The greatest potential for erosion events occurs when strong winds blow across the lake and the lake water elevation is at maximum (Adams, 2001). At such high elevations, more unconsolidated sediments are accessible to wave erosion within the backshore. At lower elevations, finer, smaller sediments have already been eroded from the shore surface, leaving gravels, cobbles, and bedrock as armor against additional erosion.

3. Climate

The climate of the Lake Tahoe basin is also important to shoreline erosion. The lake is generally higher during the late winter, spring, and summer. Erosion of the lake occurs more frequently when the elevation is 6627 feet or higher and when strong winds blow across the lake, usually during late winter or spring.

4. Fluctuating Water Elevation

Another important factor to shoreline erosion at Lake Tahoe is seiche, which is a periodic oscillation of the water body. Seiches can temporarily raise water elevation along a shore, allowing waves to go further inland. LeConte (1884) estimated that the period of a seiche at Lake Tahoe is 17 minutes in a north-south direction and 10 minutes in an east-west direction.

B. Stream Channel Erosion and Sediment Transport

Stream channel erosion occurs along some reaches of steams in the Truckee River basin, although most streams in the basin are well armored and experience little erosion. Background data on normalized average annual sediment loads in the Truckee River are presented in figure 3.35 for several sub-watersheds. The basins with the highest annual suspended sediment load include Bear, Squaw, Donner, and Gray Creek watersheds. These watersheds show high rates of suspended sediment load either because of rapid urbanization or naturally occurring high erosion rates, as in Gray Creek.

As discussed in “Water Quality,” under section 303(d) of the Clean Water Act, States, territories and authorized tribes are required to develop a list of water quality limited segments. Waters on the 303(d) list are considered impaired, i.e., they do not meet water quality standards, even after installation of the minimum required levels of pollution controls. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called TMDLs, to improve water quality. Waters within the study area that are listed as impaired on the 303(d) list are presented in table 3.30.

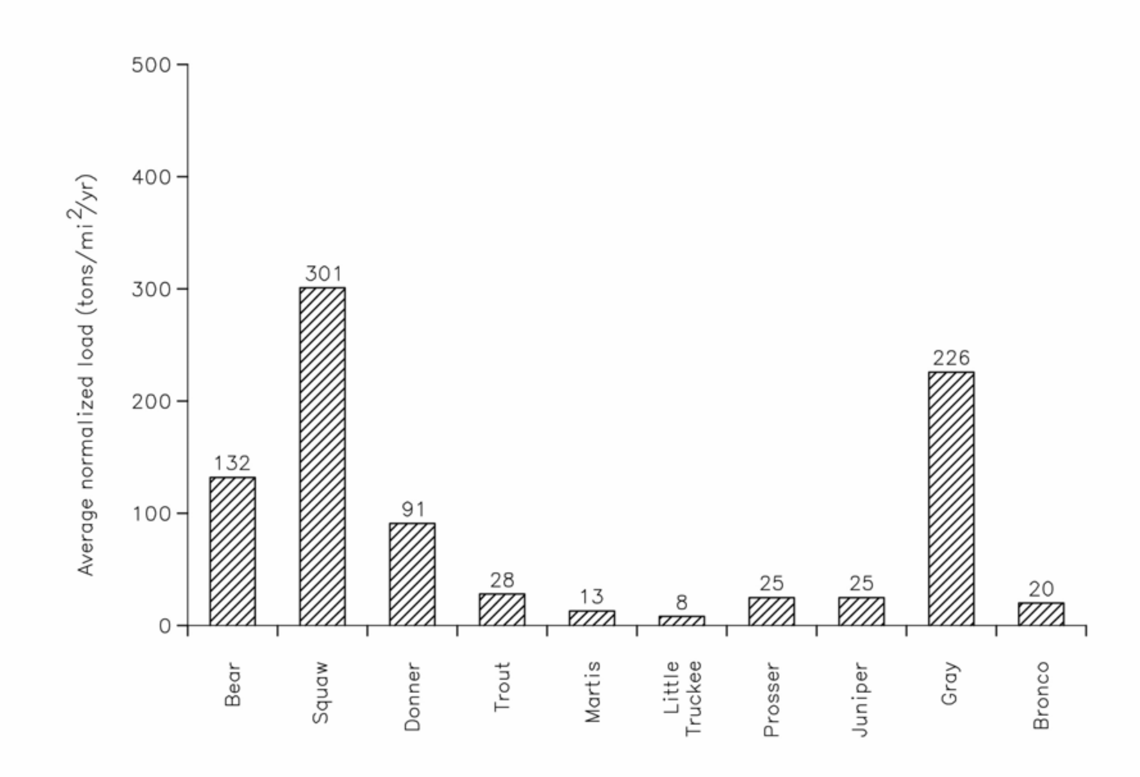


Figure 3.35—Average annual suspended sediment load normalized by area (McGraw et al., 2002).

Table 3.30—Section 303(d) list of impaired waters within study area

Name	Pollutants/stressor	TMDL priority	Extent affected
Bear Creek	Sedimentation/siltation	Medium	3 miles
Bronco Creek	Sedimentation/siltation	Medium	1.3 miles
Donner Lake	Priority Organics	Low	819 acres
Gray Creek	Sedimentation/siltation	Medium	2.8 miles
Heavenly Valley Creek (source to USFS boundary)	Chloride	Low	2 miles
	Phosphorus	Low	2 miles
Heavenly Valley Creek (USFS boundary to Trout Creek)	Chloride	Low	1.4 miles
	Sedimentation/siltation	Low	1.4 miles
Squaw Creek	Sedimentation/siltation	Medium	5.8 miles

The Upper Truckee River is the largest stream tributary to Lake Tahoe in terms of flow and watershed size, and it may deliver some of the largest nutrient and sediment loads to the lake. The watershed was severely disturbed in the 19th and early 20th centuries by logging and grazing, and in the later 20th century by urban development. The Upper

Truckee River is currently identified as impaired under section 303(d) (table 3.30). The Lake Tahoe Watershed Assessment gave the river an Aquatic Ecosystem Rating of "imperiled" (SWRCB, 2002).

The Trout Creek watershed, located east of the Upper Truckee River, has been disturbed by historic logging and livestock grazing, ski resort development (Heavenly Valley), and urban development (near Lake Tahoe). Trout Creek and its tributary Heavenly Valley Creek, Ward Creek and Squaw Creek are all 303(d)-listed.

The Truckee River from Lake Tahoe to the Nevada State line and some of its tributaries are considered impaired for sediments. Two watersheds with highly erosive drainages are also considered impaired: Bronco Creek and Gray Creek. Donner Lake is also considered impaired for organics under section 303(d) of the Clean Water Act. Additional information is presented in Chapter 4, "Cumulative Effects." The creeks are underlain by large areas of volcaniclastic rocks and are considered to be highly erosive. These watersheds also have steep valley side slopes and large gradients in the lower part of each watershed, which also make these watersheds very erosive (McGraw et al., 2001).

The potential for erosion in the Truckee River basin is based on the combined effects of precipitation, slopes, and soil types. Soils on 0- to 5-percent slopes are at the southern end of Lake Tahoe, in Martis Valley in the Little Truckee River basin, and in Truckee Meadows. These soils areas are glacial and alluvial outwash and represent 8 percent of the Truckee River basin area upstream of Reno.

Approximately 15 percent of the Truckee River basin area is located on 5- to15-percent slopes on glacial outwash and terraces and alluvial fans. These soils have moderate erosion. Areas with 15- to 30-percent slopes, which make up 15 percent of the watershed—primarily in the Little Truckee, Prosser and Donner Creek basins—are primarily mountain slopes, moraines, and upland ridges. These soils have moderate erosion. On 30- to 50-percent slopes, which comprise 42 percent of the Upper Truckee River basin area, are mountain slopes and outwash moraine. These soils have moderate erosion. About 2.5 percent of the area is on slopes greater than 50 percent, which are canyon side slopes in headwaters of Donner Creek and along the Truckee River canyon north of Farad. These soils have high to severe erosion.

The potential for erosion is greatest in the Truckee River canyon. The highest sediment yield areas of the basin are the Gray Creek watershed and the upper portion of Bronco Creek. The second highest sediment yield area of the watershed is Dog Valley and the contiguous mountain slopes to the east. Erosion also occurs in Washoe County but is not a major problem. Soils in Truckee Meadows are susceptible to erosion and can erode quickly when they are subject to heavy water flow. Occasional landslides occur along the Truckee River and have developed on slopes near Mogul, probably because of river erosion (Westpac Utilities, 1990). High turbidity, an indication of erosion, has been observed in Bronco Creek and Gray Creek during storms; these tributaries enter the Truckee River upstream of Floriston.

Little Truckee River flow between Stampede Dam and Boca Reservoir varies with Stampede Reservoir operations. Aerial photographs of the Little Truckee River were taken August 31, 1977; fall 1998; July 2002; and December 2005. Geologists from CDWR evaluated the photographs for changes in river plan form and stability of the Little Truckee River (CDWR, 2005). The evaluation revealed only normal changes in river plan form and stability over the 28-year period; no evidence of bank erosion or channel instability was identified as a result of variability of releases from Stampede Reservoir.

The Newlands Project and channel modifications have influenced sedimentation of the Truckee River from Reno to Pyramid Lake. The lowering of Pyramid Lake caused base-level lowering of the Truckee River. The lower-most reaches of the Truckee River incised in response to the base-level lowering. The high sediment loads carried by the lower Truckee River greatly accelerated the creation of the Truckee River delta. Channel incision from Numana Dam to Pyramid Lake has resulted in unstable banks and loss of riparian habitat.

Many sediment-related problems exist in the Truckee River from Derby Diversion Dam to Pyramid Lake, including scouring of the riverbed in the lower channel. Bank erosion caused by high flows is severe in much of the river downstream from Wadsworth. During long periods of low flow, new flood plains and river channels develop. These areas, which are narrower and less defined than historically, generally do not have the capacity to control large flood events. During floods, extensive erosion and migration of these new channels (the gradual change of channel course) occur. In general, greater flows result in greater sediment transport capability and, therefore, changes in erosion and deposition patterns. Sediment erosion and transport are greatest during floods that follow prolonged periods of low flows.

C. Truckee River Delta Formation at Pyramid Lake

At the point of inflow, the Truckee River currently is building a delta northward into Pyramid Lake. (A delta is a deposit, partly on the land surface, built by a river flowing into an estuary, lake, or reservoir.) At times, the river channel through the delta is shallow, braided, and poorly defined, and upriver passage of cui-ui and LCT during the spawning season is impeded or precluded. Also, fish attempting to pass through the delta are easy prey for white pelicans.

Decreased inflow caused the elevation of Pyramid Lake to recede from 3870 feet in 1910 to 3796 feet in 1994 (observed data). The decline has led to erosion and headcutting upstream of Pyramid Lake, which, in turn, has resulted in channel degradation and incision of a pre-existing delta complex between Pyramid Lake and Nixon. Headcutting is the sudden change in elevation or knickpoint at the leading edge of a gully. Headcuts can range from less than an inch to several feet high, depending on several factors. Consequently, substantial amounts of locally eroded sediment are added to the normal sediment load of the Truckee River. Deposition of this combined sediment load has formed the delta at the mouth of the Truckee River. This locally eroded sediment was greatly reduced after construction of Marble Bluff Dam in 1975, which controlled upstream headcutting. The delta is about 4,000 feet wide at the mouth, 2,500 feet wide at the head, and about 13,000 feet long.

Change in areal extent of the delta depends on the interaction of several factors, including (1) fluctuation pattern of lake elevation and (2) erosion and sediment inflow. As water elevation decreases, more of the existing delta becomes exposed. However, a decrease in water elevation changes the hydraulic conditions at the river/lake confluence. More specifically, a decrease causes a drawdown effect, resulting in higher water velocities, increased erosion, and, thus, movement of the delta farther downstream into the lake. An increase in average lake elevation will have the opposite effect. Initially, the areal extent of exposed delta will decrease as it is submerged. But the increased water elevation will cause a backwater effect, resulting in lower water velocities, increased deposition farther upstream, and movement of the delta farther upstream into the river channel.

In general, increased erosion and, thus, sediment inflow to the lake, will increase the area extent of the delta. Decreased erosion and sediment inflow will have the opposite effect.

Flows entering Pyramid Lake carry sediment of varying concentrations. Because the lake has no outlet, all sediments entering Pyramid Lake are deposited there. The coarsest sediment particles (sand and gravels) entering the lake deposit first and form the Truckee River delta. Finer sediment particles (silt and clay) are transported further in the lake and deposit in deeper water.

D. Carson River

Before construction of Lahontan Dam, flows in the Carson River downstream from the dam were subject to sudden and dramatic changes. Uncontrolled spring runoff temporarily inundated large sections of Lahontan Valley, supporting wetland habitats. During these large seasonal events, sediment load would also increase and deposit in wetland areas.

The natural hydrologic cycle of the Carson River downstream from Lahontan Reservoir (lower Carson River) has been completely altered. Most flow in the lower Carson River occurs during the irrigation season, from April through September, with the maximum flows in May and June. Thus, the greatest potential for erosion of the lower Carson River also is in these months. The greatest likelihood of erosion is during avection thunderstorm floods (when a large spring or summer rainfall event occurs with snow still on the ground; because the rain cannot infiltrate the snow-covered ground, it runs off quickly, causing extreme flooding). However, the lower Carson River does not currently cause much sedimentation or erosion because the water from the river is routed through 381 miles of canals and laterals (FWS, 1996). Substantial streambank erosion did occur in the upper Carson River during the January 1997 flood event. Operations of the Truckee River under TROA would have little effect on Lahontan Reservoir operations and, therefore, would have little effect on the dynamics of sedimentation or erosion at Lahontan Dam and Reservoir and the lower Carson River. Therefore, sedimentation or erosion at Lahontan Dam and Reservoir and the lower Carson River are not discussed in "Environmental Consequences."

II. Environmental Consequences

Modifying operations of Truckee River reservoirs could affect the elevations of lakes and reservoirs and the quality, quantity, timing, and duration of flows. Changes in elevation at Lake Tahoe, when combined with wind-induced waves, could affect shoreline erosion. Increased flows over a long period or during a short-duration flood event could cause riverbanks or channel beds to erode at an increased rate. Some of the sediment load resulting from this erosion could be deposited in less steep reaches downstream, which could damage fish habitat, decrease channel capacity, and increase Truckee River delta growth. Conversely, decreased flows could cause increased sediment deposition, which could decrease channel capacity and foul gravels used as fish spawning beds.

Information on erosion and sediment transport in the Truckee River basin was limited, particularly relative to delineating geomorphology of the river and use of sediment transport models. Overall future changes in channel stability and plan form are assumed to be minimal, and most changes in sediment dynamics would be due to channel-forming floods generally associated with a 2- to 5-year flood rather than daily operations. None of the action alternatives would affect flood flows and, therefore, should not affect sediment dynamics.

A. Introduction

This analysis evaluated the effects of changes in water elevation and flows on sedimentation and erosion using following the indicators:

- Shoreline erosion at Lake Tahoe, as measured by Lake Tahoe water surface elevation

- Stream channel erosion and sediment transport capacity in representative reaches of the Truckee River, as determined by average monthly flows in very wet hydrologic conditions (5-percent probability of exceedence) and by evaluation of aerial photographs of the Little Truckee River

- Truckee River delta formation at Pyramid Lake, as measured by water surface elevation and inflows to Pyramid Lake

The following sections describe the indicators and the methods used to analyze them. Data used in the analyses include water surface elevations, reservoir releases, flows, and inflow to Pyramid Lake generated from the operations model.

B. Summary of Effects

Analysis of operations model results, in general, shows the following:

Shoreline erosion at Lake Tahoe would not increase under No Action, LWSA, or TROA; water quality would not be degraded; and the maximum elevation at which the lake is currently operated would not be exceeded.

Erosion and sediment transport in the Truckee River from Donner Creek to the Little Truckee River confluence would not differ significantly under any alternative.

In the Little Truckee River from Stampede Dam to Boca Reservoir and the Lockwood reach of the Truckee River, erosion and sediment transport would not be significantly affected under any of the alternatives.

In the Spice reach, erosion and sediment transport would not be affected because there is no known sediment source to influence this reach.

In the Nixon reach, erosion and sediment transport would not be significantly affected under any of the alternatives. Moreover, operations model results show that average annual flows are greater under TROA; these greater flows could promote the expansion of riparian vegetation, which, in turn, would have a stabilizing effect on the river channel and reduce sediment production.

The higher water surface elevation expected under TROA could improve the connectivity between the Truckee River and Pyramid Lake for fish migration and spawning; connectivity could be adversely affected under No Action and LWSA. Other aspects of Truckee River delta dynamics would not be affected under the alternatives.

Table 3.31 summarizes the effects of the alternatives on sedimentation and erosion.

C. Shoreline Erosion at Lake Tahoe

1. Method of Analysis

Shoreline erosion at Lake Tahoe was evaluated by comparing the end-of-month water surface elevations of Lake Tahoe in very wet (5-percent exceedence) and median (50-percent exceedence) hydrologic conditions under current conditions and the alternatives. Elevations were generated from the operations model. Very wet, rather than wet, hydrologic conditions were analyzed because the lake would be higher in these hydrologic conditions; thus, shoreline erosion would be more likely to occur. Water surface elevations in dry hydrologic conditions would be too low to affect shoreline erosion.

Table 3.31—Summary of effects on sedimentation and erosion

Stream reach	Current conditions	No Action	LWSA	TROA
Shoreline erosion at Lake Tahoe				
	Minimal	No manmade induced degradation of any water quality parameters	Same as under No Action	Same as under No Action
Stream channel erosion and sediment transport capacity				
Truckee River from Donner Creek to the Little Truckee River	No overall effect	No overall effect	Same as under No Action	No significant effect
Little Truckee River from Stampede Dam to Boca Reservoir	No overall effect	No overall effect	No overall effect	No overall effect
Spice	No overall effect	Potential significant effect	Same as under No Action	No overall effect
Lockwood	No overall effect	No significant effect	Same as under No Action	No significant effect
Nixon	No overall effect	No significant effect	Same as under No Action	No significant effect
Truckee River delta dynamics at Pyramid Lake				
	No effect	Potential adverse effect on connectivity between the Truckee River and Pyramid Lake	Same as under No Action	Improved connectivity between Truckee River and Pyramid Lake for fish migration and spawning

An increase in elevation, if significant, could potentially increase shoreline erosion by exposing more fine sediment of the backshore area to wave erosion. Based on studies by Adams (2003), the potential for shoreline erosion at Lake Tahoe exists when the lake is between elevation 6627 and 6629 feet.

2. Threshold of Significance

An effect on shoreline erosion at Lake Tahoe was considered significant if the water surface elevation was at least 0.25 foot higher, on a monthly basis, under the alternatives than under current conditions, or under the action alternatives than under No Action. This difference is thought to produce a measurable increase in shoreline erosion, as described in detail by Adams (2003), included in the Sedimentation and Erosion Appendix.

3. Model Results

Table 3.32 presents operations model results for end-of-month water surface elevations in Lake Tahoe in very wet and median hydrologic conditions.

Table 3.32—Lake Tahoe end-of-month water surface elevations (msl)

Month	Current conditions	No Action	LWSA	TROA
Very wet hydrologic conditions				
October	6228.40	6228.37	6228.37	6228.36
November	6228.22	6228.30	6228.30	6228.28
December	6228.30	6228.34	6228.34	6228.34
January	6228.41	6228.44	6228.44	6228.45
February	6228.49	6228.49	6228.49	6228.51
March	6228.65	6228.65	6228.65	6228.69
April	6228.75	6228.75	6228.75	6228.75
May	6229.00	6229.00	6229.00	6229.00
June	6229.00	6229.00	6229.00	6229.00
July	6229.00	6229.00	6229.00	6229.00
August	6228.78	6228.79	6228.79	6228.77
September	6228.50	6228.51	6228.51	6228.50
Median hydrologic conditions				
October	6226.98	6226.99	6226.98	6227.16
November	6226.98	6226.94	6226.94	6227.15
December	6226.96	6226.91	6226.91	6227.12
January	6227.31	6227.21	6227.21	6227.31
February	6227.32	6227.25	6227.25	6227.39
March	6227.37	6227.34	6227.33	6227.41
April	6227.42	6227.40	6227.40	6227.52
May	6228.07	6228.07	6228.07	6228.11
June	6228.55	6228.49	6228.48	6228.52
July	6228.34	6228.30	6228.30	6228.33
August	6227.98	6227.94	6227.94	6227.96
September	6227.57	6227.52	6227.52	6227.61

4. Evaluation of Effects

a. No Action

Operations model results show that Lake Tahoe exceeds elevation 6627 feet, the threshold for potential shoreline erosion, in very wet hydrologic conditions under both No Action and current conditions. However, the lake is slightly higher under No Action in November, December, January, August, and September than under current conditions. In median hydrologic conditions, elevations from January through September exceed the threshold. However, none of the differences between No Action and current conditions are greater than 0.25 foot, the threshold of significance. On the basis of these results, the potential for shoreline erosion under No Action is essentially the same as under current conditions.

b. LWSA

In both very wet and median hydrologic conditions, Lake Tahoe's end-of-month elevations are about the same under LWSA and No Action; thus the potential for shoreline erosion would be the same. Under LWSA, elevations are slightly higher from November through January than under current conditions and are almost the same in other months. Any differences are so small that no change in shoreline erosion is expected.

c. TROA

In very wet hydrologic conditions, Lake Tahoe's end-of-month elevations do not differ by more than 0.08 foot among TROA, No Action, or current conditions. Thus, no increase in shoreline erosion is expected, and there would be no degradation of water quality under any alternative. In median hydrologic conditions, Lake Tahoe's elevation exceeds 6627 feet in all months under TROA, compared to only the months of October, November, and December under current conditions. However, the differences are not greater than 0.18 foot. Likewise, Lake Tahoe's elevation does not differ by more than 0.21 foot between TROA and No Action. Therefore, no increase in shoreline erosion is expected under TROA.

In median hydrologic conditions, the three water surface elevation comparisons show differences in proportions of affected shoreline angles (Adams, 2003). Water surface elevations under TROA are about 0.013 feet to 0.17 foot higher than under No Action or current conditions. Under TROA, approximately 84 to 91 percent of the measured shoreline angles and beach ridges would not be affected. Under No Action and current conditions, 90 to 96 percent of the sites would not be affected. Adams (2003) concludes that implementing TROA would have no measurable effects on the shoreline erosion at Lake Tahoe and would not result in any man-induced degradation of the water quality. Consequently, because TROA would not have a measurable effect on sedimentation in Lake Tahoe, TROA would not have an adverse effect on existing beneficial uses associated with Lake Tahoe, or affect the attainment of California or Nevada water quality objectives for sedimentation. (See the Sedimentation and Erosion Appendix for further discussion.)

5. Mitigation

No mitigation would be required because no man-induced degradation of the water quality of Lake Tahoe and no measurable changes in shoreline erosion would occur under any of the alternatives. The maximum water surface elevation at which the lake is currently operated would never be exceeded under any alternative. Reservoir operations under TROA would not adversely affect the non-degradation objectives developed to maintain the outstanding qualities of Lake Tahoe, as an ONR.

D. Stream Channel Erosion and Sediment Transport

1. Method of Analysis

The difference in sediment transport capacity among the alternatives and current conditions was evaluated using average monthly flows in representative reaches of the Truckee River in very wet hydrologic conditions, generated from the operations model. Very wet hydrologic conditions were selected because they best reflect those conditions that affect erosion and sediment transport—channel-forming floods generally associated with a 2- to 5-year flood. The difference in sediment transport capacity was computed as a function of flow (raised to the second or third power). Greater average monthly flows (assuming that the variability in daily flows within a month does not change) could increase sediment transport capacity and, potentially, result greater erosion of the river channel.

2. Threshold of Significance

For stream channel erosion and sediment transport, an effect was considered significant if it would cause widespread and measurable channel erosion or deposition. Widespread and measurable channel erosion is expected to occur under the alternatives when sediment transport capacity is at least 10 percent greater than under current conditions, and the streambed is not already armored. Widespread and measurable channel deposition is expected to occur under the alternatives when sediment transport capacity is at least 10 percent less than under current conditions and there is a substantial upstream source of river or tributary sediment. For example, a channel downstream from a dam would not have an upstream source of sediment and the bed material sediments would be armored (not erodible). A decrease in sediment transport capacity for a river downstream from a dam would not result in deposition without a large source of tributary sediment. Because of its armored condition, this methodology was not used for the Little Truckee River. See Section II.D.4.a(2) for a discussion of the method of analysis used to evaluate the Little Truckee River.

The following reaches were evaluated because they are considered representative of the entire river. Map 3.1 shows the locations of the reaches.

Truckee River: Donner Creek to Little Truckee River confluence
Little Truckee River: Stampede Dam to Boca Reservoir

Truckee River: Reno-Sparks to McCarran Boulevard (Spice)
Truckee River: McCarran Boulevard to Derby Diversion Dam (Lockwood)
Truckee River: Derby Diversion Dam to Pyramid Lake (Nixon)

3. Model Results

Table 3.33 presents weighted average differences in sediment transport capacity for the representative river reaches in very wet hydrologic conditions.

Table 3.33—Weighted average differences in sediment transport capacity (very wet hydrologic conditions)

Stream reach	No Action, compared to:	LWSA, compared to:		TROA, compared to:	
	Current conditions	Current conditions	No Action	Current conditions	No Action
Truckee River: Donner Creek to Little Truckee River	2 to 3% less	2 to 3% less	No change	2 to 4% greater	4 to 7% greater
Little Truckee River: Stampede Dam to Boca Reservoir	No overall effect	No overall effect	No overall effect	No overall effect	No overall effect
Spice	7 to 10% less	7 to 11% less	0 to 1% less; no effect	1 to 2% greater	8 to 13% greater
Lockwood	3 to 6% less	4 to 6% less	0 to 1% less; no change	3 to 5% greater	7 to 11% greater
Nixon	3 to 5% less	3 to 5% less	No change	3 to 5% greater	7 to 11% greater

As discussed in Section II.2, "Threshold of Significance," an effect was considered significant when sediment transport capacity was at least 10 percent greater than under current conditions, and the streambed is not already armored, or when sediment transport capacity was at least 10 percent less than under current conditions and there is a substantial upstream source of river or tributary sediment. Effects under LWSA and TROA also were compared to No Action, but, again, an effect was considered significant only if it differed by 10 percent or more from current conditions.

4. Evaluation of Effects

a. No Action

(1) Truckee River: Donner Creek to Little Truckee River Confluence

Operations model results show that annual sediment transport capacity under No Action is 2 to 3 percent less than under current conditions in very wet hydrologic conditions. On the basis of these results, erosion and sediment transport in this reach under No Action likely would be about the same as under current conditions.

(2) Little Truckee River: Stampede Dam to Boca Reservoir
As discussed previously, aerial photographs of the Little Truckee River were taken August 31, 1977; fall 1998; July 2002; and December 2005. Geologists from the California Department of Water Resources evaluated the photographs to assess any changes in river plan form and stability of the Little Truckee River (CDWR, 2005). The evaluation revealed only normal changes in river plan form and stability over the 28-year period. Because no evidence of bank erosion or channel instability was identified, it was determined no effects would occur under No Action, LWSA, or TROA.

(3) Spice
Annual sediment transport capacity under No Action is 7 to 10 percent less than under current conditions in very wet hydrologic conditions. Thus, more sediment deposition could occur in this reach than under current conditions, but because a source of sediment likely does not exist upstream, substantial deposition is not likely.

(4) Lockwood
Annual sediment transport capacity under No Action is 3 to 6 percent less than under current conditions in very wet hydrologic conditions. On the basis of these results, erosion and sediment transport in this reach would not differ significantly from current conditions.

(5) Nixon
Annual sediment transport capacity under No Action is about 3 to 5 percent less than under current conditions in very wet hydrologic conditions. On the basis of these results, erosion and sediment transport in this reach would not differ significantly from current conditions.

b. LWSA

(1) Truckee River: Donner Creek to Little Truckee River Confluence
Annual sediment transport capacities are the same under LWSA and No Action, suggesting that erosion and sediment transport in this reach likely would be the same as well.

Operations model results show that annual sediment transport capacity under LWSA is 2 to 3 percent less than under current conditions in very wet hydrologic conditions, suggesting that erosion and sediment transport in this reach would not differ significantly from current conditions.

(2) Little Truckee River: Stampede Dam to Boca Reservoir
No effects would occur, as described under No Action.

(3) Spice

Annual sediment transport capacity under LWSA is essentially the same as No Action when compared to current conditions in very wet hydrologic conditions; thus, erosion and sediment transport in this reach likely would be the same as well.

Annual sediment transport capacity under LWSA is 7 to 11 percent less than under current conditions in very wet hydrologic conditions. Thus, sediment transport in this reach likely would be less than under current conditions, and sediment deposition is possible. However, because a source of sediment does not exist upstream, substantial deposition is not likely.

(4) Lockwood

Annual and monthly sediment transport capacity under LWSA is nearly the same as under No Action, suggesting that erosion and sediment transport in this reach would be the same as well.

Annual sediment transport capacity under LWSA is 4 to 6 percent less than under current conditions in very wet hydrologic conditions, suggesting that erosion and sediment transport in this reach would not differ significantly from current conditions.

(5) Nixon

Annual sediment transport capacity under LWSA is about the same as under No Action, suggesting that erosion and sediment transport in this reach would be the same as well.

Annual sediment transport capacity under LWSA is 3 to 5 percent less than under current conditions in very wet hydrologic conditions, suggesting that erosion and sediment transport in this reach would not differ significantly from current conditions.

c. TROA

(1) Truckee River: Donner Creek to Little Truckee River Confluence

Annual sediment transport capacity under TROA is 4 to 7 percent greater than under No Action in very wet hydrologic conditions.

Annual sediment transport capacity under TROA is 2 to 4 percent greater than under current conditions in very wet hydrologic conditions. Thus, erosion and sediment transport in this reach would not differ significantly from current conditions. Consequently, TROA is not expected to impair the attainment of water quality objectives or have an adverse effect on beneficial uses within the reach of the Truckee River from Lake Tahoe to the California/Nevada State line.

(2) Little Truckee River: Stampede Dam to Boca Reservoir

No effects would occur, as described under No Action.

(3) Spice

Annual sediment transport capacity under TROA is 8 to 13 percent greater than under No Action in very wet hydrologic conditions.

Annual sediment transport capacity under TROA is 1 to 2 percent greater than under current conditions in very wet hydrologic conditions. Thus, erosion and sediment transport in this reach would be about the same as under current conditions.

(4) Lockwood

Annual sediment transport capacity under TROA is 7 to 11 percent greater than under No Action in very wet hydrologic conditions.

Annual sediment transport capacity under TROA is 3 to 5 percent greater than under current conditions in very wet hydrologic conditions, suggesting that erosion and sediment transport in this reach would not differ significantly from current conditions.

(5) Nixon

Annual sediment transport capacity under TROA is 7 to 11 percent greater than under No Action in very wet hydrologic conditions.

Annual sediment transport capacity under TROA is 3 to 5 percent greater than under current conditions in very wet hydrologic conditions, suggesting that erosion and sediment transport in this reach would not differ significantly from current conditions. Moreover, overall, operations model results indicate that, under TROA, average annual flows are greater than under current conditions or the alternatives. These greater flows could promote the expansion of riparian vegetation, which, in turn, would have a stabilizing effect on the river channel and actually reduce, rather than increase, sediment production.

5. Mitigation

No mitigation would be required because, overall, no significant adverse effects would occur under the alternatives.

E. Truckee River Delta Formation at Pyramid Lake

For this indicator, operations model results for Pyramid Lake water surface elevation and inflows were analyzed to determine the potential for Truckee River delta formation.

The water surface elevation of Pyramid Lake at the end of the period of analysis under the alternatives was compared to its end-of-period elevation under current conditions. (Simulated elevations were generated by the operations model.) A difference in elevation between the alternatives and current conditions represents conditions in which the delta could be affected by sediment transport and erosion. The effect on Truckee River delta formation was considered significant if the elevation of Pyramid Lake was 0.5 foot or more lower under the alternatives than under current conditions.

As shown in table 3.34 below and on figure 3.20 in "Surface Water," operations model results indicate that, compared to current conditions, the elevation of Pyramid Lake is 2.57 feet lower under No Action; 2.94 feet lower under LWSA; and 1.68 feet higher under TROA at the end of the period of analysis. The lower elevation under No Action and LWSA could adversely affect the connectivity between the Truckee River and Pyramid Lake. The higher elevation under TROA would improve the connectivity between the river and lake for fish migration and spawning.

Table 3.34—Difference between current conditions and alternatives in operations model results for the elevation of Pyramid Lake at the end of the period of analysis

Current conditions	No Action	LWSA	TROA
0.00	-2.57	-2.94	1.68

Sediment transport capacity, as measured by inflows to Pyramid Lake, shows no effect on delta formation. The change in annual sediment transport capacity under the all of the alternatives does not exceed threshold of significance (difference of 10 percent or more compared to current conditions). Therefore, the potential for erosion for this reach does not differ significantly from current conditions (table 3.31, Nixon reach).

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

BIOLOGICAL RESOURCES

Modifying operations of Truckee River reservoirs could affect the quality, quantity, timing, and duration of flow and the water in lakes and reservoirs. Such changes could potentially affect the habitat and life cycles of aquatic life associated with rivers and tributaries, lake and reservoirs, streamside and wetland habitats and their associated wildlife, and endangered, threatened, and other special status species.

Flow is the most important aspect of a river system because it influences both the physical structure of the substrate (the base on which an aquatic organism lives) and water quality. These two factors help determine the types of plant and invertebrate life present. Other factors that affect aquatic life include stream gradient; water depth; water temperature; water chemistry (e.g., dissolved oxygen, organic and inorganic nutrients, and salinity); substrate type; cover; seasonal variability; aquatic plant and invertebrate abundance; and the presence of other species that are food sources, competitors, or predators. All of these factors interact, and species respond differently to any given set of environmental conditions at different stages of their life cycles.

If other factors influencing temperature are relatively stable, high flow generally results in colder, well-oxygenated water that supports organisms that prefer coldwater conditions. Seasonal excessively high flows, associated with high storm runoff, may scour the river channel, altering the substrate for invertebrates and spawning fish, and removing vegetation. With very low flows, habitat area is reduced, water temperature may increase beyond the tolerance of many species, DO concentrations may decline, and organisms may become stranded in isolated pools. Stranding may result in death or increased stress resulting in lower productivity from oxygen depletion, high water temperature, or increased predation by birds and other predators that can easily reach the trapped invertebrates or fish. However, indigenous species evolved with and adapted to the highly variable flows of the unregulated river system.

Reservoir operations directly affect biological resources associated with upstream lakes and reservoirs (Lake Tahoe, Independence and Donner Lakes, and Prosser Creek, Stampede and Boca Reservoirs) through changes in storage. The release of water from upstream lakes and reservoirs also indirectly affects the amount of water that arrives at Pyramid Lake and Lahontan Reservoir.

The following sections assess the effects of the alternatives on fish in the Truckee River and its affected tributaries; on fish of lakes and reservoirs; on riparian (streamside and wetland) habitat and riparian-associated wildlife; and on endangered, threatened, and other special status species.

Fish in Truckee River and Affected Tributaries

I. Affected Environment

Both native and non-native fish species are found in the Truckee River and its tributaries. Common native fish of the Truckee River include Paiute sculpin, Lahontan redside shiner, Tahoe sucker, speckled dace, and mountain sucker. Recent information shows that mountain whitefish is also common; however, population levels can vary dramatically over time depending on river conditions (Hiscox, 2003; Tisdale, 2003).

Rainbow and brown trout are the most common non-native fish species in the Truckee River from Lake Tahoe to Vista and in many upstream tributaries; carp and mosquitofish are common in the Truckee River downstream from Vista. Additional information on the relative abundance of native and non-native fish in the Truckee River and its upstream tributaries is presented in tables 3.35 and 3.36. The Truckee River from the confluence with Trout Creek to the confluence with Gray Creek has been designated a Wild Trout Water by the California Fish and Game Commission.

Fish species native to the Truckee River are adapted to the highly variable flows of the unregulated river system. Since construction of dams and reservoirs and channelization of portions of the Truckee River, fish have had to cope with regulated flow patterns that differ from natural flows. These changes and the secondary effects they have caused (for example, higher water temperatures), along with the lowering of the elevation of Pyramid Lake, have contributed to the reduction in populations of many native fish.

Beginning in the late 1800s, many non-native fish species were introduced into the Truckee River basin (Truckee River Basin Recovery Implementation Team [TRIT], 2003; Sigler and Sigler, 1987). Rainbow and brown trout have been the two most successful species; natural recruitment is supplemented with annual plantings of hatchery-reared individuals in certain areas to improve recreational fishing (NDOW, 1992b; Wickwire, 1995). Introduced trout are reported to adversely affect the distribution and abundance of native aquatic species in the Sierra Nevada (Moyle, 2002; Knapp, 1994). In an attempt to reduce these impacts, NDOW is experimenting with stocking triploid (sterile) rainbow trout, which will reduce hybridization with native Lahontan cutthroat trout.

Under current conditions, spawning, incubation, and rearing habitat for native mountain whitefish and non-native brown and rainbow trout in Donner and Prosser Creeks and the Little Truckee River is relatively degraded and reduced in extent compared to historic conditions (CDFG, 1996b). Donner and Prosser Creeks could potentially provide spawning and fry rearing habitat for trout resident to the Truckee River. In the Truckee River, spawning and fry rearing habitat also is degraded, and many of the complex pool habitats critical to juvenile survival have been lost. Available habitat for spawning, incubation, and rearing of salmonid adults is especially restricted during severe drought.

Table 3.35—Relative abundance of native and non-native fish species in the mainstem Truckee River[1,2]

Species	Lake Tahoe to State line	State line to Vista	Vista to Derby Diversion Dam	Derby Diversion Dam to Marble Bluff Dam
Native fish				
Lahontan cutthroat trout	U-P	U-P	U-P	U-P
Mountain whitefish	C[3]	C	U	U
Paiute sculpin	C	C	none	none
Lahontan redside shiner	C	C	C	C
Speckled dace	C	C	C	C
Lahontan tui chub	none	none	none	U
Tahoe sucker	C	C	C	C
Mountain sucker	U	C	C	C
Cui-ui	none	none	none	U-S
Non-native fish				
Rainbow trout	C	C-R[4]	C	C
Brown trout	C	C-R	C-R	C-R
Brook trout	U	U	none	none
Kokanee salmon	U	none	none	U
Goldfish	none	none	U	none
Carp	none	U	C	C
Golden shiner	none	none	U	none
Largemouth bass	none	U	U	U
Smallmouth bass	U	U	U	U
Green sunfish	none	U	U	U
Black crappie	none	U	U	U
Mosquitofish	none	none	C	C
Channel catfish	none	none	U	U
Brown bullhead	none	U	U	U
Fathead minnow	none	U	C	C

[1] Sources: Hiscox, 2003; Molini, 1998; Scoppettone and Bailey, 1983; Tisdale, 2003.
[2] Occurrence classification:
P = Planted (non-reproducing)
R = Planted for recreational fishing
S = Spawning only
C = Common
U = Uncommon
[3] Based on the most recent survey information; however, population levels appear to have wide variation and may be considered uncommon during other periods.
[4] NDOW began stocking triploid (sterile) fish in 2004.

Table 3.36—Relative abundance of native and non-native fish species in the tributaries to the upper Truckee River[1,2]

Species	Donner Creek	Prosser Creek	Independence Creek	Upper Little Truckee River	Lower Little Truckee River
Native fish					
Lahontan cutthroat trout	none	none	U-S	none	U
Mountain whitefish	none	none	none	U	none
Paiute sculpin	C	none	none	C	C
Lahontan redside shiner	none	C	none	C	C
Speckled dace	none	C	none	C	C
Tahoe sucker	none	C	none	C	U
Mountain sucker	none	U	none	U	U
Non-native fish					
Rainbow trout	C	C	none	C	U-P
Brown trout	C	C	none	C	C
Brook trout	C	U	C	U	U
Kokanee salmon	none	none	none	C-S[3]	U

[1] Sources: Hiscox, 2003; Molini, 1998; Scoppettone and Bailey, 1983;Tisdale, 2003.
[2] P = Planted (non-reproducing); R = Planted for recreational fishing; S = Spawning only; C = Common; U =Uncommon
[3] Based on recent survey information; however, population levels appear to have wide variation and may be considered uncommon during other periods.

Water temperature and spawning requirements for selected fish species are summarized in table 3.37. Tributaries to the Truckee River in California are important spawning areas for salmonids and other fishes; therefore, effects on these tributaries during spawning periods may affect future fish populations throughout the system.

II. Environmental Consequences

A. Introduction

CDFG and NDOW recommended flows for reaches (map 3.1) within each agency's jurisdiction, except reach 14, where habitat/flow relations for the representative fish species are not available (table 3.35; CDFG, 1996b; Warren, 1994; FWS, 1993). Flow recommendations for brown and rainbow trout were derived using the Instream Flow Incremental Methodology (IFIM). Brown and rainbow trout were selected to represent spring and fall/winter spawning salmonids in the Truckee River and because their spawning, incubation, and rearing stages are sensitive to changes in flow. Moreover,

Table 3.37—Spawning requirements of selected fish species in the Truckee River basin

Species	Habitat	Spawning location	Spawning season/ temperature requirements	Spawning habitat	Fry habitat
Native fish					
Lahontan cutthroat trout	Cold/cool water	Streams	Spring-summer: April-July, 46-61 °F	Gravel riffles	Edge habitat in association with shallow water, low flows, and abundant food
Mountain whitefish	Cold, clear water	Lakes, streams	Fall: October-November, 34-52 °F	Riffles (streams); wave-washed shallows (lakes)	Deep area of lakes, shallow backwaters of streams
Paiute sculpin	Coldwater bottom dweller	Lakes, streams	Spring-summer: May-August, 39-45 °F	Wave-swept littoral areas or stream mouths (lakes); loose gravel/rubble (streams)	Gravels and rocks
Lahontan redside shiner	Variable shallow areas	Lakes, streams	Spring-summer: May-August, 55-75 °F	Sand/gravel shallows	Quiet shallows with cover in lakes/streams
Speckled dace	Variable shallow areas	Lakes, streams	Spring-summer: June-July, 46 °F+	Shallow gravels (lakes); gravel edges of riffles (streams)	Quiet shallows or swampy coves of lakes; channels between large rocks and macrophytes of streams
Lahontan tui chub	Variable	Lakes, streams	Spring-summer: April-July, 43-55 °F	Over macrophyte beds or algae covered rocks and gravel; sandy bottoms and stream mouths (Lake Tahoe)	Shallow weedy areas with cover
Tahoe sucker	Variable	Lakes, streams	Spring-summer: March-August, 52-73 °F	Rocks/gravel riffles or gravel bottom lakes	Flooded vegetation resulting from sustained high flows
Mountain sucker	Variable	Streams	Summer: June-August, 52-66 °F	Gravel riffles upstream of pools	Edge habitat and pool macrophyte beds
Cui-ui	Only in Pyramid Lake, except when spawning	Lower Truckee River	Spring: March-June, 57-63 °F	Gravel	Littoral area of Pyramid Lake

data on life stage requirements, required to analyze the effects of flow are not available for most other species. The relation between flow and fish habitat was developed using the Physical Habitat Simulation System (PHABSIM), a set of software and methods that allows computation of relations between flow and physical habitat for various life stages of fish (Bovee and Milhous 1978; Bovee 1982; Stalnaker et al. 1995).

Preferred flows were selected for each reach of the Truckee River and its tributaries based on the flow needs of brown and rainbow trout. Maximum and minimum flows were determined by the limits of the flow range that can sustain existing levels of fish populations. Table 3.38 presents maximum, preferred, and minimum flows. Only reaches 1 through 14 were analyzed (map 3.1); the Nixon reach was not assessed because its water temperatures are too high to support reproducing brown and rainbow trout.

Different flows are recommended for different seasons because each fish life stage has different requirements. In general, maximum flows are twice that of optimum or preferred flows. Increases and decreases in flows require ramping rates designed to avoid flushing fish downstream or stranding fish on high ground. When flows are greater than maximum, ramping can occur at any rate without causing additional damage. Preferred flows provide optimum habitat for a specific life stage of the fish species. Minimum flows are the lowest seasonal flows under which the representative fish populations could be maintained. CDFG states, “Due to the substantial reduction in habitat availability at minimum flows (to 50 percent of optimum), it is imperative that flow management providing other than optimum (preferred) flow conditions be accompanied by a spawning and rearing habitat improvement program.”

CDFG had two primary objectives in developing its recommendations: (1) maintain self-sustaining brown and rainbow trout populations and (2) provide recruitment to other tributary trout populations (CDFG, 1996). CDFG defined the minimum flow threshold as follows: (1) for the Truckee River from Lake Tahoe to the State line and the Little Truckee River downstream from Stampede Reservoir, minimum flows were based, primarily, on juvenile rainbow trout habitat availability and, secondarily, on maintaining at least 50 percent of optimum conditions for other life stages; (2) for Donner, Prosser, and Independence Creeks, and for the Little Truckee River upstream of Stampede Reservoir, minimum flows were based on conditions that would not reduce any life stage (except adult rearing habitat availability) below 50 percent of optimum during any period. CDFG (1996) determined that a fish population would decline over time if habitat conditions were maintained below 50 percent of optimum, based on using PHABSIM.

NDOW also based its recommendations on data gathered using IFIM, as well as water temperature information for the Truckee River from the California-Nevada State line to Derby Diversion Dam (FWS, 1993). In reaches downstream from Sparks, NDOW assumed (based on field observations) that when summer flow drops below the recommended minimum, all fish will be lost in that reach, primarily due to elevated water temperature (Warren, 1994). The Biological Resources Appendix describes in detail how CDFG and NDOW developed their recommended flows.

Table 3.38—Maximum[1], preferred, and minimum spawning, incubation, and rearing flow (cfs) recommendations by CDFG[2] and NDOW for brown trout and rainbow trout in the Truckee River and its major tributaries (blank spaces indicate that the States have not made recommendations)

River reach/tributary	Brown trout						Rainbow trout					
	October-January			February-March			April-July			August-September		
	Spawning and incubation			Rearing			Spawning and incubation			Rearing		
	Max.	Pref.	Min.	Max.	Pref.	Min.	Max.	Pref.	Min.	Max.	Pref.	Min.
Little Truckee River, downstream from Stampede Reservoir	250	125	45	200	100	45	250	125	45	200	100	45
Little Truckee River, upstream of Stampede[3] Reservoir		90			50			90			30	
Donner Creek[4]	100	50	8				100	50	[6]8	20	10	[6]8
Prosser Creek[5]	100	50	25	70	35	25	150	75	12	60	30	25
Independence Creek	40	20	7	20	10	4	40	20	8	20	10	4
Truckee River from Lake Tahoe to Donner Creek[7]	600	300	75	500	250	75	600	300	75	500	250	75
Donner Creek to Little Truckee River	600	300	100	500	250	100	600	300	100	500	250	100
Truckee River from Little Truckee River to Trophy	600	300	150	500	250	150	600	300	150	500	250	150
Mayberry		200	100		200	100		300	200		300	200
Oxbow		200	100		200	100		300	200		300	200
Spice		200	100		200	100		250	150		250	150
Lockwood		350	250		350	250		350	250		350	250

[1] Maximum flow recommendations are only provided for the Truckee River in California.
[2] CDFG recommendations for reaches in California are for support of self-sustaining brown and rainbow trout fisheries.
[3] While minimum flows are specified in the IFIM report (CDFG, 1996), no controlled-release facility exists for this reach.
[4] California Dam Safety Requirements require that the gates at Donner Lake remain open from November 15 to April 15; minimum flow recommendations apply only from April 5 to November 15.
[5] Since physical constraints prevent releases between 12 cfs and 25 cfs, this is the minimum flow until the dam is modified to allow a minimum flow of 16 cfs throughout the year, which is recommended by the IFIM report (CDFG, 1996).
[6] Reduced to 5 cfs or natural inflow, whichever is less, when lake is projected to have less than 8,000 acre-feet of storage on Labor Day.
[7] Due to changes in the condition of the river channel since the IFIM studies were conducted, preferred flows in these reaches have been increased from the recommendations specified in the IFIM report (CDFG, 1996).

New flow recommendations developed by FWS were implemented in 2003 (TRIT, 2003). The purpose of these new flow recommendations, known as the six-flow regime, is to guide the management of Fish Water and, under TROA, Fish Credit Water releases in order to meet ecosystem requirements along the Truckee River. The flow targets under the six-flow regime are based on recommendations for the lower Truckee River (table 3.39), but when water is released to achieve these targets, it is in addition to flows released to meet other flow requirements; therefore it does not replace, but augments, flow already in the river. The six-flow regime emphasizes maintaining essential flows while attempting to mimic the river's natural hydrologic variability, given water availability in any particular year. While the six-flow regime considers the biological requirements of fish, it also incorporates ecosystem considerations, such as flows that enhance the establishment and maintenance of willow and cottonwoods. Regimes 1, 2, and 3 are intended to promote cui-ui spawning in above average, average, and below-average water years, respectively. In above-average and wetter years, the focus of the six-flow regime is on the gradual ramping down of spring and summer flows to facilitate willow and cottonwood recruitment. Regimes 4, 5, and 6 are recommended during dry, very dry, and extremely dry years, respectively. Under regimes 3 though 6, the management focus is on using available runoff to maintain year-around flows to benefit the ecosystem. For example, enhanced riparian growth and maintenance that result from greater summer and fall flows increase shading. In turn, increased shading lowers water temperatures. More detail on the six-flow regime and the process used to determine them is included in the discussion of cui-ui in "Endangered, Threatened, and Other Special Status Species" and in the Biological Resources Appendix.

Table 3.39—The ecosystem-based six-flow regime recommendations for the lower Truckee River (TRIT, 2003)

Month	Regime (cfs)					
	1	2	3	4	5	6
January	160	150	120	110	100	90
February	160	150	120	110	100	90
March	290	220	200	160	160	140
April	590	490	420	350	300	200
May	1000	800	600	530	400	300
June	800	600	500	400	270	170
July	300	300	300	200	150	120
August	200	200	200	200	150	110
September	170	170	120	110	100	100
October	160	150	120	110	100	100
November	160	150	120	110	100	90
December	160	150	120	110	100	90
Total (acre-feet)	249,000	211,800	176,400	150,000	121,800	96,000

Changes in flow within the Truckee River basin could significantly affect the amount of habitat available for various life stages of fish associated with rivers and tributaries. In addition, low flow in the Truckee River reach from Hunter Creek to East McCarran Boulevard could result in formation of anchor ice in winter and predation or death from high temperature or anoxia in summer.

To evaluate the potential effects on the non-native trout fishery in the Truckee River and its tributaries, the following indicators were chosen; the results of each analysis are described in this section. Potential effects of diversions from the Truckee River to TMWA's hydroelectric powerplants are not considered in the following indicators, but addressed separately at this end of this chapter in "Minimum Bypass Flow Requirements for TMWA's Hydroelectric Diversion Dams on the Truckee River."

- Frequency that preferred flows for various life stages of brown trout from October through March (fall/winter months) are achieved or exceeded without exceeding maximum flows
- Frequency that minimum flows for various life stages of brown trout from October through March (fall/winter months) are sustained
- Frequency that preferred flows for various life stages of rainbow trout from April through September (spring/summer) are achieved or exceeded without exceeding maximum flows
- Frequency that minimum flows for various life stages of rainbow trout from April through September (spring/summer) are sustained
- Frequency of flushing/stranding flows
- Frequency of low flows in winter months that increase the potential for anchor ice formation

B. Frequency that Preferred Flows for Various Life Stages of Brown Trout from October through March are Achieved or Exceeded Without Exceeding Maximum Flows

1. Summary of Effects

Analysis of operations model results for the frequency that preferred flows for brown trout are achieved or exceeded without exceeding maximum flows shows that under TROA, significant beneficial effects would occur in Donner Creek, where only the month of October was analyzed. No effects would occur under either No Action or LWSA. Table 3.40 summarizes these effects.

Table 3.40—Summary of effects: frequency that preferred flows for brown trout are achieved or exceeded without exceeding maximum flows, when specified (+ = significant beneficial effect, - = significant adverse effect)

	Compared to current conditions			Compared to No Action	
River reach/tributary	**No Action**	**LWSA**	**TROA**	**LWSA**	**TROA**
Truckee River from Lake Tahoe to Donner Creek	No effect				
Truckee River from Donner Creek to Little Truckee River					
Truckee River from Little Truckee River to Trophy					
Trophy					
Mayberry					
Oxbow					
Spice					
Lockwood					
Donner Creek (October only)	No effect		+	No effect	+
Prosser Creek	No effect				
Independence Creek					
Little Truckee River upstream of Stampede Reservoir					
Little Truckee River downstream from Stampede Reservoir					

2. Method of Analysis

The frequency that preferred flows for brown trout are achieved or exceeded without exceeding maximum flows from October through March (as generated by the operations model) was analyzed. Average monthly flows for each month from October through March were tallied if they were equal to or greater than the preferred flow and equal to or less than the maximum flow (when specified) for brown trout spawning, incubation, and rearing.

3. Threshold of Significance

Each stretch of river, or reach, can have different channel morphology and habitat conditions that can influence the effects of changes in flows on fish populations. Preferred flows provide the greatest amount of optimum habitat for brown and rainbow trout; however, trout can reproduce under less flows. Changes in trout populations due to changes in flows are dependent on several factors that must be taken into account for each situation. These include the following: (1) The frequency of achieving or sustaining preferred flows, both in relative differences and absolute values; (2) the possibility of recruitment of fish from other reaches (fish movement into a reach from other reaches and on-stream reservoirs); and (3) the possibility of lethal flows (i.e., a flow below the minimum or above the maximum). Thus, best professional judgment was required to weigh these differences in specific reaches and determine the significance of effects.

Examples of the relative and absolute differences in significance of changes in flows can be understood in the following examples. A 5-percent (absolute) difference in the frequency of flows may not be likely to have a significant effect on the trout population if the relative frequencies of achieving a flow are already high, such as the difference between 75 and 80 percent. However, when the frequencies are low, such as 25 percent or less, a 5-percent (absolute) difference will actually result in relative flow change of 20 percent or greater. When absolute frequency values are in the range of 30 to 70 percent, differences of only a few percentage points are unlikely to have a significant effect on trout species.

Large absolute differences in achieving preferred or sustained flows (15 percent or greater) are more likely to produce a significant effect in trout populations than lesser relative differences in flow (8 to 15 percent). Assigning a determination of significance at these lesser levels is more challenging. In such cases, the relative frequency of flows outside of the preferred range (lethal flows in particular) was considered within the analysis. Because lethal flows directly influence trout survival, a difference in their frequency in combination with a moderate difference in the frequency of flows that support spawning, incubation, and rearing, was considered to increase the potential for a measurable adverse effect. The underlying assumption is that while a moderate change in achieving or sustaining preferred flows may have a short-term effect on trout reproductive success, the magnitude of this effect on the overall trout population over the long-term would be offset to some degree if temperatures lethal to the fish population occur less frequently. However, an increase in the frequency of lethal temperatures was considered to increase the potential for adverse effects on spawning, incubation, and rearing in trout.

4. Model Results

Table 3.41 presents operations model results for the frequency (percent of months) that preferred flows for various life stages of brown trout from October through March (fall/winter months) are achieved or exceeded without exceeding maximum flows (when specified) in the Truckee River and its tributaries.

5. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, preferred flows for brown trout are achieved about as frequently as under current conditions in all reaches of the Truckee River and its tributaries. There would be no effect.

Table 3.41—Frequency (percent of months) that preferred flows for brown trout from October through March are achieved or exceeded without exceeding maximum flows (when specified)

River reach/tributary	Current conditions	No Action	LWSA	TROA
Truckee River from Lake Tahoe to Donner Creek	10	11	11	6
Truckee River from Donner Creek to Little Truckee River	25	26	26	17
Truckee River from Little Truckee River to Trophy	58	58	57	45
Trophy	93	93	92	93
Mayberry	93	92	92	88
Oxbow	93	90	90	82
Spice	92	89	89	79
Lockwood	87	86	86	79
Donner Creek (October only)[1]	14	14	14	47
Prosser Creek	22	22	22	23
Independence Creek	18	18	18	18
Little Truckee River upstream of Stampede Reservoir	26	26	26	25
Little Truckee River downstream from Stampede Reservoir	22	22	22	22

[1] California Dam Safety Requirements require that the gates at Donner Lake dam remain open from November 15 to April 15. October is the only full spawning month in which Donner Lake releases can be controlled.

b. LWSA

Under LWSA, preferred flows for brown trout are achieved as frequently or about as frequently as under No Action and current conditions in all reaches of the Truckee River and its tributaries. There would be no effect.

c. TROA

Operations model results show that, in most reaches of the Truckee River and its upper tributaries, under TROA, preferred flows for brown trout are achieved about as frequently as under current conditions (differences of only a few percent). Such small differences do not constitute a significant effect. These reaches are not discussed further. Reaches with no effect also are not discussed.

Under TROA, preferred flows for brown trout are achieved 3 times more frequently in Donner Creek than under current conditions. Only the month of October was analyzed for Donner Creek because California Dam Safety Requirements preclude storing water in Donner Lake from November 15 to April 15, which precludes the possibility of controlled releases. As a result, brown trout spawning in Donner Creek should be enhanced, which would be significant beneficial effect under TROA.

In the two upper reaches of the Truckee River, operations model results show that, under TROA, preferred flows for brown trout are achieved slightly more than half of as frequently as under No Action or current conditions. Because preferred flows are achieved only 11 and 10 percent of the time under No Action and current conditions, respectively, the potential effects under TROA were examined on a monthly basis. Results show that potential adverse effects occur only in October when, based on Truckee River flow at Donner Creek, preferred flows for brown trout are achieved only 13 percent of the time under TROA, compared to 38 percent of the time under No Action, and 34 percent of the time under current conditions. CDFG states that if flows are not adequate for spawning in October, fish may hold in deep pools and spawn later when flows are greater (Hiscox, 2004). Therefore, while less frequent preferred flows may be adverse for spawning, incubation, and rearing of brown trout in one month in one reach, less frequent preferred flows under TROA do not constitute a significant adverse effect overall.

In a few reaches, the frequencies that preferred flows for brown trout are achieved differ by 8 to 13 percent. To better assess the significance of these differences, the frequency that lethal flows occur in these reaches also was evaluated. These reaches are discussed individually, as follows.

> **Truckee River from Little Truckee River to Trophy:** In this reach, preferred flows for brown trout are achieved in 58 percent of the fall/winter months under current conditions compared to 45 percent under TROA, a difference of 13 percent. Lethal flows occur in 36 percent of the fall/winter months under current conditions, compared to 35 percent under TROA. Because this small difference in the frequency of lethal flows is not likely to have a significant effect on adult survival and recruitment from other reaches of the river is likely to occur, the moderate difference in the frequency of achieving preferred flows for brown trout in this reach is not considered a significant effect on the long-term survival of the brown trout population.
>
> **Oxbow:** In the Oxbow reach, preferred flows for brown trout are achieved in 82 percent of the fall/winter months under TROA compared to 93 percent under current conditions. This 11-percent difference is a potential adverse effect. Lethal flows occur in 5 percent of the fall/winter months under TROA, compared to 3 percent under current conditions. Because this small difference in the frequency of lethal flows is not likely to have a significant effect on adult survival and recruitment from other reaches of the river, the moderate difference in the

frequency of achieving preferred flows for brown trout in this reach is not considered a significant effect on the long-term survival of the brown trout population.

Spice: In the Spice reach, preferred flows for brown trout are achieved in 79 percent of the fall/winter months under TROA compared to 92 percent under current conditions. This 13-percent difference is a potential adverse effect. Lethal flows occur in 6 percent of the fall/winter months under TROA compared to 4 percent under current conditions. Because this small difference in the frequency of lethal flows is not likely to have a significant effect on adult survival and recruitment from other reaches of the river, the moderate difference in the frequency of achieving preferred flows for brown trout in this reach is not considered a significant effect on the long-term survival of the brown trout population.

Lockwood: In the Lockwood reach, preferred flows for brown trout are achieved in 79 of the fall/winter months under TROA compared to 87 percent under current conditions. This 8-percent difference is a potential adverse effect. Lethal flows occur in 8 percent of the fall/winter months under TROA compared 6 percent under current conditions. Because this small difference in the frequency of lethal flows is not likely to have a significant effect on adult survival and recruitment from other reaches of the river, the moderate difference in the frequency of achieving preferred flows for brown trout in this reach is not considered a significant effect on the long-term survival of the brown trout population.

Differences between TROA and No Action in the frequencies that preferred flows for brown trout are achieved are similar to the differences between TROA and current conditions. In most reaches of the Truckee River and its upper tributaries within the study area, under TROA, preferred flows for brown trout are achieved about as frequently as under No Action (differences of only a few percent). Such small differences do not constitute a significant effect.

The same beneficial effects would occur in October on Donner Creek when TROA is compared to No Action as when it is compared to current conditions.

The differences in the frequency that preferred flows for brown trout are achieved in the Truckee River from Little Truckee River to the Trophy reach and in the Oxbow, and Spice reaches between TROA and No Action are less than the differences between TROA and current conditions, and the difference between TROA and No Action both in the Truckee River between Donner Creek and in the Little Truckee River is only 1 percent. TROA would, therefore, have no significant adverse effects in these reaches when compared to No Action.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur to brown trout in the Truckee River or its tributaries under any of the alternatives.

C. Frequency that Minimum Flows for Various Life Stages of Brown Trout from October through March are Sustained

1. Summary of Effects

Analysis of operations model results for the frequency that minimum flows for brown trout during the fall/winter months are sustained shows that, under TROA, a significant beneficial effect would occur in five reaches of the Truckee River and its tributaries (table 3.42). Significant adverse effects would occur in the Truckee River from the confluence of the Little Truckee River to Trophy under No Action and LWSA, when compared to current conditions.

Table 3.42—Summary of effects: frequency that minimum flows for brown trout are sustained (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th></th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>River reach/tributary</th><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Truckee River from Lake Tahoe to Donner Creek</td><td colspan="2">No effect</td><td>+</td><td colspan="2">No effect</td></tr>
<tr><td>Truckee River from Donner Creek to Little Truckee River</td><td colspan="5">No effect</td></tr>
<tr><td>Truckee River from Little Truckee River to Trophy</td><td>-</td><td>-</td><td colspan="2">No effect</td><td>+</td></tr>
<tr><td>Trophy</td><td colspan="5" rowspan="5">No effect</td></tr>
<tr><td>Mayberry</td></tr>
<tr><td>Oxbow</td></tr>
<tr><td>Spice</td></tr>
<tr><td>Lockwood</td></tr>
<tr><td>Donner Creek (October only)[1]</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td colspan="5">No effect</td></tr>
<tr><td>Independence Creek</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir[2]</td><td colspan="5">Not applicable</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
</table>

[1] California Dam Safety Requirements require that the gates at Donner Lake dam remain open from November 15 to April 15. October is the only full spawning month in which Donner releases can be controlled.
[2] No minimum flow is identified because there is no controlled-release facility for this reach.

2. Method of Analysis

The frequency that minimum flows for spawning, incubating, and rearing brown trout from October through March are sustained (as generated by the operations model) was analyzed. Qualifying years were those in which flow was between the specified minimum and maximum for the entire 6-month period.

3. Threshold of Significance

The same threshold of significance was used as for the first indicator of fish in the Truckee River and its tributaries.

4. Model Results

Table 3.43 presents operations model results for the frequency (percent of years) that minimum flows for various life stages of brown trout from October through March (fall/winter months) are sustained in the Truckee River and its tributaries.

Table 3.43—Frequency (percent of years) that minimum flows for brown trout from October through March are sustained

River reach/tributary	Current conditions	No Action	LWSA	TROA
Truckee River from Lake Tahoe to Donner Creek	15	14	14	22
Truckee River from Donner Creek to Little Truckee River	45	42	42	44
Truckee River from Little Truckee River to Trophy	22	17	16	23
Trophy	93	96	96	100
Mayberry	93	94	94	93
Oxbow	92	91	90	91
Spice	89	86	86	87
Lockwood	86	85	85	81
Donner Creek (October only)[1]	79	85	85	98
Prosser Creek	3	1	1	2
Independence Creek	3	3	3	32
Little Truckee River upstream of Stampede Reservoir[2]	Not applicable			
Little Truckee River downstream from Stampede Reservoir	9	6	6	26

[1] California Dam Safety Requirements require that the gates at Donner Lake dam remain open from November 15 to April 15. October is the only full spawning month in which Donner releases can be controlled.
[2] No minimum flow is identified because there is no controlled-release facility for this reach.

5. Evaluation of Effects

a. No Action

Under No Action, minimum flows for brown trout are sustained less frequently in the fall/winter months than under current conditions in the reach of the Truckee River from Little Truckee River to Trophy. Although difference in frequency is only 5 percent, it would result in a significant adverse effect because minimum flows are sustained infrequently in this reach; it represents a more than 20-percent change from current conditions. Reaches with no effect are not discussed.

b. LWSA

In the Truckee River from Little Truckee River to Trophy, under LSWA, minimum flows for brown trout in the fall/winter months are sustained as frequently as under No Action and less frequently than under current conditions. Because minimum flows are sustained infrequently, the 6-percent difference actually represents more than a 25-percent change from current conditions, which would be a significant adverse effect. Reaches with no effect are not discussed.

c. TROA

Under TROA, minimum flows for brown trout are sustained more frequently than under current conditions in two reaches of the Truckee River and three reaches of its tributaries. Reaches with no effect are not discussed.

> **Truckee River from Lake Tahoe to Donner Creek:** Under TROA, minimum flows for brown trout are sustained moderately (8 percent) more frequently than under No Action. Because minimum flows are sustained infrequently, the difference actually represents nearly a 60-percent change from No Action, which would reduce brown trout mortality and would be a significant beneficial effect under TROA. Under TROA, minimum flows for brown trout are sustained 7 percent more frequently than under current conditions. Because minimum flows are sustained infrequently, the difference actually represents nearly a 45-percent change from current conditions, which, again, would be a significant beneficial effect under TROA.
>
> **Truckee River from Little Truckee River to Trophy:** Under TROA, minimum flows for brown trout are sustained 5 percent more frequently than under No Action. Because minimum flows are sustained infrequently, the difference actually represents nearly a 35-percent change from No Action, which would be a significant beneficial effect under TROA. Under TROA, minimum flows for brown trout are sustained 1 percent more frequently than under current conditions, which would not be a significant beneficial effect.
>
> **Donner Creek:** California Dam Safety Requirements preclude storing water in Donner Lake from November 15 to April 15, which precludes the possibility of controlling releases. Therefore, the minimum flows analysis for Donner Lake

releases includes only the month of October. Minimum flows for brown trout are sustained 98 percent of years under TROA compared to 85 percent under No Action, which would be a significant beneficial effect. Under TROA, minimum flows for brown trout are sustained 19 percent more frequently than under current conditions, which would be a significant beneficial effect.

Independence Creek: Minimum flows for brown trout are sustained in 32 percent of years under TROA compared to 3 percent under No Action, which would be a significant beneficial effect. Under TROA, minimum flows for brown trout are sustained 10 times more frequently than under current conditions, which would be a significant beneficial effect.

Little Truckee River downstream from Stampede Reservoir: Under TROA, minimum flows for brown trout are sustained more than 4 times more frequently than under No Action, which would be a significant beneficial effect. Minimum flows for brown trout are sustained 3 times more frequently than under current conditions, which also would be a significant beneficial effect under TROA.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. A significant beneficial effect to brown trout spawning, incubation, and rearing in two reaches of the Truckee River and in three of its tributaries would occur under TROA.

D. Frequency that Preferred Flows for Various Life Stages of Rainbow Trout from April through September are Achieved or Exceeded Without Exceeding Maximum Flows

1. Summary of Effects

Analysis of operations model results for the frequency that preferred flows for rainbow trout are achieved or exceeded without exceeding maximum flows shows that significant beneficial effects would occur under TROA in the Truckee River from Little Truckee River to the Trophy reach, in the Oxbow and Spice reaches, compared to current conditions, and in Donner, Prosser, and Independence Creeks. No significant effects would occur under No Action or LWSA. Table 3.44 summarizes these effects.

2. Method of Analysis

The frequency that preferred flows for rainbow trout are achieved or exceeded from April through September without exceeding maximum flows (as generated by the operations model) was analyzed. Average monthly flows from each month from April through September were tallied if they were equal to or greater than the preferred flow and equal to or less than the maximum flow (when specified) for rainbow trout spawning, incubation, and rearing.

Table 3.44—Summary of effects: frequency that preferred flows for rainbow trout are achieved or exceeded without exceeding maximum flows (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th rowspan="2">River reach/tributary</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Truckee River from Lake Tahoe to Donner Creek</td><td colspan="5" rowspan="2">No effect</td></tr>
<tr><td>Truckee River from Donner Creek to Little Truckee River</td></tr>
<tr><td>Truckee River from Little Truckee River to Trophy</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
<tr><td>Trophy</td><td colspan="5" rowspan="2">No effect</td></tr>
<tr><td>Mayberry</td></tr>
<tr><td>Oxbow</td><td colspan="2" rowspan="2">No effect</td><td>+</td><td colspan="2" rowspan="2">No effect</td></tr>
<tr><td>Spice</td><td>+</td></tr>
<tr><td>Lockwood</td><td colspan="5">No effect</td></tr>
<tr><td>Donner Creek (October only)</td><td colspan="2" rowspan="3">No effect</td><td>+</td><td rowspan="3">No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td>+</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir</td><td colspan="5" rowspan="2">No effect</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td></tr>
</table>

3. Threshold of Significance

The same threshold of significance was used as for the first indicator of fish in the Truckee River and its tributaries.

4. Model Results

Table 3.45 presents operations model results for the frequency (percent of months) that preferred flows for various stages of rainbow trout from April through September are achieved or exceeded without exceeding maximum flows (when specified) in the Truckee River and its tributaries.

5. Evaluation of Effects

a. No Action

Under No Action, preferred flows for rainbow trout are achieved 13 and 12 percent more frequently than under current conditions in the Oxbow and Spice reaches of the Truckee River, respectively. These greater flows should result in more successful spawning,

Table 3.45—Frequency (percent of months) that preferred flows for rainbow trout from April through September are achieved or exceeded without exceeding maximum flows (when specified)

River reach/tributary	Current conditions	No Action	LWSA	TROA
Truckee River from Lake Tahoe to Donner Creek	26	26	26	27
Truckee River from Donner Creek to Little Truckee River	28	29	29	27
Truckee River from Little Truckee River to Trophy	21	24	25	41
Trophy	96	96	96	97
Mayberry	95	96	96	97
Oxbow	82	95	95	96
Spice	82	94	94	96
Lockwood	80	75	75	74
Donner Creek (October only)	18	18	18	31
Prosser Creek	25	25	24	34
Independence Creek	29	29	29	37
Little Truckee River upstream of Stampede Reservoir	60	60	60	57
Little Truckee River downstream from Stampede Reservoir	26	25	25	29

incubation, and rearing of rainbow trout in these reaches and would be a significant beneficial effect under No Action. Many other reaches show identical flows or differences of a few percent. Such differences are too small to produce a predictable biological response and are unlikely to have a significant effect. Other than in the Oxbow and Spice reaches, the greatest difference is 5-percent less flows in the Lockwood reach. Because preferred flows already are achieved in 80 percent of months, this difference would be unlikely to have a significant adverse effect.

b. LWSA

Under LWSA, preferred flows for rainbow trout are achieved 13 and 12 percent more frequently than under No Action and current conditions, respectively. These greater flows should result in more successful spawning, incubation, and rearing of rainbow trout in these reaches and are a significant beneficial effect when LWSA is compared to current conditions. Compared to both No Action and current conditions, flows in reaches are identical or differ by only a few percent. Such differences are too small to produce a predictable biological response and are unlikely to have a significant effect. Other than in the Oxbow and Spice reaches, the greatest difference is 5-percent less frequent flows in the Lockwood reach than under current conditions. Because preferred flows already are achieved in 80 percent of months, this difference would be unlikely to have a significant adverse effect.

c. TROA

In the Truckee River from Little Truckee River to Trophy and in Donner, Prosser, and Independence Creeks, under TROA, preferred flows for rainbow trout are achieved moderately to substantially more frequently than under No Action. In the Oxbow and Spices reaches, under TROA, preferred flows also are achieved moderately more frequently than under current conditions. These differences are discussed by reach. Reaches with no effect are not discussed.

Truckee River from Little Truckee River to Trophy: Under TROA, preferred flows for rainbow trout are achieved 17 percent more frequently than under No Action and 20 percent more frequently than under current conditions. Because preferred flows occur infrequently under No Action and current conditions, these differences represent a near doubling of the number of months in which preferred flows are achieved. More successful spawning, incubation, and rearing of rainbow trout should occur in this reach, which would be a significant beneficial effect under TROA.

Oxbow Reach: Under TROA, preferred flows rainbow trout are achieved 21 percent more frequently than under No Action and 14 percent more frequently than under current conditions. The latter difference is potentially significant. Lethal flows occur in 2.8 percent of the spring/summer months under TROA compared to 4.5 percent under current conditions. The difference in achieving preferred flows, in combination with the small difference in the occurrence of lethal flows, would be significant beneficial effect under TROA.

Spice Reach: Under TROA, preferred flows for rainbow trout are achieved 2 percent more frequently than under No Action. There would be no effect. Under TROA, preferred flows are achieved 14 percent more frequently than under current conditions; this substantial difference is potentially significant. Lethal flows occur in 3 percent of the spring/summer months under TROA, compared to 4 percent under current conditions. The difference in achieving preferred flows, in combination with the small difference in the occurrence of lethal flows, would be a significant beneficial effect under TROA.

Donner Creek: Under TROA, preferred flows for rainbow trout are achieved 13 percent more frequently than under either No Action or current conditions. This is only a moderate difference, but its actual effect would be greater because preferred flows occur infrequently in this reach under No Action and current conditions. This difference should have a beneficial effect on spawning, incubation, and rearing of rainbow trout in this reach and would be a significant beneficial effect under TROA.

Prosser Creek: Under TROA, preferred flows for rainbow trout are achieved 9 percent more frequently than under either No Action or current conditions. This is only a moderate difference, but its actual effect would be greater because preferred flows occur infrequently in this reach under No Action and current conditions. This difference should have a beneficial effect on spawning, incubation, and rearing of rainbow trout in this reach and would be a significant beneficial effect under TROA.

Independence Creek: Under TROA, preferred flows for rainbow trout are achieved 8 percent more frequently than under No Action or current conditions. This is a moderate, but potentially adverse effect. Lethal flows occur in Independence Creek in 63 percent of the spring/summer months under No Action and in 60 percent of months under current conditions compared to 42 percent under TROA, or one-third less frequently. This difference should have a beneficial effect on rainbow trout spawning, incubation, and rearing and would be a significant beneficial effect under TROA.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect to rainbow trout spawning, incubation, and rearing in three reaches of the Truckee River and in three of its tributaries would occur under TROA.

E. Frequency that Minimum Flows for Various Life Stages of Rainbow Trout from April through September are Sustained

1. Summary of Effects

Analysis of operations model results for the frequency that minimum flows for rainbow trout are sustained shows that a significant beneficial effect would occur under TROA in the Truckee River downstream from Lake Tahoe to Donner Creek, in Prosser and Independence Creeks, and in the Little Truckee River downstream from Stampede Reservoir. No effect would occur under either No Action or LWSA. Table 3.46 summarizes these effects.

2. Method of Analysis

The frequency that minimum flows for spawning, incubating, and rearing rainbow trout from April through September are sustained (as generated by the operations model) was evaluated. Qualifying years were those in which flow was between the specified minimum and maximum for the entire 6-month period.

3. Threshold of Significance

The same threshold of significance was used as for the first indicator of fish in the Truckee River and its tributaries.

Table 3.46—Summary of effects: frequency that minimum flows for rainbow trout are sustained (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th rowspan="2">River reach/tributary</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Truckee River from Lake Tahoe to Donner Creek</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
<tr><td>Truckee River from Donner Creek to Little Truckee River</td><td colspan="5" rowspan="7">No effect</td></tr>
<tr><td>Truckee River from Little Truckee River to Trophy</td></tr>
<tr><td>Trophy</td></tr>
<tr><td>Mayberry</td></tr>
<tr><td>Oxbow</td></tr>
<tr><td>Spice</td></tr>
<tr><td>Lockwood</td></tr>
<tr><td>Donner Creek (October only)</td><td colspan="5">No effect</td></tr>
<tr><td>Prosser Creek</td><td colspan="2" rowspan="2">No effect</td><td>+</td><td rowspan="2">No effect</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir[1]</td><td colspan="5">Not applicable</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
</table>

[1] No minimum flow is identified because there is no controlled release facility for this reach.

4. Model Results

Table 3.47 presents operations model results for the frequency (percent of years) that minimum flows for rainbow trout are sustained from April through September without exceeding maximum flows (when specified) in the Truckee River and its tributaries.

5. Evaluation of Effects

a. No Action

Under No Action, minimum flows for rainbow trout are sustained almost as frequently as under current conditions (difference of no more than 1 percent). There would be no effect.

b. LWSA

Under LWSA, minimum flows for rainbow trout are sustained almost as frequently as under No Action or current conditions (differences of no more than 1 percent). There would be no effect.

Table 3.47—Frequency (percent of years) that minimum flows for rainbow trout from April through September are sustained

River reach/tributary	Current conditions	No Action	LWSA	TROA
Truckee River from Lake Tahoe to Donner Creek	2	2	2	27
Truckee River from Donner Creek to Little Truckee River	14	14	14	12
Truckee River from Little Truckee River to Trophy	1	1	1	1
Trophy	92	92	92	94
Mayberry	91	92	92	93
Oxbow	89	89	89	93
Spice	89	89	89	93
Lockwood	88	88	88	92
Donner Creek (October only)	0	0	0	0
Prosser Creek	1	1	1	11
Independence Creek	0	0	0	7
Little Truckee River upstream of Stampede Reservoir[1]	Not applicable			
Little Truckee River downstream from Stampede Reservoir	1	1	1	14

[1] No minimum flow is identified because there is no controlled release facility for this reach.

c. TROA

Under TROA, minimum flows for rainbow trout are sustained substantially more frequently than under either No Action or current conditions in the Lake Tahoe to Donner Creek reach of the Truckee River, in Prosser and Independence Creeks, and in the Little Truckee River downstream from Stampede Reservoir. These results are discussed by reach. Reaches with no effect are not discussed.

Truckee River from Lake Tahoe to Donner Creek: Under TROA, minimum flows for rainbow trout are sustained substantially more frequently in this reach than under No Action or current conditions: in 27 percent of years under TROA compared to only 2 percent under No Action and current conditions. This large difference would have a beneficial effect on spawning, incubation, and rearing of rainbow trout and would be a significant beneficial effect under TROA.

Prosser Creek: Under TROA, minimum flows for rainbow trout in Prosser Creek are sustained substantially more frequently than under No Action or current conditions: 11 percent of years under TROA compared to only 1 percent under No Action and current conditions. This large difference would have a beneficial effect on spawning, incubation, and rearing of rainbow trout, and would be a significant beneficial effect under TROA.

Independence Creek: Under TROA, minimum flows for rainbow trout in Independence are sustained substantially more frequently than under No Action or current conditions. Under both No Action and current conditions minimum flows are never sustained, compared to 14 percent under TROA. This large difference would have a beneficial effect on spawning, incubation, and rearing of rainbow trout and would be a significant beneficial effect under TROA.

Little Truckee River downstream from Stampede Reservoir: Under TROA, minimum flows for rainbow trout in this reach are sustained substantially more frequently than under No Action or current conditions. Under both No Action and current conditions, minimum flows are sustained in only 1 percent of years, compared to 14 percent under TROA. This large difference would have a beneficial effect on spawning, incubation, and rearing of rainbow trout and would be a significant beneficial effect under TROA.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect to rainbow trout spawning, incubation, and rearing would occur in three reaches of the Truckee River and in three of its tributaries under TROA.

F. Frequency of Flushing/Stranding Flows

1. Summary of Effects

Analysis of operations model results shows that flows that may strand fish or flush fish downstream in Prosser Creek and in the Little Truckee River downstream from Stampede Reservoir from October through March occur much less frequently under TROA, which would be a significant beneficial effect. Table 3.48 summarizes these effects.

Table 3.48—Summary of effects: frequency that flushing/stranding flows occur (+ = significant beneficial effect, - = significant adverse effect)

Tributary	Period	Compared to current conditions			Compared to No Action	
		No Action	LWSA	TROA	LWSA	TROA
Prosser Creek	Oct–Mar	+	+	+	No effect	+
	Apr–Sep	No effect				
Little Truckee River downstream from Stampede Reservoir	Oct–Mar	No effect		+	No effect	+
	Apr–Sep	No effect				

2. Method of Analysis

For this analysis, a flushing/stranding flow is two times or more greater than the preferred flow for any given reach. CDFG has identified Prosser Creek and the Little Truckee River downstream from Stampede Reservoir as having the greatest problems with large flushing flows. To determine the frequency of flushing/stranding flows, flows in Prosser Creek and the Little Truckee River downstream from Stampede Reservoir for all months (generated from the operations model) were analyzed.

3. Threshold of Significance

Prosser Creek and the Little Truckee River each has its own brown and rainbow trout habitat conditions and channel morphology that can dramatically influence the effects of changes in the frequency of flushing/stranding flows on fish populations. Quantification of long-term effects of flushing/stranding flows is confounded by recruitment from other adjacent reaches and on-stream reservoirs. An absolute threshold value above or below which an effect is demonstrably significant is not, therefore, biologically defensible.

Interpretations of differences in the frequency of flushing/stranding flows must be based on best professional judgment, taking into consideration not just the relative difference in the frequencies being compared but also the absolute value of those frequencies. Operations model results show that flushing/stranding flows occur in 15 to 53 percent of years. The greatest differences among the alternatives occur in the fall/winter months, when frequency decreases range between 6 and 13 percent of years on Prosser Creek and between 8 and 12 percent on the Little Truckee River downstream from Stampede Reservoir. Although the value ranges are similar on the two reaches, flushing/stranding flows on Prosser Creek occur only about half as frequently as on the Little Truckee River. For this reason, the same relative difference in frequency of flushing/stranding flows cannot be expected to affect the two reaches to the same degree.

4. Model Results

Table 3.49 presents operations model results for the frequency (percent of years) that flushing/stranding flows occur (i.e., average monthly flows are equal to or are greater than twice the preferred flows for the representative fish species for that month).

Table 3.49—Frequency (percent of years) that flushing/stranding flows (i.e., twice preferred flows or greater) occur

Tributary	Season	Current conditions	No Action	LWSA	TROA
Prosser Creek	Fall/winter	28	21	21	15
	Spring/summer	28	28	28	31
Little Truckee River downstream from Stampede Reservoir	Fall/winter	53	49	49	41
	Spring/summer	16	16	16	20

5. Evaluation of Effects

a. No Action

Under No Action, flushing/stranding flows occur moderately less (7 percent) often in Prosser Creek in the fall/winter months than under current conditions. Although this difference is only 7 percent, flushing/stranding flows actually occur substantially less often. There are no other effects.

b. LWSA

Under LWSA, flushing/stranding flows occur as frequently as under No Action. There would be no effect.

c. TROA

Under TROA, flushing/stranding flows occur moderately less often in both Prosser Creek and the Little Truckee River downstream from Stampede Reservoir in the fall/winter months than under No Action or current conditions. These tributaries are discussed individually. Tributaries with no effect are not discussed.

Under TROA, flushing flows in Prosser Creek and the Little Truckee River downstream from Stampede Reservoir in the spring/summer months occur only slightly more frequently than under No Action or current conditions; this would not be a significant effect because flushing/stranding flows occur infrequently and would occur less often on an annual basis under TROA than under No Action, LWSA, or current conditions.

> **Prosser Creek:** Under TROA, flushing/standing flows occur nearly 30 percent less frequently in the fall/winter months than under No Action, which would be a significant beneficial effect. Flushing/stranding flows occur in the fall/winter months in 15 percent of years under TROA, compared to 28 percent under current conditions. Because these flows occur relatively often, this difference would be a significant beneficial effect under TROA.
>
> **Little Truckee River downstream from Stampede Reservoir:** Under TROA, flushing/stranding flows in the fall/winter months occur in 41 percent of years compared to 49 percent under No Action and 53 percent under current conditions. Because fall/winter flushing/ stranding flows occur relatively frequently, in about half of the years, the moderate difference in frequency under TROA would be a significant beneficial effect under TROA. Under TROA, in the spring/summer months, flushing/stranding flows occur 4 percent more frequently than under No Action or current conditions. Because flushing/stranding flows occur infrequently, this would not be a significant effect on fish populations.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. A significant beneficial effect would occur in Prosser Creek and the Little

Truckee River downstream from Stampede Reservoir in the fall/winter months under TROA because flushing/stranding flows would occur less frequently.

G. Frequency of Low Flows in Winter Months that Increase the Potential for Anchor Ice Formation

1. Summary of Effects

Analysis of operations model results shows that, under TROA, in Donner Creek and Independence Creek, low flows that increase the potential for formation of anchor ice occur substantially less often than under No Action and current conditions. The potential for formation of anchor ice would not be affected under LWSA or No Action (table 3.50).

Table 3.50—Summary of effects: frequency of low flows in winter months that increase the potential for anchor ice formation (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th rowspan="2">River reach/tributary</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Truckee River from Lake Tahoe to Donner Creek</td><td colspan="5" rowspan="4">No effect</td></tr>
<tr><td>Truckee River from Donner Creek to Little Truckee River</td></tr>
<tr><td>Oxbow</td></tr>
<tr><td>Spice</td></tr>
<tr><td>Donner Creek</td><td colspan="2" rowspan="2">No effect</td><td>+</td><td rowspan="2">No effect</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>+</td><td>+</td></tr>
</table>

2. Method of Analysis

The frequency of flows low enough to increase the potential for anchor ice formation from December through February (winter months), as generated by the operations model, was evaluated. Only reaches where icing is a concern were evaluated. Monthly flows were tallied if they were below minimum flows specified by CDFG and NDOW.

3. Threshold of Significance

Each reach has its own brown and rainbow trout habitat conditions and channel morphology that can dramatically influence the effects of changes in the frequency of low flows that could increase the potential for anchor ice formation on fish populations. Quantification of long-term effects of such flows is confounded by recruitment from other adjacent reaches and on-stream reservoirs. An absolute threshold value above or below which an effect is demonstrably significant, therefore, is not biologically defensible.

Interpretations of differences in the frequency of low flows that could increase the potential for anchor ice formation must be based on best professional judgment, taking into consideration not just the relative difference in the frequencies being compared but also the absolute value of those frequencies. Operations model results show that low-flow conditions conducive to anchor ice formation occur relatively rarely on the mainstem of the Truckee River, with very little difference among the alternatives. In all but two cases on Donner and Independence Creeks, there is 1 percent or no difference in the frequency of such conditions. The exceptions are so marked that the likelihood of their having a significant effect on fish populations is very high.

4. Model Results

Table 3.51 presents operations model results for the frequency (percent of years) of low flows in winter months that increase the potential for anchor ice formation in selected reaches of the Truckee River and tributaries.

Table 3.51—Frequency (percent of years) of low flows in winter months that increase the potential for anchor ice formation

River reach/tributary	Current conditions	No Action	LWSA	TROA
Truckee River from Lake Tahoe to Donner Creek	16	16	16	17
Truckee River from Donner Creek to the Little Truckee River	10	10	10	10
Oxbow	3	4	5	5
Spice	3	6	6	7
Donner Creek	12	12	12	2
Independence Creek	44	44	45	22

5. Evaluation of Effects

a. No Action

Under No Action, flows low enough to increase the potential for anchor ice formation occur about as frequently (difference as of 3 percent or less) as under current conditions. There would be no effect. Tributaries with no effect are not discussed.

b. LWSA

Under LWSA, flows low enough to increase the potential for anchor ice formation occur about as frequently as under No Action (differences of 1 percent or less) and as under current conditions (differences of 3 percent or less). There would be no effect. Tributaries with no effect are not discussed.

c. TROA

A significant beneficial effect would occur under TROA in Donner and Independence Creeks. The results for each of these tributaries are discussed. Tributaries with no effect are not discussed.

Donner Creek: Under TROA, flows low enough to increase the potential for anchor ice formation occur in only 2 percent of years, compared to 12 percent under both No Action and current conditions. Under TROA, therefore, fish within Donner Creek would experience substantially less mortality from icing conditions during winter, which would be a significant beneficial effect under TROA.

Independence Creek: Under TROA, flows low enough to increase the potential for icing conditions occur in 22 percent of years, compared to 44 percent under both No Action and current conditions. Under TROA, therefore, fish in Donner Creek would experience substantially less mortality from icing conditions during winter, which would be a significant beneficial effect under TROA.

6. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect would occur under TROA because icing conditions would occur less frequently in Donner and Independence Creeks.

Fish in Lakes and Reservoirs

I. Affected Environment

Native and non-native fish species occur in all of the lakes and reservoirs of the Truckee River system and in Lahontan Reservoir. Table 3.52 lists fish species found in each reservoir. Table 3.37 summarizes the spawning requirements of selected fish species in the Truckee River basin.

Nine native fish species occur in the Truckee River system, and all can occur in lakes and reservoirs in the study area. Lahontan redside shiner, speckled dace, Tahoe sucker, and tui chub are the most widespread species. Two species (cui-ui and LCT), are federally listed as endangered and threatened, respectively, and the mountain sucker is a California Species of Concern. See "Endangered, Threatened, and Other Special Status Species."

Most freshwater fish are adaptable to various habitat types, but each species has environmental limits that define its distribution. Some species, such as Lahontan redside shiner, speckled dace, and Tahoe sucker, have greater tolerance to different environmental conditions and, thus, are generally more widespread and abundant. Other species, such as mountain whitefish and mountain sucker, have more restricted environmental limits.

All native species, except mountain whitefish, spawn in spring and early summer when water temperatures are optimum for the species, flows are high, and lakes and reservoirs are filling or full. Mountain whitefish spawn in October and November when water temperatures are cold, streamflows are low, and lakes and reservoirs are lower because of summer releases.

Non-native fish species have been introduced extensively throughout the Truckee and Carson River basins, and some occur in each lake and reservoir. Twenty-five non-native fish species are found in lakes and reservoirs in the system (table 3.52). In general, all the non-native salmonids (trout and salmon), except rainbow trout, spawn in the fall and winter, and all but lake trout spawn in the Truckee River or its tributaries. The remaining non-native fish spawn in spring or early summer. They generally spawn in the lakes and reservoirs, although some can spawn in tributaries with large pools of slow, warm water.

Large fluctuations in elevation and steep slopes associated with Prosser Creek, Stampede, and Boca Reservoirs are not conducive to shallow water spawning. Lake Tahoe, Donner, Independence, and Pyramid Lakes and Lahontan Reservoir provide the best shallow water fish spawning habitat in the area since these water bodies may not have as many fluctuations in water elevation nor do they have as steep of slopes as the other reservoirs under operation.

Adequate water storage in lakes and reservoirs is important for fish survival. Primary concerns associated with low water volumes in the Truckee River basin reservoirs are increased temperatures and lack of dissolved oxygen. Higher temperatures and lower DO levels can lead to fish stress and kills.

Table 3.52—Occurrence and abundance of fish in lakes and reservoirs in the study area[1,2]

Species	Lake Tahoe	Donner Lake	Martis Creek Reservoir	Prosser Creek Reservoir	Independence Lake	Stampede Reservoir	Boca Reservoir	Pyramid Lake	Lahontan Reservoir
Native fish									
Lahontan cutthroat trout	none	none	U	none	C	none	none	C-P	none
Mountain whitefish	U	U	none	U	C	U	none	none	none
Paiute sculpin	C	U	none	U	C	U	U	none	none
Lahontan redside shiner	C	C	U	C	C	C	C	C	U
Speckled dace	C	C	U	C	C	C	C	C	U
Lahontan tui chub	C	C	none	U	C	C	C	C	U
Tahoe sucker	C	C	C	C	C	C	C	C	U
Mountain sucker	U	U	none	U	none	U	none	none	U
Cui-ui	none	none	none	none	none	none	none	C	none
Non-native fish [3]									
Rainbow trout	C-P[4]	C-P[4]	C	C-P[4]	none	C-P[4]	C-P[4]	none	none
Brown trout	C-P[4]	C	C	C	U	C-P[4]	C-P[4]	none	none
Brook trout	U	none	none	none	C	none	none	none	none
Mackinaw lake trout	C	C-P	none	none	none	C-P	none	none	none
Kokanee salmon	C-P	U-P	none	none	C	C-P	C-P	none	none
Sacramento perch	none	none	none	none	none	none	none	U	C
Walleye	none	none	none	none	none	none	none	none	C-P
White bass	none	none	none	none	none	none	none	none	C-P
Largemouth bass	U	none	none	none	none	none	none	none	C
Smallmouth bass	U	none	U	none	none	C	U	none	none
Spotted bass	none	none	none	none	none	none	none	none	U
Green sunfish	none	none	U	none	none	U	U	none	C
Wipers	none	none	none	none	none	none	none	none	C-P
Channel catfish	none	none	none	none	none	none	none	none	C
White catfish	none	none	none	none	none	none	none	none	C
Yellow perch	none	none	none	none	none	none	none	none	U
White crappie	U	none	none	none	none	none	none	none	C

Table 3.52—Abundance and use of lakes and reservoirs by fish of the Truckee River system – continued

Species	Lake Tahoe	Donner Lake	Martis Creek Reservoir	Prosser Creek Reservoir	Independence Lake	Stampede Reservoir	Boca Reservoir	Pyramid Lake	Lahontan Reservoir
Non-native fish – continued									
Black crappie	none	none	none	none	none	none	none	none	C
Sacramento blackfish	none	none	none	none	none	none	none	none	C
Carp	none	none	none	none	none	none	none	none	C
Goldfish	none	none	none	none	none	none	none	none	U
Fathead minnow	none	none	none	none	none	none	none	none	U
Golden shiner	U	none	none	none	none	none	none	none	none
Bullhead	U	none	none	none	none	none	none	none	C
Mosquitofish	none	none	none	none	none	none	none	none	C

[1] Sources: Coffin, 2003; Hiscox, 2003; Tisdale, 2003; Solberger, 2003.
[2] C = common; U = uncommon; P = planted (to maintain quality of recreational fishery).
[3] Many non-native species have become naturalized and no longer need to be planted to maintain population abundance.
[4] Reproducing populations may also be present.

Extensive algal blooms may occur in Lahontan Reservoir when water storage is low. Fish kills sometimes occur in summer when water elevations are low and blooms of the blue-green alga, *Aphanizomenon flos-aquae*, occur (NDOW, 1992a). When green and blue-green algae are active, they produce oxygen; when they decompose, they consume oxygen. Rapid decomposition, which may occur following large blooms, may adversely affect invertebrates and fish and lead to fish kills by reducing the amount of dissolved oxygen available for respiration. Fish kills at Lahontan Reservoir may also have resulted from the toxins produced by *Aphanizomenon* and not oxygen depletion. However, blooms may not develop if wind produces wave action on the open water or if mechanical aeration systems are activated.

II. Environmental Consequences

A. Introduction

To evaluate the effects of changes in reservoir and lake storage on resident fish, the following two indicators were selected:

- Fish survival based on minimum storage thresholds
- Spring/summer shallow water fish spawning habitat

B. Summary of Effects

Table 3.53 summarizes the effects on fish in lakes and reservoirs.

Table 3.53—Summary of effects: fish in lakes and reservoirs
(+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th rowspan="2">Lake/reservoir</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><th colspan="6">Fish survival</th></tr>
<tr><td>Prosser Creek</td><td colspan="3">+</td><td rowspan="3">No effect</td><td rowspan="3">+</td></tr>
<tr><td>Stampede</td><td colspan="2" rowspan="2">No effect</td><td rowspan="2">+</td></tr>
<tr><td>Boca</td></tr>
<tr><td>Lahontan</td><td colspan="5">No effect</td></tr>
<tr><th colspan="6">Spring/summer shallow water fish spawning habitat</th></tr>
<tr><td>Tahoe</td><td colspan="5" rowspan="5">No effect</td></tr>
<tr><td>Donner</td></tr>
<tr><td>Independence</td></tr>
<tr><td>Pyramid</td></tr>
<tr><td>Lahontan</td></tr>
</table>

C. Fish Survival Based on Minimum Storage Thresholds

1. Method of Analysis

For the fish survival analysis, minimum storage thresholds (thresholds) were assigned and analyzed for Prosser Creek, Stampede, Boca, and Lahontan Reservoirs. CDFG and NDOW have recommended thresholds for these reservoirs to maintain fisheries, water quality, and aquatic productivity. The conservation pool threshold in Lahontan Reservoir, agreed to by TCID in 1992, is recommended to minimize algal blooms. The established thresholds are as follows:

- Prosser Creek Reservoir: 5,000 acre-feet minimum
- Stampede Reservoir: 15,000 acre-feet minimum
- Boca Reservoir: 10,000 acre-feet minimum
- Lahontan Reservoir: 4,000 acre-feet minimum

The analysis for fish survival evaluated the probability (frequency) that storage in these four reservoirs is below thresholds at least once during the year, as shown by operations model results. The analysis assumes that the greater the storage throughout the year, the greater the fish productivity, and that fish survival is likely to be adversely affected the more frequently storage is below these thresholds.

2. Threshold of Significance

Fish populations at Prosser Creek, Stampede, Boca, and Lahontan Reservoirs could be adversely affected if reservoir storage were to fall below the thresholds recommended to maintain fish populations, water quality, and aquatic productivity at a sufficient frequency and magnitude, relative to current conditions or No Action, to significantly affect fish survival. The significance of differences was based on best professional judgment.

3. Model Results

Table 3.54 presents operations model results for the frequency (percent of years) that storage in the reservoirs is below the recommended thresholds.

Table 3.54—Frequency (percent of years) that storage in reservoirs is below the recommended thresholds

Lake/reservoir	Current conditions	No Action	LWSA	TROA
Prosser Creek	41	20	20	11
Stampede	15	11	14	2
Boca	90	88	89	55
Lahontan	16	16	16	16

4. Evaluation of Effects

a. No Action

(1) Prosser Creek Reservoir

Operations model results show that, under No Action, Prosser Creek Reservoir is below the threshold in about half as many years as under current conditions. As a result, under No Action, fish mortality would be substantially less than under current conditions, which would be significant beneficial effect.

(2) Stampede Reservoir

Under No Action, Stampede Reservoir is below the threshold in only 4 percent fewer years than under current conditions. There would be no effect.

(3) Boca Reservoir

Under No Action, Boca Reservoir is below the threshold in 2 percent fewer years than under current conditions. There would be no effect.

(4) Lahontan Reservoir
Under No Action, Lahontan Reservoir is below the threshold as frequently as under current conditions. There would be no effect.

b. LWSA

(1) Prosser Creek Reservoir
Under LWSA, Prosser Creek Reservoir is below the threshold as frequently as under No Action. There would be no effect. The reservoir is below the threshold in about half as many years as under current conditions, which would be significant beneficial effect under LWSA when compared to current conditions.

(2) Stampede Reservoir
Under LWSA, Stampede Reservoir is below the threshold in only 3 percent more years than under No Action. There would be no effect. Under LWSA, the reservoir is below the threshold about as frequently as under current conditions (difference of only 1 percent). This small difference would not have a significant effect.

(3) Boca Reservoir
Under LWSA, Boca Reservoir is below the threshold about as frequently as under No Action or current conditions (differences of 1 percent). These small differences would not have a significant effect.

(4) Lahontan Reservoir
Under LWSA, Lahontan Reservoir is below the threshold as frequently as under No Action or current conditions. There would be no effect.

c. TROA

(1) Prosser Creek Reservoir
Under TROA, Prosser Creek Reservoir is below the threshold in about half as many years as under No Action and in nearly 30 percent fewer years than under current conditions. As a result, fish mortality would be substantially less under TROA, which would be a significant beneficial effect.

(2) Stampede Reservoir
Under TROA, Stampede Reservoir is below the threshold in 9 percent fewer years than under No Action and in nearly 13 percent fewer years than under current conditions. As a result, fish mortality would be substantially less under TROA, which would be a significant beneficial effect.

(3) Boca Reservoir

Under TROA, Boca Reservoir is below the threshold in 33 percent fewer years than under No Action and in 35 percent fewer years than under current conditions. As a result, fish mortality would be substantially less under TROA, which would be a significant beneficial effect.

(4) Lahontan Reservoir

Under TROA, Lahontan Reservoir is below the threshold as frequently as under No Action or current conditions. There would be no effect.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect would occur under TROA because storage in Prosser Creek, Stampede, and Boca Reservoirs would fall below the thresholds substantially less often than under No Action or current conditions.

D. Spring/Summer Shallow Water Fish Spawning Habitat

1. Method of Analysis

The shallow water fish spawning habitat analysis compared the amount of available fish spawning habitat under current conditions, No Action, LWSA, and TROA based on operations model results. Spring and summer shallow water fish spawning habitat was measured by the average acres of shallow (i.e., less than 1 meter (3.28 feet) deep) water habitat in Lake Tahoe and Donner and Independence Lakes in June in wet, median, and dry hydrologic conditions. The use of wet, median, and dry hydrologic conditions is not applicable in analysis of Pyramid Lake because it is a terminal lake. The total area in wet, median, and dry hydrologic conditions, therefore, does not correlate with these hydrologic conditions due to the general trend for the water elevation of Pyramid Lake to increase from current conditions under all alternatives. The Pyramid Lake analysis uses the average total acres of shallow water habitat in June over the modeled 100-year period. June was chosen as a representative month for fish that spawn in spring and summer in the basin because, although the spawning season for the various fish species may cover different time periods in the spring and summer, the majority of fish spawn in June.

A separate analysis was conducted for spring and summer fish spawning at Lahontan Reservoir. NDOW recommends a minimum storage threshold of 160,000 acre-feet at Lahontan Reservoir in May and June to benefit fish spawning. Below this threshold, rocky substrate important for spawning and cover for young fish becomes limited (Reclamation, 1986; Sevon, 1993). The analysis for spring and summer fish spawning at Lahontan Reservoir evaluated the frequency that the storage is below this threshold in May and June under current conditions and the alternatives.

2. Threshold of Significance

An effect on fish populations at Lake Tahoe and Donner, Independence, and Pyramid Lakes were considered significant if a change in shallow water habitat of 15 percent or more were to occur in June, as shown by operations model results. An effect on fish populations at Lahontan Reservoir was considered significant if storage were to fall below the recommended threshold (160,000 acre-feet) 15 percent or more frequently in May and June, as shown by operations model results.

3. Model Results

Table 3.55 presents operation model results for the average total area in acres of shallow water fish spawning habitat in June in wet, median, and dry hydrologic conditions at Lake Tahoe and Donner and Independence Lakes. Table 3.56 presents operations model results for the average total area of shallow water fish spawning habitat in June at Pyramid Lake. Table 3.57 presents operations model results for the frequency that Lahontan Reservoir is below 160,000 acre-feet in May and June.

Table 3.55—Average total area (acres) of shallow water fish spawning habitat in June in wet, median, and dry hydrologic conditions at Lake Tahoe and Donner and Independence Lakes

Lake	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Tahoe	Wet	1,301	1,301	1,301	1,301
	Median	1,292	1,291	1,291	1,292
	Dry	715	715	715	722
Donner	Wet	38	38	38	38
	Median	38	38	38	38
	Dry	33	33	33	33
Independence	Wet	29	29	29	29
	Median	29	29	29	29
	Dry	25	26	26	24

4. Evaluation of Effects

a. No Action

(1) Lake Tahoe

Operations model results show that the average total area of shallow water fish spawning habitat at Lake Tahoe under No Action is about the same as under current conditions in all three hydrologic conditions (maximum difference of 1 acre). There would be no significant effect.

Table 3.56—Average total area (acres) of shallow water fish spawning habitat in June at Pyramid Lake

Current conditions	No Action	LWSA	TROA
1,675	1,663	1,664	1,666

Table 3.57—Frequency that Lahontan Reservoir is below 160,000 acre-feet in May and June

Current conditions	No Action	LWSA	TROA
16	18	18	20

(2) Donner Lake

The average total area of shallow water fish spawning habitat at Donner Lake under No Action is the same as under current conditions in all three hydrologic conditions. There would be no effect.

(3) Independence Lake

The average total area of shallow water fish spawning habitat at Independence Lake under No Action is about the same as under current conditions in all three hydrologic conditions (maximum difference of 1 acre). There would be no significant effect.

(4) Pyramid Lake

The average total area of shallow water fish spawning habitat at Pyramid Lake under No Action is about the same as under current conditions (difference of less than 1 percent) in all three hydrologic conditions. There would be no significant effect.

(5) Lahontan Reservoir

Under No Action, Lahontan Reservoir is below 160,000 acre-feet 2 percent more frequently than under current conditions. There would be no significant effect.

b. LWSA

(1) Lake Tahoe

The average total area of shallow water fish spawning habitat at Lake Tahoe under LWSA is the same as under No Action in all three hydrologic conditions and is about the same as under current conditions (difference of 1 acre in median hydrologic conditions). There would be no significant effect.

(2) Donner Lake

The average total area of shallow water fish spawning habitat at Donner Lake under LWSA is the same as under No Action or current conditions in all three hydrologic conditions. There would be no effect.

(3) Independence Lake

The average total area of shallow water fish spawning habitat at Independence Lake under LWSA is the same as under No Action in all hydrologic conditions and is about the same as under current conditions (difference of 1 acre in dry hydrologic conditions). There would be no effect.

(4) Pyramid Lake

The average total area of shallow water fish spawning habitat at Pyramid Lake under LWSA is about the same as under No Action or current conditions (differences of less than 1 percent). There would be no effect.

(5) Lahontan Reservoir

Under LWSA, Lahontan Reservoir is below 160,000 acre-feet as frequently as under No Action and 2 percent more frequently than under current conditions. There would be no significant effect.

c. TROA

(1) Lake Tahoe

Under TROA, the average total area of shallow water fish spawning habitat at Lake Tahoe is the same as under No Action or current conditions in wet hydrologic conditions and is about the same in median and dry hydrologic conditions (differences of less than 1 percent). There would be no effect.

(2) Donner Lake

Under TROA, the average total area of shallow water fish spawning habitat at Lake Tahoe is the same as under No Action or current conditions in any hydrologic condition. There would be no effect.

(3) Independence Lake

The average total area of shallow water fish spawning habitat at Independence Lake is the same under TROA and No Action in wet and median hydrologic conditions, and it differs by less than 8 percent in dry hydrologic conditions. It is the same as under current conditions, except in dry hydrologic conditions (difference of only 1 acre). There would be no effect. TROA would allow for water exchange among reservoirs and provide greater flexibility in the management of Independence Lake to limit or increase fish spawning habitat.

(4) Pyramid Lake

The average total area of shallow water fish spawning habitat at Pyramid Lake under TROA is less than 1 percent less than under No Action or current conditions. There would be no effect.

(5) Lahontan Reservoir

Under TROA, Lahontan Reservoir is below 160,000 acre-feet 2 percent more frequently than under No Action and 4 percent more frequently than under current conditions. These small differences are not enough to pose a threat to fish populations in Lahontan Reservoir. Most fish species that spawn in Lahontan Reservoir are introduced, many are planted, and none are imperiled. No significant effect, therefore, would occur.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

Waterfowl and Shorebirds

I. Affected Environment

Waterfowl and shorebirds that use lakes and reservoirs in the Truckee River basin are listed in the Biological Resources Appendix. In general, habitat at reservoirs is of lower quality and provides less plant and animal food for water birds than do natural (i.e., unregulated) lakes and ponds; this may be because fluctuating elevations inhibit the establishment and development of shoreline vegetation that many birds require (Beedy and Granholm, 1985). Lake Tahoe, Pyramid Lake, Lahontan Reservoir, and, to a lesser extent, Stampede Reservoir, provide large quantities of more stable, higher quality habitat that supports the largest populations of waterfowl in the study area. Stampede and Lahontan Reservoirs and Pyramid Lake also have islands where many bird species nest. Donner and Independence Lakes and Prosser Creek and Boca Reservoirs provide relatively limited habitat because of their small size, high recreational use, or widely fluctuating water elevations. During summer months, water bird use at many of the lakes and reservoirs is limited due to human recreation activities.

Common water bird species at Lake Tahoe include Canada geese, California gulls, mallards, and mergansers. The lake is used by various migrating waterfowl and shorebirds. The number of nesting birds has greatly decreased with development of the shoreline (Orr and Moffitt, 1971).

Stampede Reservoir provides foraging habitat for migrating waterfowl. Canada goose is the primary island nesting species at Stampede Reservoir; nesting occurs from March through May.

Lahontan Reservoir is used by dabbling ducks, especially during the fall, and is an important nesting and feeding area for Canada geese (Saake, 1994). American white pelicans also use Lahontan Reservoir during the spring, particularly when lakes and ponds at Stillwater National Wildlife Refuge and other Lahontan Valley wetlands are reduced during drought years. Waterbird nesting occurs on Gull and Evans Islands in Lahontan Reservoir. Colonial nesting species, such as California and ring-billed gulls; double-crested cormorant; great blue heron; snowy, great, and cattle egrets; and black-crowned night heron, nest on these islands from March through July (Neel, 1995).

Of the 51 water bird species that occur at Pyramid Lake, 29 species (excluding shorebirds) potentially breed at or near the lake; 10 of these species are winter visitors, and 12 are transients during fall and spring migration (Biological Resources Appendix). Waterfowl use at Pyramid Lake is greatest during the fall and winter. Pyramid Lake is especially important waterfowl habitat in drought years when other wetlands are dry. Anaho Island in Lake Pyramid provides nesting habitat for many bird species. The northern end of Pyramid Lake, which provides shallow feeding areas and is less disturbed by recreationists, and the southern end near the mouth of the Truckee River, are the most important feeding areas for waterfowl.

Table 3.58 presents 2003 survey data for wintering waterfowl within the four counties that include lakes and reservoirs in the study area in Nevada. The numbers included in this table are likely higher than the actual number of waterfowl using the major water bodies within the study area because the survey was county-wide; data for two wildlife management areas within the four counties but not part of this analysis are not included in the numbers shown in the table.

Table 3.58—Number of waterfowl counted during 2003 FWS mid-winter inventories of all major wetlands in Douglas County (Lake Tahoe), Lyon County (Lahontan Reservoir), Churchill County (Lahontan Reservoir), and Washoe County (Lake Tahoe and Pyramid Lake), Nevada

	Douglas Co.	Lyon Co.	Churchill Co.[1]	Washoe Co.[2]	Total
Dabbling ducks	1,020	1,645	18,436	6,114	27,215
Diving ducks	110	497	4,946	2,493	8,046
Geese	1,530	2,250	1,650	8,964	14,394
Swans	14	41	180	410	645
Coots	130	1,170	7,180	2,217	10,697
Total	2,804	5,603	32,392	20,198	60,997

[1] Churchill County data do not include waterfowl inventoried at Stillwater WMA.
[2] Washoe County data do not include waterfowl inventoried at Scripps Management Area.

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect lake and reservoir elevations. In turn, reservoir elevations could affect waterfowl, shorebirds, and island-nesting birds in the study area. This analysis evaluated the effects of changes in water elevations on these bird guilds using following indicators:

- Waterfowl and shorebird shallow water foraging habitat
- Island bird nest predation and inundation

B. Summary of Effects

At Stampede Reservoir, analysis of operations model results shows that, under TROA, predator access to islands on which birds nest occurs less frequently than under

No Action or current conditions (table 3.59). This beneficial effect would be offset, however, by the greater probability that the island would be inundated. The difference is not significant compared to No Action, but would have an adverse effect on the potential for local nesting success by Canada geese when compared to current conditions. This local adverse effect is not significant to the overall regional population of Canada geese and would require no mitigation.

Table 3.59—Summary of effects: waterfowl and shorebirds (+ = significant beneficial effect, * = nonsignificant adverse effect)

<table>
<tr><th rowspan="2">Lake/reservoir</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td colspan="6">Waterfowl and shorebird shallow water foraging habitat</td></tr>
<tr><td>Tahoe</td><td colspan="5">No effect</td></tr>
<tr><td>Stampede</td><td colspan="3">No effect</td><td>No effect</td><td>+</td></tr>
<tr><td>Pyramid</td><td colspan="5" rowspan="2">No effect</td></tr>
<tr><td>Lahontan</td></tr>
<tr><td colspan="6">Island bird nest predation and inundation</td></tr>
<tr><td>Stampede</td><td colspan="2">No effect</td><td>*</td><td colspan="2">No effect</td></tr>
<tr><td>Lahontan</td><td colspan="5">No effect</td></tr>
</table>

At Lahontan Reservoir, predator access to islands on which birds nest occurs slightly more frequently under TROA, but the difference is too small to constitute a significant adverse effect.

C. Waterfowl and Shorebird Shallow Water Foraging Habitat

1. Method of Analysis

Shallow water foraging habitat for waterfowl and shorebirds, for the purpose of this analysis, is the total area of water less than 18 inches deep along the shoreline of lakes and reservoirs. This water depth was selected because the foraging habitat of most waterfowl and shorebird species is not deeper than 18 inches (Jasmer, 2000; Biological Resources Appendix). Lake Tahoe, Stampede and Lahontan Reservoirs, and Pyramid Lake are the only lakes and reservoirs in the study area frequently used by large numbers of water birds, so only these lakes and reservoirs were evaluated. The amount of year-round foraging habitat was estimated for Lake Tahoe and Lahontan Reservoir, given their use by wintering, migrating, and breeding waterfowl. The amount of foraging habitat from February through October was estimated for Stampede Reservoir, because it is primarily used by migrating and, to a lesser degree, breeding waterfowl. The amount of foraging habitat for Pyramid Lake from September through January, the period of use by wintering waterfowl, was evaluated.

Operations model results were used to measure the total area of waterfowl and shorebird shallow water foraging habitat available in wet, median, and dry hydrologic conditions at Lake Tahoe and Stampede and Lahontan Reservoirs by averaging the number of acres of water less than 18 inches during the period of use. The use in wet, median, and dry hydrologic conditions is not applicable in analysis of Pyramid Lake because it is a terminal lake. The total area in wet, median, and dry hydrologic conditions, therefore, does not correlate with these hydrologic conditions because of the general trend for the elevation of Pyramid Lake to increase from current conditions under all alternatives. The Pyramid Lake analysis used the average total acres of shallow water habitat less than 18 inches deep over the modeled 100-year period.

2. Threshold of Significance

A change in the average total area of shallow water foraging habitat of 15 percent or greater during the period of use at Lake Tahoe, Pyramid Lake, and Lahontan and Stampede Reservoirs was considered significant. This assessment was based on the output of the operations model and best professional judgment.

3. Model Results

Table 3.60 presents operations model results for shallow water foraging habitat at Lake Tahoe and Stampede and Lahontan Reservoirs. Table 3.61 presents operations model results for shallow water foraging habitat at Pyramid Lake.

Table 3.60—Average total area (acres) of shallow water foraging habitat for waterfowl and shorebirds in wet, median, and dry hydrologic conditions during the period of use at Lake Tahoe and Stampede and Lahontan Reservoirs

Lake/reservoir	Period of use	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Tahoe	Year-round	Wet	774	774	774	790
		Median	593	588	587	617
		Dry	326	326	326	326
Stampede	February-October	Wet	48	48	48	48
		Median	43	43	43	43
		Dry	23	26	26	41
Lahontan	Year-round	Wet	997	1,012	1,012	1,012
		Median	359	351	351	354
		Dry	217	201	200	201

Table 3.61—Average total area (acres) of shallow water foraging habitat for waterfowl and shorebirds from September through January at Pyramid Lake

Current conditions	No Action	LWSA	TROA
765	759	757	764

4. Evaluation of Effects

a. No Action

Operations model results show that, with a few exceptions, under No Action, less shallow water foraging is available habitat than under current conditions. The differences are less than 2 percent, except in dry hydrologic conditions, when 7 percent less habitat is available than under current conditions. None of the differences would have a significant effect.

b. LWSA

In most cases, under LWSA, less shallow water foraging habitat is available than under No Action or current conditions. The differences are always 1 percent or less. Such small differences would not constitute a significant effect.

The differences between LWSA and current conditions are also small. All differences are less than 2 percent, except in dry hydrologic conditions, when LWSA differs from current conditions by 8 percent. None of the differences would constitute a significant effect.

c. TROA

Operation model results show that, under TROA, the same amount or more shallow water foraging habitat is available as under No Action at all lakes and reservoirs. Most differences are less than 5 percent, too small to be considered significant. Under TROA, at Stampede Reservoir in dry hydrologic conditions, however, nearly 60 percent more shallow water foraging habitat is available than under No Action, which would be significant beneficial effect.

Under TROA, the same amount or more shallow water foraging habitat is available as under current conditions at most lakes and reservoirs in most hydrologic conditions. All differences are less than 5 percent, too small to be considered significant. At Stampede Reservoir in dry hydrologic conditions, however, nearly 80 percent more shallow water habitat is available than under current conditions, which would be significant beneficial effect.

Under TROA, less habitat is available than under current conditions at Lahontan Reservoir in median and dry hydrologic conditions; the differences are less than 2 and 8 percent, respectively, and do not constitute a significant effect. One fewer acre is available at Pyramid Lake than under No Action; this also would not be a significant effect.

The greatest effect on shallow water foraging habitat occurs in dry hydrologic conditions at Lahontan Reservoir, where up to 8 percent less habitat is available under No Action, LWSA, and TROA than under current conditions. Such small and infrequent differences in habitat would not be significant because they are unlikely to affect populations of waterfowl and shorebirds over the long-term. Although such habitat decreases may affect local bird populations in dry periods, the populations can be expected to rebound as hydrologic conditions change and the amount of habitat increases.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect would occur under TROA because more shallow water foraging habitat for waterfowl and shorebirds would be available at Stampede Reservoir in dry hydrologic conditions.

D. Island Bird Nest Predation and Inundation

1. Method of Analysis

Fluctuating lake and reservoir elevations can impair breeding success of birds. Lower elevations may allow predator access to nesting islands, while higher elevations may inundates nests. Contour intervals were used to estimate the water elevation at which a landbridge could make water bird nesting islands accessible to mainland predators. Getz and Smith (1989) recommend a distance of approximately 200 to 500 feet between an island and mainland and minimum water depths of 2 to 3.5 feet to reduce predation losses from canines. The island in Stampede Reservoir and the two islands in Lahontan Reservoir are accessible to mainland predators at elevations lower than 5880, 4142, and 4127 feet, respectively. Anaho Island in Pyramid Lake could be accessed by predators if the elevation were to drop below 3795 feet. No other lakes or reservoirs in the system have islands that could be accessed by mainland predators. The island in Stampede Reservoir becomes inundated above elevation 5940 feet, thereby eliminating waterfowl nesting on the island. Gull and Evans Islands in Lahontan Reservoir are above the spillway elevation of Lahontan Dam, and inundation of Anaho Island is highly unlikely because of its height above the current elevation of Pyramid Lake.

Operations model results showing surface water elevation were used to determine the frequency (percent of years) that predator access could occur during at least 1 month in the nesting season at islands in Stampede and Lahontan Reservoirs and Pyramid Lake. These data were also used to examine the frequency (percent of years) that the island in Stampede Reservoir could be inundated during at least 1 month in the nesting season.

Operations model results show that Pyramid Lake never is below the landbridge threshold elevation of 3795 feet under current conditions or the alternatives; therefore, there is no further discussion of predator access to Anaho Island.

If predation or inundation were to occur early in the nesting season, island nesting birds could re-nest if conditions improve later in the nesting season. The potential for re-nesting is unknown and is not considered in this analysis.

2. Threshold of Significance

An analysis of historical lake elevation data from 1939 to 1996 shows that Gull Island, the main nesting island in Lahontan Reservoir, has been landbridged in 26 percent of the years during the gull nesting season. Evans Island, the smaller island where a fewer bird species nest, has been landbridged in 7 percent of these years. Despite past landbridging, island nesting birds continue to breed successfully at Lahontan Reservoir. A significant effect could potentially occur if, based on operations model results, there is a change in the frequency that predator access to island nests during the nesting season (March through July). The significance of any effect was based on best professional judgment in considering the results of the operations model.

A significant effect could occur at Stampede Reservoir if operations model results show a change in the frequency that access by mammalian predators to, or inundation of, the island at Stampede Reservoir during the Canada geese nesting season (March through May). The significance of any effect was based on best professional judgment in considering the results of the operations model.

3. Model Results

Table 3.62 presents operations model results for the frequency (percent of years) of predator access to nesting islands in Stampede and Lahontan Reservoirs. Table 3.63 presents operations model results for the frequency (percent of years) of inundation of island nests at Stampede Reservoir.

Table 3.62—Frequency (percent of years) of predator access to nesting islands in Stampede and Lahontan Reservoirs

Reservoir	Current conditions	No Action	LWSA	TROA
Stampede	19	22	22	10
Lahontan – Gull Island	25	26	26	26
Lahontan – Evans Island	8	9	9	10

Table 3.63—Frequency (percent of years) of inundation of island nests at Stampede Reservoir

Current conditions	No Action	LWSA	TROA
56	57	58	70

4. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, predator access to islands in Stampede and Lahontan Reservoirs occurs about as frequently as under current conditions (differences of 3 percent and 1 percent, respectively). Under No Action, island nests in Stampede Reservoir are inundated 1 percent more frequently than under current conditions. Such small differences would be unlikely to have long-term effects on populations of island-nesting birds and, therefore, would not be a significant effect.

b. LWSA

Under LWSA, predator access to islands in Stampede and Lahontan Reservoirs and inundation of island nests in Stampede Reservoir occur as frequently as under No Action. Effects would be the same as under No Action.

c. TROA

Under TROA, predator access to islands in Lahontan Reservoir occurs as frequently as under No Action. Effects would be the same as under No Action.

Under TROA, predator access to the island in Stampede Reservoir occurs about 50 percent less frequently than under No Action or current conditions, which would be a significant beneficial effect.

Under TROA, island nests in Stampede Reservoir are inundated 13 percent more frequently than under No Action and 14 percent more frequently than under current conditions. These differences must, however, be weighed against the less frequent predator access to the same island under TROA. Operations model results show that under TROA, predators would have access to the island 10 out of 100 years, while the island would be inundated 70 years, resulting in 20 years conducive to nesting success. Under No Action, predators would have island access 22 years, while the island would be inundated in 57 years, resulting in 21 years conducive to nesting success. Under current conditions, predators could access the island in 19 years, while it would be inundated in 56 years, resulting in 25 years conducive to nesting success. The net effect of TROA, therefore, is a 5-percent reduction compared to No Action and a 20-percent reduction compared to current conditions. While it is possible that either of these reductions could have an adverse effect on local Canada goose nesting success, no significant adverse effect is expected to the regional population. Canada geese are one of the most common waterfowl in the study area. Geese could nest at many other locations in the Truckee River basin when conditions are unfavorable at Stampede Reservoir. Moreover, resident Canada geese present a management problem in many urban areas, including Reno-Sparks.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects on island nesting birds at Lahontan and Stampede Reservoirs would occur under any of the alternatives.

Riparian Habitat and Riparian-Associated Wildlife

I. Affected Environment

Riparian (i.e., along rivers or streams) habitats, because of their moisture gradients, their dynamic response to river processes, and their long complex interfaces between both upland and aquatic habitats, are among the most diverse and biologically productive ecosystems (Naimann et al., 1993). This is particularly true in arid areas such as the Western United States; for example, an investigation on the Inyo National Forest found that riparian areas comprised less than 0.4 percent of the land area but were essential habitat for about 75 percent of local wildlife species (Kondolf et al., 1987).

Riparian vegetation (the plants growing along a stream) plays an important role in riverine ecosystems. Plant roots help stabilize soil, and stems and leaves of emergent vegetation (plants rooted in water) move with the current, decreasing flow velocity and reducing the scouring effects of water. Shade produced by overhanging vegetation helps maintain the cool water temperatures critical for many fish species. Riparian vegetation traps sediment from the watershed, preventing it from settling on food producing areas, spawning sites, fish eggs and fry, and insect larvae. Emergent vegetation provides cover as well as a substrate for organisms and eggs.

Modifying operations of Truckee River reservoirs and the resulting effect on flows could affect the abundance, distribution, and condition of riparian vegetation (Kattelmann and Embury, 1996). During periods of greater flows, portions of the flood plain may be inundated, revitalizing riparian vegetation in those areas. High flows can also remove vegetation and create the mineral surfaces that some riparian plants need for seed germination. Extremely high flows, such as occur during large storm events, may scour the stream channel of established vegetation.

During periods of low flows, particularly if prolonged, riparian vegetation may dry out, shed its leaves, and lose vigor. Some plants may die, reducing habitat for wildlife. Low flows in spring and early summer may not provide sufficient water for seed germination and seedling growth in areas away from the streambed.

Other factors, such as irrigation, runoff from upland areas, and seepage of water from streambanks also affect riparian vegetation. Changes in vegetation composition and structure that result from changes in streamflow often are not immediately obvious and may not become evident for months or even years.

A. Riparian Habitat

The Truckee River originates within mixed conifer-forested mountains and descends to arid shrub-dominated valleys. Over this distance of about 120 miles, the river descends in elevation by over 2,000 feet. The transition zone from montane forest to shrubland begins in the vicinity of the town of Truckee and is not complete until the river reaches the outskirts of Reno, a distance of roughly 35 miles. This broad transition zones marks a shift in flora and fauna between the Mediterranean climate of California and the interior continental climate of the Great Basin (Manley et al., 2000). The obvious shift from forest to shrubland is paralleled by a more subtle change in the structure and composition of riparian vegetation along the Truckee River. The montane riparian forest typified by black cottonwood and pine with an alder-willow understory merges gradually to the Great Basin riparian forest of Fremont's cottonwood and willow shrub, or stands of shrubby willow lacking trees (Caicco, 1998). This great diversity in riparian and upland vegetation along the Truckee River provides a wide variety of habitats for riparian-associated wildlife.

There is no comprehensive list of plant species for the entire Truckee River basin. A recent analysis concluded that the Lake Tahoe basin alone has at least 1,553 vascular and nonvascular plant taxa (Manley et al., 2000). This total excludes many Great Basin plant species that are not found in the Lake Tahoe basin. The total number of riparian plant species along the Truckee River and its tributaries, nevertheless, is likely to be considerably smaller than the total found in the entire Lake Tahoe basin.

Riparian areas along the Truckee River and its tributaries have been affected by a wide variety of human activities and natural disturbances, including grazing by domestic livestock, timber harvest, highway and railroad construction, urban and industrial development, clearing for agricultural uses, invasion by nonnative plant species, fire, landslides, and water impoundment, diversion, and management (Kattelmann and Embury, 1996; Caicco, 1998; Manley et al., 2000). The extent of riparian habitat and land use types found along the Truckee River was mapped from aerial photographs taken in November 1991 (FWS, 1995a). From these maps, the area of various types was calculated (table 3.64). Mapping was restricted to the flood plain and a narrow band of contiguous upland between Lake Tahoe and Marble Bluff Dam. The area of riparian vegetation type along the upper basin tributaries was calculated from National Wetlands Inventory maps (table 3.65).

Three general types in wetlands potentially affected by changes in reservoir operations occur within the study area: palustrine emergent wetlands; palustrine scrub-shrub wetlands; and palustrine forested wetlands. These are discussed in the following sections.

1. Palustrine Emergent Wetlands

Palustrine emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes (i.e., plants adapted to live in very wet habitats, often called emergent vegetation; Cowardin et al., 1979). Such wetlands are dominated by grasses, bulrushes, sedges, and rushes. Two general types of palustrine emergent wetlands occur in the Truckee River

Table 3.64—Riparian and wetland habitats (in acres) along the mainstem of the Truckee River[1]

Riparian and wetland habitats	Lake Tahoe to Boca Reservoir	Boca Reservoir to State line	State line to Vista	Vista to Derby Diversion Dam	Derby Diversion Dam to Wadsworth	Wadsworth to Dead Ox Wash	Dead Ox Wash to Numana Dam	Numana Dam to Marble Bluff Dam	Marble Bluff Dam to Pyramid Lake[2]
Riverine	160	117	219	192	94	70	47	66	38
Pond-like areas[3]	0	0.5	0.5	0	0.2	6	0.2	0.7	0
Ponds	0	0	0.02	0.5	5	0	0	0.8	0
Montane black cottonwood riparian forest	8	81	119	0	0	0	0	0	0
Modoc-Great Basin cottonwood-willow riparian forest	0	0	75	79	105	152	0	79	1
Montane riparian scrub	114	110	0	0	0	0	0	0	0
Modoc-Great Basin riparian scrub	0	0	224	76	106	172	8	184	11
Montane freshwater marsh	5	0	0	0	0	0	0	0	0
Transmontane freshwater marsh	0	0	0.3	5	0	10	5	10	0

[1] Source: FWS, 1995a.
[2] Acreage determined by Reno State Office staff from November 4, 1991, aerial photography and field checked July 1994.
[3] Pond-like areas believed to be hydrologically influenced by the Truckee River.

Table 3.65—Riparian habitats[1] along upstream tributaries to the Truckee River

Tributary	Acres of palustrine wetlands		
	Emergent[2]	Scrub-shrub[3]	Forested[4]
Donner Creek	2	18	0
Prosser Creek	0	4	0
Independence Creek	0.3	22	4
Little Truckee River Independence Creek to Stampede Reservoir	121	11	12
Little Truckee River Stampede Reservoir to Boca Reservoir	78	21	0
Little Truckee River Boca Reservoir to Truckee River	0	0	0

[1] Acres planimetered from FWS National Wetlands Inventory maps (1984).
[2] Palustrine emergent (Cowardin et al., 1979) includes montane freshwater marsh of Holland (1986).
[3] Palustrine scrub-shrub (Cowardin et al., 1979) includes montane riparian scrub of Holland (1986).
[4] Palustrine forested (Cowardin et al., 1979) includes montane black cottonwood riparian forest and mixed pine forest of Holland (1986).

system: montane freshwater marshes/wet meadows, generally found upstream of Verdi; and transmontane freshwater marsh, found downstream from Verdi (Caicco 1998; FWS, 1993; Holland, 1986; FWS, 1995a).

Emergent wetland and other herbaceous vegetation along the edges of rivers and streams commonly expands into the exposed river channel during periods of low flows. Greater flows may scour the emergent vegetation from the stream channel. The total area of emergent vegetation, therefore, can vary considerably in response to flows. A single storm event may produce flows large enough to result in a substantial decrease in the total area of emergent vegetation. The Biological Resources Appendix includes further discussion on the relation between streamside emergent vegetation, vegetated streambeds, and gravel bars.

2. Montane Freshwater Marshes/Wet Meadows

Within the study area, these habitats are generally restricted to a few small islands of vegetation between Tahoe City and the town of Truckee and to bands of vegetation along banks of the Truckee and Little Truckee Rivers. Several ecologically significant marshes occur at the mouths of tributaries at south end of Lake Tahoe (Manley et al., 2000). Smaller marshes or wet meadows also occur at the mouths of tributaries that empty into lakes, reservoirs, and the main stem of the Truckee River. These areas are typically dominated by dense perennial, emergent vegetation. Common plant species include slender-beak sedge, water sedge, and beaked sedge.

The restricted distribution of emergent vegetation and the prevalence of plant species that require a high water table indicate the habitat cannot tolerate extended periods of drought. Such habitats are inundated annually when streamflows are 100 cfs or greater, although annual inundation is not required for all plant species to persist. Flows of 500 cfs or greater may scour emergent plants from the river channel and restrict them to a narrow band along the banks; such streamflows occur about once every 1.5 years (FWS, 1993). The Biological Resources Appendix provides further discussion on frequency of inundation of this habitat.

3. Transmontane Freshwater Marsh

This habitat, which is structurally similar to montane freshwater marsh, also requires frequent inundation or a high water table. It is restricted to small areas and narrow bands of streambank vegetation downstream from Verdi and to a few low-lying areas away from the active steam channel where it may persist due to irrigation runoff or seasonal ponding.

Although no data exist to document the original area and extent of emergent wetlands found along the Truckee River, COE (1992) estimated that 450 acres of palustrine emergent wetlands occurred historically within 164 feet of the river downstream from Sparks. Based on FWS mapping (1995a), 31 acres occurred downstream from Sparks in the early 1990’s, primarily upstream of the Tracy hydroelectric plant and upstream of Derby Diversion Dam.

Other larger examples are found downstream from Dead Ox Wash. Common plant species include cattail, hardstem bulrush, Olney's bulrush, common reed, slender-beak sedge, soft rush, least spikerush, and aquatic species, such as common waterweed and pondweed. The introduced noxious weed, tall whitetop, is also common in these wetlands.

This habitat's restricted distribution and the prevalence of plant species that require a high water table suggest it cannot tolerate long periods of drought. Streamflows of 400 to 600 cfs are usually sufficient to inundate the areas where it is found, and inundation occurs annually (FWS, 1993). Flows of 4,000 cfs or greater likely scour the channel, restricting this community to a narrow band along the banks; such flows occur about once every 3 years (FWS, 1993). See the Biological Resources Appendix for further discussion on this habitat.

4. Palustrine Scrub-Shrub Wetlands

Two types of palustrine scrub-shrub wetlands were identified in the study area: montane riparian scrub and Modoc-Great Basin riparian scrub (Holland, 1986). Palustrine scrub-shrub wetlands are dominated by shrubs or young trees less than 20 feet tall (Cowardin et al., 1979).

a. Montane Riparian Scrub

Montane riparian scrub, a deciduous shrub thicket, is found on the banks and a few gravel bars along the Truckee River upstream of Reno and along upstream tributaries. Mountain alder is the most common plant species. Other associated shrubs include yellow willow, shining willow, coyote willow, dusky willow, and American dogwood. Saplings of black cottonwood are also common. A dense canopy often precludes an extensive herbaceous understory; however, mannagrass, Kentucky bluegrass, and rusty sedge are common (Caicco, 1998; FWS, 1993).

This habitat is inundated every 1 to 5 years with flows of 100 to 6,000 cfs (FWS, 1993). Periodic inundation is needed to prepare mineral surfaces for willow seed germination. Scouring flows that reduce or remove scrub vegetation in the active channel are greater than 8,000 cfs; they occur about once every 10 years and maintain habitat diversity (FWS, 1993; Richter et al., 1996; Poff et al., 1997; Richter and Richter, 2000). The Biological Resources Appendix includes further discussion on inundation of this habitat. Adequate data are not available to determine the magnitude of flows capable of removing vegetation in tributaries to the upper Truckee River.

b. Modoc-Great Basin Riparian Scrub

The Modoc-Great Basin riparian scrub is a generally dense, deciduous thicket found downstream from Verdi along riverbanks, irrigation ditches, and on stable gravel bars (Caicco, 1998; FWS, 1993). Where willows are dominant, coyote willow is the most abundant, although yellow and shining willows are also common. Downstream from Sparks, riparian scrub habitat is often dominated by Fremont cottonwood saplings.

Whether dominated by willow or cottonwood, younger stands often have dense herbaceous understories; older, denser shrub stands usually lack an herbaceous understory. The most common herbaceous species are white sweet-clover, white clover, tall whitetop, and slender-beak sedge. All but the latter are introduced species. A good example of a willow-dominated riparian scrub community occurs in Oxbow Nature Study Park in Reno. Large areas of this habitat are uncommon in the study area, except in the backwaters of some of the higher diversion dams.

Many lower terraces and toe slopes adjacent to the river channel and on gravel bars within the active channel along the lower Truckee River are dominated by cottonwood saplings. Scour during high flows in 1986 and 1997 produced mineral surfaces that enabled abundant cottonwood seed germination in subsequent springs. Flows provided for cui-ui spawning enabled the establishment of the seedlings (Rood et al., 2003). When FWS mapped and collected field data in the early 1990s, most cottonwoods that resulted from the 1986 flood were less than 10 feet high. Such young cottonwoods are initially susceptible to loss during subsequent high flows but become less so after they have become established (Rood et al., 2003). Some unknown proportion of these cottonwood saplings are now 20-30 feet high (Rood et al., 2003). Although these habitats now exceed the 20-foot threshold that distinguishes palustrine scrub-shrub from palustrine forest, their dense, thicket-like structure is distinctly different from more mature cottonwood forests.

Willow-dominated communities appear to be restricted to areas inundated annually, while lower terraces dominated by cottonwood saplings are inundated approximately once every 1 to 5 years; corresponding streamflows are 100 to 6,900 cfs between Reno and Nixon (FWS, 1993). As with montane riparian scrub, occasional scouring flows (greater than 10,000 cfs) are important to remove decadent vegetation and maintain the vigor and diversity of this habitat. Such flows occur about once every 10 years (FWS, 1993). The Biological Resources Appendix has further discussion on inundation of this plant community.

5. Palustrine Forested Wetlands

Palustrine forested wetlands are dominated by woody vegetation at least 20 feet tall (Cowardin et al., 1979). Three riparian forest types occur within the study area: montane black cottonwood, Modoc-Great Basin cottonwood-willow, and aspen. Montane black cottonwood forest and aspen communities are not expected to be affected by changes in reservoir operations but are discussed in the Biological Resources Appendix.

The Modoc-Great Basin cottonwood-willow riparian forest occurs at lower elevations along the Truckee River. Between Verdi and Reno, the flood plain supports a mix of species found in both montane black cottonwood and Modoc-Great Basin cottonwood-willow riparian forests (Caicco, 1998). Downstream from Reno, Fremont cottonwood is the sole dominant tree species in this deciduous forest. Coyote willow is present in the understory in some areas. More commonly, upland shrubs, including big sagebrush and rabbitbrush, are understory dominants. The prevalence of upland shrubs likely reflects a lowered groundwater table. There is little herbaceous understory, but extensive patches of tall whitetop are common. An exceptional example, with a grass understory dominated by slender wheatgrass, occurs in Oxbow Nature Study Park in Reno. More typical examples occur sporadically downstream from Sparks. Mature cottonwood trees, estimated to be up to 140 years old (FWS, 1993), are scattered infrequently on upper terraces now less subject to inundation.

The flood plain once contained more extensive cottonwood forest and scrub than exists today. From Sparks to Derby Diversion Dam, much of the flood plain had been cleared of riparian vegetation for agriculture, livestock grazing, industrial and urban or residential uses, and river channelization. An estimated 7,700 acres of riparian vegetation existed historically in the flood plain between Sparks and Pyramid Lake (COE, 1992); only 974 acres were identified in the early 1990's, an 87-percent loss in riparian vegetation (FWS, 1995a). In most areas, only remnant stands of Fremont cottonwood and willow are found.

In the early 1990's, there were about 80 acres of cottonwood-willow riparian forest between Sparks and Derby Diversion Dam, mostly in small patches (FWS, 1995a). Between Derby Diversion Dam and Marble Bluff Dam, there were an additional 336 acres of cottonwood-willow riparian forest, of which slightly more than half occurred between Wadsworth and Dead Ox Wash. Most stands were small and all were in a degraded condition due primarily to the lowered groundwater table. A more recent study found that 628 acres of riparian forest existed between Sparks and Marble Bluff in 2000 (Otis Bay Consultants, 2003, as cited in TRIT, 2003). This higher estimate is because some proportion of the cottonwood sapling dominated scrub-shrub vegetation has grown sufficiently to be classified as riparian forest.

Based on the 2000 estimate of 628 acres, there has been a 70-percent decrease in riparian forest acreage since 1939 (Otis Bay Consultants, 2003, as cited in TRIT, 2003). Jones and Stokes (1990) estimated that 108 acres of mature cottonwood were lost during the 10-year period from 1976 to 1987, which equates to less than half of the average rate of loss over the 60-year period. This suggests that a greater proportion of the forest was lost prior to 1976, likely as a result of agricultural development. The riparian corridor has also narrowed due to less flows, channel simplification, and stream incision. In 1938, the corridor ranged from about 1,200 to 2,000 feet wide between Wadsworth and Dead Ox Wash (Jones and Stokes, 1990). It currently averages only about 230 feet wide in this reach.

6. Other Wetlands

Several small pond-like areas (in cutoff meanders and low-lying areas on the flood plain) appear to be connected hydrologically to the river (FWS, 1993). These ponds lie entirely on private lands with no public access and, therefore, the potential hydrologic connection cannot be confirmed.

B. Riparian-Associated Wildlife

As with plants, there is no comprehensive list of animals for the entire Truckee River basin. A study confined to the Lake Tahoe basin identified 312 resident or regular visitor vertebrates, a total which includes 217 birds, 59 mammals, 5 amphibians, 8 reptiles, and 23 fish species. Previous studies in the Sagehen Creek Basin, a tributary of the Little Truckee River, have documented that nearly 40 percent of the vertebrates are strongly dependent on riparian habitat (Morrison et al., 1985, as cited in Kattelmann and Embury, 1996). This figure includes all of the 6 amphibians, 5 of 12 reptiles, 17 of 54 mammals, and 46 of 120 birds, but does not include Great Basin taxa that do not occur in the upper reaches of the Truckee River.

1. Birds

Birds show a greater preference for the specific types of riparian habitats along the Truckee River than do most other types of wildlife. Among the riparian types, the greatest number of bird species is found in scrub-shrub (93 species), mature Fremont cottonwood forest (57 species), and pole-sapling Fremont cottonwood (48 species) (Lynn et al., 1998). In contrast to lower elevation riparian areas, higher elevation streams are often bordered by narrow strips of riparian vegetation within extensive coniferous forests, and so have fewer riparian-associated birds and fewer numbers of bird species (Lynn et al., 1998). The large number of bird species downstream from Sparks is due to the extensive riparian scrub-shrub and Fremont cottonwood forest, both habitats that decrease in amount upstream. Higher elevation black cottonwood forests are not as diverse in bird species as the lower Fremont cottonwood riparian forests (Lynn et al., 1998). Although most species use a variety of habitats, some generalizations can be made regarding the use of emergent, scrub-shrub, and forested riparian habitats by individual species based on how often they are observed in these habitats (Lynn et al., 1998). This habitat relationship permits general inferences about the effects of changes in flows on bird species numbers based on predicted changes in the habitats.

Emergent wetlands, although limited along the Truckee River and tributaries, are highly productive ecosystems that provide food, cover, and nesting sites for many species of wildlife. Areas of tall emergent vegetation, such as cattails and bulrushes, provide habitat for birds such as yellow-headed, red-winged, and Brewer’s blackbirds and song sparrows. Some bird species, such as marsh wren, are restricted to tall emergent wetlands. Currently, most of the emergent wetlands are less than 1 acre and occur downstream from Sparks. As a result, emergent wetlands in the Truckee River system provide limited habitat for the above species, as well as limited foraging areas for swallows and other insectivorous birds.

Many populations of emergent wetland bird species have declined historically along the Truckee River. American bittern, sora, northern harrier, marsh wren, savannah sparrow, and common yellowthroat were common along the lower river in the late 1800s (Ridgway, 1877). None of these species was observed in the early 1970s (Klebenow and Oakleaf, 1984). During surveys in 1992 and 1993, marsh wren, savannah sparrow, and common yellowthroat were rarely observed; American bittern, sora, and northern harrier were not observed at all (Lynn et al., 1998). By 2001, however, marsh wren and common yellowthroat were common; savannah sparrow, while once again present, remained rare (Ammon, 2002a). Virginia rail, not observed since the late 1800s, was also present but rare. Neither American bittern nor sora has returned.

The palustrine scrub-shrub habitat is especially important for neotropical migratory birds. Species most frequently observed included American robin, black-billed magpie, Bewick's wren, brown-headed cowbird, Brewer's and red-winged blackbirds, song sparrow, warbling vireo, and yellow warbler (Lynn et al., 1998). A historic pattern of decline is also seen in birds associated with scrub-shrub habitats along the lower Truckee River. Black-chinned hummingbird, song sparrow, willow flycatcher, and yellow warbler were all abundant in the late 1800s, while yellow-breasted chat and rufous hummingbird were common and yellow-billed cuckoo rare (Ridgway, 1877). By the early 1970s, none of these species was observed along the lower Truckee River (Klebenow and Oakleaf, 1984). By the early 1990s, all of the species except for yellow-billed cuckoo were once again reported, although all but the song sparrow and yellow warbler were quite rare (Lynn et al., 1998). By 2001, black-chinned hummingbird and yellow-breasted chat were also reported as common (Ammon, 2002a). Yellow-billed cuckoo and rufous hummingbird have not been observed since 1868 and the early 1970s, respectively. Small patches of riparian scrub-shrub vegetation along the Little Truckee River and Independence Creek also support high numbers of bird species, including willow flycatcher (California State Endangered Species), and yellow warbler and yellow-breasted chat (both California Species of Special Concern). They are discussed in "Endangered, Threatened, and Other Special Status Species."

Fremont cottonwood riparian forest supports the second highest diversity of bird species along the Truckee River. The most common birds in the riparian forest are American robin, black-billed magpie, brown-headed cowbird, European starling, house wren, northern oriole, and red-winged blackbird. There also appears to have been a historic decline in species that prefer cottonwood forests, particularly warbling vireo, Swainson's hawk, long-eared owl, western tanager, western bluebird, and western wood pewee. Most of these species were reported as abundant or common in 1868 (Ridgway, 1877), but were rare or not observed in the early 1970s (Klebenow and Oakleaf, 1984). By the early 1990's, warbling vireo, Swainson's hawk, and western tanager were observed along the lower Truckee River, but remained relatively rare; western bluebird was not observed (Lynn et al., 1998). More recent surveys have found western wood pewee and warbling vireo to be common; western tanager was common during surveys in 1998, but not observed in 2001 (Ammon, 2002a). Long-eared owl has not been reported from the lower Truckee River since 1868 when it was recorded as common.

The total of 107 bird species was reported from the lower Truckee River in 1868 (Ridgway, 1877), compared to 65 in the early 1970s, a decline of 40 percent. Surveys during the early 1990s reported a total of 87 species and, 10 years later, 95 bird species were observed, 89 percent of that reported in 1868 (Ammon, 2002a). While many of the recent additions are either introduced species or species associated with human settlement or agricultural landscapes that were not present in 1868 (Ammon, 2002a), more than 30 species have either increased in abundance or have reappeared after having been extirpated. More than half of these are associated either with emergent or scrub-shrub wetlands, attributed to a substantial increase in early successional riparian vegetation as a result of the implementation of supplemental streamflows designed to restore riparian vegetation beginning in the 1980s (Rood et al., 2003).

The importance of Fremont cottonwoods to birds is noteworthy. Along the lower Truckee River, nearly 40 percent of the 4,399 bird observations were in Fremont cottonwoods (Lynn et al., 1998). Willows were used about 15 percent of the time and were the only other plant species used in excess of 10 percent of the time. Plant use was distributed more evenly and across more species along the upper Truckee River: willow, 21 percent; lodgepole pine, 15 percent; Jeffrey pine, 14 percent; snowberry, 11 percent; and black cottonwood, 11 percent.

Below some threshold width, riparian habitats begin to lose species (Stauffer and Best, 1980, as cited in Dobkin and Wilcox, 1986). In 1938, the riparian corridor ranged from 1,200 to 2,000 feet wide (Jones and Stokes, 1990). In its widest sections, the riparian corridor currently is approximately 500 feet wide, but the average stand width is approximately 125 feet. The area of a riparian forest patch has also been shown to be important for some bird species. For example, in California yellow-billed cuckoo requires riparian areas larger than 12 acres and 66 feet wide to provide nesting habitat (Laymon and Halterman, 1989). The largest stand of riparian forest along the river is 13.5 acres; only about 7 percent of the stands are 5 acres or greater, and 50 percent are less than 1 acre. This may explain, in part, why yellow-billed cuckoo has not recolonized the lower Truckee River.

The small, narrow patches of riparian forest along the Truckee River, with little to no understory, may also make it easier for brown-headed cowbirds to locate and lay their eggs in the nests of other birds (obligate brood parasitism). Brown-headed cowbird brood parasitism has the potential to greatly reduce populations of the host species (Mayfield, 1977). The abundance of cowbirds has increased sharply in the past 100 years, and they are now common throughout the study area (Ridgway, 1877; Lynn et al., 1998). Ten songbird species observed along the lower Truckee River in 1992 and 1993 are frequent or common cowbird hosts (Ehrlich et al., 1988; Lynn et al., 1998). Three of these (willow flycatcher, chipping sparrow, rufous-sided towhee) appear to have declined in abundance or disappeared along the river since 1868.

Certain species require large-diameter trees for nesting and/or roosting. Along the Truckee River, sapsuckers, downy woodpeckers, and northern flickers require large cottonwoods in which they excavate their own nest cavity (primary cavity nesters). These species are important because their nest sites are subsequently used by secondary cavity nesters (occupy cavities excavated by another species). Along the lower Truckee River, native secondary cavity nesters include American kestrel, common merganser, house wren, tree swallow, violet-green swallow, and wood duck. Two introduced secondary cavity nesting species (house sparrow and European starling), which compete with native cavity nesters for nest sites, are common along the lower river. Although many of the native cavity nesters remain common today, their numbers are likely fewer than they were historically. More importantly, the continuing loss of older cottonwood trees and the absence of cottonwoods in middle size classes (Caicco, unpublished data) means that species that require large-diameter trees face a habitat bottleneck within the foreseeable future.

2. Amphibians and Reptiles

Riparian areas provide habitat for amphibians and reptiles, but little is known about their habitat needs (Jennings, 1996; Reynolds et al., 1993). Open water, cool temperatures, and moist soils and microclimates make riparian areas especially important for amphibians (Brode and Bury, 1984; Jennings, 1996). Riparian areas provide breeding sites, areas of escape, and/or foraging sites for reptiles and amphibians. Thirty amphibian and reptilian species are known or are likely to occur in the various riparian habitats along the Truckee River; eight of the amphibians and six of the reptiles also occur in the Lake Tahoe basin (Schlesinger and Romsos, 2000). Ten are obligate riparian species (those found exclusively along watercourses); the others are facultative species (those that use riparian areas but are not totally dependent on them). Yosemite toad and mountain yellow-legged frog are Federal Candidate species (69 FR 24897, May 4, 2004). Northwestern pond turtle and northern leopard frog are Forest Service Sensitive Species. They are discussed further under “Endangered, Threatened, and Other Special Status Species.”

Along the upper Truckee River, common species found in the river and palustrine emergent wetlands include western aquatic garter snake and Pacific treefrog (Panik, 1992). Downstream from Verdi, bullfrog is the most common species, but Pacific treefrogs are also present. Western toads appear to be limited to a few areas; however, the large numbers of tadpoles and juvenile toads present at these sites during the spring suggest a large population of adult toads. Northwestern pond turtles inhabit the Truckee River downstream from Reno in off-channel wetlands, such as permanent oxbows that have been disconnected from the river (Ammon, 2002b).

The reach between Derby Diversion Dam and Pyramid Lake contains the highest observed species diversity of amphibians in the Truckee River system because of sufficient breeding and adult habitat, including ponds for egg and larvae development and a diversity of aquatic and emergent vegetation for cover (Panik, 1992; Panik and Barrett 1994; Ammon 2002b). Bullfrogs, Pacific treefrogs, and western toads are found in this reach. Northern leopard frogs, described by Linsdale (1940) as “the commonest and most widespread kind of frog in the state,” were recorded at only one field site in 1992 in a shallow spring-fed pond and along the river near Dead Ox Wash (Panik, 1992). Three locations with northern leopard frogs were identified on the Pyramid Lake Indian Reservation in 2001 (Ammon, 2002b).

In wet years, high flows may inundate areas away from the main river channel and provide temporary breeding ponds for amphibians if the water persists during egg and larvae development. In average years, the upper and middle portions of the Truckee River have few areas suitable for amphibian breeding or egg and larvae development. However, during the drought of 1992, breeding sites became more prevalent in the upper reaches of the river in major side channels with aquatic and emergent vegetation (Panik, 1992). In dry years, although breeding ponds may be prevalent, they may become desiccated before larvae complete development in late spring or summer. The relative amount of palustrine emergent wetlands and pond-like areas is indicative of potential amphibian breeding habitat along the Truckee River.

Seventeen additional species are thought to occur in the riparian scrub community. Western terrestrial garter snake, western fence lizard, and western aquatic garter snake are the most common. The abundant invertebrate population associated with the riparian scrub plant community provides an important food source for these animals.

3. Mammals

Wetland mammals known or expected to occur along the river and tributaries include muskrat, mink, water shrew, beaver, and river otter. Other mammals, including shrews, insectivorous bats, raccoons, and skunks, may forage on the abundant invertebrates associated with emergent wetlands.

Of the six mammal species that require freshwater streams and/or riparian vegetation, Sierra Nevada mountain beaver and river otter are primarily associated with palustrine scrub-shrub wetlands. Sierra Nevada mountain beaver occurs only in higher elevation riparian thickets of willow, alder, and red and white fir. Historically, river otters occurred throughout the Truckee River system; however, they are currently believed to be present only along the Truckee River near Wadsworth. Deer also use scrub-shrub wetlands along the Truckee River for cover, forage, and fawning. The Loyalton-Truckee mule deer herd winters along the Sierran front north and south of Reno and summers in higher elevation areas throughout the study area. A number of small, scattered resident mule deer herds also occur from Reno to Pyramid Lake.

The cottonwood forest along the lower and middle Truckee River provides habitat for mammals that otherwise would not be expected to occur at this elevation, including the mountain cottontail, western harvest mouse, long-tailed vole, western jumping mouse, bushy-tailed woodrat, porcupine, raccoon, long-tailed weasel, and skunk.

Cavities in cottonwood snags (dead trees) serve as den or resting sites for mammals, such as bats, spotted skunks, raccoons, martens, and weasels. Rodents, rabbits, foxes, raccoons, weasels, skunks, and otters use downed logs as hiding, feeding, and/or nesting areas. In the lower elevations of the study area, riparian forests along the Truckee River are the only sites that provide snag and log habitats. The riparian zone also provides an avenue for wildlife moving from one habitat or geographic area to another and for seasonal movements between high- and low-elevation areas.

II. Environmental Consequences

A. Introduction

Throughout the Sierra Nevada, alterations in flows from impoundments and diversions have affected riparian vegetation. Less flows can lead to low growth rates, a loss of canopy vigor, and high mortality of riparian plants and result in narrowing of riparian corridors, and changes in the species composition and/or structure of riparian vegetation (Harris, 1986; Harris et al., 1987; Stromberg and Patten, 1991). A reduction in flood flows can lead to less frequent scour of the active channel, channel simplification, reduced rates of channel migration, and channel incision and reduced floodplain inundation; such changes lead to the encroachment of riparian vegetation into the active channel and reduced habitat diversity, respectively (Ligon et al., 1995; Kondolf et al., 1996). Three principles have emerged from research on the ecology of regulated rivers: (1) habitat diversity is substantially reduced; (2) native biodiversity decreases and non-native species proliferate; and (3) changes are generally more severe closer to dams and diversions (Stanford et al., 1996).

The rate at which riparian vegetation responds to flow reductions is highly variable. Riparian forest area declines ranging from 23 to 48 percent have been documented over a 20-year interval downstream from dams in southern Alberta (Rood and Heinze-Milne, 1989). In contrast, a study of paired reaches above and below diversions on 11 Sierra Nevadan streams diverted for 50 or more years found no difference on four streams, decreased shrub cover on two streams, decreased herbaceous cover on two streams, decreased shrub and herbaceous cover on one stream, increased herbaceous cover on one stream, and decreased tree cover on one stream; the authors attributed these results to differing environmental characteristics among stream reaches and concluded that streams in the Sierra Nevada respond individualistically to diversions (Harris et al., 1987).

Various methods have been developed to predict the effects of changes in flows on riparian vegetation (Stromberg and Patten, 1990, 1991; Stromberg, 1993; Auble et al., 1994; Stromberg et al., 1996). More recent approaches in predicting streamflow have focused on the entire riverine and riparian ecosystem (Poff et al., 1997; Richter et al., 1997). Such studies generally begin with an analysis of unimpaired regional streamflow patterns to provide a conceptual framework for evaluating the relative importance of various factors (Poff and Ward, 1987). This framework is used to assess divergence from the natural range of hydrologic variability attributable to human influences (Richter et al., 1996, 1997, 2000; Poiani et al., 2000). This allows the development of flow management strategies that, in conjunction with ecosystem monitoring, provide a scientific basis for adaptive management.

The relative amount of riparian vegetation was selected as the indicator for this resource.

B. Summary of Effects

Analysis of operations model results shows that no significant adverse effects on riparian habitat or riparian-associated wildlife species along the Truckee River or any of the affected tributaries would occur under TROA. Significant beneficial effects to both riparian habitat and riparian-associated wildlife along all reaches of the Truckee River in dry and extremely dry hydrologic conditions and along the lowermost reaches of the Truckee River in median hydrologic conditions would occur under TROA (table 3.66). Significant beneficial effects to both riparian habitat and riparian-associated wildlife also would occur along all affected tributary reaches in wet, median, dry, and extremely dry hydrologic conditions under TROA (table 3.67).

C. Relative Amounts of Riparian Habitat

1. Method of Analysis

A comparative analysis of flow characteristics from nine streams in the same climatic region as the Truckee River, all located in areas with similar geomorphologic and topographic characteristics, has shown that the magnitude, frequency, timing, and duration of flood flows in the Truckee River do not differ substantially from natural conditions (TRIT, 2003). None of the alternatives would modify the magnitude, frequency, timing, or duration of flood flows, so such flows are not addressed.

The operations model computes average monthly flows under current conditions, No Action, LWSA, and TROA by river reach (map 3.1). Streamside vegetation also is likely to be influenced by prolonged extremes of high or low flows or by patterns of flow frequency, timing, and duration that are obscured in average monthly flows. Because average monthly flows are only one factor influencing riparian vegetation, best professional judgment was used in evaluating the effects of each alternative on riparian resources.

In lieu of more detailed data, this analysis compares average monthly flows to recommended ecosystem maintenance flows downstream from McCarran Boulevard or to recommended minimum flows (in other reaches and tributaries) from April through October. This period corresponds to the period when riparian plants emerge from winter dormancy, grow, reproduce, and re-enter dormancy, induced either by drought or colder temperatures. The ecosystem maintenance flows for the lower Truckee River incorporate flows critical to the survival of cottonwood trees in dry years (TRIT, 2003; table 3.39). Recommended flows for other reaches in Nevada and California represent minimum fish flows; it is assumed, in the absence of other data on riparian needs, that these flows also represent a critical threshold for riparian vegetation. The analysis focuses first on the potential adverse effects in the months when recommended flows are not met. It also evaluates the potential benefits to riparian resources when recommended minimum flows are exceeded.

Table 3.66—Summary of effects: riparian habitats along the mainstem of the Truckee River (- = significant adverse effect; + = significant beneficial effect). Summary is based on data in Biological Resources Appendix RIPARIAN tables 1-8; 14-21; and 27-34

<table>
<tr><th rowspan="2">Truckee River reach</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><th colspan="6">Wet hydrologic conditions</th></tr>
<tr><td>Lake Tahoe to Donner Creek</td><td colspan="3">No effect</td><td colspan="2" rowspan="8">No effect</td></tr>
<tr><td>Donner Creek to Little Truckee River</td><td>+</td><td colspan="2" rowspan="2">No effect</td></tr>
<tr><td>Little Truckee River through Trophy</td><td>+</td></tr>
<tr><td>Mayberry</td><td>+</td><td>+</td><td>No effect</td></tr>
<tr><td>Oxbow</td><td colspan="3" rowspan="3">No effect</td></tr>
<tr><td>Spice</td></tr>
<tr><td>Lockwood</td></tr>
<tr><td>Downstream from Derby Diversion Dam</td><td>+</td><td colspan="2">No effect</td></tr>
<tr><th colspan="6">Median hydrologic conditions</th></tr>
<tr><td>Lake Tahoe to Donner Creek</td><td colspan="2">No effect</td><td>+</td><td>No effect</td><td>+</td></tr>
<tr><td>Donner Creek to Little Truckee River</td><td colspan="3">No effect</td><td colspan="2" rowspan="4">No effect</td></tr>
<tr><td>Little Truckee River through Trophy</td><td>+</td><td colspan="2">No effect</td></tr>
<tr><td>Mayberry</td><td>+</td><td>+</td><td>No effect</td></tr>
<tr><td>Oxbow</td><td colspan="3" rowspan="3">No effect</td></tr>
<tr><td>Spice</td><td>+</td><td>+</td></tr>
<tr><td>Lockwood</td><td rowspan="2">No effect</td><td>+</td></tr>
<tr><td>Downstream from Derby Diversion Dam</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><th colspan="6">Dry hydrologic conditions</th></tr>
<tr><td>Lake Tahoe to Donner Creek</td><td>-</td><td>+</td><td>No effect</td><td rowspan="8">No effect</td><td>+</td></tr>
<tr><td>Donner Creek to Little Truckee River</td><td></td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River through Trophy</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Mayberry</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Oxbow</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Spice</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Lockwood</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Downstream from Derby Diversion Dam</td><td colspan="2">No effect</td><td>+</td><td>+</td></tr>
<tr><th colspan="6">Extremely dry hydrologic conditions</th></tr>
<tr><td>Lake Tahoe to Donner Creek</td><td colspan="3">No effect</td><td>+</td><td>+</td></tr>
<tr><td>Donner Creek to Little Truckee River</td><td colspan="2">No effect</td><td>+</td><td rowspan="4">No effect</td><td>+</td></tr>
<tr><td>Little Truckee River through Trophy</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Mayberry</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Oxbow</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Spice</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Lockwood</td><td>+</td><td>+</td><td>+</td><td rowspan="2">No effect</td><td>+</td></tr>
<tr><td>Downstream from Derby Diversion Dam</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
</table>

Table 3.67—Summary of effects: riparian habitats along affected tributaries to the Truckee River (- = significant adverse effect; + = significant beneficial effect). Summary is based on data in Biological Resources Appendix RIPARIAN tables 9-13; 22-26; and 35-39

<table>
<tr><th rowspan="2">Tributary reach</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><th colspan="6">Wet hydrologic conditions</th></tr>
<tr><td>Donner Creek</td><td colspan="2">No effect</td><td>+</td><td rowspan="5">No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td colspan="3" rowspan="3">No effect</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir</td><td>+</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><th colspan="6">Median hydrologic conditions</th></tr>
<tr><td>Donner Creek</td><td>No effect</td><td rowspan="2">No effect</td><td>+</td><td rowspan="5">No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir</td><td colspan="3">No effect</td><td>+</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td colspan="2">No effect</td><td>+</td><td>+</td></tr>
<tr><th colspan="6">Dry hydrologic conditions</th></tr>
<tr><td>Donner Creek</td><td>-</td><td>-</td><td>+</td><td rowspan="5">No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir</td><td>No effect</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><th colspan="6">Extremely dry hydrologic conditions</th></tr>
<tr><td>Donner Creek</td><td colspan="2">No effect</td><td>+</td><td rowspan="5">No effect</td><td>+</td></tr>
<tr><td>Prosser Creek</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Independence Creek</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River upstream of Stampede Reservoir</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Little Truckee River downstream from Stampede Reservoir</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
</table>

The analysis evaluates the effects of differences in flows on the maintenance of riparian habitats and, by extension, to riparian-associated wildlife. Habitat and, in particular, habitat structure, as a surrogate measure in predictive modeling of wildlife status, while not without limitations, is widely accepted especially where detailed information about the distribution and status of animals is limited (Schroeder and Allen, 1992; Morrison et al., 1998; Roloff et al., 2001).

2. Threshold of Significance

Operation models results show that there are relatively few months in which average monthly flows in any given reach differ by more than 15 percent among current conditions and the alternatives. At a 10-percent difference in flows, however, distinct patterns emerge. Therefore, an effect was identified as significantly adverse whenever the average monthly flows were 10 percent or more less than the flows to which they were compared in any month when either recommended minimum flows (reaches 1-12; map 3.1) or recommended ecosystem flows (reaches 13 and 14; map 3.1) were not met from April through October. An effect was identified as significantly beneficial whenever the average monthly flows were 10 percent or more greater than the flows to which they were compared in any month, regardless of whether the recommended minimum or ecosystem flows were met or not. Significance (adverse or beneficial) was based on best professional judgment and considered the timing and duration of the greater or less flows (i.e., when they occurred during the growing season and for how many months it extended) as well as the flows in the month or months that preceded and followed.

3. Model Results

a. Truckee River Reaches

Operations model results show that recommended minimum flows between Lake Tahoe and Donner Creek generally are not met under current conditions or any alternative from August through October in dry hydrologic conditions, and from July though October in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 1). Recommended minimum flows are always met in wet and median hydrologic conditions.

From Donner Creek through the Trophy reach, recommended minimum flows generally are not met in September and October in extremely dry hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 2 and 3). From the Mayberry reach through the Spice reach, recommended minimum flows generally are not met from August through October in extremely dry hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 4-6).

Downstream from Sparks, recommended ecosystem flows for the Truckee River are not met under current conditions or any alternative in June and July in wet hydrologic conditions and in all months in dry or extremely dry hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 7 and 8).

b. Upper Tributary Reaches

In Donner Creek, recommended minimum flows are not met in August in wet hydrologic conditions and in July and August in median hydrologic conditions under current conditions or the alternatives. In dry and extremely dry hydrologic conditions, recommended minimum flows are not met from May through October (Biological Resources Appendix, table RIPARIAN 9).

In Prosser Creek, recommended minimum flows are not met under current conditions or the alternatives in August and September in median hydrologic conditions. In dry and extremely dry hydrologic conditions, recommended minimum flows are not met under current conditions or the alternatives in April and from July through October; recommended minimum flows also are not met under No Action or LWSA in June in extremely dry conditions (Biological Resources Appendix, table RIPARIAN 10).

Independence Lake releases do not meet recommended minimum flows for Independence Creek under No Action and LWSA in August in median hydrologic conditions. In dry hydrologic conditions, recommended minimum flows are not met under No Action, LWSA, or TROA in April; and under current conditions, No Action, and LWSA from June through September. In extremely dry hydrologic conditions, recommended minimum flows are not met under current conditions, No Action, and LWSA from April through September. Recommended minimum flows for Independence Creek are not met under TROA in July in dry hydrologic conditions or in July and August in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 11).

In the Little Truckee River upstream of Stampede Reservoir, operations model results show recommended minimum flows are not met under No Action and LWSA in August or under current conditions or any alternative in October in median hydrologic conditions. In addition, recommended minimum flows are not met from July through October in dry hydrologic conditions or from June through October in extremely dry hydrologic conditions under current conditions or any alternative (Biological Resources Appendix, table RIPARIAN 12).

Downstream from Stampede Reservoir, recommended minimum flows in the Little Truckee River are not met under current conditions or any alternative in September and October in median hydrologic conditions. In dry hydrologic conditions, recommended minimum flows are not met under current conditions or any alternative in June or from August through October. Recommended minimum flows also are not met in extremely dry hydrologic conditions under current conditions or any alternative from May through October (Biological Resources Appendix, table RIPARIAN 13).

4. Evaluation of Effects

a. No Action

(1) Truckee River Reaches

Operations model results show that, under No Action, in the months when recommended minimum flows between Lake Tahoe and Donner Creek are not met, flows are about 20 percent less than under current conditions in September in dry and extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 14). When plants are already stressed, this situation is likely to cause many riparian plants to shed their leaves and enter dormancy early. While most riparian plants are likely to survive such an event and re-emerge the next spring, they are likely to be less vigorous because they will not have had sufficient time to store energy prior to entering dormancy. Consecutive years of dry or extremely dry hydrologic conditions are likely to cause the death of individual plants, leading to change in riparian community structure, process, and function. This would typically be a shift in dominance from riparian shrubs either to emergent herbaceous plants or, during extended droughts, to herbaceous plants adapted to upland conditions. The latter condition, a narrowing of the riparian zone, would be a significant adverse effect. While flows under No Action are 10 percent or more greater than under current conditions in October in dry and extremely dry hydrologic conditions, riparian plants are unlikely to recover from the adverse effects of the previous month's low flows.

From Donner Creek through the Spice reach, flows under No Action are 10 percent or more less than under current conditions in the months when recommended minimum flows are not met only in September in extremely dry hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 15-19). Although this is a potential adverse effect, it likely would be offset by substantially greater flows in preceding months, which should increase the available water in the soil matrix. Significant beneficial flow increases under No Action when compared to current conditions also occur in most reaches between July and September in dry hydrologic conditions, and in several reaches in October in wet or median hydrologic conditions.

Flows in the Lockwood reach under No Action are 10 percent or more less than under current conditions in April and May in dry hydrologic conditions and in April in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 20). Although greater flows are required for cottonwood recruitment in April and May, flows in this reach are always inadequate for seed germination in dry and extremely dry hydrologic conditions. Therefore, this potential adverse effect likely would be offset by substantially greater flows later in the summer. Flows downstream from Derby Diversion Dam under No Action are more than 40 percent less than under current conditions in September in extremely dry hydrologic conditions, but any adverse effects of these low flows likely would be offset by substantially greater flows in all preceding months (Biological Resources Appendix, table RIPARIAN 21).

(2) Tributary Reaches

In Donner Creek, flows under No Action and current conditions differ by 10 percent or more only in September and October in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 22). Flows that are 25 percent less in September likely would cause some riparian shrubs to shed their leaves and enter dormancy, which would be a significant adverse effect. Greater flows in October would be unlikely to compensate for this adverse effect. Several successive years in dry hydrologic conditions could lead to a loss of vigor in individual shrubs and a decrease in the total extent of riparian shrub vegetation, leading to change in riparian community structure, process, and function.

In Prosser Creek, flows under No Action are 35-50 percent less under than under current conditions in the months when recommended minimum flows are not met in July in dry and extremely dry conditions (Biological Resources Appendix, table RIPARIAN 23). Less flows in the middle of the growing season would be likely to inhibit the growth and reproduction of riparian plants, especially those growing at the edge of the riparian zone. Consecutive years of dry or extremely dry hydrologic conditions could lead to a substantial narrowing of the riparian corridor, which would be a significant adverse effect. Flows under No Action are greater than under current conditions in October in median hydrologic conditions and would provide a significant beneficial effect by extending the growing season of riparian plants. Greater flows in October in dry hydrologic conditions and in May in extremely dry hydrologic conditions would be unlikely to compensate for less flow in July, which occurs under such conditions.

In Independence Creek, in the months when recommended minimum flows are not met, flows under No Action are 10 percent or more less than under current conditions in August in median hydrologic conditions, in June in dry hydrologic conditions, and from April through June in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 24). Less flow in the early and middle parts of the growing season would be unlikely to be offset by greater flows that occur in October in these hydrologic conditions and, therefore, are all significant adverse effects.

In the Little Truckee River upstream of Stampede Reservoir, in the months when recommended minimum flows are not met, flows under No Action are 10 percent or more less than under current conditions only in July in dry and extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 25). Although this is potentially significant, flows are only 1 cfs less, and no significant adverse effect is expected. Under No Action, flows that are 10 percent or more greater than under current conditions occur in September and October in extremely dry hydrologic conditions. These greater flows would likely provide a significant beneficial effect by extending the growing season or supplying additional water during the growing season for riparian shrubs and trees in this reach.

Operations model results show that flows under No Action in the Little Truckee River downstream from Stampede Reservoir would not result in a significant adverse effect when compared to current conditions in any hydrologic condition (Biological Resources

Appendix, table RIPARIAN 26). Flows under No Action are 10 percent or more greater than under current conditions in October in wet hydrologic conditions and in July in dry and extremely dry hydrologic conditions. By extending the growing season or supplying additional water during the growing season, especially in dry and extremely dry hydrologic conditions, these greater flows would provide a significant beneficial effect.

b. LWSA

(1) Truckee River Reaches

In the Truckee River between Lake Tahoe and Donner Creek, flows are the same under LWSA and No Action, except in October in extremely dry hydrologic conditions, when they are 10 percent or more greater (Biological Resources Appendix, table RIPARIAN 27). These greater flows would provide a significant beneficial effect by extending the growing season for riparian shrub and forest vegetation. In the months when recommended minimum flows are not met, flows under LWSA are 10 percent or more less than under current conditions in September in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 15). This potential adverse effect likely would be offset by greater flows in August and October.

In the Spice reach, flows differ 10 percent or more between LWSA and No Action only in October in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 32). This would be a significant beneficial effect under LWSA. From Donner Creek through the Spice reach, flows under LWSA are 10 percent or more less than under current conditions in the months when recommended minimum flows are not met only in September in dry hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 15-19). This potentially adverse effect would be offset by substantially greater flows in preceding months and in October in such conditions. In all but reach 7, greater flows in preceding months would result in a significant beneficial effect when compared to current conditions. A significant beneficial effect would occur under LWSA when compared to current conditions in most reaches from July through September in dry hydrologic conditions, and in several reaches in October in wet or median hydrologic conditions (Biological Resources Appendix, tables RIPARIAN 15-19).

Flows in the Lockwood reach do not differ by 10 percent or more between LWSA and No Action. Flows under LWSA are 10 percent or more less than under current conditions in April and May in dry hydrologic conditions and in April in extremely dry hydrologic conditions. The effect would not be adverse because flows adequate for cottonwood regeneration do not occur in dry and extremely dry hydrologic conditions and because of substantially greater flows in subsequent months (Biological Resources Appendix, table RIPARIAN 20). Under LWSA, flows in this reach also are 10 percent or more greater than under current conditions in August and September in median hydrologic conditions. These greater flows would result in a significant beneficial effect.

Flows downstream from Derby Diversion Dam do not differ by 10 percent or more between LWSA and No Action (Biological Resources Appendix, table RIPARIAN 34). Flows under LWSA are nearly 40 percent less than under current conditions in September in extremely dry hydrologic conditions, but any adverse effects would be offset by substantially greater flows in all preceding months (Biological Resources Appendix, table RIPARIAN 21).

(2) Tributary Reaches

In Donner Creek, flows under LWSA are 10 percent or more greater than under No Action only in October in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 35). The small difference would be unlikely to provide much benefit this late in the growing season. Flows differ by 10 percent or more from those under current conditions only in September in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 22). Flows that are 25 percent less would be a significant adverse effect; some riparian shrubs would likely shed their leaves and enter dormancy early under such conditions. Greater flows in October would be unlikely to compensate for this adverse effect because these plants are unlikely to re-emerge from dormancy this late in the growing season. Several successive years of dry hydrologic conditions could lead to a loss of vigor and death of individual shrubs and a decrease in the total extent of riparian shrub vegetation.

Flows in Prosser Creek do not differ by 10 percent or more between LWSA and No Action (Biological Resources Appendix, table RIPARIAN 36). Flows under LWSA are 10 percent or more less than under current conditions in the months when recommended minimum flows are not met in July in dry and extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 23). This would be a significant adverse effect. Under LWSA, flows in October in median and dry hydrologic conditions and in May in extremely dry hydrologic conditions are greater than under current conditions. The greater October flows would be unlikely to provide much benefit to riparian vegetation because they would occur too late in the growing season. Any benefits of greater May flows in extremely dry hydrologic conditions likely would be offset by less flow in July.

Flows in Independence Creek do not differ by 10 percent or more between LWSA and No Action (Biological Resources Appendix, table RIPARIAN 37). In the months when recommended minimum flows are not met, flows under LWSA are 10 percent or more less than under current conditions in August in median hydrologic conditions, in April and June in dry hydrologic conditions, and from April through June in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 24). Successive years of dry or extremely dry hydrologic conditions are likely to lead to the death of individual riparian shrubs, perennial herbs, and grasses and also to a significant narrowing of the riparian corridor. This would be a significant adverse effect.

Flows in the Little Truckee River upstream of Stampede Reservoir do no differ by 10 percent or more between LWSA and No Action (Biological Resources Appendix, table RIPARIAN 38). In the months when recommended minimum flows are not met, flows under LWSA are 10 percent or more less than under current conditions only in July in dry and extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 25). Although this is a potential adverse effect, flows are only 1 cfs less and no significant adverse effect is expected. Flows under LWSA are 10 percent or more greater than under current conditions only in September and October in extremely dry hydrologic conditions. These flows would likely provide a significant beneficial effect by extending the growing season for riparian vegetation in this reach.

Flows in the Little Truckee River downstream from Stampede Reservoir do not differ by 10 percent or more between LWSA and No Action (Biological Resources Appendix, table RIPARIAN 38). Flows under LWSA are never 10 percent or more less than under current conditions in any hydrologic condition (Biological Resources Appendix, table RIPARIAN 26). Flows under LWSA are 10 percent or more greater than under current conditions in October in wet hydrologic conditions and in July in dry and extremely dry hydrologic conditions. These greater flows would be a significant beneficial effect.

c. TROA

(1) Truckee River Reaches

Operations model results show that in the Truckee River between Lake Tahoe and Donner Creek, flows under TROA are 10 percent or more less than under No Action only in September in dry hydrologic conditions, a potentially adverse effect that would be offset by substantially greater flows from May through June (Biological Resources Appendix, table RIPARIAN 27). Flows under TROA are 10 percent or more greater than under No Action in July in median hydrologic conditions and in October in dry and extremely dry hydrologic conditions. In the months when recommended minimum flows are not met, flows under TROA are 10 percent or more less than under current conditions in September in dry hydrologic conditions and in August and September in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 14). Potentially adverse effects would be likely in dry hydrologic conditions in most other months and in October in extremely dry hydrologic conditions.

Under TROA, in the Truckee River from Donner Creek through the Spice reach, flows in the Truckee River are never 10 percent or more less than under No Action (Biological Resources Appendix, tables RIPARIAN 28-32). Flows under TROA are 10 percent or more greater than under No Action in September and October in dry hydrologic conditions in most reaches. In extremely dry hydrologic conditions, flows under TROA are 10 percent or more greater than under No Action from August though October from the confluence of the Little Truckee River through the Mayberry reach, and from June through October in the Oxbow and Spice reaches. These would be significant beneficial effects that would enhance the vigor of riparian shrub and forest vegetation. Flows under TROA are never 10 percent or more less than under current conditions during months when recommended minimum flows are not met (Biological Resources Appendix, tables RIPARIAN 15-19). Significant beneficial effects would occur in all reaches when TROA is compared to current conditions, especially in dry and extremely dry hydrologic conditions. These greater flows occur only from August through October in the uppermost reach, but they occur from July though October in dry hydrologic conditions and from June through October in extremely dry conditions from the Mayberry reach through the Spice reach. These greater flows would enhance the vigor of riparian vegetation, which would be a significant beneficial effect.

In the Lockwood reach, flows under TROA are never 10 percent or more less than under No Action, but they are 10 percent or more greater from June through October in dry hydrologic conditions and from June through October in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 33). These greater flows would enhance the vigor of riparian shrub and forest vegetation along the lower Truckee River and would be a significant beneficial effect. Flows under TROA are 10 percent or more less than under current conditions in May in dry hydrologic conditions and in April in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 20). The potentially adverse effects of these low spring flows would be offset by substantially greater flows from August through October in dry hydrologic conditions and from June through October in extremely dry hydrologic conditions because TROA would allow the release of water to be withheld in the spring in order to create Credit Water that could then be released later in the year or in a subsequent year to enhance flow during low-flow periods.

Downstream from Derby Diversion Dam, flows under TROA are 10 percent or more greater than under No Action in April and June in median hydrologic conditions (Biological Resources Appendix, table RIPARIAN 34). This would be a significant beneficial effect and reflects the intent of TROA to make more water available for cottonwood regeneration when sufficient water is available. Flows under TROA also are 10 percent or more greater than under No Action in August in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 34). In extremely dry hydrologic conditions, flows under TROA are 10 percent or more greater than under No Action in April and from July through October. These greater flows would enhance the maintenance of riparian shrub and forest vegetation and would be a significant beneficial effect. Flows under TROA are 10 percent or more greater than under current conditions in July in wet hydrologic conditions; in June, August, and September in median hydrologic conditions; in August in dry hydrologic conditions; and in all months in extremely dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 21). These greater flows would result in significant beneficial effects.

(2) Tributary Reaches

In Donner Creek, flows differ by 10 percent or more between TROA and current conditions only in May in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 22). This potentially adverse effect would be offset by substantially greater flows from June through October. Flows under TROA also are greater than under current conditions in August in wet hydrologic conditions, in July and August in median hydrologic conditions, and from June through October in extremely dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation and would be a significant beneficial effect. Operations model results show the same pattern of significant beneficial flows when TROA is compared to No Action (Biological Resources Appendix, table RIPARIAN 36).

In Prosser Creek, flows under TROA are never 10 percent or more less than under No Action. Flows under TROA are never 10 percent or more less than under current conditions during months when recommended minimum flows are not met (Biological Resources Appendix, table RIPARIAN 23). Flows under TROA are greater than under current conditions in September in wet hydrologic conditions, in August and September of median hydrologic conditions, from April and June though October in dry hydrologic conditions, and in May and July though October in extremely dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation.

In Independence Creek, in the months when recommended minimum flows are not met, flows under TROA are 10 percent or more less than under current conditions only in April in dry hydrologic conditions (Biological Resources Appendix, table RIPARIAN 24). This potentially adverse effect would be offset by substantially greater flows from June though September. Flows under TROA also are greater than under current conditions in October in wet hydrologic conditions, in August and October in median hydrologic conditions, and in April and from July though October in extremely dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation and would be a significant beneficial effect. Operations model results show the same pattern of beneficial flows when TROA is compared to No Action, although in most months, flows are considerably greater (Biological Resources Appendix, table RIPARIAN 37).

Flows in the Little Truckee River upstream of Stampede Reservoir under TROA are never 10 percent or more less than under current conditions (Biological Resources Appendix, table RIPARIAN 25). Flows under TROA are greater than under current conditions in October in wet hydrologic conditions; in July and August in median hydrologic conditions; from June though September in dry hydrologic conditions; and in April and from July though October in extremely dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation and would be a significant beneficial effect. Operations model results show the same general pattern of significant beneficial flows when TROA is compared to No Action (RESOURCES APPENDIX, table RIPARIAN 38).

Downstream from Stampede Reservoir, flows in the Little Truckee River under TROA are greater than under No Action in September in wet hydrologic conditions; from August though October in median hydrologic conditions; and in all months except July in dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation and would be a significant beneficial effect. Flows under TROA are

10 percent or more less than under No Action only in July in extremely dry hydrologic conditions. This potentially adverse effect would be offset by greater flows in all other months under such conditions.

Flows under TROA are never 10 percent or more less than under current conditions (Biological Resources Appendix, table RIPARIAN 26). Flows are greater in September and October in wet and median hydrologic conditions, in May, June, and August through October in dry hydrologic conditions, and from May though October in extremely dry hydrologic conditions. These greater flows would enhance the vigor of riparian vegetation and would be a significant beneficial effect.

5. Mitigation and Enhancement

No mitigation would be required because of the benefits and enhanced environmental conditions that would occur under TROA. Riparian habitat for riparian-associated wildlife species would be enhanced under TROA.

Endangered, Threatened, and Other Special Status Species

Modifying operations of Truckee River reservoirs could affect elevations of lakes and reservoirs and the quality, quantity, timing, and duration of flows in the Truckee River and its tributaries. These changes could affect the life histories, habitat, and potential for recovery of endangered, threatened, and other special status species.

Lake and reservoir elevations, as well as flows, influence fish access to streams for spawning, thereby affecting their ability to reproduce, which may, in turn, affect the aquatic prey base for birds that forage on fish. The reproductive success of birds nesting on islands may be reduced if a landbridge forms as a result of low elevations in certain reservoirs. Changes in the elevation of Lake Tahoe could affect the acres of beach habitat available for Tahoe yellow cress, thereby affecting populations of this plant. Acres of riparian habitat used by special status species along streams also may change over time with changes in flows.

Forty-three special status species that could be affected by the alternatives occur or potentially occur in the study area. Federal endangered, threatened, and candidate species that could be affected and their distributions are listed in table 3.68. An “endangered species” is defined as a species in danger of extinction throughout all or a significant portion of its range. A “threatened species” is defined as a species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. If a federally listed species may be affected by the proposed action, consultation with FWS under section 7(c) of ESA will be completed. Also shown in table 3.68 are species listed by the States of California and Nevada as endangered or threatened.

Other Federal and State special status species also could be affected (table 3.69). FWS Birds of Conservation Concern include “species, subspecies, and populations of migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under ESA. Candidate species are those for which FWS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species, but for which development of a listing regulation is precluded by other higher priority listing activities. U.S. Forest Service (USFS) “sensitive species” are recognized as needing special management to prevent them from becoming endangered or threatened (Bergen and Barker, 1990).

CDFG’s “Species of Special Concern” designation applies to species that are not already included on Federal or California endangered, rare, or threatened lists, but are declining or are so few in number in California that extirpation is a possibility. Species on this list

Table 3.68—Federal and State endangered, threatened, and candidate species occurring or having the potential to occur in the study area that could be affected by modifying reservoir operations

Species	Status[1]	Habitat	Distribution
Plants			
Tahoe yellow cress, *Rorippa subumbellata*	C; FSS CE; NE	Beaches and margins of drainages that flow across beaches; sandy or cobbly substrates with little soil formation and good drainage	Endemic to Lake Tahoe Basin, with exception of historic record from Truckee, California
Fishes			
Cui-ui, *Chasmistes cujus*	E; NE	Freshwater lake and inflows	Only population is in Pyramid Lake; spawns in lower Truckee River
Lahontan cutthroat trout, *Oncorhyncus clarki henshawi*	T	Coldwater rivers, streams, and lakes	Lahontan Basin in northern Nevada, eastern California, and southern Oregon; Pyramid Lake, Truckee River, and Independence Lake
Birds			
Swainson's hawk, *Buteo swainsoni*,	BCC; CT	Associated western grasslands; nests predominantly in cottonwoods and elms in agricultural valleys	Documented nesting near Truckee River; possible breeding in the Lahontan Valley
Bald eagle, *Haliaeetus leucocephalus*	T; CE; NE	Nests and roosts in trees near lakes, reservoirs, and rivers	Nests in upper Truckee River basin, at Lake Tahoe, and at Lahontan Reservoir; winters throughout study area; fall concentrations at Taylor Creek and Little Truckee River during kokanee spawning
Willow flycatcher, *Empidonax traillii*	FSS; CE	Nests in riparian areas with broad, flat meadows containing dense willows	Historic records along lower Truckee River; recent records along Little Truckee River, upper Truckee River, and vicinity of Independence Lake; Little Truckee River supports the second largest population in California
Mammals			
Spotted bat, *Euderma maculatum*	CSSC; NT	Deserts to high mountains; roosts primarily in crevices in cliffs near water; may forage in riparian areas	Western States, including California and Nevada; documented in seven counties in Nevada; three specimens from Reno, Washoe County

[1] Status: Federal E = endangered; T = threatened; C = Candidate; BCC = FWS Bird of Conservation Concern; FSS = Forest Service sensitive species.
State NE = Nevada endangered; NT = Nevada Threatened; CE = California Endangered; CT = California Threatened; CSSC = California Department of Fish and Game Species of Special Concern

Table 3.69—Federal and State special status species occurring or having the potential to occur in the study area that could be affected by modifying operations of Truckee River reservoirs

Species	Status	Habitat	Distribution
Plants			
Shore sedge, *Carex limosa*	CNPS 2	Lake and pond lake margins, bogs and fens, and along low gradient streams often growing in sedge or sphagnum peat; elevation range 3936 – 8856 feet	Nevada and El Dorado Counties, California, vicinity of Sagehen Creek and Grass Lake
Grants Pass willowherb, *Epilobium oreganum*	FSS; CNPS 1B	Small streams, ditches, and bogs in lower montane coniferous forests; elevation range 1640 – 7350 feet	Nevada, Placer, and El Dorado Counties, California; vicinity of Sagehen Creek and Echo Summit
American manna grass, *Glyceria grandis*	CNPS 2	Wet places, meadows, lake and stream margins; elevation range 50 – 6495 feet	Placer County; vicinity of Squaw Creek and Truckee River
Marsh skullcap, *Scutellaria galericulata*	CNPS 2	Wet sites, meadows, streambanks, coniferous forest; elevation range 0 – 6888 feet	Nevada, El Dorado, and Placer Counties, California; vicinity of Truckee River
Plumas ivesia, *Ivesia sericoluca*	CNPS 1B	Meadows, rocky streams, and vernal pools within sagebrush and upper montane forest; elevation 4600 – 6600 feet	Vicinity of Stampede Reservoir, Prosser Creek Reservoir, Little Truckee River, and Truckee River
Slender-leaved pondweed, *Potamogeton filiformis*	CNPS 2	Shallow, clear water of lakes and drainage channels; elevation range 984 – 7052 feet	Placer County, California; historic record from Lake Tahoe
White-stemmed pondweed, *Potamogeton praelongus*	CNPS 2	Deep water, lakes; elevation range 5900 – 9840 feet	Sierra County, California
Water bulrush, *Scirpus subterminalis*	CNPS 2	Lakes, ponds, and marshes; elevation range 2460 – 7380 feet	Nevada and El Dorado Counties, California; vicinity of Grass and Upper Angora Lakes
Veined water lichen, *Hydrothyria venosa*	FSS	Clear, flowing, mid- to high-elevation streams where water quality appears to be very good	Known from Calaveras to Tulare Counties, California
Three-ranked hump-moss, *Meesia triquetra*	FSS; CNPS 2	Meadows and seeps, damp soil within upper montane coniferous forest; elevation range 4264 – 8200 feet	Nevada and El Dorado Counties, California
Broad-nerved hump-moss, *Meesia uliginosa*	FSS	Meadows and seeps, bogs and fens, upper montane coniferous forest; elevation range 4264 – 8200 feet	Nevada County, California

Table 3.69—Federal and State special status species occurring or having the potential to occur in the study area that could be affected by modifying operations of Truckee River reservoirs – continued

Species	Status	Habitat	Distribution
Invertebrates			
California floater, *Anodonta californiensis*	NNHP S1?	Water less than 6.5 feet deep in lakes and rivers; usually slow moving water; adults in sand, mud, or stream bottom	Historic record in Truckee River, late 1800s
Great Basin rams-horn, *Helisoma newberryi newberryi*	FSS	Large spring complexes	Reported from Lake Tahoe and adjacent downstream slow-flowing segment of the Truckee River
Nevada viceroy, *Limenitus archippus lahontani*	NNHP S1S2	Riparian habitats with willows, its host plant	Apparently restricted to Nevada where known from the Humboldt River and near Fallon and Fernley
Aquatic moth, *Petrophila confusalis*	NNHP S1	Well-oxygenated water of streams and lakes	Known to occur in Pyramid Lake
Fishes			
Mountain sucker, *Catostomus platyrhynchus*	CSSC	Small, clear mountain streams with rubble, sand, or boulder bottoms; occasionally lakes or reservoirs	Sagehen Creek, Little Truckee River, Prosser Creek, Martis Creek, and Truckee River
Amphibians			
Northern leopard frog, *Rana pipiens*	FSS	Brackish and freshwater marshes with dense vegetation; desert lowlands to high mountain meadows	Lower reach of Truckee River; 8.0 to 12.0 miles upstream from Pyramid Lake
Reptiles			
Northwestern pond turtle, *Clemmys marmorata*	FSS	Inhabits permanent and intermittent aquatic habitat. Hatchlings prefer water less than 1 foot deep with emergent vegetation	Suitable habitat has been identified in three areas along the Truckee River (Holland, 1991)
Birds			
Northern harrier, *Circus cyaneus*	CSSC	Uses wetlands, meadows, and agricultural areas	Year-round resident in Nevada; probable breeding near Truckee River; lower Truckee River
American white pelican, *Pelecanus erythrorhynchos*	NNHP S2, CSSC	Islands in freshwater lakes used for breeding; forages in rivers, lakes, and marshes	Anaho Island supports one of largest breeding colonies in US; forages in Pyramid Lake, Humboldt Sink, Honey Lake, Stillwater Marshes, Carson Lake, and Truckee River; winters on California coast and Central Valley

Table 3.69—Federal and State special status species occurring or having the potential to occur in the study area that could be affected by modifying operations of Truckee River reservoirs – continued

Species	Status[1]	Habitat	Distribution
Birds (continued)			
Long-billed curlew, *Numenius americanus*,	FSS BCC/CSSC	Nests in emergent wetlands, meadows, and pastures	Summer resident in Nevada; occasional sightings on lower Truckee River
California gull, *Larus californicus*	CSSC	Nests colonially on islands; forages in a variety of habitats	Nests colonially on Ahaho Island and the island in Lahontan Reservoir; winters on west coast
Osprey, *Pandion haliaetus*	CSSC, NNHP S2	Nests in snags near lakes or rivers with abundant fish	Nests at Lake Tahoe and Stampede Reservoir; formerly nested at Lahontan and S-Line Reservoirs; observed throughout Nevada during spring and fall migrations
Yellow warbler, *Dendroica petechia*	CSSC	Nests in riparian thickets (especially willow) and riparian forest with dense understories	Along Truckee River and tributaries
Yellow-breasted chat, *Icteria virens*	CSSC	Nests in dense riparian thickets in valleys	Historically common along lower Truckee River, but now rare; possible breeding near Truckee River
Mammals			
Pale Townsend's big-eared bat, *Corynorhinus townsendi*	FSS/CSSC	Roosts in caves and mines in a variety of habitats; may forage in riparian areas	Historic records near Pyramid Lake, Stillwater, and Fallon
Fringed myotis, *Myotis thysanodes*	NNHP S2	From low desert to fir-pine forests	Throughout study area
Pallid bat, *Antrozous pallidus*	FSS/CSSC	Primarily open lowland habitats below 6600 feet; roosts in caves, tunnels, and hollow trees; feed almost entirely on the ground	Nevada portion of study area
Western red bat, *Lasiurus blossevillii*	FSS	Found primarily in wooded habitats including cottonwood/willow riparian areas	Rare in Nevada; documented in four Nevada counties including southern Washoe and eastern Churchill Counties

[1] Status: Federal: BCC = FWS Bird of Conservation Concern; FSS = Forest Service sensitive species
State: CSSC = California Department of Fish and Game Species of Special Concern; CNPS = California Native Plant Society (1B = Rare or endangered in California and elsewhere; 2 = Rare and endangered in California, more common elsewhere); NNHP = Nevada Natural Heritage Program (S1 = Critically imperiled in Nevada due to extreme rarity, imminent threats, and/or biological factors; S2 = Imperiled in Nevada due to rarity and/or other demonstrable factors).

have no legal status under California State law. The Nevada Natural Heritage Program and the California Native Plant Society maintain prioritized lists of sensitive plants and animals and plants, respectively. The general distribution and habitat of all such sensitive species along the Truckee River and associated lakes and reservoirs potentially affected by changes in reservoir management are presented in table 3.69. Eighty-eight special status species known or likely to occur in the study area would not be affected by any alternative and are summarized in the Biological Resources Appendix.

Cui-Ui

I. Affected Environment

A. Status and Distribution

Cui-ui, were abundant in Pyramid Lake and in the adjacent Winnemucca Lake at the beginning of the 20th century. As water diversions for M&I and agricultural uses, especially the Newlands Project, were developed, Truckee River inflow to Pyramid Lake diminished substantially. During the 1930s, the elevation of Pyramid Lake dropped rapidly and a large delta formed at the mouth of the Truckee River, making it frequently impassable to the stream spawning cui-ui. Winnemucca Lake dried up at this time as well. By the early 1940s, the Pyramid Lake strain of LCT had been extirpated. In most years after the 1930s, neither cui-ui nor LCT were able to gain access to the river for spawning. By 1967, Pyramid Lake was nearly 80 feet lower than in 1900. FWS and the State of Nevada listed the cui-ui as endangered in 1967. A Recovery Plan was approved in 1978, with the most recent revision completed in 1992.

Because cui-ui may live as long as 45 years or more (Scoppetonne et al., 1996), it has been able to take advantage of the occasional high water years to reproduce. From 1950 to 1979, cui-ui produced large numbers of young in only two years (1950 and 1969) (Scoppettone and Vinyard, 1991). Successful spawning occurred in 14 years from 1980 to 2003. This improvement is attributed to cooperative management efforts among FWS, Reclamation, and the Pyramid Tribe; construction of Marble Bluff Dam and subsequent design improvements; the dedication of Stampede Reservoir storage to cui-ui and LCT; wet years and flow management during drought years that support spawning under less flows; and, reduced diversions to the Newlands Project over the last two decades. Table 3.70 presents recent cui-ui adult passage through Marble Bluff Dam.

Table 3.70—Recent cui-ui adult passage through Marble Bluff Dam

Year	Estimated spawners	Year	Estimated spawners
1994	66,000	2001	No spawning run
1995	112,000	2002	39,000
1996	172,000	2003	160,000
1997	307,000	2004	169
1998	492,000	2005	1,356,000
1999	584,000	2006	956,000
2000	183,000		

Rounded to nearest thousand (except for 2004).

B. Life History

The lake-dwelling cui-ui is an obligatory stream spawner in the Truckee River. The size of the spawning run is influenced by the size and year-class structure of the adult population, river access, and inflow. When lake elevation and spring inflows have been high, spawning runs have been large (Buchanan and Coleman, 1987). The spawning migration begins in April or May, depending on inflow, river access and water temperatures and continues for 4 to 8 weeks. Most of the spawners enter the river during a 1- to 2-week period (Buchanan and Coleman, 1987).

Historically, cui-ui may have spawned in the lower 43 miles of the Truckee River. Most now spawn downstream from Numana Dam, but cui-ui migrate beyond Numana Dam during high spawning runs. More than an estimated 250,000 spawners have been observed at Wadsworth, and larvae have been captured just downstream from Wadsworth (Heki, 2004). Cui-ui spend up to 16 days in the river: 1 to 11 days acclimating to the river environment before spawning and 1 to 5 days after spawning is initiated. Once an adult has finished spawning, it moves back to the lake within hours and does not return to the river until the following spring at the earliest (Scoppettone et al., 1986).

Like other suckers, cui-ui spawn in groups, depositing eggs over a broad area of predominantly gravel substrate in water 0.8 to 4.0 feet deep, where water velocity is 1 to 2 feet per second (Buchanan and Coleman, 1987). Fertilized eggs hatch in 1 to 2 weeks depending on water temperature. Embryo survival decreases when daily maximum temperatures exceed 63 ºF. After eggs hatch, the yolk-sac larvae spend 5 to 10 days in the gravel before they emerge. Cui-ui are considered yolk-sac larvae from the time they hatch until the yolk-sac is absorbed and feeding begins, about two weeks. Upon emergence, most larvae are swept passively downstream to the lake, although a few may find refuge in the river's backwaters for a month or two. The mouths of larvae do not open until about 16 days after hatching (Bres, 1978), and emigrating larvae usually retain their yolk sacs. The timing of mouth opening corresponds with entry into the lake.

Upon reaching the lake, larvae remain in the shallow littoral zone feeding on zooplankton. In late summer they disperse into deeper water, where both young-of-the-year juveniles and adults feed on zooplankton and benthic invertebrates. Although juveniles and adults are commonly found near the lake bottom in 50 to 100 feet of water throughout the year, their movement in Pyramid Lake is not well known (Buchanan and Coleman, 1987).

C. Management

1. Flow Regimes for Stampede Reservoir Storage

The completion of Stampede Dam and Reservoir on the Little Truckee River contributed to reestablishing Truckee River flows suitable for cui-ui (FWS, 1992a). Since 1976, FWS has used water from Stampede Reservoir to adjust volume and timing of flows to enhance cui-ui spawning runs and to maintain water temperatures suitable for egg incubation. In 1982, the U.S. District Court for the District of Nevada affirmed the

Secretary's authority by ruling that the Secretary was to use "…the waters stored in Stampede Reservoir for the benefit of the Pyramid Lake fishery until such time as the cui-ui and LCT are no longer classified as threatened or endangered, or until sufficient water becomes available from other sources to conserve the cui-ui and LCT." The U.S. Ninth Circuit Court of Appeals affirmed this decision, and the U.S. Supreme Court declined to review the case. This gave cui-ui its only assured water supply.

Early management guidelines established flow regimes for the lower river (FWS, 1992a). Minimum management spawning flows during May and June were set at 1,000 cfs (approximately 60,000 acre-feet per month. Flows were not to exceed 2,500 cfs to reduce the potential for killing eggs and yolk-sac larvae by scouring and to enable adult movement (Buchanan, 1987; Buchanan and Burge, 1988; Buchanan and Strekal, 1988). From January through April, 60,000 acre-feet of attraction flows were required.

In the mid-1990s, FWS-funded research led to the development of four variable flow recommendations for the Truckee River. Research conducted by The Nature Conservancy indicated that flow management that varies across seasons and across years was the optimum solution for meeting all ecosystem needs in a naturally variable riverine system with variable availability of water for environmental flows. The Nature Conservancy developed four flow management regimes for the lower Truckee River in 1995 (Gorley, 1996). FWS implemented these flow regimes using water stored in Stampede Reservoir in excess of fish water to enhance riparian recruitment, channel maintenance; aquatic and riparian ecosystem maintenance; and a survival flow regime for use as an emergency plan during extremely dry years. These flow regimes used by FWS from 1995 through 2000 resulted in substantial improvement in the riparian forest downstream from Derby Diversion Dam and in other sites along the Truckee River (TRIT, 2003).

Beginning in 2002, FWS, in cooperation with the Pyramid Tribe, replaced these four flow regimes by six-flow regimes. The six-flow regimes were intended to release less water in the spring and more water in late summer and fall, resulting in measured releases of water in the Truckee River over the entire year. The strategy was designed to more closely mimic a natural river system while protecting habitat for both cui-ui and LCT. A successful cui-ui spawning event was supported in 2002 during an extreme dry year using only 23,000 acre-feet of storage water.

Such flow patterns also have proven effective in maintaining riparian trees and shrubs that established in the 1980s through droughts in the early and late 1990s (Rood et al., 2003). The six-flow regime recommendations are intended to provide the flexibility to implement an adaptive management strategy for the Truckee River. The recommended flows, which currently use Stampede (and a portion of Prosser Creek) Reservoir storage, vary according to the amount of water available in the system at any given time (table 3.39). Additional discussion of the six-flow regime is provided in "Fish in Truckee River and Affected Tributaries" and in the Biological Resources Appendix.

These ecosystem flows benefit both cui-ui and LCT, either directly or indirectly by maintaining or enhancing riparian vegetation, which provides shade along the river, thereby reducing the volume of water needed to maintain suitable temperatures for spawning and incubation. Alternatives presented in this EIS/EIR would not alter the way in which FWS manages the six-flow regimes; the alternatives, however, may indirectly affect the amount of water available and the flow regime that can be achieved in any given year. Flow regimes 1, 2, and 3 are specifically designed to support cui-ui spawning runs.

2. Recovery Plan

The 1992 Revised Recovery Plan sets out four broad categories of conservation measures to improve and protect cui-ui spawning, incubation, and rearing habitat: (1) increase volume and improve timing of inflow to Pyramid Lake; (2) rehabilitate the lower Truckee River; (3) achieve water quality standards; and (4) improve fish passage in the lower Truckee River. Much progress has been made in restoring the lower Truckee River as evidenced by implementation of the various flow regimes for management of Stampede Reservoir storage (Rood et al., 2003). Progress also has been made in improving fish passage at Marble Bluff Dam. Fish passage over the Truckee River delta has been improved recently because of rising Pyramid Lake elevations. Recent droughts, however, are again exacerbating delta conditions at the terminus of the Truckee River (Heki, 2004).

3. Fish Passage

Three major structures impede fish movements between Pyramid Lake and Derby Diversion Dam: Marble Bluff Dam, 3 miles upstream; Numana Dam, 8.3 miles upstream; Derby Diversion Dam itself, 34 miles upstream. There are also six small rock structures within the Pyramid Lake Reservation that impede passage.

a. Marble Bluff Dam

Reclamation constructed this dam and fish passageway in 1975 to reduce river headcutting and to provide passage of fish from the lake to the lower river. FWS manages the fish facility at Marble Bluff Dam, while Reclamation maintains the dam and fish lock. A state-of-the-art lock system at the dam provides a means of capturing fish as well as passage over the dam for fish which migrate via the river. The facility also includes a clay-lined fishway, with a capacity of 50 cfs that provides a 3-mile-long passageway to the Truckee River for both cui-ui and LCT to spawn and return to the lake when they are unable to migrate upriver either because of low river or lake elevations. The fishway terminates at the river though a bypass ladder installed in 1998 (Heki, 2004). Fish in the fishway can also be run through a fish handling building for sampling.

Flooding in January 1997 damaged the existing rock armoring of the dam, and Reclamation in conjunction with the Pyramid Tribe and FWS, repaired it in 1998. The 1997 flood caused extensive scouring in the channel downstream from the dam, altering the river hydraulics. A rock armored channel was constructed in 1998 to improve fish access to the fish lock. Reclamation, FWS and the Pyramid Tribe completed work on a major modification to the fish passage facility in 1998. The modifications provide a more efficient and reliable passage for cui-ui from Pyramid Lake to Truckee River. The modified facility handles approximately 10 times the number of fish per hour than the earlier design.

b. Numana Dam

This dam was constructed in 1917 to divert Truckee River water for agricultural purposes to the Pyramid Lake Indian Reservation. It is located about 8 miles off the Pyramid Lake shoreline. The fish ladder and screens were retrofitted in 1976 to facilitate fish passage but design limitations create a severe bottleneck for fish. By 2000 the screens were badly corroded and not functional. In 2001, COE began investigating a range of alternatives including a fish passage channel and removal of the dam. Currently, cui-ui are not provided access upstream of Numana Dam because adult and larval entrainment into the canal occurs. Numana Dam is a complete impediment to cui-ui and, therefore, impedes spawning success.

4. Derby Diversion Dam

This dam was completed in 1905. The dam, an integral part of the Newlands Project, diverts Truckee River water into the Truckee Canal for irrigation of the Truckee Division lands and for supplemental storage in Lahontan Reservoir on the Carson River for the Carson Division of the Newlands Project. A fish ladder was installed at Derby Diversion Dam in 1908, but the ladder is no longer functional. In 2002, Reclamation completed construction of the Derby Diversion Dam Fish Passage Project to provide passage to cui-ui and LCT past Derby Diversion Dam. The fishway is 935 feet long; large boulders in the fishway can be adjusted to control the velocity of water through the channel and to provide a resting spot for fish.

II. Environmental Consequences

A. Introduction

For cui-ui, the analysis of alternatives focuses on habitat conditions related to spawning. The following indicators were evaluated:

- Annual average inflow to Pyramid Lake
- Frequency (number of years) that flow regime 1, 2, or 3 is achieved in the lower Truckee River (between Numana and Marble Bluff Dams) from April through June
- Relative amounts of riparian vegetation along the lower Truckee River

B. Summary of Effects

1. Average Annual Inflow to Pyramid Lake

Operations model results show that, under TROA, average annual inflow to Pyramid Lake is greater than under No Action or current conditions. Greater inflow would benefit cui-ui by maintaining Pyramid Lake at a higher elevation, which, in turn, would enhance lake habitat and river access. Under both No Action and LWSA, average annual inflow to Pyramid Lake are less than under current conditions, adversely affecting cui-ui. Table 3.71 summarizes these effects.

Table 3.71—Summary of effects: average annual inflow (acre-feet) to Pyramid Lake (+ = significant beneficial effect, - = significant adverse effect)

	Compared to current conditions			Compared to No Action	
	No Action	LWSA	TROA	LWSA	TROA
Net change	-	-	-	-	+

2. Frequency that Flow Regime 1, 2, or 3 is Achieved in the Lower Truckee River from April through June

Overall, operations model results show that flow regimes 3 and greater are achieved about as frequently under LWSA and TROA as under No Action and as frequently under No Action, LWSA, and TROA as under current conditions. Under TROA, however, flow regime 1 or 2 is achieved more frequently in May and June, which would be a significant beneficial effect under TROA. Table 3.72 summarizes these effects.

Table 3.72—Summary of effects: achievement of flow regime 1, 2, or 3 (+ = significant beneficial effect)

Month	Compared to current conditions			Compared to No Action	
	No Action	LWSA	TROA	LWSA	TROA
April	No effect		No effect	No effect	No effect
May			+		+
June			+		+

3. Relative Amounts of Riparian Habitat Along the Lower Truckee River

A significant beneficial effect on riparian habitat along the lower Truckee River in median, dry, and extremely dry hydrologic conditions would occur under TROA compared to both No Action and current conditions. Cui-ui would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. Significant beneficial effects on riparian habitat along the lower Truckee River in wet, median, and extremely dry hydrologic conditions would occur under No Action and LWSA when compared to current conditions. No effect would occur under LWSA when compared to No Action. Table 3.73 summarizes these effects.

Table 3.73—Summary of effects: relative amounts of riparian habitat along the lower Truckee River (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th rowspan="2">Hydrologic condition</th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>Wet</td><td>+</td><td colspan="2">No effect</td><td colspan="2">No effect</td></tr>
<tr><td>Median</td><td>+</td><td>+</td><td>+</td><td rowspan="3">No effect</td><td>+</td></tr>
<tr><td>Dry</td><td>No effect</td><td colspan="2">+</td><td>+</td></tr>
<tr><td>Extremely dry</td><td>+</td><td>+</td><td>+</td><td>+</td></tr>
</table>

C. Average Annual Inflow to Pyramid Lake

1. Method of Analysis

Operations model results were used to calculate average annual inflow to Pyramid Lake under current conditions and each alternative over the modeled 100-year period, based on flow at Nixon.

2. Threshold of Significance

An objective of the Cui-ui Recovery Plan is to increase Truckee River inflow to Pyramid Lake to enhance river access and habitat for spawning. Any change in inflow was considered significant.

3. Model Results

Table 3.74 presents operations model results for average annual inflow to Pyramid Lake.

Table 3.74—Average annual inflow (acre-feet) to Pyramid Lake

Current conditions	No Action	LWSA	TROA
495,430	490,940	490,380	500,670

4. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, average annual inflow to Pyramid Lake is 4,490 acre-feet less than under current conditions, which would result in a significant adverse effect.

b. LWSA

Average annual inflow to Pyramid Lake under LWSA is 560 acre-feet less than under No Action and 5,050 acre-feet less than under current conditions, which would result in a significant adverse effect under LWSA compared to No Action or current conditions.

c. TROA

Under TROA, average annual inflow to Pyramid Lake is 9,730 acre-feet greater than under No Action and 5,240 acre-feet greater than under current conditions. Greater inflow is due to the conversion of M&I Credit Water to Fish Credit Water, in combination with increased return flow of groundwater from the sewage effluent reuse program. Water Quality Water accounts for the additional difference between TROA and current conditions. Greater average annual inflow would increase the elevation of Pyramid Lake. Greater inflow would result in improved adult and juvenile lake rearing habitat; improved adult migration conditions across Truckee River delta and into the lower Truckee River; and greater flows in spawning habitat in the lower Truckee River. The greatest benefits would occur in dry and very dry years, which are the most critical for cui-ui survival. These would be significant beneficial effects under TROA.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. A significant beneficial effect for cui-ui would occur under TROA because annual average inflow to Pyramid Lake would be greater.

D. Frequency that Flow Regime 1, 2, or 3 is Achieved in the Lower Truckee River from April through June

1. Method of Analysis

Operations model results were used to calculate the frequency (number of years over the 100-year modeled period) that the average monthly flows for regime 1, 2, or 3 are achieved, based on flow at Nixon, from April through June, the period of cui-ui spawning.

2. Threshold of Significance

The number of years that flow regime 1, 2, or 3 is achieved from April though June was compared. It was assumed that flow regime 1 would be more beneficial for cui-ui than flow regime 2, and flow regime 2 would be more beneficial than flow regime 3.

3. Model Results

Table 3.75 presents operations model results for the frequency (number of years) that flow regime 1, 2, or 3 is achieved in the lower Truckee River from April through June.

Table 3.75—Frequency (number of years) that flow regime 1, 2, or 3 is achieved in the lower Truckee River from April through June

Flow regime (flow recommendation)	Current conditions	No Action	LWSA	TROA
April				
1 (flow ≥ 590 cfs)	68	64	64	62
2 (flow ≥ 490 cfs)	8	9	8	11
3 (flow ≥ 420 cfs)	5	5	6	4
April total (1 + 2 + 3)	81	78	78	77
May				
1 (flow ≥ 1000 cfs)	57	56	56	55
2 (flow ≥ 800 cfs)	7	7	7	11
3 (flow ≥ 600 cfs)	10	12	12	7
May total (1 + 2 + 3)	74	75	75	73
June				
1 (flow ≥ 800 cfs)	48	48	48	49
2 (flow ≥ 600 cfs)	8	8	8	14
3 (flow ≥ 500 cfs)	13	12	12	5
June total (1 + 2 + 3)	69	68	68	68

4. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, flow regimes 3 and greater are achieved 3 fewer times in April, 1 more time in May, and 1 fewer time in June than under current conditions. These differences would be unlikely to have a significant effect on the cui-ui population.

b. LWSA

Under LWSA, flow regimes 3 and greater are achieved as frequently as under No Action or current conditions except for two minor differences. These differences would be unlikely to have an effect on the cui-ui population.

c. TROA

Under TROA, flow regimes 3 and greater are achieved 1 fewer time in April and 2 fewer times in May than under No Action, which would be unlikely to have a significant adverse effect. Flow regimes 2 and greater, however, are achieved 3 percent more frequently in May and 7 percent more frequently in June. This moderate difference likely would benefit cui-ui spawning and, therefore, would be a significant beneficial effect when TROA is compared to No Action.

Under TROA, flow regimes 3 and greater are achieved 4 fewer times in April and 1 fewer time in May and June than under current conditions. Flow regime 2 and greater, however, are achieved only 3 percent less frequently in April, 2 percent more frequently in May, and 7 percent more frequently in June. This moderate difference likely would benefit cui-ui spawning and, therefore, would be a significant beneficial effect when TROA is compared to current conditions.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. A significant beneficial effect for cui-ui would occur under TROA because flow regimes 1 and 2 would be achieved more frequently in May and June than under No Action or current conditions.

E. Relative Amounts of Riparian Habitat Along the Lower Truckee River

See "Riparian Habitat and Riparian-Associated Wildlife" for discussions of method of analysis and threshold of significance. For the cui-ui analysis, only riparian habitat downstream from Derby Diversion Dam was evaluated.

1. Evaluation of Effects

a. No Action

Compared to current conditions, a significant beneficial effect on riparian habitat along the lower Truckee River would occur under No Action in wet, median, and extremely dry conditions. Cui-ui would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. See more detailed discussion in "Riparian Habitat and Riparian-Associated Wildlife."

b. LWSA

When compared to No Action, riparian habitat along the lower Truckee River would not be affected under LWSA. Compared to current conditions, a significant beneficial effect on riparian habitat along the lower Truckee River in median and extremely dry hydrologic conditions would occur under LWSA. Cui-ui would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. See more detailed discussion in "Riparian Habitat and Riparian-Associated Wildlife."

c. TROA

When compared to both No Action and current conditions, a significant beneficial effect on riparian habitat in median, dry, and extremely dry hydrologic conditions would occur under TROA. Cui-ui would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. See more detailed discussion in “Riparian Habitat and Riparian-Associated Wildlife.”

2. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. Enhancing riparian habitat along the lower Truckee River, thereby reducing water temperatures through shading effects, would be a significant beneficial effect under TROA.

Lahontan Cutthroat Trout

I. Affected Environment

A. Status and Distribution

Lahontan cutthroat trout, is an inland subspecies of cutthroat trout endemic to the Lahontan basin of northern Nevada, eastern California, and southern Oregon. It was listed by FWS as endangered in 1970 (35 FR 13520, August 25, 1970) and later reclassified as threatened in 1975 to facilitate management and allow regulated angling (40 FR 29864, July 16, 1975). A recovery plan was issued in 1995. There is no designated critical habitat. LCT has been introduced into habitats outside its native range, consistent with the recovery plan.

The LCT Recovery Plan estimated that less than 0.2 percent of lake habitat and about 2.2 percent of stream habitat in the Truckee River basin were occupied by LCT (FWS, 1995b). The only remaining indigenous population resides in Independence Lake and the main inlet tributary Independence Creek (Peacock et al., 1999). LCT within the Truckee River basin is included in the Western Lahontan Basin population segment, one of three population segments of LCT. Within the Truckee River basin, there are currently seven small headwater tributaries with a total of 8 miles that support self-sustaining river populations. These populations are found in Independence Creek, Pole Creek, Upper Truckee River, Bronco Creek, Hill Creek, and West Fork Gray Creek. There are two lake populations in Pyramid and Independence Lakes. Only Independence Lake has a naturally reproducing population. Pyramid Lake has a hatchery-maintained population.

LCT occupied about 360 miles of suitable stream habitat and 284,000 acres of lake habitat within the Truckee River basin prior to the 1860s (Gerstung, 1986). The largest populations of LCT occurred in Pyramid Lake and Lake Tahoe, where the fish was a major food source, along with the cui-ui, for local Indians.

1. Pyramid Lake

By 1944, the original Pyramid Lake LCT population was extirpated after it lost access to its Truckee River spawning grounds due to Derby Diversion Dam, pollution, commercial harvest and exotic fish introductions into the main Truckee River system (Sumner, 1940; Gerstung, 1988; Knack and Stewart, 1984; Behnke, 1992). Hatchery stocking developed a popular LCT sport fishery at Pyramid Lake. Four strains of LCT (Heenan, Walker, Summit and Independence Lakes) were used for stocking into Pyramid Lake until the 1980s (Coleman and Johnson, 1988). Since the early 1980s, LCT eggs have been taken exclusively from Pyramid Lake spawners and reared for release (FWS, 1995b).

2. Lake Tahoe

The native Lake Tahoe LCT population was extirpated in 1939 as a result of damage to spawning tributaries from pollution, logging, diversions and dams; overfishing; and the inability to compete with the introduced lake trout (Gerstung, 1986, 1988; Behnke, 1992).

3. Independence Lake

Independence Lake has the only self-sustaining lake LCT population in the Truckee River basin. This population is genetically unique (Cowan, 1988; Bartley and Gall, 1993) and is vulnerable to extinction (FWS, 1995b). The lake supports a small catch-and-release fishery, and historically supported spawning runs of 2,000 to 3,000 fish (Welch, 1929). By 1960, the population had declined to less than 100 spawners per year (Gerstung, 1988), despite many attempts to supplement this population with hatchery-reared native Independence Lake LCT stock. The population decline is thought to be the result of competition with non-native kokanee salmon in the lake and brook trout in the stream. Additionally, a sand/silt delta has formed where Independence Creek enters the lake, which blocks LCT spawning runs into the creek when lake storage is less than 7,500 acre-feet (FWS, 1995b).

B. Life History

River- and lake-adapted forms of LCT have different behavior, ecology and habitat use. Optimal river habitat is characterized by the following: (1) clear cold water with an average maximum summer temperature of less than 22 ºC (72 ºF), and relatively stable summer temperature regime averaging about 13 ºC (55 ºF) plus or minus 4 ºC (7 ºF); (2) pools in close proximity to cover and velocity breaks to provide hiding cover and spawning areas; (3) well vegetated, stable stream banks; (4) 50 percent or more of stream area providing cover; and (5) a relatively silt free rocky substrate in riffle-run areas (FWS, 1995b). Optimal lake habitat is characterized by: (1) clear, cool/cold water with an average summer surface layer temperature of less than 72 ºF; (2) a surface layer with a pH of 6.5 to 8.5 and dissolved oxygen content of less than 8 milligrams per liter (mg/L); and (3) access to spawning tributaries.

LCT is an obligate stream spawner. Spawning occurs from February through July, depending on flow, elevation, and water temperatures. Historically, populations in Pyramid and Winnemucca Lakes migrated more than 100 miles up the Truckee River through Lake Tahoe to headwaters in its tributaries to spawn (Sumner, 1940; La Rivers, 1962). The upper river provided the cool water temperatures needed for spawning and fry and for juvenile rearing. The most important LCT spawning habitat in the Truckee River was upstream of Verdi, Nevada.

Providing spawning opportunities and permanent rearing habitat for LCT in the lower reaches of the Truckee River has been unachievable because of seasonal high water temperatures, lack of spawning habitat, high sediment loads, variable flows downstream from diversions, and lack of passage at Derby Diversion Dam. Cooperative efforts are ongoing to improve riparian and riverine habitat. Spawning downstream from Derby Diversion Dam is not an objective for LCT because they probably never spawned (or reared) in the lowest reaches.

Access to historic spawning habitat in the upper Truckee River is blocked by more than 10 dams and water diversion structures (TRIT, 2003). Some progress in improving passage has been made with the renovation of Marble Bluff Dam (1999) and completion of the Derby Diversion Dam fish ladder (2002).

Trout populations in the Truckee River basin are predominantly non-native. Rainbow, brook, brown, and lake trout as well as kokanee salmon have been stocked into Truckee basin waters over the last century (Peacock et al., 1999). Most of these species compete with LCT and are at least partially responsible for extirpation of the native strain that occupied the Truckee River basin. Rainbow trout, a closely related species, spawns at the same time and in the same habitats as LCT, with which it can hybridize (TRIT, 2003). Kokanee and lake trout are particularly detrimental to lake LCT populations. In lakes, kokanee successfully compete for zooplankton, a major LCT food source (Behnke, 1992), and lake trout are efficient predators of LCT.

C. Management

Fish passage and flow management described for cui-ui also apply to LCT restoration.

1. Recovery Plan

In 1995, FWS released the LCT Recovery Plan encompassing six river basins within LCT historic range, including the Truckee River basin. The plan identified five conditions contributing to the decline and affecting the potential for recovery of LCT in the Truckee River basin: (1) reduction and alteration of streamflow and discharge; (2) alteration of stream channels and morphology; (3) degradation of water quality; (4) reduction of Pyramid Lake elevation and concentration of chemical components; and (5) introductions of non-native fish species. Recently, a Short-Term Action Plan for LCT in the Truckee River Basin was released (TRIT, 2003). This plan focuses on gathering information about habitat requirements and implementing demonstration projects and research.

2. Hatchery Stocking

In addition to various habitat restoration measures, CDFG, NDOW, FWS, and the Pyramid Tribe are actively engaged in LCT stocking efforts in the Truckee River Basin. Since the extirpation of the original Pyramid Lake strain of LCT, the fishery has been maintained by a hatchery stocking program currently operated by the Pyramid Lake Paiute Tribal Fishery Program and FWS. Several strains of LCT from other waters were planted in Pyramid Lake to redevelop the fishery. The fishery is currently sustained by capturing LCT during the spawning period, taking spawn, and hatching the fish at the Numana Tribal Fish Hatchery and the Lahontan National Fish Hatchery (LNFH). Most

LCT are captured at the Sutcliffe spawning facility. FWS has funded genetic research on this species to improve understanding of the origins of out-of-basin populations. Based on this research (TRIT, 2003), LNFH has developed a brood stock of the Pilot Peak strain, believed to be original Pyramid Lake stock. FWS is using this strain in the Truckee River and Fallen Leaf Lake.

The LCT recovery program has stocked LCT out of its historic range into headwaters tributaries with barriers to protect the LCT from hybridization with nonnative rainbow trout since 1996. Six streams with a total length of 30 miles have been stocked.

In 2003, about 30,000 catchable sized LCT were released in the Truckee River between Tahoe City and Truckee. The purpose of this effort is to gain information to improve understanding of the conservation needs of LCT in the Truckee River Basin (Heki, 2004). This is a small part of a broader effort to reestablish LCT in the watershed.

In 2003, NDOW and the Pyramid Tribe cooperated on the release of 2,200 mature LCT between Fisherman's Park in Reno upstream to Crystal Peak Park in Verdi. The introduction of these fish marked the beginning of a 5-year study to determine the feasibility of restoring LCT to the Truckee River. Fish collected during the spawning run at Pyramid Lake ranged from 18 to 24 inches long. The fish will be monitored to determine spawning locations and potential for spawning success (http://ndow.org/fish/forecast/west.shtm).

In the lower Truckee River, NDOW, FWS, and the Pyramid Tribe are conducting an ongoing project to assess movement patterns and survival of stocked LCT. A total of about 50,000 8-inch LCT are stocked in the river annually (Heki, 2004). In 2006, about 100,000 LCT eggs will be incubated at Pyramid Lake or in the Truckee River or its tributaries and fry survival and movement will be studied (NDOW, 2006).

3. Riparian Vegetation Restoration

Narrow bands of Fremont cottonwood with some sandbar and black willow became established in 1983 and 1987 along the lower Truckee River as an unplanned consequence of flow regulation directed toward the spawning needs of the cui-ui (Rood et al., 2003). These stands of cottonwoods and willows provided the basis for streamflow prescriptions designed to promote seedling establishment from 1995 through 2000 (TRIT, 2003). These flows enabled further seedling establishment. An important feature of these flows is a gradual decrease of flows during the critical seedling establishment period.

The establishment of riparian forests in the lower Truckee River and the increased understanding of flow requirements that promote seedling establishment and survival has tremendous consequences for re-establishing LCT in the lower Truckee River. Re-establishment of cottonwoods and willows has altered sediment scour and deposition resulting in a narrower deeper channel. The deepening of the channel along with shading has resulted in cooler water temperatures, and reduced erosion and sedimentation. In 1999, in contrast to prior years, trout were observed in the lower Truckee River throughout the summer (Rood et al., 2003).

II. Environmental Consequences

A. Introduction

This analysis focuses on how modifying operations of Truckee River reservoirs would affect the habitat and management efforts for LCT.   Two recovery criteria set forth in the 2003 Short-Term Action Plan are relevant to the operations alternatives considered in this study: (1) Truckee River water is managed to support LCT migration, life history, and habitat requirements and (2) threats to LCT and its habitat have been reduced or modified to where they no longer represent a threat of extinction or irreversible population decline.

The following three indicators were selected to analyze potential effects:

- Average annual inflow to Pyramid Lake
- Relative amounts of riparian vegetation along the lower Truckee River
- LCT spawning access to Independence Creek in dry and extremely dry hydrologic conditions

B. Summary of Effects

Operations model results show that, under TROA, average annual inflow to Pyramid Lake is greater than under No Action or current conditions. Greater inflow would benefit LCT by maintaining Pyramid Lake at a higher elevation, which would enhance lake habitat and river access. Under both No Action and LWSA, average annual inflow to Pyramid Lake is lower than under current conditions, which would adversely affect LCT. Table 3.71 summarizes these effects.

Significant beneficial effects to riparian habitat along the lower Truckee River in median, dry, and extremely dry hydrologic conditions would occur under TROA. LCT would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. Significant beneficial effects to riparian habitat along the lower Truckee River in wet, median, and extremely dry hydrologic conditions would occur under LWSA and No Action. The effect under LWSA would be the same as under No Action. Table 3.66 summarizes these effects.

TROA would result in a significant beneficial effect by providing additional access to Independence Creek in August, when compared to current conditions, and in July and August, when compared to No Action. Under both No Action and LWSA, a significant adverse effect compared to current conditions would occur in July and August. In addition, TROA provides that CDFG can direct TMWA to provide and maintain a fish channel through the Independence Creek delta should storage in Independence Lake drop below 7,500 acre-feet. This condition would not apply under No Action or current conditions. Table 3.76 summarizes these effects.

Table 3.76—Summary of effects: LCT spawning access to Independence Creek in dry and extremely dry hydrologic conditions (+ = significant beneficial effect, - = significant adverse effect)

<table>
<tr><th></th><th colspan="3">Compared to current conditions</th><th colspan="2">Compared to No Action</th></tr>
<tr><th>Spawning period</th><th>No Action</th><th>LWSA</th><th>TROA</th><th>LWSA</th><th>TROA</th></tr>
<tr><td>May</td><td colspan="3" rowspan="2">No effect</td><td rowspan="4">No effect</td><td rowspan="2">No effect</td></tr>
<tr><td>June</td></tr>
<tr><td>July</td><td>-</td><td>-</td><td>No effect</td><td>+</td></tr>
<tr><td>August</td><td>-</td><td>-</td><td>+</td><td>+</td></tr>
</table>

C. Average Annual Inflow to Pyramid Lake

See discussions of method of analysis, threshold of significance, model results, and evaluation of effects in “Cui-ui.” The exception is that for the threshold of significance, the LCT Recovery Criteria (TRIT, 2003) for Pyramid Lake calls for obtaining water through water right purchases or other means to protect a secure and stable Pyramid Lake ecosystem and meet life history and habitat requirements of LCT. Also, no mitigation would be required because no significant adverse effects would occur under TROA. TROA would provide a significant beneficial effect for LCT by increasing the amount of average annual inflow to Pyramid Lake and improving riverine habitat through management of dedicated water.

D. Relative Amounts of Riparian Vegetation Along the Lower Truckee River

See discussions of method of analysis, threshold of significance, and model results in “Riparian Habitat and Riparian-Associated Wildlife.”

1. Evaluation of Effects

a. No Action

A significant beneficial effect on riparian habitat along the lower Truckee River in wet, median, and extremely dry hydrologic conditions would occur under No Action. LCT would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. See the more detailed discussion of effects in “Riparian Habitat and Riparian-Associated Wildlife.”

b. LWSA

Under LWSA, the effect on riparian habitat along the lower Truckee River would be the same as under No Action.

c. TROA

A significant beneficial effect on riparian habitat in median, dry, and extremely dry hydrologic conditions would occur under TROA when compared to both No Action and current conditions. LCT would be likely to indirectly benefit from cooler water temperatures as a result of shading by riparian vegetation. See the more detailed discussion of effects in “Riparian Habitat and Riparian-Associated Wildlife.”

2. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. TROA would provide a significant beneficial effect for LCT by enhancing riparian habitat along the lower Truckee River, thereby reducing water temperatures through shading effects.

E. Access to Independence Creek for Spawning LCT

1. Method of Analysis

Operations model results were used to determine Independence Lake storage under current conditions and the alternatives. All water years were examined, but only dry and extremely dry hydrologic conditions are highlighted because storage does not fall to 7,500 acre-feet in other hydrologic conditions.

2. Threshold of Significance

LCT access to the spawning habitat in Independence Creek is blocked by the delta when Independence Lake storage is at or below 7,500 acre-feet. Any change in the number of times that storage is at or below 7,500 acre-feet was considered significant.

3. Model Results

Table 3.77 presents operations model results for the differences in the number of years (out of 100) that Independence Lake storage is at or below 7,500 acre-feet during the LCT spawning period.

Table 3.77—Difference in number of years (out of 100) that Independence Lake storage is at or below 7,500 acre-feet during the LCT spawning period

	Compared to current conditions			Compared to No Action	
	No Action	**LWSA**	**TROA**	**LWSA**	**TROA**
May	0	0	0	0	0
June	0	0	0	0	0
July	+1	+1	0	0	-1
August	+1	+1	-1	0	-1

4. Evaluation of Effects

a. No Action

Operations model results show that, under No Action, storage in Independence Lake falls below 7,500 acre-feet one more time than under current conditions in July and August. Because of the extreme vulnerability of the LCT population in Independence Creek, any potential loss of access to its spawning habitat would be a significant adverse effect.

b. LWSA

Operations model results and effects under LWSA are the same as under No Action.

c. TROA

Under TROA, Independence Lake falls below 7,500 acre-feet one fewer time during each of July and August than under No Action. There are no differences in May and June. Independence Lake falls below the 7,500 acre-feet threshold one fewer time than under current conditions in August; there are no differences in May, June, or July. TROA provides that CDFG can direct TMWA to provide and maintain a fish channel through the Independence Creek delta should Independence Lake storage drop below 7,500 acre-feet. This condition would not apply under No Action or current conditions. The additional opportunities to provide spawning access for the Independence Lake LCT population would be significant beneficial effects under TROA.

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. TROA would provide a significant beneficial effect for LCT by reducing the number of times that Independence Lake falls below 7,500 acre-feet and by providing the ability for CDFG to direct TMWA to provide and maintain a fish channel though the Independence Creel delta should storage fall below 7,500 acre-feet.

Bald Eagle

I. Affected Environment

The threatened bald eagle historically nested at Pyramid Lake and Lake Tahoe (Cantrell, 1989).[6] Bald eagles were last known to nest at Pyramid Lake in 1866 (Alcorn, 1988). Since 1997 bald eagles have nested at Emerald Bay along the southwest part of Lake Tahoe (Jurek, 2003). From 2001 to 2003 bald eagles attempted to nest near Marlette Lake, just inland from the east central shore of Lake Tahoe (Espinosa, 2003). Currently, bald eagles nest at Independence Lake and Stampede, Boca, and Lahontan Reservoirs. Other bald eagles could nest within the study area (Jurek, 2003).

In the study area, bald eagles winter at Lake Tahoe, along the Truckee River, and at ice-free lakes and reservoirs. Winter bald eagle surveys at Lake Tahoe recorded 4 to 20 birds annually (U.S. Department of Agriculture, 1998). Lahontan Reservoir is also a bald eagle wintering area. The use of wintering areas is usually traditional, but is also dependent on a reliable food supply (Herron et al., 1985). The arrival of wintering bald eagles in the upper elevations of the study area generally coincides with the peak of kokanee spawning in Taylor Creek and the Little Truckee River, which occurs around mid-October. Wintering bald eagles usually leave the Lake Tahoe area around March (Cantrell, 1989).

Live or dead fish, as well as rodents, small mammals, and other birds may be part of a bald eagle diet in the Great Basin (Ryser, 1985). Most live fish that were observed taken from reservoirs by bald eagles were captured in water more than 6 feet deep (BioSystems, 1992). Eagles cannot reach prey at depths greater than about 2 feet; forages observed over deeper water are likely to be for prey floating on or swimming near the surface. No data exist on the relative importance of native and stocked fish in the diet of nesting bald eagles at Independence Lake and Stampede, Boca, and Lahontan Reservoirs. Both live fish and carrion, are available to bald eagles (BioSystems, 1992). Tui chub and Tahoe sucker, which are common in local reservoirs, are the major prey items for bald eagles at other California reservoirs. In addition, tui chub and Tahoe sucker spawn in shallow waters during the bald eagle nesting season, which makes them vulnerable to bald eagle predation. LCT is also a likely forage species at Independence Lake during the April through June spawning season. Eagles may also take advantage of recently released hatchery fish that die or undergo stress and fish injured by anglers. A variety of non-native fish species have been introduced into Lahontan Reservoir (NDOW, 2004). Of these, crappie, channel catfish and bass have been shown to be an important component of bald eagle diet on Arizona reservoirs (BioSystems, 1992).

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[6] The bald eagle was proposed for delisting in 1999. On February 8, 2007, the U.S. Fish and Wildlife Service announced that a court-approved agreement had been reached allowing the agency to make a final determination on the eagle’s status no later than June 29, 2007.

II. Environmental Consequences

A. Introduction

The analysis of the effects on bald eagle was based on the analyses of the effects on the primary prey base of bald eagles: fish in lakes and reservoirs. Two indicators were selected for this analysis:

- Fish survival based on minimum storage thresholds (Stampede, Boca, and Lahontan Reservoirs)

- Spring/summer shallow water spawning habitat (Lake Tahoe, Independence Lake, and Lahontan Reservoir)

B. Summary of Effects

Table 3.78 presents a summary of the effects on the primary prey base of bald eagles: fish in lakes and reservoirs.

Table 3.78—Summary of effects: bald eagle prey base
(+ = significant beneficial effect, - = significant adverse effect)

Lake/reservoir	Compared to current conditions			Compared to No Action	
	No Action	LWSA	TROA	LWSA	TROA
Fish survival					
Stampede	+	No effect	+	-	+
Boca	No effect		+	No effect	+
Lahontan	No effect				
Spring/summer shallow water spawning habitat					
Tahoe	No effect				
Independence					
Lahontan					

C. Fish Survival

1. Method of Analysis

See discussion in “Fish in Lakes and Reservoirs.”

2. Threshold of Significance

Bald eagles at Lake Tahoe, Independence Lake, and Stampede, Boca , and Lahontan Reservoirs could be adversely affected if reservoir storage were to fall below current volumes at a sufficient magnitude and frequency to significantly affect fish survival, the eagles' prey base. The significance of differences among the comparisons was based on best professional judgment.

3. Model Results

See model results in "Fish in Lakes and Reservoirs."

4. Evaluation of Effects

See discussion in "Fish in Lakes and Reservoirs."

5. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under TROA. A significant beneficial effect would occur under TROA because storage in Stampede and Boca Reservoirs would fall below the minimum thresholds much less frequently than under No Action or current conditions.

Tahoe Yellow Cress

I. Affected Environment

Tahoe yellow cress, is a Federal candidate plant species and is listed by California as endangered and by Nevada as critically endangered. In the world, Tahoe yellow cress is found only in scattered populations around the shore zone of Lake Tahoe. The highest number of populations is located on the south and west shores where the greatest amount of sandy beach habitat occurs (California State Lands Commission [CSLC], 1998). The Conservation Strategy for Tahoe yellow cress (Pavlik et al., 2002) was developed to guide the conservation and management of Tahoe yellow cress and its habitat. A Memorandum of Understanding (MOU) was signed to ensure implementation of the protective measures identified in the conservation strategy. The parties to this MOU are Tahoe Lakefront Owners Association; League to Save Lake Tahoe; Tahoe Regional Planning Agency; California Department of Fish and Game; California Department of Parks and Recreation; California Tahoe Conservancy, California State Lands Commission; Nevada Division of Forestry; Nevada Division of State Parks; Nevada Division of State Lands; Nevada Natural Heritage Program; FWS; and USFS. Successful implementation of this strategy should obviate listing this species under ESA.

As part of the Conservation Strategy, occurrence data over the period since the plant species was first scientifically described in 1941 were analyzed. The analysis showed that although Tahoe yellow cress had been observed or collected from 51 locations, not all known occurrences have been occupied at the same time. In fact, the species has been shown to occupy nearly 80 percent of its known habitat during the best of conditions and as little as 20 percent during the worst (Pavlik et al., 2002). This is typical of a highly dynamic species that has the ability to expand its population in response to favorable conditions (low lake water) and contract and persist through periods when conditions are less favorable (high lake water).

These data show a strong correlation between lake elevation and Tahoe yellow cress presence. During the drought years 1989 to 1994, when the mean lake elevation was 6,222.8 feet, the plant was present at 89 percent of the known sites on an estimated 1,863 acres. During the wet years from 1995 to 2000, the mean lake elevation was 6227.7 feet, and the plant was present at 32.8 percent of known sites on an estimated 233 acres (Pavlik et al., 2002).

Much Tahoe yellow cress habitat is popular for recreation and associated use, such as facility development and construction, and beach property maintenance (beach raking and clearing) which have been documented as sources of disturbance to the plant and its habitat (TRPA, 1995; CSLC, 1998). The habitat is also subject to various natural physical processes, including the erosive forces of waves and wind and fluctuation of lake elevations (TRPA, 1995). Wave action during high water periods affects the shoreline and can alter beaches. During such events, aerial stems and rootstocks of the plant can be washed away (Josselyn et al., 1992). Wave action can also have a positive benefit for the plant by creating foreshore berms (a relatively flat bench that slopes towards shore and is limited by a steeper slope closer to the lake). Plants may concentrate in low areas created by these berms that offer higher moisture concentrations or protection from wave action.

Under current conditions, dam operations alter the historical seasonal fluctuation of the lake, maintaining higher elevations in spring and summer, the growing season for Tahoe yellow cress (Stone, 1991 as cited in Josselyn et al., 1992). The effect of prolonged inundation on Tahoe yellow cress is not fully known. Although data indicate the species has some mechanism for surviving periods of inundation, maintaining Lake Tahoe at its maximum elevation of 6229.1 feet for long periods of time could adversely affect the survival of certain populations (Josselyn et al., 1992; Ferreira, 1987). In accordance with the Truckee River Agreement of 1935, the legal maximum lake elevation is 6229.1 feet. While the lake has dropped below its rim elevation (6223.0 feet) for extended periods of time during drought situations, the legal maximum elevation has rarely been exceeded for any substantial length of time since 1935.

II. Environmental Consequences

A. Introduction

The Tahoe Yellow Cress Conservation Strategy (Pavlik et al., 2002) lists five major factors that contribute to the current status of the species:

- Alterations in lake level dynamics caused by construction and operations of the Truckee River outlet dam and reservoir
- Destruction of actual and potentially suitable habitat by the construction of piers, jetties, and other structures
- High levels of recreation activities associated with beaches and dunes
- Disturbance of the beach sand by public and private property maintenance activities
- Possible stochastic environmental events

Modifying operations of Truckee River reservoirs could influence Tahoe yellow cress by altering lake level dynamics and changing the amount of available shore zone habitat. In addition, if lake levels were markedly increased at high lake elevations, increases in trampling in the reduced available habitat could adversely affect Tahoe yellow cress. Because the number of populations of Tahoe yellow cress that are present in any given year is dependent upon available habitat, which is determined primarily by the elevation of Lake Tahoe, lake elevation provides the best indicator of change or significant effects caused by changes in management of water in Lake Tahoe.

B. Summary of Effects

Operations model results show that, under TROA, slightly more shore zone habitat is available for Tahoe yellow cress during most months of the primary growing season (May through September) in dry hydrologic conditions than under No Action or current conditions. The greater available habitat, however, is less than 1 percent of the total potential habitat and would not be a significant effect. Under TROA, in median hydrologic conditions, an average of 20 fewer acres are available than under No Action and about 6 fewer acres than under current conditions. Both are differences of less than 1 percent of the total available habitat. In wet hydrologic conditions, under TROA, about the same amount of habitat is available as under No Action, and about 2 acres more than under current conditions. None of these small differences constitute a significant effect (table 3.79).

Table 3.79—Summary of effects: available and total potential habitat for Tahoe yellow cress during the primary growing season (May through September) (+ = significant beneficial effect, - = significant adverse effect)

Hydrologic condition	Compared to current conditions			Compared to No Action	
	No Action	LWSA	TROA	LWSA	TROA
Wet	No effect				
Median					
Dry					

C. Method of Analysis

To determine potential effects, this analysis compared the area of available shore zone habitat in wet, median and dry hydrologic conditions during the primary growing season (May through September), based on lake elevation. Monthly lake elevations from the operations model were used to calculate the habitat area. The maximum modeled lake elevation is 6229.0 feet, where the amount of available shore zone habitat is considered to be zero. The minimum modeled lake elevation of 6220.05 feet corresponds to the maximum available habitat of 2,752 acres. Habitat area markedly decreases area between elevation 6227 feet, when 35 percent (972 acres) of the shore zone is exposed, and elevation 6228 feet, when only 9 percent (238 acres) is exposed (table 3.80).

Table 3.80—Amount of shore zone habitat available at lake elevations 6220 through 6229 feet

Lake elevation (feet)	Shore zone habitat (acres)	Percent of total habitat
6220	2752	100
6221	2401	87
6222	2115	77
6223	1862	68
6224	1658	60
6225	1458	53
6226	1236	45
6227	972	35
6228	238	9
6229	0	0

Soil inundation during the spring and summer inhibits vegetative growth and can delay the onset of flowering of Tahoe yellow cress. Flooding during late stages of the growing season can also inhibit or delay reproduction of the species (Pavlik et al., 2002). The analysis includes a comparison of lake elevations, peak elevations, and declines in elevation during the primary growing season in wet, median and dry hydrologic conditions.

Annual surveys have been conducted for Tahoe yellow cress since 1979 and are annually summarized by CSLC. The 2002 survey report states that the optimal lake elevation to ensure the persistence of the population is 6225 feet or below. Above elevation 6225 feet, there is a statistically significant decline in the number of occupied sites (CSLC, 2003). Lake elevations recorded in the annual surveys and referenced in the CSLC report correspond to the elevation when the annual survey was conducted, generally late August or early September. The operations model generates end-of-month elevations. End-of-August elevations were used to compare the number of years that lake elevations are below 6225 feet, creating preferred conditions for Tahoe yellow cress.

Tahoe yellow cress habitat could also be adversely affected by the concentration of human activities in narrow shore zone habitat areas during high water years. Not only is the amount of habitat greatly reduced at lake elevations above 6227 feet, but recreational activities are concentrated in this narrow zone of habitat, which could increase the trampling of the plants and modify the habitat. Monthly elevations during the growing season (generated from the operations model) were used to calculate the number of years that lake elevations exceeded 6227, 6228, and 6229 feet under each alternative. Elevations that exceeded the selected elevation for any month of the growing season were recorded.

D. Threshold of Significance

Successful implementation of the Conservation Strategy should preclude the need to list Tahoe yellow cress under ESA. Because of its special status, a significant effect would be a reduction in the average amount of shore zone habitat available to the species. Given the understanding of the species biology presented in the Conservation Strategy, it is expected that fluctuations in lake elevations within usual climatic variation are not significant in the long run. Significant adverse effects could occur if increased high water elevations occurred and restricted core populations were not protected from trampling and other habitat destruction, or if elevations were increased and kept atypically high. Signatories to the MOU to implement the Conservation Strategy have committed to protecting sites from trampling at high water.

TRPA has developed a threshold standard for Tahoe yellow cress based on a minimum number of population sites (26) for maintaining the species. The threshold is considered to be in "attainment" when there is a minimum number of populations for the species and the population is protected from adverse effect. TRPA evaluates the species every 5 years and considered the Tahoe yellow cress population to be in "non-attainment" status in 1991, 1996, and 2001 (TRPA, 2002). The threshold of 26 population sites set by TRPA is achievable only in drought years (figure 3.36) and is only met in those years when the lake elevation is at or below 6225 feet. This threshold was not chosen for this analysis because the method is not based on the most current knowledge of the species.

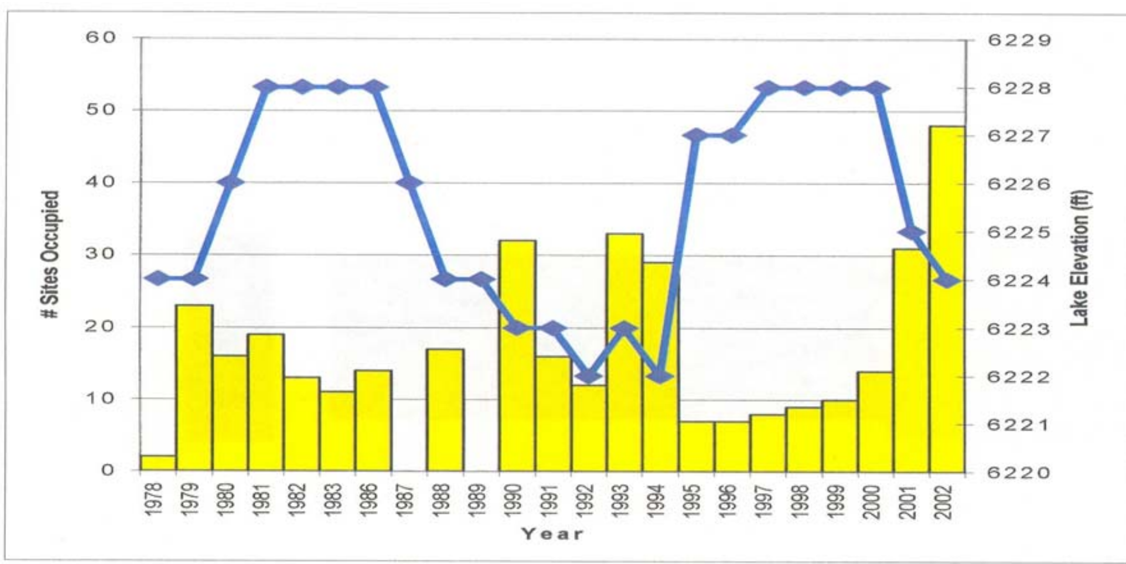

Figure 3.36—Lake elevation and number of Tahoe yellow cress sites occupied, by survey year (blue line = lake elevation) (CSLC, 2003).

E. Model Results

Table 3.81 presents operations model results for the area of available habitat and percent of total potential habitat for Tahoe yellow cress in each month of the growing season.

Table 3.81—Monthly and average growing season available habitat (acres) and percent of total potential habitat based on Lake Tahoe elevations

Hydrologic condition	Month	Current conditions		No Action		LWSA		TROA	
		Acres	Percent habitat	Acres	Percent habitat	Acres	Percent habitat	Acres	Percent habitat
Dry	May	1620	59	1629	59	1630	59	1641	60
	June	1593	58	1604	58	1605	58	1615	59
	July	1642	60	1657	60	1658	60	1674	61
	August	1728	63	1740	63	1741	63	1753	64
	September	1822	66	1833	67	1834	67	1838	67
	Average	1681	61	1693	61	1694	61	1704	62
Median	May	220	8	222	8	222	8	213	8
	June	112	4	122	4	123	4	113	4
	July	158	6	166	6	167	6	160	6
	August	250	9	280	11	282	11	268	10
	September	569	21	592	22	594	22	525	19
	Average	262	10	276	10	278	10	256	10
Wet	May	17	1	20	1	20	1	14	1
	June	0	0	0	0	0	0	0	0
	July	0	0	0	0	0	0	0	0
	August	63	2	63	2	63	2	65	2
	September	134	5	135	5	135	5	139	5
	Average	42	2	44	2	44	2	44	2

F. Evaluation of Effects

1. No Action

Operations model results show that, under No Action, slightly more shore zone habitat is available for Tahoe yellow cress than under current conditions in most months of the primary growing season (May through September) in all three hydrologic conditions. An average of about 12 acres more is available in dry hydrologic conditions; 14 acres more in median hydrologic conditions; and 2 acres more in wet hydrologic conditions.

Under No Action, soil saturation and inundation during the spring and summer, which can inhibit vegetative growth and delay the onset of flowering, would be no greater than under current conditions. The small difference in available habitat between No Action and current conditions represents less than 1 percent of the total potential habitat, and would not be a significant effect.

2. LWSA

Under LWSA, about 1 acre more of shore zone habitat is available in each month in dry hydrologic conditions; up to 2 acres more in median hydrologic conditions, and the same amount in wet hydrologic conditions as under No Action. All differences are less than 1 percent of the total potential habitat for Tahoe yellow cress.

Under LWSA, 12 to 20 more acres of habitat are available in dry hydrologic conditions (an average of 13 acres more) than under current conditions. In median hydrologic conditions, 2 to 32 acres more are available (an average of 16 acres more). Only slightly more habitat is available in May and September in wet hydrologic conditions than under current conditions. The maximum difference, in terms of total potential habitat, is about 2 percent in August in median hydrologic conditions.

Soil saturation/inundation would be no greater under LWSA, and the existing population of Tahoe yellow cress would not be significantly affected by the small differences in available habitat under LWSA compared to either No Action or current conditions.

3. TROA

Under TROA, about 5 to 14 acres more shore zone habitat are available in dry hydrologic conditions (average of 11 acres more) and 6 to 67 fewer acres in median hydrologic conditions (average of 20 acres or less than 1 percent of the total potential habitat) than under No Action. In wet hydrologic conditions, 6 fewer acres are available in May, 2 to 4 acres more are available in August and September, and the same acres are available in June and July as under No Action. On average, under TROA, 2 acres more are available than under No Action in wet hydrologic conditions.

Under TROA, about 16 to 32 acres more shore zone habitat are available in dry hydrologic conditions (average of 23 acres more) and 1 to 18 acres more are available in median hydrologic conditions than under current conditions, except in September, when

44 fewer acres are available. On average, 6 acres fewer are available than under current conditions, a difference of less than 1 percent of the total potential habitat. In wet hydrologic conditions, 3 fewer acres are available in May; 2 to 5 acres more are available in August and September, and the same acres are available in June and July. On average, under TROA, 2 acres more are available than under current conditions in wet hydrologic conditions.

Soil saturation/inundation would not be greater under TROA. The greatest difference in available habitat occurs in September in median hydrologic conditions, when operations model results show 67 fewer acres than under No Action, a reduction in available habitat of only 3 percent at the end of the growing season. Median hydrologic conditions are not as critical to the population dynamics of Tahoe yellow cress as wet hydrologic conditions, when most sites become inundated, or dry hydrologic conditions, when the amount of available habitat exposed expands substantially. Therefore, it was concluded that a minor loss of potential habitat for the Tahoe yellow cress in median hydrologic conditions under TROA is not a significant effect.

G. Mitigation and Enhancement

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

Island Nesting Water Birds

I. Affected Environment

Anaho Island at Pyramid Lake supports one of the largest breeding colonies of American white pelicans (a California Species of Special Concern) in western North America (Bell and Withers, 2002). The number of nesting colonies in the western United States has declined from 23 to fewer than 10 (Ehrlich et al., 1992). Over the past 25 years, the number of breeding adult pelicans has fluctuated between about 3,000 to more than 21,000. The most recent high of 17,000 breeding adults occurred in 1999. In 2003, there were about 5,000 breeding adults (Withers, 2004). Recent satellite and conventional telemetry studies have shown that individual birds from Pyramid Lake commonly travel throughout northern Nevada and to the Central Valley of California; individuals have been tracked as far east as the Great Salt Lake in Utah and as far south as the states of Guanajuato and Michoacan in central Mexico (Yates, 1999).

There is no estimate of the current American white pelican population. Although the species was in a long-term historical decline until the 1960s, populations have increased through the 1980s (Evans and Knopf, 1993). Based on the North American Breeding Bird Survey, the population trend in the Basin and Range from 1966–2001, where the study area is located, is negative (-9.6 percent per year). These data are acknowledged to have important deficiencies because of the low regional abundance of birds, few survey routes, low precision, and inconsistencies in trend over time (Sauer et al., 2003). The Great Basin as a whole is estimated to support 18 percent of the world's breeding American white pelicans (Carter et al., 1996, as cited in Neel, 1999). The Nevada Partners in Flight Bird Conservation Plan has set an objective of maintaining an average of 4,500 nesting pairs of pelicans at Anaho Island through 2004. This number is based on the yearly averages in the 1980s and 1990s (Neel, 1999). There is presently no access by terrestrial mammalian predators, such as coyotes, to Anaho Island because of the depth of water and distance of the mainland.

Pelicans begin to arrive at Anaho Island the second or third week of March and begin to build nests and lay eggs about the second week of April (Woodbury, 1966). Cui-ui is an important food source for adult pelicans and provide a substantial food source during the early part of the nesting season when there is a cui-ui spawning run (Scoppettone and Rissler, 2002; Scoppettone, 2003). Cui-ui runs occur in higher water years and counts of white pelican adults, nests, and chicks at Anaho Island are strongly correlated with springtime flows (Murphy and Tracy, 2002). When cui-ui ascends the Truckee River in April or May to spawn, they are heavily preyed upon by pelicans.

Primary foods of young pelicans are carp and tui chub. Tui chub is an abundant fish indigenous to Pyramid Lake, and carp is found in nearby wetlands, such as Humboldt Sink, Stillwater Marshes, and Carson Lake (Knopf and Kennedy, 1980). No data are available on the density, availability, or relative proportion of other prey used by pelicans. However, pelicans are opportunistic feeders and will travel great distances to forage on seasonally available fish (Bell and Withers, 2002). Maintaining wetlands and their fish biomass within approximately 62 miles of nesting islands is essential to the continued success of the nesting colony (Knopf and Kennedy, 1980).

California gull nests at Anaho Island in Pyramid Lake and on islands in Lahontan Reservoir. It is currently considered a third priority species, which means that it is not in any present danger of extirpation and its populations within most of its California range do not appear to be in serious decline (CDFG, 2004). The current list is undergoing review: a review draft indicates that California gull does not meet the criteria for inclusion on the new Bird Species of Special Concern List. Currently, there are no identified conservation concerns for this species in Nevada.

The current population of California gull likely contains between 500,000 and 1 million individuals, a number that is likely larger than it was soon after the turn of the nineteenth century (Winkler, 1996). Based on the North American Breeding Bird Survey, the population trend in the Basin and Range from 1966–2001 shows an increase of 3.2 percent per year. Because of the highly colonial nature of the California gull, estimates based on transects (such as the Breeding Bird Survey) are not likely to provide a very accurate picture of bird abundance (Winkler, 1996).

Since 1950, the number of California gull nests on Anaho Island has ranged from1,000 to 3,300 (FWS, 1990). There are approximately 3,000 pairs of California gulls in colonies on islands in Lahontan Reservoir (Yochem et al., 1991). The California gull colony at Lahontan Reservoir is the largest of the few colonies in Nevada (Yochem et al., 1991); it is not known whether gulls from this colony move to other colonies in California or elsewhere to breed. Both food supply and a nesting sanctuary are key factors in the nesting success of this species (Gaines, 1988).

In other locations, there is limited genetic exchange between isolated colonies. California gull population structures typically are islands that experience some genetic exchange through breeding individuals that disperse among populations (Pugesek, 1996). There are no data on the importance of individual colonies to the species as a whole (Shuford, 1996) or how many individual colonies are necessary to maintain a level of genetic exchange to ensure genetic viability. Like most California gull colonies, the Lahontan Reservoir population is relatively small; of the 206 known breeding colonies only nine supported more than 20,000 birds (Winkler, 1996). The genetic influence of the Lahontan population on the total California gull population, therefore, may be small (Winkler, 1996).

California gulls were first documented nesting on islands in Lahontan Reservoir in 1939 (Alcorn, 1988). Since then, lake elevation data show that the main nesting island (Gull Island) has been landbridged in 26 percent of the years during the gull nesting season and the smaller island (Evans Island), which has a small population of California gulls and other species, has been landbridged in 7 percent of the years from 1939 to 1996. The stability of the population of California gulls at Lahontan Reservoir is unknown (Yochem et al., 1991).

It is also not known what effect historic predation has had on the population of gulls and other colonial nesting species at Lahontan Reservoir; however, colonial species have continued to use these islands over time despite past land bridging.

II. Environmental Consequences

A. Introduction

Two indicators were selected to evaluate effects on island nesting birds:

- American white pelican prey availability (based on two indicators from the cui-ui analysis: average annual inflow to Pyramid Lake and the frequency that flow regime 1, 2, or 3 is achieved in the lower Truckee River from April through June)
- Predator access to California gull nesting islands in Lahontan Reservoir

B. Summary of Effects

The summary of effects on American white pelican prey availability is the same as discussed in "Cui-ui" for the indicators of average annual inflow to Pyramid Lake and the frequency that flow regime 1, 2, or 3 is achieved in the lower Truckee River from April through June.

Operations model results show that, under TROA, mainland predators could access California gull nests on islands in Lahontan Reservoir 1-2 percent more frequently than under current conditions and the same or 1 percent more frequently than under No Action (or LWSA). There would be no effect on California gull nesting.

C. American White Pelican Prey Availability

See "Cui-ui" for discussions of methods of analysis, thresholds of significance, model results, evaluations of effects, and mitigation and enhancement.

D. Predator Access to California Gull Nesting Islands in Lahontan Reservoir

See "Waterbirds and Shorebirds" for discussions of method of analysis, model results, and evaluation of effects.

1. Threshold of Significance

No scientific data exist to support an absolute numeric threshold for the frequency of predator access that would constitute a significant adverse effect. A significant adverse effect on the population of California gulls at Lahontan Reservoir would occur if predation caused it to decline below a self-sustaining level (this level is unknown)or if the colony were abandoned and the gulls were not able to establish a new colony or breed elsewhere. If gulls abandoned Gull Island, they may move to Evans Island or to other historic nesting sites in the Carson Sink or Stillwater National Wildlife Refuge if appropriate conditions (high water) were to exist (Neel, 1997). In other locations, when adults abandon a colony as a result of predation, it is not known where they go or if they breed elsewhere (Shuford, 1996).

Landbridging has occurred in the past at Lahontan Reservoir, and California gulls continue to breed successfully at this site. The determination of significance, therefore, was based on best professional judgment.

2. Mitigation and Enhancement

Operations model results show that the elevation of Pyramid Lake never falls below the threshold under current conditions and the alternatives. Predator access to islands in Lahontan Reservoir where California gulls nest occurs slightly more frequently under TROA, but the difference is too small to constitute a significant adverse effect. No mitigation, therefore, would be required.

Osprey

I. Affected Environment

Osprey are known to nest at Stampede Reservoir and Lake Tahoe. This species also is known to nest along the Little Truckee River. In the California portion of the study area there may be other pairs of nesting osprey, but the sites have yet to be documented (Jurek, 2003).

II. Environmental Consequences

Live fish comprise at least 99 percent of osprey prey items (Poole et al., 2002). A wide variety of fish species are taken but often only two or three species account for the majority of prey taken in any one area. Inland osprey forage along rivers, mashes, reservoirs, and natural ponds and lakes, in both shallow and deep water. Reservoirs often provide ample expanses of shallow, clear water that provide ideal conditions for hunting. Nesting densities also show a preference for shallow water. Periods of low water can lead to reduced prey availability due to the prolific growth of aquatic vegetation (Poole et al., 2002) Effects on osprey were, therefore, based on analyses of the effects on the primary prey base of osprey, live fish in lakes and reservoirs, the same indicator as for bald eagle. See “Bald Eagle” for discussions of summary of effects, method of analysis, threshold of significance, model results, evaluation of effects, and mitigation and enhancement.

Habitat for Other Special Status Plants

I. Affected Environment

In addition to Tahoe yellow cress, eight plants, one lichen, and two mosses may occur in the study area and potentially could be affected by modifying operations of Truckee River reservoirs. These plant species and their habitats are discussed below.

A total of 32 other special status plants known or likely to occur within the study area were evaluated. Most occur in upland habitats or other non-riparian/riverine habitats that would not be affected by the alternatives. A list of these species is included in the Biological Resources Appendix.

Shore sedge, on CNPS List 2, is rare in California but has a widespread, patchy, distribution elsewhere in western North America. It is typically associated with sphagnum but may also be found along lake, pond, and small stream margins. It is unlikely to occur along the mainstem of the Truckee River, but could potentially be found along the upper tributaries. It is know to occur in the Sagehen Creek drainage, upstream of Stampede Reservoir (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

Grants Pass willowherb, on CNPS List 1B, is also rare in California where is primarily found in the Klamath Mountains. It is also known from the adjacent Siskiyou Mountain in Oregon, where it is considered rare. Like the shore sedge, it typically is found with sphagnum but may also be found along small streams. It is known to occur in the Sagehen Creek drainage, upstream of Stampede Reservoir (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

American manna grass, on CNPS List 2, is extremely rare in California, which lies along the southern edge of this more northerly species' range. Its typical habitats include meadows, lakes, and stream margins. Within the study area, it has been documented from the vicinity of Squaw Creek near the Truckee River (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

Marsh skullcap, on CNPS List 2, is a circumboreal species, which is rare in California. It may be found in wet meadows and along streambanks. It was collected in 1884 near Truckee and is known to occur in the Lake Tahoe basin (CalFlora, 2004; CNPS, 2003; Holst and Ferguson, 2000; Hickman, 1993).

Plumas ivesia, on CNPS List 1B, occurs only in a few northern Sierra counties where it may occur in wetlands. Within the study area, there are numerous known locations in the Sagehen Creek drainage upstream of Stampede Reservoir and in Martis Valley east of Truckee (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

Slender-leaved pondweed, on CNPS List 2, always occurs in wetlands typically in shallow, freshwater marshes and lakes. It is a circumboreal species that is rare in California. It was collected in 1931 from Lake Tahoe; it is also documented from Sierra County (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

White-stemmed pondweed, on CNPS List 2, always occurs in wetlands, typically in deep water and lakes. It is a circumboreal species that is rare in California. Although it has not been reported from the study area, it is documented from adjacent Sierra County (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

Water bulrush, on CNPS List 2, is known from lake margins and water edges. It is a more northerly species which reaches the southern limit of its distribution in California. It is not known from the study area but has been documented from the Lake Tahoe basin (CalFlora, 2004; CNPS, 2003; Hickman, 1993).

The veined water lichen, a USFS Sensitive Species, is freshwater lichen that ranges from the Sierra Nevada north to Alaska. It grows in clear, mid- to high-elevation streams where water quality appears to be very good. This aquatic lichen grows primarily on small to medium rocks or bedrock and occasionally on wood, or partially buried in loose gravel (Derr, 2000). Within California, it is known from only a few streams from Calaveras County south to Tulare County (Shevock, 1996).

The three-ranked hump-moss, a USFS Sensitive Species and California Species of Special Concern, and the broad-nerved hump-moss, a Forest Service Sensitive Species, are aquatic mosses. Both are on CNPS List 2 and occur in meadows and seeps and other wetland habitats in the Sierra Nevada. The three-ranked hump-moss is known to occur in the Sagehen Creek drainage upstream of Stampede Reservoir. The broad-nerved hump-moss, has not been documented to occur in the study area (CNPS, 2003).

II. Environmental Consequences

The relation between riparian-associated and aquatic special status plant species and their habitats has been described. As with other riparian plants, changes in riparian habitat can be used to assess the probable effects of the various scenarios on special animal species. Moreover, since the effects on riparian habitats are based on average monthly flows, the same analysis can be used for special status aquatic plant species. A single indicator, therefore, was chosen for other special status plant species: relative amounts of riparian habitat. See “Riparian Habitats and Riparian-Associated Wildlife” for discussions of summary of effects, method of analysis, threshold of significance, model results, evaluation of effects, and mitigation and enhancement.

Habitat for Other Special Status Animal Species

I. Affected Environment

In addition to the individual animal species previously discussed, 12 other species of mammals, birds, fishes, invertebrates, amphibians, and reptiles listed by either the State of California or Nevada, or otherwise accorded special status occur within the study area and could potentially be affected by modifying operations of Truckee River reservoir. These species are discussed by their habitat relationships as follows.

An additional 37 species of mammals, birds, and invertebrates known or likely to occur within the study area were evaluated. Most occur in upland habitats or other non-riparian/riverine habitats that will not be affected by the alternatives under consideration. A list of these species is included in the Biological Resources Appendix.

A. Palustrine Emergent Wetlands

Four special status species have a primary association with emergent wetlands within the study area: northern leopard frog, northwestern pond turtle, northern harrier, and long-billed curlew.

The distribution of northern leopard frog, a Forest Service Sensitive Species, appears to have been severely reduced along the Truckee River and now occurs along a reach of the lower river approximately 10 miles upstream of Pyramid Lake (Panik, 1992; Panik and Barrett, 1994; Ammon, 2002b). Breeding habitat is described as off channel wetlands such as oxbows, spring heads and, spring outflows (Ammon, 2002b). Breeding has been documented along the lower Truckee River in permanent wetland areas, but the population is considered extremely small and vulnerable to extinction (Ammon, 2002b). Northern leopard frogs use many different habitat types along this section of river; therefore, it is critical that all riparian habitat types are protected and that the river and riparian areas function properly for this species to survive. Non-native bullfrogs are found throughout this same section of the Truckee River and pose a considerable threat to the continued existence of northern leopard frog (Panik and Barrett, 1994; Ammon, 2002b).

Northwestern pond turtle, a USFS Sensitive Species, occurs in Nevada mostly along the Carson River, although some individuals may persist in a few sites along the Truckee River (Jennings et al., 1992). The species inhabits rivers, tributaries, ponds, lakes, marshes, oxbows, and other seasonal and permanent wetlands (Stebbins, 1985; Reese and Welsh 1998). Channelization of streams and rivers reduces or eliminates critical habitat such as slow, deep pools with large woody debris and stable undercut banks (Reese, 1996). Introduced species are the primary predators on juvenile turtles (Reese 1996; Hays et al. 1999). Bullfrogs have been reported as preying on juvenile turtles (Hays et al., 1999) and are considered a primary threat to juvenile survival and population recruitment (Ammon 2002b). Eggs, juveniles, and adults on land also face a myriad of predators including raccoon, coyote, red fox, and ravens (Ammon, 2002b). Females may leave the riparian corridor to excavate a nest site in uplands, and individuals over winter away from watercourses in upland areas (Jennings et al., 1992; Reese, 1996). The relative amount of palustrine emergent wetlands and affected pond-like areas is an indicator of how changes in flows may affect this species.

Northern harrier, a California Species of Special Concern, has greatly declined as a breeding bird in California where it is now considered a permanent resident only of the northeastern plateaus, coastal areas, and the Central Valley. Although it is known to breed at up to elevation 5,700 feet in the Sierra Nevada, it does not frequent forested areas. It was not observed during surveys along the Truckee River and its tributaries (Lynn et al., 1998). Northern harrier is a common permanent resident at many locales throughout the Great Basin. In both California and the Great Basin, it is most often associated with marshes and agricultural areas (CPIF, 2000; NDOW, 1985; Ryser, 1985). It is frequently observed during Christmas bird counts in the Truckee Meadows and Pyramid Lake areas (Clark, 1998; Eidel and Clark, 1999; Floyd and Eidel, 2000).

Long-billed curlew, a California Species of Special Concern and FWS Bird of Conservation Concern, is not known from the study area in California but is a migrant and known to breed in the Great Basin of Nevada where it has been declining as a result of agricultural and other land development (Ryser, 1985). It was observed infrequently during surveys along the lower Truckee River (Lynn et al., 1998), and was recorded as common in 1868 (Klebenow and Oakleaf, 1984). Long-billed curlew prefers closely cropped grasslands, pastures, wet meadows, and dry meadows (usually associated with water), either on the fringe of a marsh, in a meadow, or on a broad floodplain (Neel, 1999).

B. Palustrine Scrub-Shrub Wetlands

Four special status animal species are known to be closely associated with scrub-shrub wetlands within the study area: willow flycatcher, yellow warbler, yellow-breasted chat, and Nevada viceroy.

Willow flycatcher, a California Endangered species and a USFS Sensitive Species, is associated primarily with montane riparian habitats. The species has declined in California and, although breeding populations remain in a few strongholds in the Sierra Nevada, in recent surveys, 53 of 135 known sites were found to no longer support willow flycatchers. Willow flycatcher in the Sierra Nevada is considered a population in peril (Green et al., 2003). Within the study area, only two of the seven known breeding sites in the Lake Tahoe Basin Management Unit were active, a decline of 71 percent; in the Tahoe National Forest, the number of active sites has declined from 18 to 14, or 22 percent. Willow flycatchers occur along the Little Truckee River where suitable habitat occurs in broad, flat meadows that are generally larger than 19.8 acres, contain free water, and have 50-70 percent cover of patchy willow thickets at least 6.6 feet tall (Sanders and Flett, 1989). They are also known to occur southwest of Independence

Lake (Serena, 1982), and along the Upper Truckee River (Lynn et al., 1998). Although the range of the willow flycatcher is known to extend eastward into the Great Basin of Nevada, its status there is poorly understood (Neel, 1999). The most recent records from the lower Truckee River are museum specimens taken from the Reno area in the late 1960s (Alcorn, 1988). Direct threats to the species in the Sierra Nevada include poor meadow conditions that increase erosion and brown cowbird parasitism, water diversion, recreation, and roads (Green et al., 2003).

Yellow warbler, a California Species of Special Concern, is declining over much of the United States, especially in the West, and particularly in California and Arizona (Ehrlich et al., 1992). California populations are much reduced and have been extirpated in some areas (Remsen, 1978). In the early 1990s, yellow warblers were found in all reaches of the Truckee River in relatively high numbers (Lynn et al., 1998) and they remained common along the lower Truckee River through 2001 (Ammon, 2002a). Optimal nesting habitat is provided in wet areas with dense (60 to 80 percent) crown cover and moderately tall (6.6 feet or greater) stands of willow and alder of at least 0.37 acre (Schroeder, 1982).

Yellow-breasted chat, a California Species of Special Concern, was once a common summer resident in riparian woodlands throughout the State, but is now much reduced in numbers. It nests in riparian scrub and cottonwood-willow habitats and was observed along the lower Truckee River in small numbers in the early 1990s (Lynn et al., 1998). It was not seen along the upper Truckee River or its tributaries during these surveys. During surveys in 1998 and 2001 it was reported as common along the lower Truckee River, attributed to a substantial increase in early successional riparian shrublands (Ammon, 2002a).

Nevada viceroy, considered critically imperiled in Nevada, is a butterfly known only from Nevada where it is found primarily along the Humboldt River. Additional colonies are known in the study area near Fallon and Fernley. It occurs only in the immediate vicinity of willows, which are its larvae host plant (Austin, 1990).

C. Palustrine Forested Wetlands

One special status species, Swainson’s hawk, is associated with riparian forests. It is a State of California Threatened species and FWS Bird of Conservation Concern. Once found throughout the Central Valley (but absent from the Sierra Nevada), today it is restricted to portions of the Central Valley and the Owens Valley in the Great Basin (CDFG, 2000). In Nevada, Swainson’s hawk is a resident from April through October. Although it was described in 1877 to be “one of the most abundant of the large hawks of the interior” (Ridgway, 1877), a decline of 20.4 percent was identified by the Breeding Bird Survey in the Basin and Range Province from 1966 to 1979.

Since 1980, the population has shown an increasing trend of about 3.8 percent. In Nevada, Swainson's hawks reside in agricultural valleys interspersed with cottonwood trees or on river floodplains with cottonwood trees (Neel, 1999). Swainson's hawks have not been observed during recent surveys along the Truckee River (Lynn et al., 1998).

D. General Riparian or Aquatic Habitats

Aquatic special status species occurring within the study area and potentially affected by changes in reservoir operations include a fish, mountain sucker, and three aquatic invertebrates: California floater, Great Basin rams-horn, and a moth. Mountain sucker, a California Species of Special Concern, has a wide distribution in the western United States although the population within the Truckee River has long been isolated from all others. It typically inhabits clear streams with moderate gradients; 10–50 feet wide and less than 6 feet deep; with rubble, sand, or boulder bottoms. It also can live in large rivers and turbid streams. Although found in lakes and reservoirs, it is absent from Lake Tahoe and Pyramid Lake. It does not persist in reservoirs, which usually flood habitat and isolate populations. In California, only small populations susceptible to extirpation remain. Within the study area in Nevada, high densities of mountain sucker may exist in the Truckee River upstream from Reno (Moyle, 2002).

California floater, a freshwater mollusk, is considered critically imperiled in Nevada. It occurs in lakes and fairly large streams or slow rivers. It is generally found on soft substrates such as mud or sand (Frest and Johannes, 1995). The original distribution included the Pacific Northwest, south to the northern San Joaquin Valley of California. It has apparently been extirpated from Utah and has a very limited distribution in Arizona. In the 1880s, California floater was found sparingly in the Truckee River (Call, 1884). It is clearly declining in numbers and in area occupied throughout its range.

Great Basin rams-horn, also a freshwater mollusk, occurs in larger lakes and slow rivers including springs and spring-fed creeks, usually in areas with soft substrates and clear, very cold, slowly flowing water (Frest and Johannes, 1995). The species historically occupied 14 widely distributed sites throughout the western United States; few sites survive. Within the study area, it has been reported from Lake Tahoe and the adjacent slow segment of the Truckee River (Taylor 1981, as cited in Frest and Johannes, 1995).

The aquatic moth, considered critically imperiled in Nevada, is a widespread western North American species found in well-oxygenated water of streams and lakes. The adult female usually deposits eggs on the underside of rocks. In northern California, two to three generations of this species occur a year (Lange, 1984). Larvae are most abundant in lakes and streams where the water velocity is between 0.4 and 1.4 meters per second (Tuskes, 1981 as cited in Lange, 1984). They are generally shredders-herbivores that feed on aquatic plants. This species was identified in a recent during a recent study of the invertebrate communities of Pyramid Lake (Alexandrova, 2003).

Riparian habitat sustains four species of bat: pallid bat, pale Townsend's big-eared bat, western red bat, and the fringed myotis. The first two are USFS Sensitive Species and California Species of Special Concern. Pallid bat is unusual in that it feeds almost entirely on prey captured on the ground; it may on occasion roost in tree cavities, including cottonwoods. Pale Townsend's bat may forage in riparian areas. Western red bat, a USFS Sensitive Species, roosts only in tree foliage and is closely associated with lowland riparian forest in arid areas. Fringed myotis, considered imperiled in Nevada, is typically a woodland species at middle elevations in the mountains, but may also be found in more arid environments.

II. Environmental Consequences

The relation between riparian-associated and aquatic special status animal species and their habitats has been described above. As with other animal species, changes in riparian habitat can be used to assess the probable effects of the various scenarios on special animal species. Moreover, since the effects on riparian habitats are based on average monthly flows, the same analysis can be used for special status aquatic animals. A single indicator, relative amounts of riparian habitat, therefore, was chosen for special status animal species. See "Riparian Habitats and Riparian-Associated Wildlife" for discussions of summary of effects, method of analysis, threshold of significance, model results, and evaluation of effects. Because of the benefits and enhanced environmental conditions under TROA, no mitigation would be required. Riparian habitat for riparian-associated and aquatic special status animal species would be enhanced under TROA.

RECREATION

I. Affected Environment

A. Introduction

Streams, lakes, and reservoirs within the study area provide a valuable water resource that helps support two of the most important recreation activities in America: boating (rafting, kayaking, canoeing, and flat water power craft) and fishing. Streams, lakes, and reservoirs also support other popular water-based activities, including swimming, sightseeing, tubing, and camping (which occurs primarily near the water).

The Truckee River and its tributaries and nearby reservoirs service the recreation needs of one of the fastest growing population centers in the United States—the Tahoe, Truckee, and Truckee Meadows areas (Auckerman, et al., 1999). Recreation settings and activities associated with water bodies throughout the study area are accessible, affordable, and diverse.

The numerous recreational resources and opportunities in the study area range from forested mountains in California to arid deserts in Nevada. The California portion of the study area is characterized by high country rivers, reservoirs and natural lakes, and outstanding scenery. The Nevada portion of the study area is characterized mainly by high desert terrain, riverine vegetation, rivers, Pyramid Lake, reservoirs, and wildlife areas.

The gaming industry in Nevada, combined with the setting and recreational opportunities, makes the study area a primary destination for tourists. Recreationists are drawn mostly from the San Francisco Bay area, Sacramento, and Reno. Since 1960, the Squaw Valley Olympic site has attracted visitors from all over the world for skiing during the winter and unique ski area activities during the summer.

The water-based recreation season considered in this analysis is the 7-month period from April through October, when recreationists are most likely to use the Truckee River and its associated reservoirs and lakes. Other months of the year are cold and snowy, deterring many visitors, except skiers and snowboarders.

Table 3.82 presents recreation activity participation rates that reflect interview research completed in August 1995 and updated in 1999 by the University of Nevada, Reno (UNR) for Reclamation. These data are the most recent detailed data available. The 1995 interviews were conducted in the final years of a drought; therefore, participation rates could be somewhat low. Table 3.82 also compares the recreation activity participation rates in the Truckee River basin to those of Californians in general (derived

Table 3.82—Recreation activity participation at lakes and reservoirs in the Truckee River basin (percent of population)

Recreation activity	California SCORP	Truckee River basin interviews by UNR
Picnicking	64	31
Camping	46	65
Fishing	37	57
Swimming	59	34
Boating	20	19
Fishing from boat	No data	33
Water skiing	14	28
Jet skiing	No data	15
Rafting	No data	7
Kayaking	15	3
Biking	23	15
Other activities	No data	30

from the California State Comprehensive Outdoor Recreation Plan [SCORP]). The survey showed 3.37 activities per person per day, confirming the diversity of activity interest. Camping, fishing, water skiing, and “other activities” had high participation rates.

Table 3.83 (also a result of UNR interview research) presents repeat visitation at lakes and reservoirs in the Truckee River basin in 1993 and 1994. The amount of repeat visitation indicates that visitors are satisfied with the recreation experiences associated with the recreation resources, facilities, and opportunities at lakes and reservoirs in the Truckee River basin. Table 3.83 also displays percentages of visitors who made repeat visits. The number of visits represents how many times the interviewees visited each reservoir during the year.

Table 3.83—Repeat visitation at lakes and reservoirs in the Truckee River basin

	1993		1994	
Lake/reservoir	Percent of repeats	Number of visits	Percent of repeats	Number of visits
Donner	No data	No data	46	5
Prosser Creek	19	8	16	6
Stampede	53	4	37	4
Boca	49	11	26	6
Pyramid	28	8	36	10

B. Recreation Facilities

Recreation at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs could be affected by modifying operations of Truckee River reservoirs. Operations model results show that the proposed action would have a minimal effect on Lake Tahoe and Independence Lake water surface elevations; therefore, effects on recreation would be minimal and are not analyzed. Also, because the proposed action would have no effect on smaller facilities, such as Webber Lake and Martis Creek Reservoir, effects on recreation at these facilities are not analyzed.

1. Lakes and Reservoirs

a. Lake Tahoe

A wide variety of recreational activities occur on Lake Tahoe's 122,200 water surface acres and along its 71 miles of shoreline. Adjacent recreation lands and facilities are primarily owned and managed by USFS, California and Nevada, local entities such as North Tahoe and Tahoe City Public Utility Departments, and South Lake Tahoe. Intermingled with the government-operated areas are privately-owned and operated campgrounds, marinas, golf courses, hotels, restaurants, casinos, and numerous resorts and other commercial businesses.

Lake Tahoe is a primary destination spot for visitors from all over the United States and offers year-round recreation opportunities. Visitation is greatest during the summer recreation season (June, July, and August); however, the 25 ski resorts in the area and the casinos attract a large number of visitors through the winter season. The primary recreation activities are sailing, boating, gambling, water skiing, camping, scuba diving, windsurfing, swimming, sightseeing, hiking, photography, and fishing for mackinaw, kokanee, rainbow trout, and brown trout.

The visual quality of Lake Tahoe is considered outstanding, especially in light of the amount of commercial development on adjacent lands and along the lakeshore. The large oval-shaped basin and lake, rugged shoreline, and dense pine forests offer enough absorptive characteristics to lessen the effects of development and visitor use on the surrounding landscape.

b. Donner Lake

Donner Lake is located on Donner Creek. Donner Lake Dam, near the western edge of Truckee, California, was originally constructed in 1877 at the natural lake's outlet and rebuilt in 1933. Today, the dam site is surrounded by Donner Memorial State Park. Recreation facilities are owned by California Department of Parks and Recreation, Truckee-Donner Recreation and Park District, Tahoe-Donner Homeowners' Association, Donner Lake Homeowners' Association, and individual private landowners.

Truckee-Donner Recreation and Park District is responsible for operating and maintaining several facilities at Donner Lake, including two beaches, 36 piers, and the only public boat launch ramp. Tahoe-Donner Homeowners' Association maintains a beach and boat launch facility at the east end of Donner Lake. Donner Lake Homeowners' Association maintains 330 feet of lakefront and two private piers on the north side of Donner Lake.

Numerous second homes and condominiums are located around the shoreline. During the summer and winter, many residences are rented for family vacations. Most visitors are from the San Francisco Bay and Sacramento areas. The aesthetic qualities include views of the lake and mountains, the shade and scent provided by the mature trees, and the relative serenity.

Donner Lake visitation is as follows:

- Truckee-Donner Recreation and Park District (1999): about 77,600 visits between Memorial Day and Labor Day. Total estimate, April through October: 108,640

- Tahoe-Donner Homeowners' Association, east end of lake (1988-93): annual summer usage varied from 16,680 to 26,456 people

- Donner Lake Homeowners' Association: average annual attendance of 40,000 people

- Donner Tract Homeowners' Association, north side of lake: no visitation records available

- Donner Memorial State Park: 200,000 visitors annually

The ideal elevation at Donner Lake is 5935 feet msl. At this elevation, public and private facilities are fully usable. The 36 piers are used by swimmers, fishermen, and boaters. However, at elevation 5934 feet, use of many of the facilities becomes marginal. In particular, the boat launch ramps at Tahoe-Donner Homeowners' Association facilities and Donner Lake Homeowners' Association facility are barely usable below elevation 5934 feet. Safety becomes a concern at the public piers because the water is shallow. At elevation 5933 feet, only the public ramp is usable; all other boat ramps and piers are unusable.

The 1943 Donner Lake Indenture directs that Donner Lake not fall below elevation 5932 feet during June, July, and August, except to meet minimum streamflow requirements. (See chapter 2.) Additionally, dam safety requirements specify that the discharge gates of the dam be held open from November 15 through April 15 to prevent it from exceeding elevation 5926.9 feet. Drawdowns may occur in September and October in anticipation of opening the discharge gates to meet this requirement. The maximum elevation of Donner Lake is 5940 feet.

c. Prosser Creek Reservoir

Prosser Creek Dam and Reservoir, completed in 1962, are located on Prosser Creek 1.5 miles upstream of its confluence with the Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 2,070 acres of land, 748 surface acres of water, and 12 miles of shoreline.

Recreation facilities include three boat launch ramps with two lanes each, eight toilets, and three campgrounds, with a total of 46 campsites. There are no concession facilities or cabins on the project lands. USFS collects $12-per-night user fees for the campsites through a private campground concessionaire.

The most popular recreation activities are fishing, motor boating, and picnicking. During the fall, hunting for mule deer, geese, and ducks is popular. CDFG stocks kokanee and rainbow and brown trout in the reservoir.

Prosser Creek Reservoir is the smallest of the three reservoirs in the upper Truckee River basin. It is more appropriate for recreation use by small, slow watercraft. Local officials enforce several restrictions, including a 10-mile-per-hour speed limit and a boat movement traffic pattern. The reservoir's physical characteristics and management make it popular for fishing, paddle boating, canoeing, and water play. There are no designated swimming areas, but visitors wade and swim. The reduced speed and traffic patterns reduce conflicts among the activities. The reservoir is also conducive to passive uses on the water and shoreline. Nearby residents enjoy taking walks to and around the reservoir.

No recent site-specific recreation visitation data are available for Prosser Creek, Stampede, or Boca Reservoirs. In 1995, USFS changed its visitor use reporting system at the direction of Congress. Recreation visitation reported since that time using the newly established system is on a forest-wide basis with limited site-specific information.

When the reservoir elevation is 5724 feet (548 surface acres) or greater, use of the boat launch ramps is unimpaired. When the elevation is less than 5724 feet, the ramps become less usable, and the following changes occur:

- Larger boats have limited access to the water. If boats are launched in areas without a ramp or off the old Highway 89 roadbed, the vehicle, trailer, or boat may get stuck in the mud.
- Aesthetics of the reservoir and USFS campground decline due to the "bathtub ring" effect.
- Visitors must travel greater distances from the water to the toilet facilities.
- Conditions for stocking fish in the reservoir are marginal.

d. Stampede Reservoir

Stampede Dam and Reservoir, completed in 1970, are located on the Little Truckee River 8 miles upstream of its confluence with the Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 10,740 acres of land, 3,452 surface acres of water when full, and 29 miles of shoreline.

Recreation facilities include one picnic area with four tables, one boat launch ramp with three lanes, 20 toilets, and seven campgrounds, with a total of 256 campsites; and three group camp facilities that accommodate 150 people. USFS collects $15-per-night user fees for the campsites through a campground concessionaire.

The most popular recreation activities during the summer are fishing, camping, and motor boating. During the fall, hunting for mule deer, geese, and ducks is popular. CDFG stocks kokanee and lake, rainbow, and brown trout.

Stampede Reservoir is the largest reservoir in the Truckee River basin. It is about a 20-minute drive beyond Boca Reservoir, which makes it slightly less accessible to visitors traveling the main roads in the area.

Stampede Reservoir boat launch ramps provide unimpeded access to the water when the elevation is 5881 feet (1,475 surface acres) or greater. When the elevation is lower than 5881 feet and the boat ramps are less usable, the following changes in recreation occur:

- Number of boats launched decreases.
- There is a substantial walk from the water to parking facilities and toilet facilities.
- The campground is somewhat removed from the reservoir shoreline. Anglers tend to drive to and use different areas of the reservoir to avoid crossing the foreshore mudflats. Toilet facilities in the day use area are not close to the water, and visitors must walk up to one-half mile to them.
- Aesthetic qualities around the reservoir diminish. Odors from decaying vegetation, mudflats in the foreshore area, and turbidity in the water all occur. Turbidity reduces the quality of the fishing experience.
- The growth rate of kokanee is reduced, which reduces the quality of the fishing experience.

e. Boca Reservoir

Boca Dam and Reservoir, completed in 1939, are located on the Little Truckee River about 3 miles downstream from Stampede Dam and immediately upstream of the confluence of the Truckee River and the Little Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 3,052 acres of land, 887 surface acres of water, and 15 miles of shoreline.

Recreation facilities include one boat launch ramp with two lanes, five toilets, and two campgrounds, with a total of 59 campsites. USFS collects $12-per-night user fees for the campsites through a private campground operator.

The most popular recreation activities are fishing, camping, water skiing, windsurfing, and jet skiing. During the fall, hunting for mule deer, geese, and ducks is common. CDFG stocks kokanee and rainbow and brown trout.

Boca Reservoir boat launch ramps provide unimpeded access to the water when the elevation is 5591 feet (822 surface acres) or greater. When the elevation is lower than 5591 feet, the following changes in recreation occur:

- Large watercraft use decreases.
- Shallow waters tend to be warmer and more inviting to waders and swimmers in areas with beaches. Broad expansive mudflats, however, are not conducive to swimming.
- After mud flats dry, off-road vehicles, dirt bikes, and mountain bikes use the reservoir’s expanded shoreline.
- Ski Jump Cove, where a ski club practices water skiing skills, cannot be used. The favorable water ski dropoffs and takeoffs are no longer useable.
- Noise is reduced because of fewer boat engines, but more reservoir foreshore is exposed, revealing mud flats and odors from decaying vegetation.

f. Lahontan Reservoir

Lahontan Dam and Reservoir, completed in 1915, are located on the Carson River. Nevada Division of Parks manages the water surface area, consisting of 12,100 acres at full pool; adjacent lands, consisting of 18,262 acres; and associated recreation facilities for recreation purposes. The reservoir has approximately 70 miles of shoreline. Seasonal entrance fees are collected at the two main access points located at Churchill Beach and Silver Springs Beach.

Lahontan Reservoir offers a number of facilities and opportunities to western Nevada residents, the primary users of the reservoir. Facilities include one developed campground with 27 sites, two boat ramps, six restrooms with flush toilets and showers, 12 vault toilets, 12 pit toilets, and three restrooms with flush toilets but no showers. The beach areas are open to public camping. The recreation season extends from April 1 to October 31. Recreation activities include boating, jet skiing, water skiing, camping, fishing, sightseeing, picnicking, hunting, and swimming. Fishing occurs primarily from boats. The warm water fishery supports walleye, white bass, catfish, largemouth bass, sunfish, and a cool water fish, rainbow trout. The reservoir holds the State record for walleye. Table 3.84 presents recreation visitation at Lahontan Reservoir from 1993–2002. Data are from Summary Statistical Data Sheets, Nevada Division of Parks.

Table 3.84—Recreation visitation at Lahontan Reservoir: 1993–2002

Year	Total recreation visitation (number of visitors)
1993	356,844
1994	246,471
1995	460,222
1996	436,939
1997	385,750
1998	384,253
1999	383,493
2000	584,918
2001	325,330
2002	331,181

The boat ramps provide unrestricted access to the water when the reservoir elevation is 4138 feet or higher. When the elevation is lower than 4138 feet, the following changes in recreation use occur:

- Number of boats launched decreases, especially larger boats.
- Decreased surface area compromises the safety of boaters using the reservoir.
- Visual quality of the reservoir decreases due to exposed mud flats.
- Access to developed facilities from the shoreline becomes more difficult.
- Visitation to the reservoir decreases.
- As the mudflats dry, off-road vehicle use increases in these areas.

2. Rivers and Streams

a. Recreation Activities

The Truckee River is well known for its scenic values and water-based recreation opportunities. Most recreational activities within the area are directly water-based; hiking, camping, mountain biking, bird watching, picnicking, and sightseeing are popular activities that are indirectly linked to the river. The following water-based activities, discussed in more detail, are the most popular and are used as indicators to analyze the effects of the alternatives on the recreational resources within the study area.

(1) Fly Fishing

The Truckee River and selected tributaries have a long history of fly fishing. Before the 1930's, the river and Pyramid Lake were the only places in the world where an angler could catch 10-to-30-pound LCT. Although those days are gone ("Past Cumulative Effects"), LCT is being reintroduced into the river in hopes of establishing the species throughout the system. Fly fishing is still one of the most popular recreational uses of the river.

(2) Spin/Lure/Bait Fishing

Anglers who use spinning and casting methods to catch fish are in a separate category than fly fishers. Although some anglers who use spinning or casting methods wade in the river, they most commonly fish from shore. Because the Truckee River has different regulations for different reaches, anglers who use spinning gear, lures, and bait tend to use sections that allow these methods. Spin, lure, and bait fishing methods can be more effective at flows that are greater and less than those best suited for fly fishing.

Spin/lure/bait fishing is also popular in Donner Creek primarily because its family atmosphere appeals to the general angler. Bait anglers tend to be more oriented toward catching and keeping their limits (consumptive) than fly anglers, who tend to be more oriented toward catch and release.

(3) Rafting

From late June through early August, rafting is the most popular activity on the river. Commercial rafting (both guided and unguided) takes place on most reaches of the river downstream to Reno. Private rafters are known to use the entire river. Several of the counties license commercial outfitters, while public rafters are unregulated. Rafting does not occur on the Little Truckee River, Independence Creek, Donner Creek, or Prosser Creek.

More rafters use the upper section of the river than any other section. Rafting also takes place in the Reno/Sparks area and occasionally between Sparks and Pyramid Lake.

(4) Kayaking

Kayaking is a growing sport on the Truckee River. The river's physical characteristics make it an ideal environment for kayakers. From Class I to Class IV whitewater (depending on season and flows), the Truckee River has runs to suit the abilities of most kayakers. Although there are a few Class IV rapids (Bronco, Jaws, and Dead Man's Curve), 95 percent of the river is rated as Class II and III, which appeals to intermediate kayakers. Kayaking does not occur on the Little Truckee River, Independence Creek, Donner Creek, or Prosser Creek. (Ratings of the rapids are discussed under "Recreation Characteristics of Stream Reaches.")

b. Recreation Characteristics of River Reaches and Streams

For purposes of this study, the Truckee River and its streams have been divided into a series of reaches, as shown on map 3.1. Each reach has unique characteristics that are attractive to different user groups and types of experiences desired, as described in the following paragraphs.

Additionally, the following narrative uses the internationally-accepted river rating classification system to describe sections of whitewater or rapids for kayakers and rafters. These ratings are designed to give boaters an approximate difficulty of a given section of river so paddlers can match their skill levels to the particular demands of the river section. This river classification is accepted on rivers throughout the world, and includes Class I (easiest) through Class VI (most difficult). Most of the Truckee River is rated Class II or III, but a few rapids (Bronco, Jaws, and Dead Man's Curve) are considered Class IV. River classifications are subjective and change with flow. The following list describes the characteristics for each class.

Class I—Easy

Fast-moving water with riffles and small waves. Few obstructions, all obvious and easily missed, with little training. Risk to swimmers is slight, and self rescue is generally easy.

Class II—Novice

Straightforward rapids with wide, clear channels, which are evident without scouting the river ahead. Occasional maneuvering may be required, but rock and medium sized waves are easily missed by trained paddlers. Swimmers are seldom injured, and group assistance, while helpful, is seldom required. Rapids at the upper end of this rating are rated as Class II +.

Class III—Intermediate

Rapids with moderate and irregular waves, which may be difficult to avoid. Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required. Large waves are present but are easily avoided. Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids at the upper end of this rating are rated Class III +.

Class IV—Advanced

Intense, powerful, but predictable rapids requiring precise boat handling in turbulent water. Rapids may require "must do" moves above dangerous hazards. Scouting the rapids is necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self rescue difficult. Group assistance for rescue is often essential but requires practiced skills. Rapids at the upper end of this rating are rated as Class IV +.

Class V—Expert
Extremely long, violent rapids, which expose a paddler to above-average dangers. Drops may contain large, unavoidable waves and holes or steep, congested chutes with complex demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. A very reliable “Eskimo roll,” proper equipment, extensive experience, and practiced rescue skills are essential.

Class VI—Extreme
These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

(1) Donner Creek: Donner Lake Dam to Truckee River
Donner Creek is a small tributary that feeds into the Truckee River just upstream of the town of Truckee. Most recreational activity occurs on the segment of creek that runs through Donner Memorial State Park. Both fly and spin/lure/ bait fishing occur from the banks. Because the creek is small, rafting and kayaking do not occur.

Following are the recreation characteristics of this creek:

- Angling occurs on this section of the creek but is not considered as good as other areas within the study area (Aukerman, et al., 1999).
- Most of the fishing is by campers who stay in the nearby campgrounds.
- Spin and bait fishing seem to be the dominant form of angling.
- Most anglers are more generalists than “expert” fly anglers.
- Most of the creek is 15-30 feet wide and can be easily fished from its banks.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River
Prosser Creek is a small stream popular with fly anglers. Many anglers visit the stream when the Truckee River becomes crowded. Prosser Creek is accessible from westbound I-80, 4 miles west of Boca Reservoir.

Following are the recreation characteristics of this creek:

- It is popular with a relatively small number of fly anglers.
- It offers a greater degree of solitude than other streams in the study area.
- It has fewer spin/lure/bait anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

(3) Independence Creek: Independence Lake to Little Truckee River

Independence Creek is another small stream that anglers visit when the Truckee River becomes crowded. Independence Creek is fairly remote.

Following are the recreation characteristics of this creek:

- It offers a high degree of solitude.
- It is popular with fly anglers.
- It has fewer spin/lure/bait anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

Desired flows for stream-based fishing in Independence Creek were not established.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

The meadow reaches of the upper Little Truckee fish well in early summer as soon as runoff subsides. Rainbow trout from Stampede Reservoir move into the gravel bars to spawn and many remain as the water level drops. Because the creek is small, rafting and kayaking do not occur.

Following are the recreation characteristics of this section of the tributary:

- It offers high degree of solitude.
- It is becoming popular with fly anglers.
- It has fewer spin/lure/bait anglers than fly anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

The reach between Stampede and Boca Reservoirs is heavily used by anglers of all types during the early spring (May and June) and after the spring runoff has subsided to 500 cfs or less. Fly and bank anglers congregate where the Little Truckee River enters Boca Reservoir because of easy access and quality fishing. Prolific insect populations and quality habitat support a highly productive fish population.

Following are the recreation characteristics of this section of the tributary:

- It has open meadows and valleys popular with fly and spin/lure/bait anglers.
- Only artificial lures with barbless hooks can be used, and the maximum size allowed to be kept is 14 inches, with a bag limit of two.
- It has a large population of fish.
- It has ample parking and access.
- There is no rafting or kayaking.

(6) Truckee River: Lake Tahoe to Donner Creek

The Truckee River begins at the outlet of Lake Tahoe at the small dam on the lake's northwest shore. This reach of river has more recreational activity than any other reach. Recreational activities are prohibited for 1,000 feet downstream from "Fanny Bridge" at the outlet. Fanny Bridge is a popular spot to view very large rainbow trout waiting for tourists to throw them a free meal as they sit in the highly oxygenated water. Unguided rafting is the most popular recreational activity. Two licensed rafting companies operate on this reach. Each is allowed 100 rafts on the water at any given time. The rafting season ranges from the middle of June through early September, depending on river temperature and flow. A public boat launch provides easy access for those with their own rafts. It is unlawful for watercraft to operate on the river if the flows exceed 1,250 cfs. The commercial rafting companies cannot send rafts out before 10 a.m. or after 4 p.m. to allow anglers a raft-free river at peak fishing times and also to reduce conflicts among different user groups on the river. Most commercial rafting companies stop renting rafts when flows are below 100 cfs.

Fishing occurs throughout the fishing season but is more popular during the early spring and fall when rafting activity has subsided. This reach of river is rated as Class I, with Class II and Class III water closer to Truckee. A bike path that parallels this reach of river has greatly increased use by bicyclists, joggers, rollerbladers, and walkers. The greatest dangers for boaters are private bridges, which have little clearance during high flows.

USFS has three campgrounds (Silver Creek, Goose Meadows, and Granite Flats) along this reach. Heavy use of this river reach can be attributed to the location of these campgrounds and easy access to the river. While most of the river is easily accessible to recreational users, many homes (especially on the eastern side of the river) and private properties are posted against trespassing.

Following are the recreation characteristics of this reach of river:

- Rafting is one of the most popular recreational activities, although both fly and spin/lure/bait fishing occur.

- Commercial rafting companies use this section of river.
- People are abundant, and solitude is not an important aspect of the recreation experience.

(7) Truckee River: Donner Creek to Little Truckee River

This reach begins at the Donner Creek confluence (Ollie's Bridge) at the southwest corner of the town of Truckee. An unimproved parking area with a capacity of about 10 vehicles is a popular access point for kayakers who wish to boat the challenging "Town Section" of the river (rated as Class III) during spring runoff. For anglers, the most popular segment of this reach parallels Glenshire Road, where many pullouts and unimproved parking areas provide easy access to the river. From Trout Creek to Gray Creek, the river is designated as "wild trout water." Both fly and spin/lure/bait fishing occur, but fly fishing is more common. The most popular times to fish this reach are April and May (before the peak spring runoff occurs) and late July through the end of the fishing season on October 15.

The segment between Glenshire Bridge and Boca Bridge is popular with recreational boaters and is rated as Class II. This 4.5-mile segment offers easy access points at both bridges. Although considered a Class II section, at greater flows (4,000 cfs), many consider it Class III. Fishing in this segment has resulted in confrontations with the San Francisco Flycasters, who own 0.5 mile of property along the river and restrict foot access. However, those floating through on watercraft are allowed to fish. Fishing becomes popular when flows are below 800 cfs in both the spring and fall. Wading is more difficult here than in other reaches of the river; consequently, spin/lure/bait fishing is more popular in this reach than fly fishing.

Prosser Creek enters the Truckee River in this reach and offers anglers (willing to walk) fine small-stream fishing. Prosser Creek at the confluence is accessible from I-80 west by turning north on an unimproved road. This area is popular among fly fishers and is known as "Joe's Schoolyard." Long, smooth runs make the area around the Prosser Creek inflow attractive to the dry fly enthusiast. Fishing in the Prosser Creek area is most popular in August and September. The Little Truckee River enters the Truckee River just before Boca Bridge and is a popular put-in point for commercial rafting companies.

Following are the recreation characteristics of this reach of river:

- It is popular with kayakers, especially during the spring.
- When flows are less, anglers replace kayakers.
- Both spin/lure/bait anglers rate this stretch of river "good" on a scale of excellent to poor (Aukerman, et al., 1999).

- The river through the town of Truckee is a popular intermediate to advanced run for kayakers.

- From the east end of Truckee to Hirshdale Bridge, fly fishing is very popular.

- Along the Truckee River from Trout Creek to the Boca Bridge, only artificial lures with barbless hooks can be used, and the minimum size fish allowed to be kept is 15 inches, with a bag limit of two.

- From Glenshire Bridge to Boca Bridge, fishing and boating are equally popular.

(8) Truckee River: Little Truckee River to State Line

This reach is the most popular with commercial rafting companies. Most outfitters put in at the Little Truckee confluence a few hundred yards from Boca Bridge and take out at Floriston. Much of this reach is Class II and III except the last 0.5 mile, which contains the Class IV Bronco and Jaws rapids. Rafting occurs when flows range from 1,000 to 4,000 cfs. Numerous rafting guides consider flows of about 2,000 cfs to be “ideal.” This reach is also popular with more experienced kayakers. The area around Boca Bridge is popular with anglers because of its easy access and quality fishing.

Following are the recreation characteristics of this reach of river:

- The most heavily used reach of the Truckee River for rafting and kayaking is from Boca Bridge to Floriston.

- It is the most heavily used by commercial rafters.

- Fishing is popular, but access is limited due to the distance from the highway.

(9) Trophy

Just downstream from Floriston Bridge, where the washed out Farad diversion dam is located, is a popular spot for kayakers to “surf” and execute “rodeo” moves on the wave produced by a concrete slab from the fallen dam. Commercial and private rafters and kayakers often use this reach of river. This reach is rated as Class II, except for the portion from Farad to Verdi, which contains both Dead Man’s and Staircase rapids (both considered Class IV whitewater). This reach requires three portages because of concrete diversion dams (Fleish, Steamboat Canal, and Verdi). Crystal Peak Park at the west end of Verdi is a popular recreation site that offers improved facilities and easy access to the river. Although this is not a popular put-in site for boaters, rafters and kayakers frequently pass through. Spin/lure/bait fishing is popular and productive because of many deep holes that hold trout.

Following are the recreation characteristics of this reach of river:

- It is popular with rafters and kayakers.
- Floriston to Verdi is considered more suitable for advanced river runners, with numerous Class III rapids and one Class IV rapid (Dead Man's Curve).
- Crystal Peak Park on the west side of Verdi is popular with anglers and offers good access to the river.
- Anglers have good access to the river on the east side of Verdi
- Spin/lure/bait angling is the most popular type of fishing.

(10) Mayberry, Oxbow, and Spice

These reaches are considered together because of the homogeneous characteristics of recreational use. This "urban" section of the Truckee River is easily accessible because of the many parks that line the river through downtown Reno and Sparks. Some limited rafting and kayaking occur during March, April, and May when the spring runoff begins. A kayak slalom course near Mayberry Bridge is used in the early spring and summer months. During the hot summer months, rafters occasionally use this reach to "play" in the river to beat the hot temperatures. Fishing is the most popular recreational activity. Although some fly fishing occurs, spin/lure/bait fishing is more popular. Several anglers who fish this reach say fishing is good because of the periodic stocking by NDOW. Stocking begins in March and continues through September, with rainbow trout released every 2 weeks from Sparks west to Verdi. Most fishing takes place during the late spring and summer when the flows have started to decline from the spring runoff.

Recently, Nevada's first whitewater park and kayak slalom racing course opened in this stretch of river, in the heart of the downtown Reno hotel-casino district. The whitewater course features 11 "drop pools," a slalom racing course, and more than 7,000 tons of smooth, flat rocks along the shores to aid access to the river.

Following are the recreation characteristics of this reach of river:

- Portions of this reach of river are stocked with "catchable" sized rainbow trout, increasing its popularity for fishing.
- Reno and Sparks have many river parks that allow access to the river.
- Spin/lure/bait fishing is the most popular form of fishing, although some fly fishing occurs.
- There are several kayak slalom courses established in this reach of river.
- Private raft and kayak use is more prevalent than use by commercial recreation service providers.

(11) Lockwood and Nixon

Some minimal recreational use occurs on these reaches, including spin/lure/bait fishing and rafting. From Sparks, the river flows through a hot and dry desert environment for approximately 40 miles along I-80 until it leaves the highway and enters the Pyramid Lake Indian Reservation. Because of the large amount of private property, the only river access site commonly used along I-80 is near Derby Diversion Dam.

Following are the recreation characteristics of this reach of river:

- Recreational use is much less than on other reaches of river.
- Access to the river on the Pyramid Lake Tribal lands is by permit only, which may serve to discourage some users.
- Rafting and kayaking are minor activities.

c. Desired Flows

Desired flows within the context of this recreation analysis are flows most desired by recreationists for their particular water-based activity. These are not the California Guideline flows for fish. Desired flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking for this study were developed using information obtained through a study commissioned by BOR (Aukerman et al., 1999). The desired flows for the various recreation activities used in this study were derived from the average flows as recommended by professional outfitters and guides because of their extensive knowledge and experience with both professional and private recreational use of the river and their knowledge of instantaneous flows on the river.

Desired flows were used to provide a measure of the quality of a river recreation experience under the alternatives analyzed in this study. Desired flows are subjective and depend on the type of experience desired and the skill level of the user. A recreationist may still choose to participate in a given activity even if flows are less than or greater than preferred. In this case, their experience may be less than expected; however, for commercial enterprises, it is generally the goal of recreation managers to provide a setting conducive to maximizing the participant’s satisfaction with the experience.

Rafters and kayakers prefer higher water conditions, which provide for more exciting and challenging runs down the river. Greater flows produce “standing waves,” such as the popular “park and surf” just downstream from Floriston Bridge discussed previously. Changes in flows can increase or decrease the difficulty rating of a particular section of river. A section that is rated as Class III (such as the Boca to Floriston run) at flows above 1,500 cfs is rated as Class II at flows below 800 cfs.

Overall, anglers prefer more moderate to lower flows than rafters and kayakers. Fly anglers look for flows that allow for easy wading and access to fish-holding water, which might be in the middle of the river, and obstructions that hold trout. Although not necessary, wading increases a fly angler's enjoyment and success rate. Greater flows also limit commercial guiding opportunities because increased flows may be dangerous for inexperienced anglers. Some guides will not take clients on the river when high flows create an unacceptable risk. Bank anglers tend to be less particular about flow levels because they do not need to enter the river. However, flows that rapidly increase or decrease adversely affect success rates of both groups of anglers.

Table 3.85 presents the range of desired flows for these stream-based recreation activities for the river reaches used in this analysis. (See the Economics and Recreation Appendix for further information on development of desired flows.)

Table 3.85—Desired flows (cfs) for stream-based recreation in the Truckee River basin

Reach	Fly fishing	Spin/lure/bait fishing	Rafting	Kayaking
Donner Creek: Donner Lake to Truckee River	40-70	40-70	Not applicable	Not applicable
Prosser Creek: Prosser Creek Reservoir to Truckee River	40-70	40-70	Not applicable	Not applicable
Independence Creek: Independence Lake to Little Truckee River	No data	No data	Not applicable	Not applicable
Little Truckee River: Independence Creek to Stampede Reservoir	40-70	40-70	Not applicable	Not applicable
Little Truckee River: Stampede Reservoir to Boca Reservoir	100-250	200-500	Not applicable	Not applicable
Truckee River: Lake Tahoe to Donner Creek	350-600	350-800	400	1,000
Truckee River: Donner Creek to Little Truckee River confluence	400-500	400-800	900-1,200	900-1,200
Truckee River: Little Truckee River to State line	400-500	400-800	900-1,200	1,000-1,200
Trophy	500-700	500-600	2,000-4,000	2,000-4,000
Mayberry, Oxbow, Spice	500-800	600-800	2,000-4,000	2,000-4,000
Lockwood, Nixon	1,000-1,500	1,000-3,000	1,000-3,000	1,000-3,000

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect lake and reservoir elevations and the quality, quantity, timing, and duration of flows. In turn, these changes could affect water-based recreation activities in the study area. This analysis evaluated the effects of changes in elevations and flows on water-based recreation using the following indicators:

- Lake- and reservoir-based recreation:
  - Seasonal recreation visitation (as measured by overnight and day use visitors correlated to reservoir elevation and reservoir surface area)
  - Boat ramp usability (as measured by water surface elevation from April through October)
  - Effects of fluctuating elevation on use of stationary docks at Donner Lake
- Stream-based recreation:
  - Suitability of flows for stream fishing during the recreation season (fly fishing and spin/lure/bait fishing) (as measured by number of months that desired flows occur)
  - Suitability of flows for rafting during the recreation season (as measured by number of months that desired flows occur)
  - Suitability of flows for kayaking during the recreation season (as measured by number of months that desired flows occur)

B. Summary of Effects

Analysis of operations model results, in general, shows the following:

Visitation at Prosser Creek, Stampede, and Boca Reservoirs generally would be greater under TROA than under No Action and current conditions, primarily because annual average water elevations would be higher under TROA, thus enhancing recreational access and ensuring a higher quality recreational experience. Visitation at Donner Lake would be negligibly (less than 1 percent) less under TROA than under current conditions, but greater than under either No Action or LWSA.

Effects on boat ramp usability would be the same in all hydrologic conditions at Pyramid Lake and Prosser Creek and Lahontan Reservoirs under TROA, LWSA, and No Action. Boat ramps would be more usable in median hydrologic conditions at Donner Lake; in dry hydrologic conditions at Stampede Reservoir, and in wet hydrologic conditions at Boca Reservoir under TROA than under No Action and LWSA. Boat ramps would be less usable in dry hydrologic conditions at Donner Lake and in median hydrologic conditions at Boca Reservoir under TROA than under No Action. Usability of stationary docks at Donner Lake would not be significantly affected under any alternative in June, July, or August.

Effects on flows for fly fishing, rafting, and kayaking would be minimal under No Action, LWSA, and TROA. Because of the nature of spin/lure/bait fishing, and because anglers can and will still pursue their sport when flows are either greater or less than preferred, none of the effects on flows under any of the alternatives is considered significant.

Table 3.86 summarizes the effects of the alternatives on water-based recreation.

C. Lake- and Reservoir-Based Recreation Visitation

1. Method of Analysis

Differences in seasonal recreation visitation at lakes and reservoirs were quantified by the number of overnight and day use visitors during the recreation season compared to changes in reservoir surface acres during the same period. Recreation model results (described in "Economic Environment) were used to determine numbers of overnight and day use visitors. Recreation visitation used in this analysis reflects only recreation that occurs during the 7-month prime recreation season, April through October. Therefore, recreation visitation shown in this section is less than that shown in the analysis of the economic environment, which considers the entire year. Operations model results were used to determine reservoir surface acres.

Boat ramp usability was quantified as the percent of the recreation season that reservoir elevation equaled or exceeded the elevation suitable for launching large and mid-sized watercraft. Elevations were generated by the operations model. Note that boat ramp usability is not absolute because it depends on a number of factors, such as the type of watercraft, slope of the boat ramp, lake or reservoir bottom structure at the toe of the ramp, and emergence of potential hazards, such as large rocks or stumps.

Stationary dock use at Donner Lake was quantified as the number of draw downs between elevations 5931.5 and 5935.5 feet in June, July, and August, as shown by operations model results.

Lahontan Reservoir was not included in the study that established a relation between visitation and changes in upper Truckee basin reservoir surface acres. Therefore, operations model results were used to calculate likely recreation use at Lahontan

Table 3.86—Summary of effects on water-based recreation

Indicator	Current conditions	No Action	LWSA	TROA
Seasonal recreation visitation	Recreational visitation varies among hydrologic conditions at all reservoirs, with greatest losses in visitation occurring in dry hydrologic conditions. Visitation losses occur in median hydrologic conditions, but losses are not as great as in dry hydrologic conditions	Same as under current conditions, except slightly less at Donner Lake in median hydrologic conditions	Same as under No Action, except slightly more at Donner Lake in median hydrologic conditions	Same as under No Action, except more at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in some hydrologic conditions
Boat ramp usability	Boat ramps are unusable from 0 to 100 percent of the recreation season, depending on lake or reservoir and hydrologic condition. Boat ramps are unusable the greatest number of months in dry hydrologic conditions at Prosser Creek Reservoir; ramps are usable the greatest number of months at Stampede Reservoir in wet and median hydrologic conditions	Same as under current conditions, except slightly more usable at Boca Reservoir in wet hydrologic conditions	Same as under No Action	Same as under No Action, except slightly more or less usable at Donner Lake and Boca Reservoir in certain hydrologic conditions
Suitability of flows for fly fishing	Flows are suitable 71 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows	Same as under current conditions, with a few exceptions	Same as under No Action	Same as under No Action

Table 3.86—Summary of effects on water-based recreation – continued

Indicator	Current conditions	No Action	LWSA	TROA
Suitability of flows for spin/lure/bait fishing	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows	Desired flows would occur more often in the Little Truckee River from Independence Creek to Stampede Reservoir and in the Trophy reach in wet hydrologic conditions and less often in the Mayberry, Oxbow, and Spice reaches in dry hydrologic conditions than under current conditions	Same as under No Action, except desired flows would occur more often in the Mayberry, Oxbow, and Spice reaches in median hydrologic conditions.	Desired flows would occur more often in Prosser Creek in median hydrologic conditions and in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions and less often in several reaches, primarily in wet hydrologic conditions, than under No Action and current conditions
Suitability of flows for rafting	Flows are suitable 43 to 0 percent of the recreation season, depending on location and hydrologic condition. The Trophy section of the river offers the greatest number of months of suitable flows	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Suitability of flows for kayaking	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions.

Reservoir based on the average surface acreage available during the recreation season in wet, median, and dry hydrologic conditions; inferences were drawn regarding recreationist response to surface acres available, e.g., when mud flats develop, the quality of the fishing experience decreases and fewer recreationists are attracted to the area.

2. Threshold of Significance

This section identifies thresholds of significance for recreation visitation, boat ramp usability, and use of stationary docks at Donner Lake.

a. Recreation Visitation

Analysis of recreation and operations model results, in general, shows that as elevation declines, the number of visitors decline. It is difficult, however, to identify a point at which declining number of visitors becomes significant, because for some recreationists, fewer visitors translates into a higher quality recreation experience. A better indicator of the significance of declining visitation is the economic impact realized from fewer visitor expenditures. (See “Economic Environment” for the economic significance of declining visitation.).

As visitor numbers decline, there is less competition for available facilities and services, enhancing the experience for some visitors. However, a declining user population can prompt resource management agencies to reallocate capital investments and services to areas with greater visitation. Therefore, visitors accustomed to certain levels of facilities and services might find that as visitation declines, they will have fewer fish to catch or restrooms and boat launch facilities to use. The visitation level at which agencies would consider reallocating capital investments and services cannot be readily quantified.

b. Boat Ramp Usability

The effect of operations on the reservoir and lake elevations becomes significant when watercraft can no longer be launched from boat ramps. For the purpose of this analysis, it was assumed that significant effects occur when water levels reach the toe or base of the ramp, thus rendering the ramp totally unusable and making the launch of all but small, portable watercraft impractical. However, a second threshold was used for analyzing overall boat ramp usability. For the second analysis, it was assumed that large- and mid-sized watercraft generally cannot be safely launched when there is less than 3 feet of water on the mid or lower portion of the ramp. However, some smaller watercraft can be launched. Therefore, at these lower elevations, a boat ramp was considered “less than fully usable” but not completely unusable. However, when reservoir elevations fall below the bottom of the boat ramps and the ramps become unusable, the length of the existing boat ramps could be extended where topography allows. If extending the existing ramp is impractical due to terrain or other environmental concerns, it may be possible to relocate the boat ramp.

c. *Stationary Dock Use at Donner Lake*

An effect on stationary dock use at Donner Lake was considered significant if the elevation was below 5934 feet. As discussed previously, stationary dock use at Donner Lake was analyzed using operations model results to show the number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August. Only these months were analyzed because dam safety requirements specify that the discharge gates of the dam be held open from November 15 through April 15 to prevent the lake from exceeding elevation 5926.9 feet, and draw downs may occur in September and October in anticipation of opening the discharge gates to meet this requirement. Furthermore, the 1943 Donner Lake Indenture directs that elevation of Donner Lake not be allowed to fall below 5932 feet in June, July, and August, except to meet minimum flow requirements. (See chapter 2).

3. Model Results

Table 3.87 presents seasonal recreation visitation; table 3.88 presents the percent of the recreation season that boat ramps are unusable ("high and dry"); table 3.89 presents the percent of the recreation season that boat ramps are usable for large- and mid-sized watercraft; table 3.90 presents average surface acres at Lahontan Reservoir; and table 3.91 presents the number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August at Donner Lake. Elevations below 5934 feet are not acceptable for stationary dock use.

Table 3.87—Seasonal recreation visitation (as measured by the number of overnight visitors and day use visitors from April through October)

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	127,626	127,643	127,643	127,578
	Median	123,566	116,939	97,821	118,324
	Dry	98,781	98,788	98,788	98,534
Prosser Creek	Wet	20,600	20,640	20,640	21,369
	Median	18,519	18,928	21,032	20,031
	Dry	8,738	10,710	10,801	14,612
Stampede	Wet	71,383	71,398	71,368	71,414
	Median	69,019	68,703	71,194	71,136
	Dry	15,642	15,852	15,838	39,989
Boca	Wet	29,716	29,740	29,744	29,454
	Median	24,976	24,844	25,034	25,874
	Dry	8,883	8,739	8,724	10,992

Table 3.88—Percent of the recreation season boat ramps are unusable (“high and dry”)

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	0	0	0	0
Prosser Creek	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	86	100	71	28
Stampede	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	100	100	100	0
Boca	Wet	14	0	14	14
	Median	42	42	42	42
	Dry	100	100	100	100
Lahontan	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	42	42	42	42
Pyramid	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	0	0	0	0

Table 3.89—Percent of the recreation season boat ramps are usable for large and mid-sized watercraft

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	71	71	71	71
	Median	57	57	57	71
	Dry	57	57	57	42
Prosser Creek	Wet	86	86	86	86
	Median	86	86	86	86
	Dry	0	0	0	28
Stampede	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	0	0	0	100
Boca	Wet	57	71	71	86
	Median	57	57	57	43
	Dry	0	0	0	0
Lahontan	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	57	57	57	57
Pyramid	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	100	100	100	100

Table 3.90—Average surface acres at Lahontan Reservoir from April through October

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Wet	12,444	12,520	12,529	12,520
Median	6,702	6,604	6,600	6,588
Dry	4,207	3,673	3,659	3,651

Table 3.91—Stationary dock use at Donner Lake number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August

Elevation (feet)	Current conditions	No Action	LWSA	TROA
June				
5935.5	22	22	22	24
5935.0	17	17	17	19
5934.5	10	10	10	13
5934.0	5	5	5	7
5933.5	2	2	2	4
5933.0	1	1	1	1
5932.5	0	0	0	0
5932.0	0	0	0	0
5931.5	0	0	0	0
July				
5935.5	37	37	37	53
5935.0	20	20	20	30
5934.5	16	16	16	21
5934.0	12	12	12	17
5933.5	8	8	8	8
5933.0	3	3	3	4
5932.5	1	1	1	1
5932.0	0	0	0	0
5931.5	0	0	0	0
August				
5935.5	81	81	81	92
5935.0	41	41	41	62
5934.5	24	24	24	48
5934.0	19	19	19	30
5933.5	13	13	13	21
5933.0	10	10	10	11
5932.5	6	6	6	7
5932.0	2	2	2	2
5931.5	0	0	0	0

4. Evaluation of Effects

a. No Action

(1) Donner Lake

Recreation model results show about the same number of visitors at Donner Lake under No Action and current conditions in wet and dry hydrologic conditions. The greatest difference occurs in median hydrologic conditions, when, under No Action, there are 6,627 fewer visitors than under current conditions, or 5 percent less, a minor difference, but it could have the following effect:

- Enhanced recreation experience for users that place a high value on solitude
- Reallocation of capital investments and services to areas with greater visitation

Operations model results show that, under No Action, boat ramp usability at Donner Lake is the same as under current conditions in all hydrologic conditions.

For stationary docks at Donner Lake, operation model results show the same number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under both No Action and current conditions.

(2) Prosser Creek Reservoir

Under No Action, recreation model results show 409 more visitors at Prosser Creek Reservoir than under current conditions in median hydrologic conditions, or about 2 percent more, which would have negligible effect. In wet hydrologic conditions, model results show even less difference between No Action and current conditions (40), or less than a 1-percent difference, and would have negligible effect. In dry hydrologic conditions, recreation model results show 1,972 fewer visitors than under current conditions (18 percent less), which could have the following effects:

- Fewer impacts on private landowners within upland areas surrounding the reservoir because of fewer visitors.
- Less competition among recreationists for use of the recreational resources and facilities, although the recreation experience would likely be highly diminished because of low water.
- Displacement of visitors to other destinations within the study area, increasing the burden on the operational resources of those areas. Additionally, recreationists gathering where suitable water exists could result in crowding and increased pressure on those resources.

Operations model results show that boat ramps at Prosser Creek Reservoir are fully usable 100 percent of the recreation season in wet and median hydrologic conditions under No Action compared to 86 percent of the season under current conditions. In dry hydrologic conditions, operations model results show that boat ramps are unusable throughout the recreation season under both No Action and current conditions. As a result, boat launching could be difficult because of low water conditions. Visitors could experience bottom and propeller damage. Additionally, site managers could have increased maintenance costs associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp.

(3) Stampede Reservoir

Under No Action, recreation model results show 15 fewer visitors at Stampede Reservoir in wet hydrologic conditions, 316 fewer visitors in median hydrologic conditions, and 210 more visitors in dry hydrologic conditions than under current conditions. In all cases, this is less than a 1 percent difference and would have negligible effect.

Operations model results show that boat ramp usability at Stampede Reservoir under No Action is the same as under current conditions: boat ramps are fully usable 100 percent of the recreation season in wet and median hydrologic conditions and less than fully usable in dry hydrologic conditions.

(4) Boca Reservoir

Recreation model results show less than a 1 percent difference in the number of visitors at Boca Reservoir between No Action and current conditions, which would have negligible effect.

Operations model results show that boat ramp usability at Boca Reservoir under No Action is about the same as under current conditions. In wet hydrologic conditions, boat ramps are usable 71 percent of the recreation season under No Action compared to 57 percent under current conditions. Under both No Action and current conditions, boat ramps are usable 57 percent of the season in median hydrologic conditions and unusable throughout the recreation season in dry hydrologic conditions.

Therefore, the following effects could occur:

- Diminished recreation experience in August, September, and October in median hydrologic conditions because of difficult boat launching

- Diminished recreation experience throughout the recreation season in dry hydrologic conditions because of difficult boat launching

- Increased maintenance costs associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp

(5) Lahontan Reservoir

Operations model results show that, under No Action, average surface acres are about the same as under current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under current conditions.

b. LWSA

(1) Donner Lake

Recreation model results show about the same number of visitors at Donner Lake under LWSA, No Action, and current conditions in wet and dry hydrologic conditions.

However, in median hydrologic conditions, under LWSA, there are 19,118 fewer visitors than under No Action in median hydrologic conditions, or approximately 16 percent less, and 25,745 fewer visitors than under current conditions, or approximately 26 percent less. As a result, the following effects could occur in median hydrologic conditions:

- Enhanced recreation experience for visitors seeking solitude because of less crowding and competition for available facilities and services.

- Displacement of visitors to other destinations, increasing the burden on the operational resources of those areas. Additionally, recreationists gathering where suitable water exists could result in crowding and increased pressure on those resources.

- Reallocation of capital investments and services to areas with greater visitation. Fewer impacts on private landowners within upland areas surrounding the reservoir because of fewer visitors.

Operations model results show that boat ramp usability is virtually the same under LWSA, No Action and current conditions: boat ramps are fully usable 71 percent of the recreation season in median hydrologic conditions and fully usable about 57 percent of the season in median and dry hydrologic conditions. However, in all three cases, boat ramps are less than fully usable in April, September, and October, when visitation is much less. Therefore, effects would be much less than if the boat ramps were not fully usable in the prime recreation months of June, July, and August.

For stationary docks at Donner Lake, operation model results show the same number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under LWSA, No Action, and current conditions. Elevations of less than 5934 feet seldom occur. Thus, effects on stationary docks at Donner Lake would be relatively minor.

(2) Prosser Creek Reservoir

Under LWSA, recreation model results show the same number of visitors at Prosser Creek Reservoir as under No Action and 40 fewer than under current conditions in wet hydrologic conditions, or less than a 1 percent difference, which would have negligible effect.

In median hydrologic conditions, under LWSA, there are 1,104 more visitors than under No Action and 1,513 more than under current conditions, or about 7 percent more in both cases.

In dry hydrologic conditions, under LWSA, there are 91 more visitors than under No Action, and 2,063 more than under current conditions, or less than 1 percent more than under No Action and 19 percent more than under current conditions.

As a result, the following effects could occur under LWSA in dry hydrologic conditions:

- Diminished recreation experience for users that place a high value on solitude
- Greater impacts on private landowners within upland areas surrounding the reservoir because of increased incidents of trespass and other impacts resulting from more visitors
- Increased burden on operational resources of managing agencies because of greater visitation

Operations model results show that in wet hydrologic conditions, boat ramps are usable 86 percent of the recreation season under the LWSA, 14 percent less than under No Action and the same as under current conditions.

In median hydrologic conditions, boat ramps are usable 86 percent of the recreation season—the same as under No Action and 28 percent more than under current conditions. In dry hydrologic conditions, boats ramps are less than fully usable throughout the recreation season under LWSA, No Action, and current conditions. Thus, the effects in dry hydrologic conditions would be the same as under No Action.

(3) Stampede Reservoir

Under LWSA, recreation model results show 30 fewer visitors at Stampede Reservoir than under No Action and 15 more than under current conditions in wet hydrologic conditions, or less than a 1 percent difference in both cases, which would have negligible effect.

In median hydrologic conditions, under LWSA, there are 2,491 more visitors than under No Action and 2,175 more than under current conditions, or a 3 percent difference in both cases, which would have negligible effect.

In dry hydrologic conditions, under LWSA, there are 14 more visitors than under No Action and 196 more than under current conditions, or about a 1 percent difference in both cases, and which would little consequence in terms of differences between alternatives or effects on the recreational resource.

Operations model results show that boat ramp usability at Stampede Reservoir is the same under LWSA, No Action, and current conditions. Thus, the effects would be the same as under No Action.

(4) Boca Reservoir

Under LWSA, recreation model results show 4 more visitors at Boca Reservoir than under No Action and 28 fewer visitors than under current conditions in wet hydrologic conditions; 190 more than under No Action and 58 more than under current conditions in median hydrologic conditions; and 15 fewer under than under No Action and 159 fewer than under current conditions in dry hydrologic conditions. Each of these differences is less than 1 percent and would have negligible effect.

Operations model results show that boat ramp usability under LWSA is the same as under No Action or current conditions. Thus, the effects would be the same as under No Action.

(5) Lahontan Reservoir

Operations model results show that, under LWSA, average surface acres are about the same as under No Action or current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under No Action and current conditions.

c. TROA

(1) Donner Lake

Recreation model results show 125 fewer visitors at Donner Lake under TROA than under No Action and 108 more than under current conditions in wet hydrologic conditions; 1,385 more than under No Action and 5,242 more than under current conditions in median hydrologic conditions; and 254 fewer than under No Action and 247 fewer than under current conditions in dry hydrologic conditions. In all cases, the differences are less than 4 percent and would have negligible effect.

Operations model results show that boat ramps are usable 71 percent of the recreation season under TROA, No Action, and current conditions in wet hydrologic conditions; usable 71 percent of the season under TROA compared to 57 percent of the season under

No Action and current conditions in median hydrologic conditions; and usable 71 percent of the season under TROA compared to 43 percent of the season under both No Action and current conditions in dry hydrologic conditions.

Thus, the following effects could occur:

- Same effect as under No Action in wet hydrologic conditions.
- Minimal disruption to boaters in median hydrologic conditions, because boat ramps would be more usable under TROA than under current conditions or the other alternatives. Moreover, under TROA, boat ramps would be less than fully usable in April and October, when usage is lowest.
- Better conditions for boaters in dry hydrologic conditions under TROA than under No Action or current conditions, because boat ramps would be usable in two more months.
- Diminished recreation experience when boat ramps less than fully usable because of difficulties with launching large- and mid-sized watercraft.
- Increased maintenance costs when boat ramps less than fully usable associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp.

For stationary docks at Donner Lake, operation model results show slightly more draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under TROA than under either No Action or current conditions. As the elevation drops below 5934 feet, however, draw downs occur less frequently under TROA. Overall, effects on stationary docks at Donner Lake would be minor under TROA.

(2) Prosser Creek Reservoir

Recreation model results show 729 more visitors at Prosser Creek Reservoir under TROA than under No Action and 769 more visitors than under current conditions in wet hydrologic conditions, a difference of about 3 percent in both cases, which would have negligible effect.

In median hydrologic conditions, there are 1,103 more visitor under TROA than under No Action and 1,512 more than under current conditions, differences of 5 and 7 percent, respectively.

In dry hydrologic conditions, there are 3,902 more visitors under TROA than under No Action and 5,874 more visitors than under current conditions, or 27 and 40 percent more, respectively. Potential effects of these differences follow. Dry hydrologic conditions are often temporary, so the following effects would most likely be temporary as well:

- Diminished recreation experience for users that place a high value on solitude
- Diminished recreation experience because of increased competition for the use of available services and facilities
- Possibly more and better services and facilities in response to higher visitation

Operations model results show that boat ramp usability is the same under TROA as under No Action and current conditions. Therefore, the effects would be the same as under No Action.

(3) Stampede Reservoir

Recreation model results show 16 more visitors at Stampede Reservoir under TROA than under No Action and 31 more than under current conditions in wet hydrologic conditions; 2,433 more than under No Action and 2,117 more visitors than under current conditions in median hydrologic conditions. In all cases, these differences are less than 3 percent and would have negligible effect.

However, in dry hydrologic conditions, recreation model results show 24,137 more visitors under TROA than under No Action and 24,347 more than under current conditions, or approximately 60 percent more in both cases. Thus, the following effects could occur in dry hydrologic conditions:

- Existing facilities would be sufficient to prevent crowding and overuse
- Capital investments and services could be reallocated to areas with greater visitation, resulting in an overall decrease in services and facilities, and, thus, adversely affecting the recreation experience

Operations model results show that boat ramp usability is the same under TROA, No Action, and current conditions. Thus, the effects would be the same as under No Action.

(4) Boca Reservoir

Recreation model results show 286 fewer visitors at Boca Reservoir under TROA than under No Action and 262 fewer than under current conditions in wet hydrologic conditions; 1,030 more than under No Action and 898 more than under current conditions in median hydrologic conditions; and 253 more than under No Action and 109 more than under current conditions and in dry hydrologic conditions. In all cases, this is less than a 3 percent difference and would have negligible effect.

In wet hydrologic conditions, operation model results show that boat ramps are 86 percent of the recreation season under TROA, compared to 71 percent under No Action and 57 percent under current conditions. Thus, boaters would have better access under TROA in wet hydrologic conditions.

In median hydrologic conditions, boat ramps are usable 57 percent of the recreation season under both No Action and current conditions but usable only 43 percent of the recreation season under TROA. The effect would be minor, however, because the boat ramps would be unusable mostly in lower use months, such as September and October.

In dry hydrologic conditions, operation model results show that boat ramps could be less than usable throughout the recreation season under all alternatives.

(5) Lahontan Reservoir

Operations model results show that average surface acres are about the same under TROA as under No Action and current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under No Action and current conditions.

5. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

D. Stream-Based Recreation

1. Method of Analysis

Suitability of flows for fly fishing, spin/lure/bait fishing, rafting and kayaking were quantified by determining the number of months with desired flows for each activity during the recreation season.

Desired flows were established through interviews and statistical surveys of actual river users engaged in each particular activity (Auckerman, et al., 1999). Note, however, that users may still elect to participate in a given activity even if flows are not within desired ranges. In other words, anglers may still fish although flows are either low or high. The nature of water-based recreation is that as long as there is water, some percentage of the user population will still participate in that activity. The highly engaged enthusiast may elect to go somewhere else if elevations are too high or too low during the 7-month recreation season, but the casual user may still participate in the activity, if not for the particular experience they are seeking, then for some other reason, such as enjoying the scenic setting. For this reason, the model results should not be viewed as absolutes but rather indicators of trends of recreational use.

River users were asked to identify flows that were higher than desired, desired, or were less than desired (in cfs) for their activity. These survey data were then averaged to determine flow preferences. These averaged flows were then compared to flows for reaches of river and streams (map 3.1) generated by the operations model for three hydrologic conditions—wet, median, and dry (i.e., hydrologic conditions with 10-, 50- and 90-percent exceedences)—for the 7-month recreation season under current conditions, No Action, LWSA, and TROA.

Table 3.92 shows the percentage of survey respondents that indicated either high or low flows would prevent them from using the river.

Table 3.92—Percentage of survey respondents that indicated either high or low flows would prevent them from using the river

Activity	Percentage who said low flow would stop use	Percentage who said high flow would stop use
Fly fishing	24	76
Spin/lure/bait fishing	34	66
Kayaking	92	8
Rafting	84	16

2. Threshold of Significance

For stream-based recreation, an effect was considered significant when flows (either high or low) would prevent participants from pursuing their activity.

3. Model Results

Tables 3.93 through 3.96 present operations model results for the number of months various flows occur in the 7-month recreation season in wet, median, and dry hydrologic conditions under current conditions, No Action, LWSA, and TROA. The relation of the flows to desired flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking is shown. Note that reservoirs are not operated to achieve desired flows unless they coincide with Floriston Rates; achievement under any alternative or current conditions would be happenstance.

4. Evaluation of Effects

a. No Action

(1) Donner Creek: Donner Lake Dam to Truckee River

Operations model results show the same flows for fly fishing under No Action and current conditions. Desired flows occur only in median hydrologic conditions; flows are either greater or less than desired throughout the recreation season in all other hydrologic conditions. Fly fishing is a minor activity on this stream.

Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Donner Creek: Donner Lake to Truckee River	Wet	>	5	5	5	4
		=	0	0	0	0
		<	2	2	2	3
	Median	>	1	1	1	1
		=	2	2	2	2
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Prosser Creek: Prosser Creek Reservoir to Truckee River	Wet	>	6	6	6	6
		=	0	0	0	1
		<	1	1	1	0
	Median	>	5	4	4	4
		=	0	1	1	2
		<	2	2	2	1
	Dry	>	0	0	0	0
		=	0	0	1	0
		<	7	7	6	7
Independence Creek: Independence Lake to Little Truckee River	Wet	>	Not applicable	Not applicable	Not applicable	Not applicable
		=				
		<				
	Median	>	Not applicable	Not applicable	Not applicable	Not applicable
		=				
		<				
	Dry	>	Not applicable	Not applicable	Not applicable	Not applicable
		=				
		<				
Little Truckee River: Independence Creek to Stampede Reservoir	Wet	>	2	2	2	2
		=	2	2	2	2
		<	3	3	3	3
	Median	>	0	0	0	0
		=	2	2	2	2
		<	5	5	5	5
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Little Truckee River: Stampede Reservoir to Boca Reservoir	Wet	>	5	4	4	1
		=	1	2	2	4
		<	1	1	1	2
	Median	>	3	3	3	1
		=	1	2	2	4
		<	3	2	2	2
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

**Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Lake Tahoe to Donner Creek	Wet	>	1	1	1	1
		=	5	5	5	2
		<	1	1	1	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Donner Creek to Little Truckee River confluence	Wet	>	4	4	4	4
		=	2	2	2	0
		<	1	1	1	3
	Median	>	3	3	3	3
		=	0	0	0	0
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Little Truckee River to State line	Wet	>	7	7	7	6
		=	0	0	0	1
		<	0	0	0	0
	Median	>	6	6	6	5
		=	1	1	1	2
		<	0	0	0	0
	Dry	>	4	5	4	3
		=	1	1	1	2
		<	2	1	2	2
Trophy	Wet	>	4	5	5	4
		=	3	2	2	2
		<	0	0	0	1
	Median	>	3	3	3	3
		=	2	3	3	2
		<	2	1	1	2
	Dry	>	1	3	1	1
		=	3	3	3	3
		<	3	1	3	3
Mayberry, Oxbow, Spice	Wet	>	3	3	3	3
		=	2	2	2	2
		<	2	2	2	2
	Median	>	3	2	2	2
		=	0	1	1	1
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	1	1	1	1
		<	6	6	6	6

**Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Lockwood, Nixon	Wet	>	3	3	3	3
		=	0	0	0	0
		<	4	4	4	4
	Median	>	0	0	0	0
		=	1	1	1	1
		<	6	6	6	6
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

**Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Donner Creek: Donner Lake to Truckee River	Wet	>	4	6	5	4
		=	1	0	0	0
		<	2	1	2	3
	Median	>	1	1	1	1
		=	2	2	2	2
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Prosser Creek: Prosser Creek Reservoir to Truckee River	Wet	>	6	6	6	6
		=	0	0	0	1
		<	1	1	1	0
	Median	>	5	4	4	4
		=	0	1	1	2
		<	2	2	2	1
	Dry	>	0	0	0	0
		=	0	1	1	0
		<	7	6	6	7
Independence Creek: Independence Lake to Little Truckee River	Wet	> = <	Not applicable	Not applicable	Not applicable	Not applicable
	Median	> = <	Not applicable	Not applicable	Not applicable	Not applicable
	Dry	> = <	Not applicable	Not applicable	Not applicable	Not applicable

Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season – continued

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Little Truckee River: Independence Creek to Stampede Reservoir	Wet	>	4	4	4	4
		=	2	2	2	2
		<	1	1	1	1
	Median	>	3	3	3	3
		=	1	1	1	1
		<	3	3	3	3
	Dry	>	2	2	2	2
		=	1	1	1	1
		<	4	4	4	4
Little Truckee River: Stampede Reservoir to Boca Reservoir	Wet	>	3	3	3	2
		=	2	2	2	3
		<	2	2	2	2
	Median	>	0	0	0	0
		=	3	3	3	3
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Lake Tahoe to Donner Creek	Wet	>	0	0	0	1
		=	6	6	6	2
		<	1	1	1	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Donner Creek to Little Truckee River confluence	Wet	>	3	3	3	3
		=	3	3	3	1
		<	1	1	1	3
	Median	>	0	0	0	1
		=	3	3	3	2
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Little Truckee River to State line	Wet	>	4	4	4	4
		=	3	3	3	3
		<	0	0	0	0
	Median	>	3	3	3	3
		=	4	4	4	4
		<	0	0	0	0
	Dry	>	0	0	0	0
		=	5	5	5	5
		<	2	2	2	2

Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season – continued

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Trophy	Wet	>	6	5	5	5
		=	1	2	2	1
		<	0	0	0	1
	Median	>	3	3	3	3
		=	2	3	3	2
		<	2	1	1	2
	Dry	>	1	1	2	1
		=	2	2	2	2
		<	4	4	3	4
Mayberry, Oxbow, Spice	Wet	>	3	3	3	3
		=	2	2	2	1
		<	2	2	2	3
	Median	>	3	2	2	2
		=	0	1	1	1
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	1	0	0	0
		<	6	7	7	7
Lockwood, Nixon	Wet	>	1	1	1	1
		=	2	2	2	2
		<	4	4	4	4
	Median	>	0	0	0	0
		=	1	1	1	1
		<	6	6	6	6
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

Table 3.95—Rafting –
Number of months various flows occur in 7-month recreation season

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Lake Tahoe to Donner Creek	Wet	>	0	0	0	0
		=	6	6	6	3
		<	1	1	1	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

Table 3.95—Rafting –
Number of months various flows occur in 7-month recreation season – continued

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Donner Creek to Little Truckee River	Wet	> = <	3 0 4	3 0 4	3 0 4	3 0 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Little Truckee River to State line	Wet	> = <	3 1 3	3 0 4	3 0 4	3 0 4
	Median	> = <	1 1 5	1 1 5	1 1 5	1 1 5
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Trophy	Wet	> = <	0 3 4	0 3 4	0 3 4	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Mayberry, Oxbow, Spice	Wet	> = <	0 2 5	0 2 5	0 2 5	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Lockwood, Nixon	Wet	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.96—Kayaking –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Truckee River: Lake Tahoe to Donner Creek	Wet	>	0	0	0	0
		=	6	6	6	3
		<	1	1	1	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Donner Creek to Little Truckee River	Wet	>	3	3	3	3
		=	0	0	0	0
		<	4	4	4	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Little Truckee River to State line	Wet	>	3	3	3	3
		=	0	0	0	0
		<	4	4	4	4
	Median	>	0	0	0	0
		=	2	2	2	2
		<	5	5	5	5
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Trophy	Wet	>	0	0	0	0
		=	3	3	3	3
		<	4	4	4	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Mayberry, Oxbow, Spice	Wet	>	0	0	0	0
		=	2	2	2	3
		<	5	5	5	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

**Table 3.96—Kayaking –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Lockwood, Nixon	Wet	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Median	> = <	0 1 6	0 1 6	0 1 6	0 1 6
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

Flows for spin/lure/bait fishing are the same in the median and dry hydrologic conditions under No Action and current conditions. In wet hydrologic conditions, desired flows do not occur under No Action, compared to one month under current conditions. Because the majority of anglers are generalists who are engaged by other aspects of the overall recreation experience and for whom angling may be secondary to camping, there would be no effect.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River

Operations model results show the same flows for fly fishing under No Action and current conditions in wet and dry hydrologic conditions. In median hydrologic conditions, one month of desired flows occurs under No Action compared to no months under current conditions. The effect on fly fishing would be insignificant.

The same number of months with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under No Action and current conditions. In median and dry hydrologic conditions, one month with desired flows occurs under No Action compared to no months under current conditions. However, because of the relatively small numbers of fly anglers in this creek, the overall effect on spin/lure/bait fishing would be insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River

No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

Operations model results show the same flows for flying fishing under No Action and current conditions. In both wet and median hydrologic conditions, desired flows occur 2 months; less-than-desired flows occur more frequently than greater-than-desired flows, which could displace fly anglers to other streams and creeks offering with more suitable flows. However, an insignificant number of anglers likely would be displaced, because many would continue to pursue their sport during non-desired flows to enjoy other aspects of the experience, such as refining casting skills, enjoying solitude, and viewing scenic vistas.

Flows for spin/lure/bait fishing also are the same under current conditions and No Action: desired flows occur 2 months in wet hydrologic conditions, and 1 month in median hydrologic conditions. More spin/lure/bait anglers than fly anglers would be displaced by non-desired flows, which could result in crowding and increase use pressure on parking areas and sanitation facilities at locations with better fishing conditions.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show 1 more month with desired flows for fly fishing under No Action (total of 2 months) than under current conditions in both wet and median hydrologic conditions, and no desired flows in dry hydrologic conditions under either No Action or current conditions. In all hydrologic conditions, when flows are less than or greater than desired, fly anglers could be displaced to other streams and creeks offering with suitable flows. However, as in the Little Truckee River from Independence Creek to Stampede Reservoir, an insignificant number of anglers likely would be displaced, because many would continue to pursue their sport during non-desired flows to enjoy other aspects of the experience, such as refining casting skills, enjoying solitude, and viewing scenic vistas, which would be especially true in light of the abundance of open meadows that offer excellent terrain for casting and enjoying scenic vistas.

Flows for spin/lure/bait fishing are the same under No Action and current conditions: desired flows occur in 2 months in wet hydrologic conditions and in 3 months in median hydrologic conditions. Desired flows do not occur in dry hydrologic conditions. Consequently, spin/lure/bait anglers could be displaced to other locations with more suitable flows, which could result in crowding and excessive pressure on those areas.

(6) Truckee River: Lake Tahoe to Donner Creek

Operations model results show the same flows for fly fishing under No Action and current conditions: 5 months with desired flows in wet hydrologic conditions and less-than-desired flows throughout the recreation season in median and dry hydrologic conditions. These less-than-desired flows could diminish the fly fishing experience. However, because of the multiple-use nature of this reach of river and the numbers of recreationists, fly anglers here are, for the most part, not the highly skilled and dedicated practitioners of the sport. Therefore, fewer fly anglers would likely be displaced than in other, less popular, reaches.

Flows are the same for spin/lure/bait fishing under No Action and current conditions: 6 months with desired flows in wet hydrologic conditions and less-than-desired flows throughout the recreation season in median and dry hydrologic conditions.

Flows for rafting and kayaking are similar to those for fly and spin/lure/bait fishing: 6 months with desired flows in wet hydrologic conditions and no months with desired flows in median and dry hydrologic conditions under both No Action and current conditions. In general, flows are less than preferred, which could adversely affect commercial guided rafting companies, prompting them to shift operations to other areas with better flows or cease operations. Unguided rafting would be expected to continue regardless of flows.

(7) Truckee River: Donner Creek to Little Truckee River Confluence

Operations model results show that flows for fly fishing are the same under No Action and current conditions. Conditions would be the best in wet hydrologic conditions, with 2 months of desired flows, compared to no months with desired flows in median and dry hydrologic conditions. Because of the many fish in the river, together with favorable terrain, open banks for casting, and nice scenery, few anglers would likely move because they would continue to enjoy other aspects of the experience in this reach.

Flows for spin/lure/bait fishing are the same under No Action and current conditions, including 3 months with desired flows in wet and median hydrologic conditions, or almost half of the recreation season. Thus, few anglers would likely be displaced to other areas.

No desired flows for rafting and kayaking occur under either No Action or current conditions in any hydrologic condition, although operations model results show 3 months with greater-than-desired flows in wet hydrologic conditions under both No Action and current conditions. As result, several of the rapids could become Class III whitewater, which could cause more accidents and dangerous conditions for less practiced boaters. In median and dry hydrologic conditions, flows are less than preferred, thus making the river easier for novice and intermediate rafters and kayakers. More advanced boaters could be displaced to other areas with higher flows; however, this displacement could be offset by lower flows that could attract more beginning and intermediate users.

(8) Truckee River: Little Truckee River to State Line

Operations model results show that flows are the same for fly fishing under No Action and current conditions. Flows are consistently greater-than-desired in wet hydrologic conditions. Flows are also greater than desired in median hydrologic conditions, except for 1 month with desired flows. In dry hydrologic conditions, under No Action, 1 month fewer with less-than-desired flows occurs than under current conditions. Fly anglers could remain or find other places to fish with more favorable flows. However, minimal displacement would occur because most anglers are likely seeking other recreational attributes that complement the fishing experience, such as scenic viewing, picnicking, or camping, that would not be affected by high flows.

Spin/lure/bait anglers would fare much better than fly anglers in this reach of river. Again, operation model results show the same flows under both No Action and current conditions: desired flows occur 3 months in wet hydrologic conditions; 4 months in median hydrologic conditions, and 5 months in dry hydrologic conditions. Thus, overall, flows for spin/lure/bait anglers would be relatively favorable under either current conditions or No Action.

Flows for rafting differ between No Action and current conditions only in wet hydrologic conditions; under No Action 1 less month with desired flows occurs than under current conditions. In median and dry hydrologic conditions, flows are less than desired almost throughout the recreation season, which could adversely affect the recreation experience by lowering the skills required and making the experience more passive. Experienced rafters could look for more favorable flows elsewhere.

Flows for kayaking are the same under both No Action and current conditions. Flows in median hydrologic conditions are most favorable for kayaking, with 2 months with desired flows. Flows are either greater than desired or less than desired in wet hydrologic conditions and are consistently less than preferred in dry hydrologic conditions. The effect on kayaking would be the same as for rafting in this reach of river.

(9) Trophy

Operations model results show that in this reach, flows for fly fishing differ somewhat between No Action and current conditions: 1 less month with desired flows occurs under No Action than under current conditions in wet hydrologic conditions and 1 more month (total of 3 months) occurs in median hydrologic conditions. A total of 3 months with desired flows occur under both No Action and current conditions in dry hydrologic conditions. Less-than-desired river flows could displace a percentage of fly anglers.

For spin/lure/bait fishing, operations model results show the following: 1 more month with desired flows occurs under No Action than under current conditions in wet and median hydrologic conditions (total of 3 and 2 months, respectively) and 2 months with desired flows occur in dry hydrologic conditions under both No Action and current conditions. Less-than-desired flows would probably not displace as many spin/lure/bait anglers as fly anglers because of many deep pools that would retain sufficient water for spin/lure/bait angling despite less-than-desired flows.

Flows for both rafting and kayaking are the same under No Action and current conditions: 3 months with desired flows in wet hydrologic conditions and less-than-desired flows in median and dry hydrologic conditions. Less-than-desired flows could serve to displace commercial rafting/kayaking companies and advanced-to-expert enthusiasts who equate higher flows with the challenge and skill application essential to the quality of the experience.

(10) Mayberry, Oxbow, Spice

Operations model results show 1 month with desired flows for fly fishing in median hydrologic conditions under No Action compared to no desired flows under current conditions and no desired flows under either No Action or current conditions in wet and dry hydrologic conditions. However, because of the relatively few fly anglers, these flows would have an insignificant effect on the sport.

Desired flows for spin/lure/bait fishing occur 2 months in wet hydrologic conditions under both current conditions and No Action; however, less-than-desired flows occur under No Action, while greater-than-desired flows occur throughout the remainder of the recreation season under current conditions. In median hydrologic conditions, flows are either greater than preferred or less than preferred under current conditions, compared to 1 month with desired flows under No Action. In dry hydrologic conditions, no months with desired flows occur under No Action, compared to 1 month under current conditions. However, because most of the fishing in this reach of river is supplemented by stocked fish, flow levels are less important because stocked fish are easier to catch than wild fish and will more readily strike lures or bait under differing conditions. Therefore, success rates for spin/lure/bait anglers should be higher, regardless of flows.

Flows for rafting and kayaking are the same under No Action and current conditions: desired flows only occur in wet hydrologic conditions (2 months); flows are less than preferred for the rest of the season. Less-than-desired flows also occur throughout the recreation season in median and dry hydrologic conditions, which could have the same effects as discussed under “Trophy.”

(11) Lockwood, Nixon

Operations model results show that flows for fly fishing are the same under No Action and current conditions. Desired flows only occur in median hydrologic conditions and only in 1 month. Greater-than-desired flows only occur in wet hydrologic conditions, and less-than-desired flows occur the remainder of the time. These flows have minor significance, however, because of the relatively few fly anglers on this reach of river.

Likewise, flows for spin/lure/bait fishing are the same under No Action and current conditions. Desired flows only occur in wet (2 months) and median hydrologic conditions. Less-than-desired flow occur the remainder of the time. Again, these model results are of minor significance because of the relatively few spin/lure/bait anglers on this reach.

Flows for both rafting and kayaking are the same under No Action and current conditions.

b. LWSA

(1) Donner Creek: Donner Lake to Truckee River

Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

In wet hydrologic conditions, no desired flows for spin/lure/bait fishing occur under LWSA (or No Action) compared to 1 month under current conditions. Flows are the same in median and dry hydrologic conditions under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River
Operations model results show that flows for fly fishing are the same under LWSA, No Action and current conditions, and effects would be the same as under No Action. Desired flows for spin/lure/bait fishing are the same in wet hydrologic conditions under LWSA, No Action, and current conditions. In median and dry hydrologic conditions, 1 month with desired flows occurs under LWSA and No Action compared to no desired flows under current conditions. However, because of the relatively few spin/lure/bait anglers, the effect would be insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River
No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir
Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir
Operations model results show 1 more month with desired flows for fly fishing under LWSA and No Action than under current conditions in both wet and median hydrologic conditions and no desired flows in dry hydrologic conditions under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

Flows for spin/lure/bait fishing are the same under LWSA, No Action and current conditions, and effects would be the same as under No Action.

(6) Truckee River: Lake Tahoe to Donner Creek
Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for rafting and kayaking also are the same under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

(7) Truckee River: Donner Creek to Little Truckee River
Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action. Flows for kayaking and rafting also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

(8) Truckee River: Little Truckee River to State Line
Operations model results shows that flows for fly fishing are the same under LWSA, No Action, and current conditions in wet and median hydrologic conditions. In dry hydrologic conditions, 4 months with greater-than-desired flows occur under LWSA and current conditions compared to 5 months under No Action.

Flows for spin/lure/bait fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows and the subsequent effects on rafting under LWSA are the same as under No Action. Flows for kayaking are the same as under No Action and current conditions, and effects would be the same as under No Action.

(9) Trophy
Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action, and effects would be the same as under No Action.

(10) Mayberry, Oxbow, Spice
Flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action, and effects would be the same as under No Action.

(11) Lockwood, Nixon
Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action and current conditions, and effects would be the same as under No Action.

c. TROA

(1) Donner Creek: Donner Lake to Truckee River
Operations model results show that flows for fly fishing are similar under TROA, No Action, and current conditions and effects would be the same as under No Action.

Flows for spin/lure/bait fishing under LWSA are the same as under No Action, and effects would be the same as under No Action.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River
Operations model results show 1 month with desired flows in wet hydrologic conditions under TROA compared to no desired flows under either No Action or current conditions, and 2 months with desired flows in median hydrologic conditions, compared to 1 month under No Action and no desired flows under current conditions. Flows in dry hydrologic conditions are the same under TROA, No Action, and current conditions. Overall, effects would be the same as under No Action.

One month with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under TROA, compared to no desired flows under either No Action or current conditions. In median hydrologic conditions, 2 months with desired flows occur under TROA, compared to 1 month under No Action and no desired flows under current conditions. As a result, flows for spin/lure/bait fishing in this reach are best under TROA. However, because of the relatively few fly anglers, this difference between the alternatives and current conditions is relatively insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River
No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir
Operations model results show that flows for fly fishing and spin/lure/bait fishing also are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir
Operations model results show 2 more months with desired flows for fly fishing under TROA (total of 4 months) than under No Action and 3 more months than under current conditions in both wet and median hydrologic conditions. No desired flows occur in dry hydrologic conditions under TROA, No Action, or current conditions. In both wet and median hydrologic conditions, conditions under TROA would be more favorable for fly anglers.

One more month with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under TROA (total of 3 months) than under No Action or current conditions. Flows in median and dry hydrologic conditions are the same under TROA as under No Action and current conditions. Overall, effects would be the same as under No Action.

(6) Truckee River: Lake Tahoe to Donner Creek
Operations model results show that flows for fly fishing are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action. Flows for spin/lure/bait fishing vary only in wet hydrologic conditions under

TROA, No Action, or current conditions, when 4 fewer months of desired flows (total of 2 months) occur under TROA than under No Action or current conditions. Effects would be the same as under No Action.

Three fewer months with desired flows for rafting and kayaking occur under TROA than under No Action or current conditions (total of 6 months each). Desired flows are the same in both median and dry hydrologic conditions under TROA, No Action, and current conditions. Effects would be the same as under No Action.

(7) Truckee River: Donner Creek to Little Truckee River

Operations model results show several minor differences in flows for fly fishing under TROA, No Action, and current conditions in wet and median hydrologic conditions. In wet hydrologic conditions, no desired flows occur under TROA, compared to 2 months under both No Action and current conditions. Flows are consistently less than preferred under TROA. In median and dry hydrologic conditions, no desired flows occur under TROA, No Action, or current conditions. Overall, effects would be the same as under No Action.

For spin/lure/bait fishing, 3 fewer months with desired flows occur (total of 1 month) in wet hydrologic hydrologic conditions and 1 less month with desired flows (total of 2 months) occurs in median hydrologic conditions under TROA than either current conditions or No Action. Flows are less than preferred throughout the recreation season under TROA, No Action, and current conditions. Overall effects would be the same as under No Action.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(8) Truckee River: Little Truckee River to State Line

Operations model results show that flows for fly fishing differ under TROA, No Action, and current conditions. In wet and median hydrologic conditions, 1 month of desired flows occurs under TROA compared to no desired flows under either No Action or current conditions. In dry hydrologic conditions, 2 months with desired flows occurs under TROA compared to 1 month under No Action and current conditions. Flows that are not preferred range tend to be greater-than-desired flows. Effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

Flows for rafting vary under TROA, No Action, and current conditions in wet and median hydrologic conditions. In wet hydrologic conditions, no desired flow occurs under TROA and No Action compared to 1 month under current conditions. In median hydrologic conditions, 2 months with desired flows occur under TROA, compared to

1 month under both No Action and current conditions. Effects generally would be the same as under No Action, except that flows could be more favorable under TROA in median hydrologic conditions.

Flows for kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(9) Trophy

Operations model results show that flows for fly fishing vary somewhat under TROA, No Action, and current conditions. In wet hydrologic conditions, under TROA, 1 fewer month with desired flows occurs than under No Action and 2 fewer months occur than under current conditions. In median hydrologic conditions, 1 fewer month with desired flows occurs under TROA and current conditions (total of 3 months) than under No Action. Three months with desired flows occur in dry hydrologic conditions under TROA, No Action, and current conditions. Two more months with less-than-desired flows occur under TROA and current conditions than under No Action. Overall, flows would be less preferable fly anglers in this reach under TROA than under No Action and current conditions, which could serve to displace a percentage of fly anglers.

Flows for spin/lure/bait fishing also vary under TROA, No Action, and current conditions. In wet and median hydrologic conditions, 1 fewer month with desired flows occurs under TROA and current conditions than under No Action. In dry hydrologic conditions, 2 months with desired flows occur under TROA, No Action, and current conditions. When flows are less than preferable, spin/lure/bait anglers could voluntarily seek out other streams and reaches of the river with more favorable flows, acting to concentrate anglers in those locations. This concentration could result in overuse of parking areas, facilities, and access points. Less-than-desired flows probably would not displace as many spin/lure/bait anglers as fly anglers because of the presence of many deep pools that would retain sufficient water for spin/lure/bait angling despite less-than-desired flows.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(10) Mayberry, Oxbow, Spice

Operations model results show one more month with desired flows (total of 1 month) for fly fishing in median hydrologic conditions under both TROA and No Action. In wet and dry hydrologic conditions, no desired flows occur under TROA, No Action, or current conditions. However, because of the relatively few fly anglers, greater-than-desired flows (wet hydrologic conditions) and less-than-desired flows would have an insignificant affect.

Flows for spin/lure/bait fishing vary somewhat in wet hydrologic conditions, with 1 fewer month (total of 1 month) with desired flows under TROA than under No Action and current conditions. No desired flows occur in median hydrologic conditions, no desired flows occur under TROA, No Action, or current conditions. In dry hydrologic conditions, no desired flows occur under current conditions compared to 1 month under current conditions. Effects would be the same as under No Action.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, except that 3 months with desired flows occurs in wet hydrologic conditions under TROA compared to 2 months under No Action and current conditions. Effects would be the same as under No Action.

(11) Lockwood, Nixon

Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

5. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. As river conditions change, though, some users would move to areas with more desirable flows for their activity; however, these users could be replaced by other users who may find the new flows more conducive for their type of recreation activity.

ECONOMIC ENVIRONMENT

I. Affected Environment

This section provides an overview of the current economic environment of the study area and a description of aspects of the regional economy that could be affected by modifying operations of Truckee River reservoirs and changing the allocation of water use.

A. Current Economic Environment

1. California

The California portion of the study area includes the eastern parts of El Dorado, Nevada, and Placer Counties and the southeastern part of Sierra County. Population centers include South Lake Tahoe (El Dorado), Truckee (Nevada), and Tahoe City (Placer). The economies of the western parts (outside the study area) and eastern parts (inside the study area) of these counties vary greatly. Most of the population (88 percent) resides and is employed in the western parts of the counties, primarily because of the influence of metropolitan Sacramento and the presence of large manufacturing, service, and agricultural sectors. The remaining 12 percent resides within the study area.

The Lake Tahoe tourist industry is an important contributor to the economy of eastern El Dorado and Placer Counties, which contain the western portion of the lake. Approximately 78 percent of the total employment in the California portion of the study area is located in the eastern side of these two counties. The industry includes lake-based recreation in the summer and skiing and snowmobiling in the winter, which generate employment and income in the retail trade and service sectors of the economy. Some residents of these counties are also employed by the hotel, gaming, and recreation industry on the Nevada side of South Lake Tahoe.

In Nevada County, tourism, skiing, and recreation on Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs and along the Truckee River generate income and employment in the retail trade and service sectors. In the Truckee-Donner area, important economic sectors are retail trade, services, real estate, and construction.

Most of Sierra County is rural and contains Tahoe and Toiyabe National Forests. The government sector employs about 40 percent of workers in the entire county, mostly in State and local government. Logging and sawmill operations and recreational activities also generate some employment and income.

2. Nevada

The Nevada portion of the study area includes parts of Douglas, Lyon, Washoe and Churchill Counties. Population centers include Fernley (Lyon) and Reno-Sparks, Wadsworth, Nixon, and Sutcliffe (Washoe). Fallon is located in Churchill County in the lower Carson River basin.

The hotel, gaming, and recreation industry is also important to the economies of the Nevada counties within the study area. Agriculture, government, and construction and mining also contribute to the economy.

In Douglas County, which contains the southeast portion of Lake Tahoe, approximately 50 percent of employment and earnings are derived from the service sector. Within the service sector, more than 50 percent of the employment is in the hotel, gaming, and recreation industry.

The economy of Lyon County is based mostly on manufacturing, services, and agriculture. The county is noted for its alfalfa and beef cattle production. The northwestern part of the county, Fernley, and a portion of the Truckee Division of the Newlands Project is in the study area. Fernley has been growing in the past decade due to its proximity to Truckee Meadows.

Washoe County, which contains the northeast portion of Lake Tahoe, Pyramid Lake, and the rapidly growing Truckee Meadows, is the most populous and economically diverse county in the study area. This county's economy has expanded over the past 20 years, because of growth in the hotel and casino industry, warehousing, and manufacturing. A majority of the study area's employment (84 percent) occurs in Truckee Meadows. Important economic sectors are service, manufacturing, retail trade, and government. Expenditures related to the recreational activities at Pyramid Lake also contribute to local economy. There are irrigated lands within Truckee Meadows.

Churchill County is located east of Storey and Lyon Counties. In the past, agriculture and mining were the dominant economic sectors in the county (MacDiarmid, et. al, 1994). In the past decade, however, the county's economic structure has become more diversified and is now mostly based on services, government, trade, manufacturing, and agriculture (Darden, et. al, 2003). NASF is a major source of employment and income. An estimated 2,900 county residents are employed directly or indirectly by service sector employment attributed to the presence of NASF (Churchill County Economic Development Authority, 2003). In the Fallon area, there are plans for development of industrial/business park to accommodate new businesses locating in the area. The area is also attracting retirees.

Churchill County includes most of the Newlands Project's Truckee Division and all of the Carson Division. The project generates most of the agricultural production in

Churchill County. The Truckee River provides a portion of the project's irrigated water supply via the Truckee Canal. Alfalfa and livestock are primary agricultural commodities produced in the area.

From 1987 to 1997, irrigated acreage in Churchill County declined by approximately 24 percent. During the drought years from 1990 to 1994, alfalfa hay acreage did not significantly change but crop yield did decline by about 25 percent in 1992. From 1997 to 2002, irrigated acreage increased slightly (about 4 percent). Thus, overall, from 1987 to 2002, irrigated acreage declined by 20 percent (1997 and 2002 Census of Agriculture, Nevada). The decline is most probably due to changing agricultural markets and the increasing demand for non-agricultural water in the area. In the future, water right purchases under the Truckee River Water Quality Settlement Agreement, Nevada State AB 380 program, Water Rights Acquisition Program for Lahontan Valley wetlands, and by private developers will continue the trend of declining agricultural water rights and irrigated agriculture in Churchill County.

B. Employment and Total Income

Table 3.97 presents employment and total income for those parts of the counties within the study area. Data were derived from baseline data collected for the regional economic model. Employment and income associated with recreation expenditures under current conditions, No Action, LWSA, and TROA are discussed under "Recreation Expenditures."

Employment is based on the number of full- and part-time jobs within the study area. Total income is defined as personal income, which is based on wages, salaries, other income, dividends, interest, rent, and government transfer payments.

1. California

Major employment sectors (more than 10 percent of total employment) in the California portion of the study area are construction (13 percent); wholesale and retail trade (19 percent); finance, insurance, and real estate (10 percent); and services (20 percent). El Dorado County reported the most full- and part-time nonagricultural jobs (12,097), followed by Placer County (6,792), Nevada County (4,775), and Sierra County (150). The estimated total income in 2002 for those portions of the California counties within the study area was approximately $576 million.

2. Nevada

Major employment sectors in the Nevada portion of the study area are hotels, gaming, and recreation (14 percent); services (21 percent); wholesale and retail trade (16 percent); and State and local government (10 percent). Agriculture, construction, manufacturing, and mining also contribute to the economy. Washoe County reported the most full- and part-time nonagricultural jobs (238,577), followed by Churchill County (11,533), and

Table 3.97—Employment and income in the study area, 2002

	Total income (million $)	Total employment (full- and part-time jobs)
Portions of California counties		
El Dorado	272.3	12,097
Nevada	117.0	4,775
Placer	183.0	6,792
Sierra	3.9	150
California total	$ 576.2	23,814
Nevada counties		
Douglas	$221.5	3,754
Churchill	$662.0	11,533
Lyon	$870.3	13,825
Washoe	$13,420.2	238,577
Nevada total	$15,174.	267,689
Total	$15,750.2	291,503

[1] Only those portions of the California counties and Douglas County, Nevada, within the study area are included in this analysis.
Sources: University of Nevada, Reno, Technical Reports UCED2005/06-07 and 98/99-04; U.S. Department of Commerce, "Regional Economic Information System," Washington D.C., 2002.

Lyon County (13,825) of which Fernley's employment is approximately 3,200 jobs and Douglas County (3,754). In 2002, estimated total income for those portions of the Nevada counties within the study area was $15,174 million.

C. Agricultural and M&I Water Use

Current agricultural and M&I water use in the study area are discussed in "Water Resources." In the future, TMWA is expected to continue to acquire agricultural water rights in Truckee Meadows to meet increased M&I demands.

Most agricultural production within the study area occurs in Churchill County, followed by Washoe County and the small portion in Lyon County. The Newlands Project is located in Churchill County; it primarily produces alfalfa, other hay, irrigated pasture, cereal/grains, livestock, and dairy products.

Current agricultural water rights are about 28,283 acre-feet per year in Truckee Meadows and about 13,885 acre feet per year in the Truckee Division. For Truckee Meadows, most of these rights are in small acreage and, if the water is used, it is mostly for pasture in livestock production. The primary crops grown in the study area are alfalfa hay, other hay and pasture. Livestock and dairy production also occur in the area. Total gross agricultural output is approximately $133 million. Total employment and personal income, based on 2002 data for the agricultural sector, are approximately 1,109 jobs and $16 million, respectively. As of 2002, TMWA had dedicated 57,170 acre-feet of agricultural water rights for future M&I use. M&I demand in Truckee Meadows is 83,140 acre-feet per year.

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect the study area economy by: (1) changing lake and reservoir storage, (2) changing the quality, quantity, timing, and duration of flows (3) reducing hydroelectric power generation along the Truckee River and (4) affecting groundwater usage in the Truckee Meadows area.

Changes in reservoir storage could affect recreation visitation and, thus, affect recreation expenditures. The change in recreation expenditures could “ripple through” the economy, resulting in changes to recreation-related employment and income. Reducing hydroelectric power generation from plants along the river could affect associated revenues. The hydroelectric power generation along the river is classified as “nonfirm baseload power,” which is low cost to produce but is not a reliable source because of the variability of Truckee River flows.

Allowing for different storage amounts of M&I and agricultural water in the Truckee River basin could also affect the study area economy. Future water demand in urban areas will require the purchase of agricultural water rights and storage to be used for M&I purposes. TROA would provide the flexibility to store and release water for these two uses in the upper basin reservoirs. This flexibility in storage would allow for reallocation of water from agriculture to M&I water use. The trend of declining agricultural water use to greater M&I water use in the study area should result in further changes in the agriculture economic sector, as well as those economic sectors that are supported by M&I water.

This analysis evaluated the effects of changes in lake and reservoir storage, changes in flows, changes in hydroelectric power revenue, and changes in water use on the study area economy using the following indicators:

- Employment and income affected by recreation visitation
- Employment and income affected by changes in water use
- Hydroelectric power generation and revenues
- Groundwater pumping costs

B. Summary of Effects

Table 3.98 summarizes current conditions and the effects of the alternatives on the study area economy. While the population in Truckee Meadows will most probably grow, as will the recreation demand within the study area, that growth and associated recreation demand would be the same under all alternatives. For the purposes of the EIS/EIR, it is important to estimate only that recreation visitation that would be linked to modifying operations of the reservoirs and streamflows and the associated expenditures.

1. Recreation-Related Employment and Income

Economic model results show that recreation-based employment and income are about the same under the alternatives as under current conditions (differences of less than 1 percent). Such small differences would not significantly affect the regional economy.

2. Employment and Income Affected by Changes in Water Use

Two analyses were conducted to show the effects of (1) meeting the M&I water demand in Truckee Meadows in 2033 and (2) transferring agricultural water rights in Truckee Meadows and the Truckee Division of the Newlands Project to M&I use.

For the first analysis, the economic model calculated the amount of employment and income that could be supported by the increase (approximately 36,000 acre-feet) in M&I water supplies from current conditions to meet the future M&I demand of 119,000 acre-feet in Truckee Meadows under No Action, LWSA, and TROA. Model results show the same amount of employment and income would be associated with that future demand under the alternatives.

For the second analysis, the economic model calculated the effects of transferring agricultural water rights on employment and income. Economic model results show slightly (less than 1 percent) less employment and income in the study area under No Action, LWSA, and TROA than under current conditions. The economic model also shows slightly less employment and income under TROA than under No Action; the overall effect on the regional economy would be less than 1 percent.

3. Hydroelectric Power Generation and Revenues

Analysis of operations model results shows that, under TROA, both hydroelectric power generation and gross revenues for Truckee River run-of-the-river hydroelectric powerplants are about .4 percent less than under No Action and .5 percent less than under current conditions in wet hydrologic conditions; about 3 percent less than under No Action and current conditions in median hydrologic conditions; and about 3 percent greater than under No Action and 4.6 percent greater under current conditions in dry hydrologic conditions. Any reduction in gross revenue would require compensation, as provided in section 7.A.6 of the Negotiated Agreement.

Table 3.98—Summary of effects on economic environment

Indicator	Current conditions	No Action	LWSA	TROA
Recreation-based employment and income	Baseline (California) Employment: 23,814 jobs Income: $576 million	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Employment and income affected by changes in water supply	Baseline (Nevada) Employment: 267,689 jobs Income: $15.2 billion	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Hydroelectric power generation and revenues: run-of-the-river	Wet hydrologic conditions: 67,829 MWh; $3.20 million	Wet hydrologic conditions: same as under current conditions	Wet hydrologic conditions: same as under No Action and current conditions	Wet hydrologic conditions: .4 percent less than under No Action; .5 percent less than under current conditions
	Median hydrologic conditions: 65,910 MWh; $3.11 million	Median hydrologic conditions: same as under current conditions	Median hydrologic conditions: approximately the same as under No Action and current conditions	Median hydrologic conditions: 3.1 percent less than under No Action; 3.1 percent less than under current conditions
	Dry hydrologic conditions: 45,985 MWh; $2.17 million	Dry hydrologic conditions: 1.8 percent greater than under current conditions	Dry hydrologic conditions: about the same as under No Action; 1.5 percent greater than under current conditions	Dry hydrologic conditions: 2.8 percent greater than under No Action; 4.6 percent greater than under current conditions
Hydroelectric power generation and revenues: Lahontan Dam	Wet hydrologic conditions: 26,837 MWh; $1.27 million	Wet hydrologic conditions: about 3 percent less than under current conditions	Wet hydrologic conditions: about the same as under No Action; about 3 percent less than under current conditions	Wet hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Median hydrologic conditions: 22,866 MWh; $1.08 million	Median hydrologic conditions: about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Dry hydrologic conditions: 21,520 MWh $1.02 million	Dry hydrologic conditions: about 3 percent less than under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
Total annual groundwater development costs	$1,520,395	$3,348,102 or 120 percent greater than under current conditions	40 percent greater than under No Action; $4,696,483 or 200 percent greater than under current conditions	36 percent less than under No Action; $2,151,982 or 42 percent greater than under current conditions

For Lahontan Dam hydroelectric powerplants, both generation and gross revenues under TROA are about the same as under No Action in all hydrologic conditions and about 3 percent less than under current conditions in all hydrologic conditions.

4. Groundwater Pumping Costs

On the basis of information provided by TMWA, groundwater usage to meet future M&I water demand would vary under current conditions, No Action, LWSA, and TROA. Groundwater production and recharge has associated capital, operation, and maintenance costs. Based on a comparison of the annual groundwater costs for each of the alternatives, the least cost alternative is TROA ($2.15 million), followed by No Action ($3.48 million), and LWSA ($4.70 million); all are more costly than current conditions ($1.52 million). Under No Action and LWSA, the higher annual costs are due to greater groundwater pumping. Groundwater pumping not only would be greater under LWSA than under current conditions and TROA, but because of groundwater recharge provisions for this alternative, it has greater future capital investments.

C. Recreation-Related Employment and Income

1. Method of Analysis

To analyze the effects on employment and income associated with recreation visitation, this analysis used two models: the recreation model and the regional (multi-county) input-output (I-O) model (economic model).

The recreation model first calculated recreation visitation associated with Truckee River flows and reservoir storage at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in wet, median, and dry hydrologic conditions (10-, 50-, and 90-percent exceedences). River flows and storage were generated from the operations model. Next, the recreation model calculated recreation expenditures in the study area associated with recreation visitation. Then, the economic model estimated the employment associated with the recreation expenditures. Once total employment associated with recreation expenditures was estimated, the economic model calculated the income generated by the estimated employment.

The analysis considered the effects on those portions of El Dorado, Nevada, Placer, and Sierra Counties in California and those portions of Churchill, Lyon, and Washoe Counties in Nevada within the study area.

For Lahontan Reservoir, a separate economic analysis was conducted based on the recreation analysis. (See “Recreation.”) No significant regional economic impacts were identified by the recreation analysis.

a. Economic Model

Reclamation and the Center for Economic Development at University of Nevada, Reno developed the regional I-O model.

I-O models are used to estimate changes in employment and income brought on by changes in “outputs” or final demand. I-O analysis is based on the interdependence of production and consumption sectors in a regional area. Industries must purchase “inputs” from other industries, as well as primary inputs (e.g., water) to produce outputs that are sold either to other industries or to final consumers. Thus, a set of I-O accounts can be thought of as a "picture" of a study area’s economic structure. Flows of industrial inputs can be traced via the I-O accounts to show linkages between the industries composing the regional economy. The accounts are also transformed into a set of simultaneous equations that permit the estimation of economic effects (e.g., changes in employment and income) resulting from changes in resources (e.g., water) and management activities.

For this study, the economic model was used to estimate the economic effects resulting from changes in the resource of water, i.e., Truckee River flows and storage in Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs.

Using data collected from a 1999 recreation survey (see “Recreation Model”) the recreation model established a relationship between river flows and lake and reservoir storage (generated from the operations model) and recreation visitation. Changes in storage and river flows resulted in changes in recreation visitation. Changes in recreation visitation resulted in changes in recreation expenditures, which trickled through the regional economy, affecting intermediate industry purchases and final demand. The economic model then calculated the resulting changes in recreation-based employment and income in the study area.

Economic impact analysis is not an exact science. I-O methodology, as well as other methods, serves more as a broad indicator of changes to a regional economy due to changes in output and activities. For this study, the economic model was used as a tool to help identify the differences between the alternatives and current conditions and between the action alternatives and No Action.

b. Recreation Model

A recreation model was developed to provide input to the economic model and to calculate recreation visitation associated with Truckee River flows and Donner Lake and Prosser Creek, Boca, and Stampede Reservoir storage.

To develop recreation visitation data, more than 500 visitors along the Truckee River and at these reservoirs were surveyed during the 1999 recreation season. Day use visitors and campers were asked when they visited and how many visits they would make at different flow and storage levels. Visitors also were asked about their expenditures in the study area. (Recreation preferences concerning Lake Tahoe elevations were not collected because operations under the proposed action would not result in a measurable change in surface acreage. The Lake Tahoe economy [retail trade, eating and drinking, lodging, services, etc.] is accounted for in the economic impact function of the economic model.)

Using the survey data, the recreation model developed a mathematical relationship between river flows (generated from the operations model) and river-related recreation.

The survey also collected recreation visitor expenditure data at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs. Expenditures related to second homeowners from later research were also included in the data. These recreation expenditures, which are made in the regional economy, include such items as licenses, camping fees, hotels or motels, restaurants, groceries, equipment and supplies, rental charges, and fuel. Expenditure data were used to develop expenditure equations for camping and day use visitation. The expenditure equations were applied to the monthly camping and day use visitation estimates to calculate the monthly expenditure estimates based on lake and reservoir storage. These monthly expenditures were summed to a total annual recreation expenditure, which is defined as a direct impact on the regional economy.

To estimate the indirect and induced economic impacts, the direct impact (total annual recreation expenditure) calculated from the recreation model was linked to the economic model by allocating this annual expenditure into economic sectors, such as wholesale and retail trade, eating, drinking, and lodging. The direct impacts "flow though" these economic sectors, resulting in associated purchases of goods and services, which are defined as indirect impacts. The associated purchases of goods and services in the regional area, in turn, cause additional purchases of goods and services brought on by salaries and profits, which are defined as induced impacts. The total impact is the summation of the direct, indirect, and induced impacts brought on by recreation visitation at the lake and reservoirs included in this analysis.

For more information on the economic and recreation models, see the Economics and Recreation Appendix.

2. Threshold of Significance

Establishing a threshold of significance when conducting a regional economic impact analysis is difficult because effects depend on the size and types of employment and income from which effects can be measured (i.e., baseline). For recreation-related regional impact analysis, the baseline employment and income is the California portion the study area which is 23,800 jobs baseline and $576 million. It is reasonable to assume that a difference of 1 percent or less from the baseline employment and income under the alternatives is not significant. Thus, a difference of more than 1 percent from the baseline was considered significant.

3. Model Results

Table 3.99 presents annual recreation visitation and associated annual recreation expenditures at Donner Lake and Prosser Creek, Stampede, Boca Reservoirs, and along the river under current conditions and No Action, LWSA, and TROA in wet, median, and dry hydrologic conditions. These visitation and expenditure estimates are based on results from the operations and recreation models. Annual recreation visitation at the reservoirs and along the river covers the recreation activity during all 12 months of the year. Therefore, recreation visitation shown in this section is greater than that shown for the 7 prime recreation months in the "Recreation" section. The annual recreation

Table 3.99—Recreation visitation and expenditures

Location	Current conditions			No Action			LWSA			TROA		
	Wet	Median	Dry	Wet	Median	Dry	Wet	Median	Dry	Wet	Median	Dry
Annual recreation visitation												
Donner Lake	134,151	130,046	104,888	134,168	123,194	104,893	134,168	124,684	104,893	134,089	124,684	104,664
Prosser Creek Reservoir	21,531	19,435	9,220	21,574	19,840	11,233	21,574	20,592	11,327	21,487	20,592	15,321
Stampede Reservoir	73,779	71,335	16,156	73,795	71,015	16,373	73,795	73,504	16,358	73,810	73,256	40,997
Boca Reservoir	31,383	25,769	9,303	31,383	25,608	9,166	31,383	25,766	9,150	31,346	27,097	11,482
River recreation	77,571	114,940	123,123	78,775	126,333	123,265	78,781	126,310	123,184	89,984	127,630	117,989
Total annual visitation	338,415	361,525	262,690	339,695	365,990	264,930	339,701	370,856	264,912	350,716	373,259	290,453
Recreation expenditures ($)												
Donner Lake	8,040,428	7,794,388	6,286,543	8,041,462	7,383,714	6,286,851	8,041,462	7,473,036	6,286,851	8,036,756	7,473,036	6,273,111
Prosser Creek Reservoir	860,938	777,126	368,675	862,649	793,345	449,163	862,666	837,801	452,922	859,193	837,810	612,630
Stampede Reservoir	4,018,096	3,884,979	879,884	4,018,919	3,867,550	891,677	4,018,920	4,003,097	890,876	4,019,772	4,004,284	2,232,719
Boca Reservoir	1,132,770	930,140	335,675	1,132,770	924,336	330,837	1,132,770	930,030	330,286	1,131,446	978,071	414,442
River recreation	2,450,936	3,593,242	3,728,186	2,482,302	3,978,383	3,747,153	2,482,441	3,978,347	3,744,323	2,886,708	4,046,068	3,589,899
Total annual expenditures	16,503,168	16,979,875	11,598,963	16,538,102	16,947,328	11,705,681	16,538,259	17,222,311	11,705,258	16,933,875	17,339,269	13,122,801
Regional economic impacts												
Employment: Jobs	194	204	158	195	204	159	195	206	159	200	208	168
Income (millions $)	2.84	2.97	2.24	2.84	2.96	2.26	2.85	3.00	2.26	2.92	3.03	2.41
Compared to current conditions												
Difference: Jobs				+1	0	+1	+1	+2	+1	+6	+4	+10
Difference: Income (million $)				>+.01	-$.01	+$0.02	+$.01	+$.03	+$.02	+$.08	+$.06	+$.17
Compared to No Action												
Difference: Jobs							0	+2	0	+5	+4	+9
Difference: Income (million $)							+$.01	+$.04	0	+$.08	+$.07	+$.15

expenditures presented in table 3.99 were used to calculate recreation-related employment and income in the study area under current conditions and the alternative.

As shown in the "Recreation" section, changes in recreation visitation at Lahontan Reservoir would not be significant; therefore regional economic impacts also would not be significant.

Most of the direct recreation expenditures and, thus, most of the economic effects would occur in the Truckee River basin in California. Based on the total employment (23,800 jobs) for the California portion of the basin (table 3.99), the recreation-related economic impacts for all of the alternatives on employment are about 1 percent of the total employment in the upper basin of the study area. The income impacts are less than 1 percent of the total income for that portion of the study area.

4. Evaluation of Effects

a. No Action

Recreation model results show that annual recreation visitation and recreation expenditures are nearly the same under No Action and current conditions in wet, median, and dry hydrologic conditions.

At Donner Lake, estimated recreation visitation and expenditures are about the same in wet and dry hydrologic conditions. Visitation and expenditures are about 5 percent less in median conditions than under current conditions, which is made up by greater visitation and expenditures at other reservoirs and along the river corridor.

Under No Action, reservoir storage and streamflows at most sites (Water Resources Appendix) are slightly less than under current conditions during the summer recreation season. However, these differences are so slight that, under No Action, associated recreation visitation and recreation expenditures and, hence, associated employment and income, are essentially the same as under current conditions. The economic effects on regional employment and income are 1 percent or less and, therefore, not considered significant.

b. LWSA

Recreation visitation and expenditures under LWSA are about the same as under No Action in wet and dry hydrologic conditions and slightly (1.4 percent) greater in median hydrologic conditions. Overall, they are slightly (0.30-2.7 percent) greater in all three hydrologic conditions than under current conditions.

At Donner Lake, visitation and expenditures under LWSA are about same in wet and dry hydrologic conditions as under No Action or current conditions. In median hydrologic conditions, visitation and expenditure under LWSA are somewhat greater (1.2 percent) than under No Action and about 4 percent less than under current conditions. The effects of less visitation would be the same as under No Action.

Economic impact model results shows that, under LWSA, the slightly greater visitation and expenditures at most sites results in only slightly greater (less than 1 percent) or no change in employment and income compared to No Action or current conditions in wet, median, and dry hydrologic conditions.

c. TROA

Visitation and expenditures in wet and median hydrologic conditions under TROA are slightly greater (2-3.6 percent) than under No Action or current conditions. In dry hydrologic conditions, visitation and expenditures are 6 to 10 percent greater than under No Action or current conditions.

At Donner Lake, visitation and expenditures under TROA are slightly less (less than 1 percent) in wet and dry hydrologic conditions than under No Action or current conditions; they are slightly better (1.2 percent) in median hydrologic conditions than under No Action and about 4 percent less than under current conditions. Again, the slightly less recreation visitation and expenditures in median hydrologic conditions is made up by increases in other reservoirs and along the river corridor.

Under TROA, economic model results show 2-3 percent more recreation-related employment and income in wet and median hydrologic conditions than under current conditions or No Action. In dry hydrologic conditions, results show that employment and income under TROA are about 6 percent greater than under No Action or current conditions, equating to about 9 more jobs and $0.16 million in income. The effect would still not be significant when compared to the baseline regional employment and income or to the California portion of the regional baseline.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

D. Employment and Income Affected by Changes in Water Use

1. Method of Analysis

Two analyses were conducted to show the effects of (1) meeting the M&I water demand in Truckee Meadows in 2033 and (2) acquiring agricultural water rights in Truckee Meadows and the Truckee Division of the Newlands Project and transferring these rights to M&I use. (A negligible amount of water rights would be transferred in the Carson Division.) An underlying assumption was that TROA would provide greater flexibility to meet future water demand in Truckee Meadows by allowing more M&I water to be stored in the upper basin reservoirs.

For the first analysis, the economic model calculated the amount of employment and income that could be supported by the increase (approximately 36,000 acre feet) in M&I water supplies from current conditions to meet the M&I demand of 119,000 acre-feet in Truckee Meadows under No Action, LWSA, and TROA (i.e., in 2033).

To meet the future 119,000 acre-foot annual water demand, TMWA will need to augment its M&I water supplies. The M&I water supply will consist of numerous water sources, including purchased agricultural water rights. The market price for water rights is expected to increase in the future because of demand for a finite resource, i.e., surface water rights in the Truckee Meadows area, with diminishing availability. The increase in price or costs to obtain these water rights is not included in this analysis because of the difficulty of predicting these future costs. It is recognized that the future increase in the price for water rights is a cost which the water right purchaser and, ultimately, the final water user will incur. It is difficult to predict how these future costs could affect the regional economy at this time. The potential effect on the regional economy will depend on the amount of the cost increases and how these increases will be distributed in the regional economy.

The impact area for this analysis encompassed the Truckee River basin, but effects would be concentrated in Truckee Meadows and Fernley.

2. Threshold of Significance

As for the indicator of recreation-related employment and income, it is reasonable to assume that a difference of 1 percent or less from the baseline regional employment of 267,689 and baseline regional income of $15,174 million under the alternatives is not significant. Thus, a difference of more than 1 percent from the baseline indicators was considered significant.

3. Model Results

Table 3.100 presents the changes in water use under current conditions and the alternatives and the effects on employment and personal income. Results are derived from the operations and economic models.

4. Evaluation of Effects

a. No Action

(1) M&I Water Supplies

To meet the projected annual M&I demand of 119,000 acre-feet in Truckee Meadows, TMWA plans to continue to exercise its existing water rights and expand its conservation and water acquisition programs.

M&I water supplies in Truckee Meadows are expected to increase in the future, from approximately 83,140 acre-feet under current conditions to 119,000 acre-feet under

Table 3.100—Employment and income affected by changes in water use

M&I water supply				
	Current conditions	**No Action**	**LWSA**	**TROA**
M&I water supply (Truckee Meadows) (acre-feet)	83,140	119,000	119,000	119,000
Change in M&I water supply compared to current conditions (acre-feet)		+35,860	+35,860	+35,860
Economic indicators supported by change in M&I water supply (compared to current conditions)[1]				
Employment (jobs)		74,400	74,400	74,400
Personal income (millions $)		$2,566	$2,566	$2,566
Agricultural water rights (acre-feet)				
Truckee Meadows	28,283	14,915	14,915	2,916
Truckee Division (Fernley M&I water)	13,885	0	0	0
Total agricultural water rights	42,168	14,915	14,915	2,916
Economic indicators affected by transfer of agricultural water rights[2]				
Employment	267,689 (baseline)	267,558	267,558	[3]264,475
Personal income (millions $)	$15,174 (baseline)	15,171	15,171	[3]15,170

[1] The employment and income estimates are based on that portion of the regional economy that could be supported by the M&I water supply changes.
[2] Employment and income baseline estimates are shown for the Nevada counties in the study area.
[3] The benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be greater than the projected reduction in employment and income associated with the reduction of water rights for agricultural production in Truckee Meadows and the Truckee Division of the Newlands Project.

No Action (an increase of approximately 36,000 acre-feet). Economic model results show that this increase in M&I water supplies supports approximately 74,400 full- and part-time jobs and an associated $2.6 billion in personal income.

(2) Agricultural Water Rights

Irrigation water supplies are expected decline in the future because of the purchase of agricultural water rights in Truckee Meadows and Truckee Division of the Newlands Project for M&I water use. TMWA anticipates that developers in Truckee Meadows would continue under No Action the current practice of dedicating water rights for new service commitments. As stated previously, as of 2002, TMWA had dedicated 57,170 acre-feet of former agricultural water rights for future M&I use.

The operations model assumes that, under No Action, agricultural water demand will be reduced by 13,368 acre-feet through additional purchases of agricultural water rights in the Truckee Meadows area and reduced by 13,885 acre-feet in the Truckee Division through the purchases of agricultural water rights for Fernley and for Truckee River water quality under WQSA. Thus, under No Action, total agricultural water rights would be 27,253 acre-feet less than under current conditions, resulting in about 131 fewer full- and part-time jobs and $2.4 million less in income, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area. It is not possible to identify precisely where in the study area employment and income loss will occur, but most of the direct impacts would occur in Truckee Meadows and the Fernley area.

b. LWSA

(1) M&I Water Supplies
M&I water supplies in Truckee Meadows under LWSA would be the same as under No Action, and the effects would be the same as under No Action.

(2) Agricultural Water Rights
Purchase and transfer of agricultural water rights in Truckee Meadows and the Truckee Division under LWSA would be the same as under No Action, and the effects would be the same as under No Action.

c. TROA

(1) M&I Water Supplies
Under TROA, M&I water supplies in Truckee Meadows would be the same as under No Action, and the effects would be the same as under No Action.

(2) Agricultural Water Rights
In Truckee Meadows, 25,367 acre-feet of agricultural water rights would be purchased and transferred under TROA. In the Truckee Division, 13,885 acre-feet of water rights also would be purchased and transferred (the same as under either No Action or LWSA). Thus, under TROA, a total of 39,252 acre-feet of agricultural water rights would be purchased and transferred, or about 12,000 acre-feet more than under No Action or LWSA. As a result, the economic model estimates 214 fewer jobs and $3.8 million less in personal income under TROA than under current conditions, and 83 fewer jobs and $1.42 million less in personal income than under No Action, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area.

The benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be greater than the projected reduction in associated employment and income that is related to the reduction of water rights for agricultural production in Truckee Meadows and the Truckee Division of the Newlands Project.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

E. Hydroelectric Power Generation and Revenues

The four Truckee River hydroelectric powerplants have a maximum capacity of about 10 megawatts. These plants provide non-firm base load power to the regional power system. In 1991, these plants provided less than 1 percent of the total electrical power generated from all of Sierra Pacific’s plants. Low Truckee River flows could potentially affect power generation, but greater usage of combustion-generated power could replace any loss of the small amount of power generated by the hydroelectric powerplants resulting from low flows.

A separate analysis using the same methodology to estimate gross hydroelectric power generation and revenues was conducted for TCID’s hydroelectric powerplants at Lahontan Dam.

1. Method of Analysis

For this study, gross hydroelectric power revenues were calculated based on the annual power generated by these hydroelectric powerplants in wet, median, and dry hydrologic conditions. Annual hydroelectric power generation was generated from the operations model. An annual energy value was calculated using the California-Oregon Border (COB) Electricity Price Index (2004 data).[7] A weighted annual average value based on firm daily peak and off peak power demand was estimated to be $47.25 per megawatt (MWh) hour or $0.047 per kilowatt-hour. (It is recognized that TMWA charged a higher rate ($56 MWh) based on the market conditions in 2002, but the COB Price Index was used to be consistent with the methodology defined in the Draft Agreement). The annual energy value was multiplied by the hydroelectric power generation to calculate a gross annual hydroelectric power revenue value.

Hydroelectric power generation is based on minimum bypass flows at the four run of the river power plants under each alternative. (See “Minimum Bypass Flow Requirements for TWWA’s Hydroelectric Diversion Dams on the Truckee River” in this chapter.) Hydroelectric power generation data for Lahontan Dam was provided by TCID and other

[7] The electricity price index was selected based on previous TROA investigations.

sources were used to generate annual power estimates for each of the alternatives (Water Resources Appendix, Exhibit 12). The same per unit power value for the run-of-the-river hydroelectric powerplants was used to estimate the gross power revenue for the Lahontan Dam hydroelectric powerplants.

2. Threshold of Significance

For the gross revenue analysis on hydroelectric power generation on Truckee River run-of-the river hydroelectric powerplants, any loss in revenue was considered significant and would require compensation under section 7.A.6 of the Negotiated Agreement.

For the Lahontan Dam hydroelectric powerplants, since there are no water rights associated with hydropower generation, no compensation is considered for reduced gross power revenues. The surface water and hydroelectric power generation (Water Resources Appendix, Exhibit 12) and the economic analyses show little impact on hydroelectric power generation under No Action, LWSA or TROA.

3. Model Results

Table 3.101 presents average annual hydroelectric power generation and associated average annual gross revenues in wet, median, and dry hydrologic conditions.

Table 3.101—Model results for average annual hydroelectric power generation and average annual gross power revenues

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Truckee River average annual hydroelectric power generation (MWh)				
Wet	67,829	67,750	67,750	67,447
Median	65,910	65,899	65,928	63,852
Dry	45,985	46,778	46,676	48,085
Truckee River average annual gross power revenue (millions $)				
Wet	3.20	3.20	3.20	3.19
Median	3.11	3.11	3.12	3.02
Dry	2.17	2.21	2.21	2.30
Lahontan Dam average annual hydroelectric power generation (MWh)				
Wet	26,837	25,948	25,948	25,948
Median	22,866	22,292	22,292	22,292
Dry	21,520	20,919	20,915	20,898
Lahontan Dam average annual gross power revenue (millions $)				
Wet	1.27	1.23	1.23	1.23
Median	1.08	1.05	1.05	1.05
Dry	1.02	0.99	0.99	0.99

4. Evaluation of Effects

a. No Action

Operations model results show that under current conditions, average annual hydroelectric power generation ranges from a high of 67,829 MWh in wet hydrologic conditions to a low of 45,985 MWh in dry hydrologic conditions and the associated average annual gross power revenue ranges from $3.2 million to about $2.2 million. Under No Action, average annual hydroelectric power generation ranges from a high of 67,750 MWh and low of 46,778 MWh, and associated average annual gross power revenues range from a high of $3.2 million to a low of about $2.2 million. Average annual hydroelectric power generation and revenues under No Action are about the same (less than 1 percent difference) as under current conditions in wet and median hydrologic conditions. In dry hydrologic conditions, average annual gross revenues under No Action are $40,000 or about 2 percent greater than under current conditions.

For Lahontan Dam, average annual hydroelectric power generation under current conditions ranges from 26,837 MWh in wet hydrologic conditions to 21,520 MWh in dry hydrologic conditions and associated average annual gross power revenues based on a value of $47.25 per MWh range from a high of $1.3 million to a low of about $1 million. Under No Action, average annual hydroelectric power generation ranges from 25,948 MWh to 20,919 MWh, and the associated average annual revenue ranges from $1.23 million to about $1.0 million. Average annual hydroelectric power generation and revenues under No Action are slightly less (approximately 3 percent) than under current conditions in wet, median, and dry hydrologic conditions.

b. LWSA

Average annual hydroelectric power generation ranges from a high of 67,750 MWh in wet hydrologic conditions to a low of 46,676 MWh in dry hydrologic conditions under LWSA. Associated average annual gross power revenues range from a high of $3.2 million to a low of about $2.1 million. Under LWSA, average annual hydroelectric power generation and revenues are about the same as under No Action in wet, median, and dry hydrologic conditions. Average annual hydroelectric power generation and revenues under LWSA are slightly less (less than 1 percent) than under current conditions in wet hydrologic conditions and slightly greater under median conditions. In dry hydrologic conditions, average annual hydroelectric power generation and revenues are 1.5 percent greater than under current conditions.

For Lahontan Dam, average annual hydroelectric power generation under LWSA ranges from 25,948 MWh in wet hydrologic conditions to 20,915 MWh in dry hydrologic conditions. Average annual hydroelectric power generation and gross revenue under LWSA are about the same as under No Action in wet, median, and dry hydrologic conditions; and about 3 percent less than under current conditions in all hydrologic conditions.

c. TROA

Average annual hydroelectric power generation ranges from a high of 67,477 MWh in wet hydrologic conditions to a low of 48,084 MWh in dry hydrologic conditions under TROA. Associated average annual gross power revenues in wet, median, and dry hydrologic conditions are $3.19 million, $3.02 million, and $2.30 million, respectively.

Average annual hydroelectric power gross revenues under TROA are about $13,000 or 0.4 percent, less in wet hydrologic conditions; $96,000 or 3.1 percent, less in median hydrologic conditions, and $62,000 or 2.8 percent, greater in dry hydrologic conditions than under No Action. They are about $17,000 or 0.5 percent, less in wet hydrologic conditions; $97,000 or 3.0 percent less, in median conditions; and $99,000 or 4.6 percent, greater in dry hydrologic conditions than under current conditions.

At Lahontan Dam, under TROA, average annual hydroelectric power generation ranges from a high of 25,948 MWh in wet hydrologic conditions to a low of 20,898 MWh in dry hydrologic conditions. Overall, there is little difference in average annual hydroelectric power generation and gross revenues (difference of less than 1.0 percent) between TROA and No Action in wet, median, and dry hydrologic conditions and the regional economy would not be significantly affected. Average annual hydroelectric power generation and revenues are approximately 3.0 percent less under TROA and No Action than under current conditions.

5. Mitigation

Reduced hydroelectric power generation at the Truckee River run-of-the-river hydroelectric powerplants, if any, resulting from implementation of TROA would be compensated consistent with the provisions of TROA 7.A.6. Because no water right is associated with hydroelectric power generation at Lahontan Dam, reduced hydroelectric power generation and revenues would not be compensated.

F. Annual Groundwater Costs

TMWA provided information on the maximum amount of groundwater that could be pumped in the Truckee Meadows in a year because of drought conditions and the associated costs (capital investments and production costs) for each of the alternatives considered in this EIS/EIR. (See Chapter 2, “Alternatives.”) The analysis in this section identifies those costs for each alternative and compares them to costs under No Action and current conditions.

1. Method of Analysis

For this study, TMWA provided maximum annual groundwater estimates and the associated annual production cost for each of the alternatives. Capital investments (construction of new groundwater pumps) over the study time period were also provided. The annual groundwater production costs are based on the amount of groundwater pumped and the acre-foot pumping cost. For example, if up to 15,950 acre-feet are pumped, then the average pumping rate is about $91 per acre-foot. If 15,951 to 21,930 acre-feet are pumped, then the rate is $200 per acre-foot. From this rate structure, the maximum annual groundwater pumping costs can be estimated based on the amount of groundwater pumped and/or recharged under each alternative. The capital investment costs for new pumping systems were included in this analysis. These investment costs occurred in different times over the study period. These capital costs were present-valued to beginning of the study period and then calculated on an annual basis to be comparable to the annual groundwater production costs calculated earlier. This approach is consistent with standard planning procedures under the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Standards (Principles and Guidelines).

2. Threshold of Significance

Comparison of pumping costs among alternatives was used to evaluate significance; the least per acre foot cost is used to determine significance among the action alternatives.

3. Model Results

Table 3.102 shows calculated groundwater pumping costs under current conditions and the alternatives.

Table 3.102—Groundwater pumping (acre-feet) and development costs ($)

Indicator	Current conditions	No Action	LWSA	TROA
Maximum annual pumping	15,960	21,930	21,930	15,960
Drought year recharge	0	0	4,450	0
Total annual pumping	15,960	21,930	26,380	15,960
Total annual development costs	$1,520,395	$3,348,102	$4,696,483	$2,151,982
Cost per acre-foot	$95.26	$152.67	$178.03	$134.84

4. Evaluation of Effects

a. No Action

Under No Action, TMWA plans to pump an annual maximum amount of 21,930 acre-feet in Truckee Meadows, or 5,970 acre-feet more than under current conditions. The additional pumping costs and capital investments under this alternative would be $1.8 million (120 percent) more in total annual groundwater-related costs than under current conditions. The cost per acre-foot is $152.67.

b. LWSA

Under LWSA, TMWA plans to pump an annual maximum amount of 21,930 acre-feet per year in Truckee Meadows as well as recharge the groundwater by 4,450 acre-feet per year, or 4,450 acre-feet per year more than under No Action and 10,420 acre-feet per year more than under current conditions. The additional pumping costs and capital investments under this alternative would be $1.35 million more in groundwater-related costs than under No Action and $3.2 million more than under current conditions, or about 40 percent more than under No Action and about 200 percent more than under current conditions. The cost per acre foot is $178.03.

c. TROA

Under TROA, TMWA plans to pump a maximum of 15,950 acre-feet per year in Truckee Meadows, 5,980 acre-feet per year less than under No Action and the same as under current conditions. While the amount of groundwater pumping is the same as under current conditions, future capital investments increase the annual groundwater costs for this alternative, resulting in about $632,000 more (or 42 percent) in groundwater-related costs than under current conditions and $1.2 million less (or 36 percent) than under No Action. The cost per acre foot is $134.84.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

G. Additional Analyses

In response to comments received on the revised DEIS/EIR, additional analyses were conducted for this final EIS/EIR on the economic effects of five shortage years in a drought period—88, 90, 91, 92, and 94—on agricultural production in the Carson Division and on hydroelectric power generation at Lahontan Dam.

1. Carson Division Shortages and Agricultural Production

Operations model results show that, in the five shortage years, Carson Division shortages range from 56,310 to 145,640 acre-feet per year under current conditions; 70,250 to 158,290 acre-feet per year under No Action; 71,620 to 159,110 acre-feet per year under LWSA; and 70,170 to 158,090 acre-feet per year under TROA. (See figure 3.23 in Section F, “Exercise of Water Rights to Meet Demand” in “Surface Water.”)

Thus, in these years, compared to current conditions, Carson Division shortages are similar under the three alternatives, ranging from approximately 9.0 to 28.8 percent greater than under current conditions. Shortages such as these could result in smaller crop yields compared to current conditions which could, in turn, result in less production and gross crop revenues, depending on irrigation practices and market prices. For example, in recent drought years, particularly in 1992, while the number of irrigated acres did not change substantially, crop yield (alfalfa hay) declined. It is difficult to determine the effect on the regional economy on the basis of these shortages. While such cumulative shortages may potentially affect individual irrigators and the irrigation district, the effect would not be significant (greater than 10 percent change in jobs or income) within the regional area.

As noted in Section F, "Exercise of Water Rights to Meet Demand" in "Surface Water," Newlands Project supplies from the Truckee River in the future are less than under current conditions because Carson Division demand is less and water rights in the Truckee River basin are more fully exercised. Effects would be similar under all the alternatives compared to current conditions. Compared to No Action, shortages are 0.5 to 2.0 percent greater under LWSA and 0.1 percent less under TROA. Such small differences in shortages among the action alternatives would not have a significant effect on the regional economy.

2. Carson Division Shortages and Lahontan Dam Hydroelectric Power Generation

Hydroelectric power generation data provided by TCID and other sources were used to generate average annual power estimates under each alternative (Water Resources Appendix). The same per unit power value ($47.25 per MWh) for the run-of-the-river hydroelectric powerplants was used to estimate the gross power revenue for the Lahontan Dam hydroelectric powerplants. The hydroelectric power generation data for the five Carson Division shortage years were obtained from operations model results. Table 3.103 shows Lahontan Dam average annual hydroelectric power generation and gross revenues in these years.

Table 3.103—Lahontan Dam hydroelectric average annual power generation and average annual gross revenues

	Shortage years in drought period				
	88	**90**	**91**	**92**	**94**
Average annual hydroelectric power generation (MWh/year)					
Current conditions	19,106.78	21,832.34	13,128.79	10,660.50	19,448.10
No Action	17,229.62	19,054.10	11,708.25	9,120.41	17,698.70
LWSA	17,162.84	18,965.61	11,667.86	9,045.40	17,582.46
TROA	17,152.95	18,942.01	11,816.75	9,041.19	17,564.32
Average annual estimated gross revenues ($47.25 per MWh)					
Current conditions	$902,795	$1,031,578	$620,335	$503,709	$918,923
No Action	$814,099	$900,306	$553,215	$430,939	$836,264
LWSA	$810,944	$896,125	$551,306	$427,395	$830,771
TROA	$810,477	$895,010	$558,341	$427,196	$829,914

Comparison of average annual hydroelectric power generation for the shortage years indicates gross revenues would be 9 to 15 percent less under the alternatives than under current conditions. The effect on the regional economy would not be significant because other sources in the regional power grid could provide additional required power. Analysis shows that average annual hydroelectric power generation and gross revenues would be slightly less under LWSA and TROA than under No Action (less than 1 percent), which should not significantly affect the profitability of TCID's hydroelectric power operations or the regional economy.

SOCIAL ENVIRONMENT

I. Affected Environment

This section provides an overview of the current social environment of the study area and describes aspects, including population and demographics, urbanization of Truckee Meadows, and air quality, which were identified by the public as social issues of concern.

A. Overview

For discussion and analytical purposes, the study area has been divided into five distinct components: Lake Tahoe basin, the Truckee River basin in California, Truckee Meadows, agricultural lands in the Newlands Project, and Indian lands.

1. Lake Tahoe Basin

The Lake Tahoe basin attracts residents and visitors because of its numerous recreational opportunities and proximity to the communities around Lake Tahoe and Truckee Meadows. While 85 percent of the Lake Tahoe basin is public land held by the Federal government and managed by USFS, 85 percent of the lakeshore is privately owned. Both California and Nevada maintain State parks in the basin; the largest is Lake Tahoe Nevada State Park on Lake Tahoe's eastern shore.

The 2000 Census estimated about 41,160 housing units in the Lake Tahoe basin. About 32 percent of these were owner-occupied, and 23 percent were renter-occupied; about 40 percent of total available housing—16,660 units—was for seasonal, recreational, or occasional use. Businesses in the Lake Tahoe basin provide goods and services to the tourism and recreation trade, plus the normal mix of community utility and health services, agricultural services, construction and maintenance businesses, and the stores and dealerships associated with any community.

Private lakeshore property owners historically have sought to maintain Lake Tahoe's water elevation and water quality to protect the lakeshore they own and to maintain the aesthetic appeal of the lake. The lake and its scenic surroundings are lures to recreationists and tourists. Other seasonal activities (skiing, camping) and year-round attractions (casinos and other entertainment) provide diversity. Residents and property owners are concerned with maintaining other quality of life factors throughout the basin. Development and use are tightly controlled by the Tahoe Regional Planning Agency. TRPA has broad regulatory authority over private land use and development as well as oversight control in areas such as zoning and water treatment requirements.

2. Truckee River Basin in California

Residents share the aesthetic and environmental concerns of residents closer to Lake Tahoe but generally are less affected by the immediacy of those issues. They also share the "quality of life" values which are characteristic throughout the study area. Many businesses depend on the diversity of tourism and recreational trade attracted to local reservoirs and lakes.

Of the 11,800 total housing units in the area, more than 80 percent are in Truckee, the largest city in the basin. More than 70 percent of the occupied housing was owner-occupied, according to the 2000 Census. Similar to the Lake Tahoe Basin, about 40 percent of the total available housing was for seasonal, recreational, or occasional use.

3. Truckee Meadows

Truckee Meadows, which contains the urban Reno-Sparks area, has evolved from a predominantly agricultural area to one of the fastest growing communities in the country. It is about 30 miles northeast of Lake Tahoe in central Washoe County, Nevada.

About 60 percent of the available housing in Truckee Meadows is owner-occupied, and about 40 percent is renter-occupied. Less than 1 percent of the housing is for seasonal, recreational, or occasional use. The area has an average per capita income of slightly more than $24,000. Reno-Sparks depends on the hotel, gaming, and entertainment industries and on the eating, drinking, and lodging businesses that support those enterprises.

Truckee Meadows residents are concerned with maintaining quality of life in the face of growing population and increasing demands on the environment and economy. The continuing transition from an agricultural to nonagricultural lifestyle has created demand for more urban water uses at the expense of rural/farm uses. Likewise, air quality and habitat were not issues 20 years ago but have become important contemporary issues. Consequently, the community has identified the following measures of quality of life: economic vitality, education, health, land use and infrastructure, natural environment, and public health and welfare (Truckee Meadows Tomorrow, 2003).

A heightened awareness of the relationship between environmental concerns and growth is reflected in the 2002 Truckee Meadows Regional Plan (Regional Plan) four planning principles: Regional Form and Development Patterns, Natural Resources Management, public services and facilities, and regional plan implementation. (Truckee Meadows Regional Planning Agency, 2003) These principles guide the goals and policies of the Regional Plan to encourage land use to promote responsible management of the region's air and water resources to attain and maintain Federal and State quality standards. The quality of life indicators and the Regional Plan suggest the community is interested in ensuring a diverse economy with a high standard of living without sacrificing the natural environment.

4. Agricultural Lands on the Newlands Project

This area includes Fernley, Fallon, and Naval Air Station Fallon.

When established in 1904, Fernley served travelers on the transcontinental railroad and highway. With the completion of the Truckee Canal in 1905, Fernley evolved into an agricultural center for the farmers served by the Newlands Project. Today, Fernley maintains its rural character but has targeted itself as a location for housing for commuters to Truckee Meadows, small industries, and retirement centers for senior citizens. Town planners believe the lower cost of land and the town's nonurban character appeal to these groups. While subdivided land and housing construction have attracted residents, Fernley's industrial sites are also attracting businesses. The community's residents exist in a delicate balance between enjoying a lower cost of living (compared to Truckee Meadows) and requiring expanded community services.

Agriculture continues to contribute substantially to the rural way of life and the local economy. Farms generate income for owners and laborers. As business enterprises, farms also make contributions in terms of operation and maintenance expenditures, investments in capital equipment, land improvements, and taxes paid on farm sales, purchases, and real estate, much of which is spent in the local economy. While many farmers on the Newlands Project value their way of life, some have chosen to sell their water rights and cease farming.

NASF was established as a naval auxiliary station in 1944 following the construction of a military airfield in 1942. It currently is the Navy's major training center for carrier-based aviators. It encompasses approximately 240,792 acres. While Churchill County's early growth and prosperity was founded in agriculture, the county now depends heavily on NASF, which accounted for about 40 percent of Churchill County's jobs (3,077 of 7,150) in 2001.

5. Indian Lands

Indian tribes in the study area include: Pyramid Lake Paiute Tribe: Pyramid Lake Indian Reservation (which includes Pyramid Lake) in Nevada; Reno-Sparks Indian Colony: Reno and Hungry Valley, in Nevada; Fallon Paiute-Shoshone Tribes: Fallon Paiute-Shoshone Reservation and Fallon Colony in Nevada; and Washoe Tribe of Nevada and California: colonies of Carson City, Dresslerville, Stewart, Washoe Ranch (in Nevada) and Woodfords (in California), Pine Nut allotments (in Nevada), and cultural interests at and near Lake Tahoe. See "Indian Trust Resources" for detail.

B. Population

To present a representative picture of the ethnic and racial composition of the study area population, the study area was divided into several areas: Lake Tahoe basin, Truckee River basin in California, Truckee River basin in Nevada, Truckee Meadows, Pyramid Lake, and lower Carson River basin. These areas have been further broken down by county and county subdivision. The number of persons accounted for in the 2000 Census and percentages of population for five racial categories—(1) White, (2) Black or African American, (3) American Indian or Alaska Native, (4) Asian, and (5) Other (includes Native Hawaiian and Other Pacific Islander, Some Other Race, and Two or More Races)—are presented in table 3.104.

Table 3.104—Study area population, 2000[1]

	White	Black or African American	American Indian or Alaska Native	Asian	Other[2]	Total	Hispanic or Latino[3]
Lake Tahoe basin							
El Dorado County, California South Lake Tahoe Division/ CCD[4]	27,661	232	285	1,558	4,306	34,042	6,847
Placer County, California Lake Tahoe	10,434	54	116	129	1,425	12,158	2,432
Washoe County, Nevada Incline Village	9,053	46	59	156	638	9,952	1,207
Total	47,148	332	460	1,843	6,369	56,152	10,486
Percent of total	84.0	0.6	0.8	3.3	11.3	100.0	18.7
Truckee River basin in California							
Nevada County, California Donner Division/CCD[4]	12,853	35	86	121	1,397	14,492	1,793
Sierra County, California East Sierra Division/CCD[4]	2,350	7	46	3	95	2,501	163
Total	15,203	42	132	124	1,492	16,993	1,956
Percent of total	89.5	0.2	0.8	0.7	8.8	100.0	11.5
Truckee River basin in Nevada							
Lyon County, Nevada Fernley Division/CCD[4]	7,750	39	131	58	618	8,596	759
Storey County, Nevada Clark Division/CCD[4]	803	4	4	22	49	882	52
Washoe County, Nevada Verdi Division/CCD[4]	3,049	15	10	45	74	3,193	113
Total	11,602	58	145	125	741	12,671	924
Percent of total	91.6	0.5	1.1	1.0	5.8	100.0	7.3

Table 3.104—Study area population, 2000[1] – continued

	White	Black or African American	American Indian or Alaska Native	Asian	Other[2]	Total	Hispanic or Latino[3]
Truckee Meadows							
Washoe County, Nevada Flanigan Division[5]	48,426	900	1,232	1,315	4,183	56,056	5,430
New Washoe City Division[6]	10,912	39	79	129	285	11,444	405
Reno-Sparks Division[7]	200,356	6,092	3,540	12,875	33,352	256,215	48,780
Total	259,694	7,031	4,851	14,319	37,820	323,715	54,615
Percent of total	80.2	2.2	1.5	4.4	11.7	100.0	16.9
Pyramid Lake Division/CCD[4]							
Total	395	1	1,221	3	94	1,714	146
Percent of total	23.0	0.1	71.2	0.2	5.5	100.0	8.5
Lower Carson River basin							
Churchill County, Nevada Fallon Division/ CCD[4]	20,033	383	1,141	647	1,608	23,812	2,072
Total	20,033	383	1,141	647	1,608	23,812	2,072
Percent of total	84.1	1.6	4.8	2.7	6.8	100.0	8.7
Study area							
Grand total	354,075	7,847	7,950	17,061	48,124	435,057	70,199
Percent of grand total	81.4	1.8	1.8	3.9	11.1	100.0	16.1

[1] Source: 2000 Census of Population.
[2] Other includes remaining population who declared either as being of one race not listed on the chart or as being multi-race.
[3] As explained in the text, the Hispanic or Latino population may be of any race.
[4] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial Census statistics.
[5] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.
[6] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.
[7] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno SouthEast CCD, and Reno SouthWest CCD.

The numbers and percentages of the Hispanic or Latino population, a minority ethnic group, are also shown. Those identifying themselves as Hispanic or Latino may be of any race. Percentages were arrived at based on the numbers and totals of the subdivisions for each basin. While the actual population numbers may fluctuate somewhat, depending on seasonal and economic factors (more or fewer jobs related to tourism or farm labor, for example), the percentages shown provide a “snapshot” of the population in the study area.

The study area is overwhelmingly (more than 80 percent) White. The largest ethnic segment of the population is Hispanic or Latino, about 16 percent. All other groups combined make up less than 10 percent; American Indian or Alaska Natives comprise less than 2 percent. More detail regarding population in various parts of the study area follows.

Based on the 2000 Census, with a total population of 56,152 in 2000, the Lake Tahoe basin is about 84 percent White, 3 percent Asian, and less than 1 percent each Black or African American and American Indian or Alaska Native. The Hispanic or Latino ethnic group, which may come from any racial group, is the largest minority, with about 18 percent of the population. The overall population is well educated; more than 85 percent are high school graduates, and more than 20 percent hold bachelor’s or advanced degrees.

The Truckee River basin in California has a population of 16,993 with about 90 percent White and less than 1 percent each American Indian or Alaska Native, Black or African American, or Asian in 2000. The Hispanic or Latino ethnic group accounts for about 12 percent. More than 80 percent are high school graduates, and more than 15 percent have bachelors or advanced degrees.

The Truckee Meadows population (323,715) is larger than that of all the other regions in the study area combined. It is also more diverse with a distribution of 80 percent White, 2 percent Black or African American, 1.5 percent American Indian or Alaska Native, and 4 percent Asian. The Hispanic or Latino ethnic group accounts for about 17 percent of the population.

The population (12,671) in the Truckee River basin in Nevada (generally north, east, and west of Truckee Meadows) has a racial distribution of 91.6 percent White, about 1 percent each American Indian or Alaska Native and Asian, and less than 1 percent Black or African American. The largest minority group is Hispanic or Latino ethnic, with about 7.3 percent of the population. In general, populations of the smaller agricultural communities along the river tend to be comprised of older residents; a growing community, Fernley is attracting younger people. The 2000 population of the Pyramid Lake Division was 1,714. The largest percent of American Indian or Alaska Natives in the study area, 71.2, is in this Division. The Division includes most of the Pyramid Lake Indian Reservation population. In the lower Carson River basin, Fallon’s population was 7,536 in 2000, and 16,276 people lived in the area immediately around Fallon.

Table 3.105 presents change in population in different parts of the study area between 1990 and 2000; table 3.106 presents population and growth on Indian lands as of 2000; and table 3.107 presents the percent of urban population in the study area and the percent of urban change from 1990 to 2000.

C. Urbanization of Truckee Meadows

Truckee Meadows is experiencing rapid growth and developing a more urban character, particularly in Reno-Sparks. Consequently, TMWA is expected to acquire additional Truckee Meadows agricultural water rights to total 83,030 acre-feet and transfer these rights to municipal and industrial use. Existing groundwater rights also would be required for M&I use.

For example, in Washoe County, as many as 48,500 acres were irrigated in 1960. By 1990, 31,100 acres were irrigated. By 2020, only about 20,869 acres are projected to remain under irrigation. This trend is probably reflective of Truckee Meadows. Similarly, farm-generated income for the entire county reflects the decline of agriculture. While the number of irrigated acres and farm income ratios fluctuate on a year-to-year basis, the trend is the decrease of agriculture and the growth of nonagricultural businesses.

D. Air Quality

The 1970 Clean Air Act and its amendments provide the framework for all pertinent organizations to protect air quality. All states are required to show compliance with the National Ambient Air Quality Standards (NAAQS) or to develop control plans designed to achieve compliance with them. The rules and policies developed under these plans are codified in federally enforceable State Implementation Plans (SIPs) that are submitted to EPA for approval. Under Federal law, States are responsible for controlling stationary pollution sources and for insuring maintenance of motor vehicle pollution control devices.

California law delegates air pollution control authority to local air pollution control districts, primarily based on county boundaries. In the Lake Tahoe basin, the control responsibility for permitting stationary sources is held by El Dorado and Placer Counties.

Nevada has regulatory authority for air quality, except for delegation to its two most populated counties, Washoe (Reno-Sparks metropolitan area) and Clark (Las Vegas). In the Lake Tahoe basin, Nevada permitting authority is split between Washoe County and the State (acting in Carson City and Douglas County).

Under the Federal Clean Air Act, primary air quality planning authority is vested in the States. In California, the California Air Resources Board (CARB) acts as an intermediary between the local air quality agencies and EPA. Along with its authority to set environmental thresholds, TRPA has been granted a role in managing air quality through its transportation and land use management authority. Under this structure, El Dorado and Placer Counties, in consultation with TRPA, jointly develop a plan for the

Table 3.105—Study area population and growth rate, 1990–2000[1]

	1990 Population	2000 Population	Annual average growth rate 1990–2000 (percent)
Lake Tahoe basin			
El Dorado County, California South Lake Tahoe Division/CCD[2]	29,652	34,042	1.4
Placer County, California Lake Tahoe Division/CCD[2]	9,257	12,158	2.8
Washoe County, Nevada Incline Village Division/CCD[2]	7,567	9,952	2.8
Total	46,476	56,152	1.9
Truckee River basin in California			
Nevada County, California Donner Division/CCD[2]	9,420	14,492	4.4
Sierra County, California East Sierra Division/CCD[2]	2,029	2,501	2.1
Total	11,449	16,993	4.0
Truckee River basin in Nevada			
Lyon County, Nevada Fernley Division/CCD[2]	5,188	8,596	5.1
Storey County, Nevada Clark Division/CCD[2]	700	882	2.3
Washoe County, Nevada Verdi Division/CCD[2]	2,465	3,193	2.6
Total	8,353	12,671	4.3
Truckee Meadows			
Washoe County, Nevada Flanigan Division[3] New Washoe City Division[4] Reno-Sparks Division[5]	 790 10,109 231,651	 56,056 11,444 256,215	 5.3 1.2 1.0
Total	242,550	323,715	2.9
Pyramid Lake Division/CCD[2]			
Pyramid Lake Division/CCD[2]	466	1,714	13.9
Lower Carson River basin			
Churchill County, Nevada Fallon Division/CCD[2]	17,760	23,812	3.0
Study area total	327,054	435,057	2.9

[1] Source: 1990 and 2000 Census of Population.
[2] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial census statistics.
[3] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.
[4] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.
[5] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno SouthEast CCD, and Reno SouthWest CCD.

Table 3.106—Population of Indian lands

	1990 Population	2000 Population	Annual average growth rate 1990–2000 (percent)
Reno-Sparks Colony	724	881	2.0
Pyramid Lake Paiute Reservation	1,308	1,734	2.9
Fallon Paiute-Shoshone Reservation and Colony[1]	[2]758	743	-0.2

Source: 1990 and 2000 Census of Population.
[1] Fallon Paiute-Shoshone Reservation and Colony area was changed from the 1990 to the 2000 Census. It is now a combination of Fallon Paiute-Shoshone Colony and the Fallon Paiute-Shoshone Reservation and Off-Reservation Trust Land areas.
[2] Fallon Paiute-Shoshone Tribes, 1990. The 1990 Census showed a population of 546.

Table 3.107—Study area population percent urban and percent of urban change 1990–2000

	Population						Urban population	
	1990 Urban	1990 Total	1990 Urban	2000 Urban	2000 Total	2000 Urban	Change, 1990–2000	
	Number	Number	Percent	Number	Number	Percent	Number	Percent
Lake Tahoe basin								
El Dorado County, California								
South Lake Tahoe Division/CCD[1]	21,586	29,652	73	31,705	34,042	93	10,119	47
Placer County, California								
Lake Tahoe Division/CCD[1]	2,929	9,322	31	9,056	12,158	74	6,127	209
Washoe County, Nevada								
Incline Village Division/CCD[1]	7,119	7,494	95	8,051	9952	81	932	13
Basin total	31,634	46,468	68	48,812	56,152	87	17,178	54
Upper Truckee River basin (California)								
Nevada County, California								
Donner Division/CCD[1]	3,511	9,420	37	7,384	14,492	51	3,873	110
Sierra County, California								
East Sierra Division/CCD[1]	0	2030	0	0	2501	0	0	—
Basin total	3,511	11,450	31	7,384	16,993	43	3,873	110

Table 3.107—Study area population percent urban and percent of urban change 1990–2000 – continued

	Population						Urban population	
	1990 Urban	1990 Total	1990 Urban	2000 Urban	2000 Total	2000 Urban	Change, 1990–2000	
	Number	Number	Percent	Number	Number	Percent	Number	Percent
Lower Truckee River basin (Nevada)								
Lyon County, Nevada								
Fernley Division/CCD[1]	5,164	5,170	100	6,725	8,596	78	1,561	30
Storey County, Nevada								
Clark Division/CCD[1]	0	709	0	0	882	0	0	—
Washoe County, Nevada								
Verdi Division/CCD[1]	911	2507	36	1,994	3,193	62	1,083	119
Basin total	6,075	8,386	72	8,719	12,671	69	26,44	44
Truckee Meadows								
Washoe County, Nevada								
Flanigan Division[2]	0	882	0	47,929	56,056	86	479,29	—
New Washoe City Division[3]	2,932	10,113	29	3,503	11,444	31	571	19
Reno-Sparks Division[4]	212,880	231,605	92	253,014	256,215	99	25,3014	119
Basin total	215,812	242,600	89	304,446	323,715	94	88,634	41
Pyramid Lake Division								
Pyramid Lake Division/CCD[1]	0	1,451	0	587	1,714	34	587	—
Basin total	0	1,451	0	587	1,714	34	587	—
Lower Carson River Basin								
Churchill County, Nevada								
Fallon Division/CCD[1]	6,438	17,776	36	15,337	23,812	64	8,899	138
Basin total	6,438	17,776	36	15,337	23,812	64	8,899	138
ALL BASINS EXCEPT RENO-SPARKS	50,590	317,136	16	132,271	178,842	74	81,681	161
ALL BASINS	263,470	328,131	80	385,285	435,057	89	12,1815	46

Source: 1990 and 2000 Census of Population.

[1] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial census statistics.

[2] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.

[3] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.

[4] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno Southeast CCD, and Reno Southwest CCD.

Lake Tahoe Air Basin (LTAB) encompassing the California portion of the Lake Tahoe basin; that plan is then subject to CARB and EPA approval. In Nevada, TRPA cooperates directly with the State and Washoe County in the development of their respective plans.

The baseline air quality standards for the study area are the NAAQS for the federally designated criteria pollutants: particulate matter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). California has adopted more stringent standards for the same criteria pollutants, as well as additional standards for sulfates, hydrogen sulfide (H_2S), and visibility-reducing particles (VRP). The State standards include special provisions for even lower permissible levels of CO and VRP for the California portion of the LTAB. Nevada also has adopted more stringent standards applicable in the Lake Tahoe basin, matching the California LTAB standards for CO and visibility and cutting the one-hour maximum ozone standard to equal California's statewide standard. Under the federally chartered bi-state compact that created TRPA, the authority to determine environmental thresholds to protect various resources was granted to TRPA. TRPA's thresholds for visibility and CO are essentially the same as the California and Nevada State standards.

Currently, the California portion of the Lake Tahoe area is classified as being in attainment or "unclassified" for all applicable standards except the California standard for PM_{10}, for which it is designated as being in nonattainment. Since 1990, the Nevada portion of the Lake Tahoe area had been identified as being in nonattainment for CO. However, in 2003 Nevada requested EPA to redesignate the Lake Tahoe Nevada area "not classified" CO nonattainment area to attainment for the CO NAAQS and submitted a CO maintenance plan for the area as a revision to the Nevada SIP. EPA approved the maintenance plan and redesignated the Lake Tahoe Nevada nonattainment area to attainment as of February 13, 2004 (68 FR 69611-69618, December 15, 2003).

In Washoe County, the Truckee Meadows hydrographic area is designated as being in nonattainment for CO with a classification of "moderate" since 1990, while the Reno planning area (hydrographic area 212) is designated as being in nonattainment for PM10, with a "serious" classification since 2001. The Fernley area and Truckee Meadows are designated as not meeting primary standards for total suspended particulate. Since 2001, the Reno area has been designated as being in nonattainment for the one-hour ozone standard (40 CFR 81.329). All other counties in the study area are in attainment for the designated air quality criteria pollutants.

EPA has devised a health-based scale of the NAAQS called the Air Quality Index (AQI), formerly called the Pollution Standard Index (PSI). The pollutants are considered unhealthful at a concentration over 100 on the AQI. Since 1990, there has been a general increase in "good" days (AQI of 0-50) and decreases in "moderate" (AQI 51-100) and "unhealthful" (AQI over 101) in Truckee Meadows. The overall decline in violations may be attributed in part to the weather, but it is also due to the use of oxygenated fuels in the winter months, the vapor recovery program for gasoline dispensing facilities, restriction on residential wood burning, Federal emissions limitation on new cars, and vehicle inspection and maintenance requirements (Washoe County, 2003).

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect the storage and water elevations of lakes and reservoirs and the quantity, quality, timing, and duration of flows, which could indirectly affect the social environment.

This analysis evaluated the effects of changes in reservoir storage and water elevations and flows on the social environment using the following indicators:

- Population
- Urbanization of Truckee Meadows
- Air quality

B. Summary of Effects

Overall, effects on the social environment indicators of population, urbanization of Truckee Meadows, and air quality under TROA and LWSA would be the same as under No Action.

In the future, under all alternatives, the study area is projected to experience a steadily increasing population, an expansion of M&I water use, and a decline in agricultural-based living. Between 2000 and 2033, the population of Truckee Meadows is projected to increase from 284,147 to 440,874. Under No Action and LWSA, about 13,400 acre-feet of agricultural water rights, and, under TROA, an additional 12,000 acre-feet would be acquired and transferred to M&I use in response to increasing population until demand in the Truckee Meadows service area reaches 119,000 acre-feet. Local and State governments would continue to implement regulatory and monitoring programs to maintain compliance with air quality standards. Table 3.108 summarizes these effects.

C. Population

The population indicator is used to access potential burdens placed on community infrastructure (e.g., transportation, fire and police protection, schools, recreation facilities, etc.). If the population indicator is not significantly affected, further in-depth analysis of other more detailed indicators is not necessary.

Table 3.108—Summary of effects on the social environment

Indicator	Current conditions	No Action	LWSA	TROA
Population of Truckee Meadows	284,147	440,874	440,874	440,874
Urbanization of Truckee Meadows	M&I water supply of 83,140 acre-feet Baseline employment: 267,689 jobs Baseline income $15.2 billion	Change in M&I water supply to meet additional 36,000 acre-foot demand (total 119,000 acre-foot demand) would support 74,400 full- and part-time jobs and $2.56 billion in personal income	Same as under No Action	About the same as under No Action (differences in employment and income of less than 1 percent from baseline)
Air Quality	Regulatory programs and monitoring in place to comply with air quality criteria standards	Same as under current conditions	Same as under No Action	Same as under No Action

1. Method of Analysis

Future population levels and water demands used in this EIS/EIR are based on projections made by State and regional service and planning entities responsible for planning for M&I water supply and demand in the Lake Tahoe and Truckee River basins.

2. Threshold of Significance

The average annual growth rate for the Washoe County area served by TMWA (1.3 percent) was calculated from projections provided by TMWA (attachment C). Any difference from this rate was considered significant.

3. Evaluation of Effects

a. No Action

In general, the study area is projected to experience a steadily increasing population, M&I expansion, and a decline in agricultural-based living. Simply put, the future under No Action is expected to include more people coming to the study area to live an urban/suburban lifestyle and fewer people continuing to make an agricultural living.

The Washoe County growth rate is consistent with the growth anticipated throughout the region and within the study area. An annual growth rate average of 1.3 percent is estimated for the Washoe County area served by TMWA under the alternatives. This growth rate results in a projected population increase in the study area from 284,147 to 440,874 between 2000 and 2033.

With consistent population growth, the region is expected to face a wide range of predictable growth-related issues and problems. Population increases require an increase in local services, such as schools and hospitals, police and fire fighting capabilities, and community utilities, such as sewage, water supplies, and power. In general, regional and community planning is designed to keep pace with growth.

The projected increase in population also brings with it certain unavoidable conditions and issues associated with the environment. Development of new housing and business communities in the region may affect scenic and recreation values. All of the social benefits and disadvantages that accompany growth and development could change the character of the natural environment. The degree to which environmental change occurs can be controlled by regulation and planning.

b. LWSA

Because population growth under LWSA is projected to be the same as under No Action, effects on population in the study area would be the same as under No Action.

c. TROA

Because population growth under TROA is projected to be the same as under No Action, effects on population in the study area would the same as under No Action.

4. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

D. Urbanization of Truckee Meadows

1. Method of Analysis

The effects on urbanization of Truckee Meadows were quantified by evaluating the effect on population associated with changes in water supply, including the transfer of agricultural water rights to M&I use, as discussed in “Economic Environment.” Population is not the only indicator of urbanization of Truckee Meadows, but it provides some perspective on relative differences among the alternatives.

The economic model calculated the amount of employment and income that could be supported by the 36,000 acre-foot increase in M&I water supplies from current conditions to meet the 2033 M&I demand of 119,000 acre-feet. The economic model then calculated employment and income and associated population that could be supported by the increase in M&I supplies. The economic model also calculated the effect of transferring agricultural water rights in Truckee Meadows on regional employment and income.

2. Threshold of Significance

The same threshold of significance was used as for "Population."

3. Evaluation of Effects

a. No Action

M&I water supplies in Truckee Meadows are expected to increase in the future, from approximately 83,140 acre-feet under current conditions to 119,000 acre-feet under No Action (increase of approximately 36,000 acre-feet). Economic model results show that this increase in M&I water supplies supports approximately 74,400 full- and part-time jobs and $2.6 billion in personal income, associated with a population of about 120,400.

In the past, agricultural lands in Truckee Meadows area have been converted to urban uses, resulting in less water available for agriculture and more water available for M&I and other water uses. The operations model assumes that, under No Action, irrigation water demand will be reduced by 13,368 acre-feet through additional purchases of agricultural water rights in Truckee Meadows.

The economic model estimates that the transfer of agricultural water rights in Truckee Meadows under No Action results in about 131 fewer jobs, resulting in about $2.4 million less in income, and about 212 fewer persons than the baseline regional economy. These differences are less than 1 percent and are considered negligible.

In the future, existing groundwater rights also would be acquired to increase use of groundwater supplies for M&I use.

b. LWSA

Under LWSA, the same amount of water would be allocated for M&I use as under No Action. Changes in employment, income, and population due to transfers of agricultural water rights would be the same as under No Action.

c. TROA

In Truckee Meadows, 25,367 acre-feet of agricultural water rights would be purchased and transferred under TROA. As a result, the economic model estimates 138 fewer jobs and $2.5 million less in personal income under TROA than under current conditions, and 83 fewer jobs and $1.42 million less in personal income than under No Action, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area. Because these differences are less than 1 percent of the baseline regional economy, the effects would be negligible. Also, as discussed under "Economic Environment," the benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be greater than the projected reduction in employment and income associated with the reduction of water rights for agricultural production.

4. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

E. Air Quality

1. Method of Analysis

This analysis used information from EPA, the Air Quality Management Division of the Washoe County District Health Department, and the Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality Planning.

2. Threshold of Significance

For this indicator, any violation of air quality standards was considered significant.

3. Evaluation of Effects

a. No Action

Air quality in the Truckee Meadows area may be affected by increased automobile and manufacturing emissions. However, continuing reservoir operations in their existing pattern would not contribute to air quality problems.

Although the population is projected to increase and pollutant sources will also increase, it is expected that existing Federal, State, and/or local programs to safeguard air quality will be enhanced to cope with these changes. Monitoring programs are expected to continue, as well as the existing public education programs and rigorous enforcement of regulations. Other options and programs will be considered to deal with changing conditions when and if they become necessary. Over the period of analysis, it is difficult to assess what measures and quality levels might be in effect or attained. However, continued concern and high values placed on healthy air quality (as evidenced by present programs) indicate that this area's air quality will remain a respected and cared for resource. Continued action by Federal, State, and, especially, local county managers and planners is anticipated.

Reservoir operations, as proposed under No Action, would not affect air quality when compared to current conditions.

b. LWSA

No identifiable population impacts, changes in transportation patterns, or identifiable point source pollution impacts would be caused by LWSA; thus, LWSA would not contribute to any changes in air quality. Effects on air quality in Truckee Meadows would be the same as under No Action.

c. TROA

No identifiable population impacts, changes in transportation patterns or identifiable point source pollution impacts would be caused by TROA; thus, TROA would not contribute to any changes in air quality. Effects on air quality in Truckee Meadows would be the same as under No Action.

4. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

CULTURAL RESOURCES

Cultural resources, the remains of past human activity, are finite, nonrenewable, and often fragile. These resources encompass a broad range and can include specific places associated with traditional ceremonies; artifacts, structures, object, or buildings; and landscapes associated with a period of time, a person, or historic movements. Federal agencies are required to identify and evaluate the significance of cultural resources located within the area of potential effect (APE) of any Federal undertaking.

Federal agencies' responsibility to consider and protect cultural resources is based on a number of Federal laws and regulations. (See Chapter 5, "Consultation and Coordination.") In particular, the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations for section 106, set out the requirements and process to identify and evaluate cultural resources, assess effects to these resources, and mitigate effects to significant resources which occur as a result of the agency's permitted undertaking. Under section 110 of NHPA, the responsibility of the Federal agency that owns or formally manages land includes identifying and managing the cultural resources on that land, even when there is no new undertaking.

The California Environmental Quality Act also requires consideration and protection of historical and archaeological resources listed in, or determined to be eligible for listing in, certain local registries, the California Register of Historic Resources, and the National Register of Historic Places. CEQA provides that a substantial adverse change to a resource listed or eligible for listing in the specified registries is a significant effect on the environment. Recent follow-up research to the previous DEIS/EIR considered all recent California and local registry cultural resource information within and immediately adjacent to the primary study area to assure that the analysis included all resources to which CEQA applies. And, although Nevada has no specific State requirements regarding environmental analysis of cultural resources similar to NEPA or CEQA, the same followup procedures (checking recorded cultural resources listed by the State register, then corroborating this information with the most recent National Register information available) were done for all Nevada counties within the primary and secondary study areas.

I. Affected Environment

This section summarizes known cultural resources in the area of potential effect and the level of survey conducted to date to identify them as a basis for impact analysis. The vast majority of these sites have not been evaluated for eligibility in the National Register of Historic Places (NRHP). Clearly, the list is incomplete for areas in which no or limited identification efforts have taken place.

A. Definition of Study Area

The Cultural Resources Appendix describes the general settlement and use through time of the study area (location map) and concludes with a list of the types of cultural resources sites that could be expected to occur as a result of this use. The geographic area defined for discussion of existing conditions and alternative analysis is more restricted. Cultural resources that fall near or below maximum monthly elevation of lakes and reservoirs or streams may be affected by submergence or by fluctuations in the elevation, particularly by the resulting erosion (or, in some cases, deposition) of soil in the area of the site. A range of human activities that occur near the edge of the water surface may also affect sites. For examples, see discussion in Nesbitt et al. (1991).

Thus, the critical factors in determining the areas to be considered in the evaluation of potential effects on cultural resources are the maximum monthly elevation and the fluctuation of that elevation in a lake or reservoir, and the maximum monthly flow in the river or its tributaries associated with operating system requirements. The affected areas, referred to collectively as the "primary study area" include (1) the land covered by the maximum water surface, plus a band of up to 200 yards around the perimeter (exact width depends on the terrain and use of the water body) of all system lakes and reservoirs: Lake Tahoe, Donner Lake, Prosser Creek Reservoir, Independence Lake, Stampede Reservoir, and Boca Reservoir; (2) a corridor of approximately 200 yards on either side of the Truckee River for its entire length from Lake Tahoe to Pyramid Lake; (3) similar corridors for stretches of drainages between reservoirs or to the Truckee River; and (4) the land up to the 3,900-foot elevation at Pyramid Lake. The primary study area is greater than the area within which impacts are expected.

The "secondary study area" for this revised DEIS/EIR includes a perimeter of approximately 200 yards around Lahontan Reservoir.

B. Data Sources

In preparing this section and the Cultural Resources Appendix, the following types of sources were consulted: a number of technical reports on small (and a few larger scale) archeological surveys and literature searches, reports on or references to testing or excavation of sites in or near the primary area, general and specific historical and ethnographic works, historic maps, Reclamation project information, USGS data and staff, flood reports, and site locational data obtained from a number of sources.

It is possible that, despite these substantial efforts, data gaps may occur in site information. These gaps, however, are not believed to affect the overall presentation of impacts and recommendations. Also, properties and sites *eligible* for NRHP are not included in the discussions or tables because very few exist within the study areas, and all occur in locations that would not be affected under any alternative.

A Truckee River-focused historic timeline and bibliographies of relevant historical and archeological sources for both study areas are included in the Cultural Resources Appendix.

The amount and level of detail of site information available for portions of the primary area vary greatly. For example, some Truckee River stretches in which development has taken place (Truckee and Reno/Sparks) have been completely surveyed, even more than once, while other portions (from the Little Truckee River to the State line) have had little to no attention. In some cases, site locations were recorded on 15-minute or 30-minute quadrangles (the best available at the time of survey) or with sketch maps, and exact site location is now uncertain. Sites are known to exist in some areas but have not been recorded. In other cases, while thorough surveys have been completed, final reports have not, and specific information is not available.

In addition, State records centers are in the process of converting archeological and historical site data from hand-plotted maps to computerized GIS layered plotting. In the interim, all site locations obtained from all sources have been plotted as exactly as possible on the appropriate 7-1/2-minute USGS quadrangle. The 264 sites around lakes and reservoirs and the 161 sites along various river reaches are listed in the Cultural Resources Appendix in specific table(s) labeled "CRA.2-(facility or reach)." And, the 77 sites (Historic Properties) in the primary and secondary study areas formally listed in the NRHP are presented in tables CRA.3-A (California) and CRA.3-B (Nevada). (Map 3.1 shows the reaches of river used in this analysis.)

The discussion of known cultural resources within the primary study area begins at Lake Tahoe and extends to Pyramid Lake; the cultural resource discussion for the secondary study area includes Lahontan Reservoir. For each lake or reservoir and reach of river or major tributary, there is a summary description of the amount and level of inventory completed (when known) and a summary of the types of sites recorded. Most of the historic properties listed in tables CRA.3-A and CRA.3-B lie within the limits of a few communities along the Truckee River; discussion of these properties is limited.

C. Cultural Resources in the Study Areas

1. Lake Tahoe

The lands surrounding Lake Tahoe are managed by the Lake Tahoe Basin Management Unit of the U.S. Forest Service, California State Parks and Recreation, and by the TRPA, which oversee development of private and public land. Reclamation holds title to Lake Tahoe Dam. Cultural resource surveys of most of the Federal lands in the primary area have been completed. The amount of survey work completed on State and private land is unclear but substantial.

Prehistoric sites recorded within the primary area include the following: large and small prehistoric base and temporary campsites, 11 with only hunting material (e.g., flakes, projectile points, scrapers), primarily of basalt with occasional obsidian, and 13 with only milling or grinding features.

Sixteen ethnographic sites include ones identified as fishing or resting places, mortars, a cemetery, and a campsite associated historically with a particular family. A variety of historic sites include 18 with foundations and/or structures, some with trash dumps and one with a well; 20 separate trash dumps; eight road and three railroad alignments; a power line; two sawmills; two logging locations; nine dams, ditches, flumes, and other water control structures, either separate or part of other sites; and a cemetery. Three sites are of unknown type, and two are rock alignments of unknown age. Many of the sites, some recorded in the 1950s, are reported to be badly disturbed and in areas of development.

In addition to these formally recorded sites, a knowledgeable avocational archeologist, Charles E. Blanchard, documented a large number of probable or actual prehistoric and historic sites during a September 1988 survey. Blanchard conducted the survey on foot and by canoe during a period of extreme low water, and plotted the locations around the shoreline on USGS quadrangles. No elevations are available, but the majority of sites are assumed to lie between 6229 feet (maximum elevation under the Truckee River Agreement of 1935) and 6223 feet, the natural rim of the lake. As no cultural material has been recorded on the exposed land above elevation 6230 feet that correlates with these locations, the extent of remaining material within the pool is unknown.

The resources include the following: 30 possible and 13 definite bedrock mortars or slicks, plus one with a possible minnow trap; 31 definite and two possible rock alignments, cairns, and jetties (prehistoric and historic); 20 prehistoric lithic scatters, and one described as protohistoric with flaked glass; three definite fishing-related sites (traps), plus one natural formation that may have been used as a trap; 58 log or rock dock remains (including pilings); 14 historic house or building remains, plus a round log sea wall; 12 areas of historic trash, plus one with only historic ceramics; three definite or possible quarries; nine sites with rails or railroad alignments; one rock shelter; one logging related site, and 34 examples of modern construction added to historic log cribbing.

Tahoe Dam and Outlet Works and the Gatekeepers Cabin are listed in NRHP as a part of the historic Newlands Project, America’s first Bureau of Reclamation project.

Of the 109 sites listed in the Cultural Resources Appendix (table CRA.2-Lake Tahoe), 19 extend to the beach (at elevation of approximately 6230 feet) or lie on the beach along or near the water‘s edge. Three sites are described as going into the water. Two others are described as possibly going into the water but are at elevation 6230 feet. One site is described as in the water near the beach (elevation 6225 to 6230 feet).

No sites along the beach (but not in the water) are directly affected by the current maximum elevation of 6229 feet. These may well be affected by wave action. (See "Sedimentation and Erosion.")

The lake's minimum elevation was 6220 feet (November 1993), so most of the sites noted by the foot and canoe survey appear to fall in the area between elevation 6229 and 6223 feet and are clearly subject to the effects of fluctuation. Sites reported in shallow water at that time would normally be submerged all year.

2. Truckee River: Lake Tahoe to Donner Creek

Lands along this reach of the Truckee River lie within the Tahoe National Forest Truckee Ranger District and the Lake Tahoe Basin Management Unit. One site is recorded in the Lake Tahoe Basin Management Unit portion.

Cultural resources surveys along this reach include some early general investigation and more recent compliance work along utility corridors and for timber sales and commercial development, resulting in intense coverage for some portions and limited or no coverage for others. In particular, a number of sites are recorded in the deltas or on terraces overlooking the confluence of tributary streams and the river.

Forty-three sites have been recorded on this reach, including prehistoric sites with only material associated with hunting, sites with milling material, and sites with both hunting and milling cultural material. Four of these prehistoric sites also include a limited amount of historic material. Among the historic materials are trash scatters, a railroad alignment, town sites, a mine and tailing pile, a rock ring hearth, a hobo camp, and a Basque tree carving.

3. Donner Lake

The resources of Donner Memorial State Park, which arcs around the east and southeast end of the lake, have been defined. As part of a statewide management program, the park's cultural resources, previously identified and newly discovered, were documented and organized into one general site with several loci of activity (Nesbitt, 1990). Survey of portions of the remainder of the perimeter of the lake, much of which is private land, has been limited to areas associated with development and recreation management; the extent is not known at this time. Much of the area within the primary area on the north side of the lake has been disturbed by historic and recent infrastructural/industrial development.

Within Donner Memorial State Park, the following resources have been defined: two prehistoric lithic scatters, one large and one small; the locations of the historic Murphy and Donner cabin sites; material possibly associated with the historic 1864-66 and slightly later development; and a possible Chinese habitation site.

Two other prehistoric sites have been recorded on the south and west ends of the lake. The one on the west end, originally recorded in 1953, is an extensive scatter of thousands of basalt flakes and a number of tools; the other is a smaller basalt lithic scatter. Two known sites are affected by fluctuating elevation.

In their November 1988 survey of areas of the Donner Memorial State Park exposed by low lake elevations, archeologists from the California Department of Parks and Recreation (CDPR) examined a large lithic scatter which extends downslope to elevation 5933 feet. The site was said to be affected by fluctuating elevations, particularly at elevation 5936 feet (Woodward, 1991).

Another site is shown extending downslope along the beach to the maximum elevation; it is not known if the site extends below elevation 5936 feet. If it does, that portion is affected by fluctuating elevation.

4. Donner Creek: Donner Lake to Truckee River

Survey of the area downstream from Donner Memorial State Park has been limited to relatively small areas associated with aspects of development such as utility corridors, highways, and housing.

Four prehistoric sites have been recorded with extensive basalt and lithic scatters and midden (trash pile). One undefined site (possible Pioneer Village #1, and not listed) is noted near the confluence of Cold Creek and Donner Creek. Some of the features of cultural resources sites which are within Donner Memorial State Park and lie along Donner Creek are discussed under Donner Lake.

5. Truckee River: Donner Creek to State Line

Although it is not entirely clear from USGS quadrangles, much of the primary study area along this reach of the river appears to be private land. Surveys of this segment are associated with highway rights-of-way and development and include linear alignments and small and medium size blocks; 40 percent of the area has been surveyed.

Most of the 26 recorded sites are located upstream of the confluence of Prosser Creek and the Truckee River. The prehistoric sites of varying sizes which have been recorded include the following: six basalt flake scatters, some with tools; a flake scatter with obsidian and jasper as well as basalt material; and a campsite with house rings, flakes and points, one lithic scatter, and a shallow midden. Three of the prehistoric sites also have historic materials, including an historic ice company facility and associated debris and a hotel and “historic ruin.” The other historic site is the location of the Tahoe Ice Company. One recorded protohistoric and historic Washoe Camp is located along the river at Truckee. The material of three remaining plotted sites is unknown.

The site downstream from the confluence of Prosser Creek and the Truckee River is the Boca Brewery, located on the south side of the Truckee, slightly west of the Little

Truckee. Speer (1984) estimated that 10 to 25 percent of the archeological deposit from the brewery's 1893 demise remained. Recent surveys have concentrated on areas within Truckee city limits, as well as the Farad Powerhouse site.

Additionally, two historic sites between Boca Dam and the Truckee River include the Boca townsite (both sides of the Little Truckee River) and a Civilian Conservation Corps camp used during the dam's construction.

6. Prosser Creek Reservoir

Based on the Memorandum of Agreement executed in 1970 transferring project lands to USFS under the Federal Water Project Recreation Act, lands other than those managed by Reclamation and below elevation 5741 feet are the property of and managed by the Forest Service, which has recorded sites in the primary area. Extent of USFS's reservoir perimeter survey to identify cultural resources is not known, but based on copies of USFS maps, it is estimated to be less than 15 percent.

In August 1957, an intensive but unsystematic survey of the proposed Prosser Creek Reservoir area was conducted to locate "sites of archeological importance" (Elsasser, 1957:1). On the forms for the sites recorded, location is referenced to the Truckee 30-minute quadrangle, by quarter-quarter section; all elevations are given as 5800 feet. Elsasser notes that sites were plotted to the nearest 100-foot contour line and that "sites which might be flooded sometimes appear as being above the expected pool elevations of the reservoirs" (Elsasser, 1957:2). Plots for these sites on 15-minute quadrangles by the site repository do not always match the description and location on the site form. Notes on site forms indicate that certain sites will or may be flooded by the dam's construction. Best judgment has been used as to which sites are below or above the maximum elevation. Two of the 16 sites recorded in the Prosser Creek drainage by the 1957 survey were tested before construction. One of these appears to be outside the primary study area.

Twenty-eight sites have been recorded. These sites include prehistoric basalt flake and flake and tool scatters, one historic campsite with prehistoric lithic material, one lithic scatter, and one lithic scatter with ground stone. One site of unknown type has been recorded by non-USFS work.

7. Prosser Creek: Prosser Creek Reservoir to Truckee River

The amount of survey conducted along this stretch of the river is unknown; USFS may have surveyed a portion. One small prehistoric campsite recorded in the general vicinity may be located in the primary study area.

8. Independence Lake

The extent of professional cultural resources survey around the perimeter of privately owned Independence Lake is unknown but appears to be very limited. The reliability of the results of surveys by State Forest technicians is unknown. Four sites have been recorded around the lake. Two sites (for which accurate site information is available) include locations with Basque tree carvings and a basalt flake scatter. The location of the third site, a prehistoric temporary camp, is unknown. Given the slopes of the valley, the presence of numbers of sites, other than perhaps in the valley floor along the creek beneath the lake, seems unlikely.

9. Independence Creek: Independence Lake to Little Truckee River *and* Little Truckee River: Independence Creek to Stampede Reservoir

Downstream from Independence Lake dam, six sites have been recorded near Independence Creek: the remains of a waterwheel and flume, the circa 1915–18 logging camp of the Hobart Estate Company, two basalt flake scatters, as well as the Henness Pass Road and the old Holcomb Dairy. Only one historic site, a berm, has been recorded on the Little Truckee River stretch between Independence Creek and Stampede Reservoir, and it was deemed not eligible for inclusion on the National Register (Wallner, 1996.) No elevation is available for this site.

10. Stampede Reservoir

In 1957, A.B. Elsasser and P.J.F. Schumacher recorded seven sites in the area later inundated by construction of Stampede Reservoir; the intensity and extent of the survey are unknown. Two additional sites, recorded in 1958 and 1966, were intensively investigated in 1967 by Payen and Olsen. CDPR archeologists and historians have recorded two sites (Nesbitt, et al., 1991), and USFS has recorded five sites within the inundation area. One other site, recorded in 1967, may lie within the inundation area.

Lands surrounding Stampede Reservoir, except those managed by Reclamation, are part of the Tahoe National Forest, which has recorded sites in the primary study area. Based on USFS maps, perhaps 10 percent of the perimeter of the lake has been formally surveyed, plus a small additional area above elevation 6000 feet.

The 26 sites recorded within the primary study area include prehistoric occupation areas; prehistoric basalt flake and flake/tool scatters of differing extent and intensity; prehistoric sites described as lithic scatters; sites with lithic scatters and milling features, sites whose types are unknown, and the Boca and Loyalton Railroad segment. At one of the prehistoric sites originally recorded as a flake scatter, more than 100 projectile points and large quantities of ground stone artifacts were discovered during excavation. The second excavated site was a large circular stone enclosure, which yielded a small number of projectile points and other tools. In addition to the historic Smith Mill, four of the prehistoric sites have historic materials, largely trash scatters.

Eighteen sites are known near or below the maximum elevation of Stampede Reservoir. Two sites were partially excavated in 1967 and may require no further attention.

11. Little Truckee River: Stampede Reservoir to Boca Reservoir

Eleven sites have been recorded on this stretch of the Little Truckee River. Site information and the usually small, discrete areas surveyed recorded on USFS atlas sheets form the basis of the discussion.

Recorded prehistoric sites include six flake and tool scatters and two others with flaked and ground stone. One is a historic weir on the Little Truckee River. Historic sites include one historic settlement with structural features, debris, railroad bed, trash scatters, and a segment of an emigrant trail. All three historic trash scatters occur at prehistoric sites. Two sites are not defined on the site forms. All except a segment of the California route of the Overland Trail are situated above modeled maximum elevations.

12. Boca Reservoir

In 1939, Reclamation completed construction of Boca Dam and Reservoir. Although no formal systematic survey of the reservoir area was conducted before construction, between 1954 and 1962, eight sites were recorded below the maximum elevation; at least two of these have been re-recorded by USFS. Locational information is limited for all sites other than those recorded by USFS. Review of copies of USFS atlas maps indicates that the perimeter of the reservoir above maximum elevation has been surveyed.

Sixteen sites recorded to date include prehistoric basalt tool and flake scatters, lithic scatters, prehistoric flake and ground stone scatters, one historic trash scatter, a prehistoric site, and one of unknown type. One of the flake and ground stone sites has historic structural remains. The Boca facility is listed on the NRHP as part of the Newlands Project.

13. Trophy/Mayberry/Oxbow/Spice

Portions of this segment of the study area, particularly the western third, have been surveyed one or more times in response to urban/municipal development and proposed Federal flood control studies.

The 35 recorded sites include several prehistoric lithic scatters and isolates, ranging from small to large and including, in one case, historic trash; prehistoric sites with milling features or ground stone, two with possible shelters; prehistoric sites with both lithic debris and ground stone/milling features, one possibly a Washoe site, one with a possible historic logging camp, and one with a pile of lumber; one prehistoric campsite with petroglyphs, stone rings, lithics, and bedrock metates; and two Washoe sites, one of which was a stratified winter village. Historic sites not found with prehistoric material include five historic irrigation ditches that parallel the river or have their diversion from it in this stretch; one historic corral and rock feature; a ranch complex; a stone wall; remains of the Verdi Lumber Company; other historic foundations and trash; Jameson’s Station; an emigrant trail; and an isolated Chinese bowl rim fragment.

Raven (1992) identified other historic sites whose legal descriptions appear to place them in or near the primary study area in this reach, but these are not formally recorded and, thus, not included in the reach-specific table of the Cultural Resources Appendix. These sites include the locations of Hunter's Bridge and Hotel, Lake's Bridge and Hotel, the Stone and Gates Hotel and Bridge, and diversions for the Eastman, Abbey, American Irrigating, Countryman, Central Pacific Railroad, and English Company historic irrigation ditches.

14. Lockwood

Twenty-three surveys have been conducted, largely in the western third of this segment of the study area, and primarily along the highway on the north side of the river and in a few small to medium-sized block surveys. An estimated 20 percent of the total area has been surveyed.

Prehistoric sites recorded include eight lithic and ground stone scatters, one dense, six with shell, and one with pictographs; eight lithic scatters, one of which is a quarry and one isolate; and one "prehistoric campsite." Historic sites include the Patrick, Derby (not relocated in 1990), and Clark townsites; Tracy Powerplant; two historic debris scatters, one of which may be a railroad construction camp; and Derby Diversion Dam, a NRHP (Newlands Project) listed property and Reclamation's first dam.

15. Nixon

Relatively little of this river reach is reported as having been surveyed; in some cases, portions of block or linear surveys fall near the river. The 12 sites recorded in this reach include one prehistoric lithic scatter; an historic trash dump; two diversion structures; a portion of the Truckee Canal; and the foundations of Adoth townsite. Information on the other sites is lacking.

In 1973, Reclamation asked Dr. Donald R. Tuohy, who completed a survey of the Pyramid Lake Reservation for the Nevada State Museum in cooperation with the Pyramid Tribe in 1965–66, to identify and indicate the value of sites that could potentially be affected by construction of the proposed Marble Bluff Dam and Fishway. Two sites in the primary study area were excavated. Tuohy and Clark (1979) note that one of these was likely to have been under 4 to 12 feet of water in 1862 and 1868 and up to 10 feet in 1890. The other site was probably inundated in 1862, 1871, and 1891.

Resources recorded in this reach, including the excavated sites, are burials found with house pits, prehistoric and protohistoric artifacts, and habitation sites.

16. Pyramid Lake

In 1927, formal cultural resource investigations within the Pyramid Lake Reservation began, with work focused on excavation of a large cave in Marble Bluff. At the Tribe's request, the work was discontinued and no additional work was undertaken on the reservation until 1965, when the Nevada State Museum entered into a contract with the

Tribe to conduct further investigations. Dr. Donald Tuohy directed the work which, in addition to exploring and recording the surface archaeology of the reservation, tested or excavated 102 of the 748 sites located. Additional excavation after 1966 was to be focused on particular classes of sites, including large ones near the mouth of the Truckee River which were badly eroded by the river and heavily collected (Tuohy and Clark, 1979). Small-scale surveys in association with development and improvements have also been conducted on the reservation.

Of the 49 sites recorded at or below elevation 3900 feet and listed (table CRA.2-Pyramid Lake in the Cultural Resources Appendix), 24 have no site record on file. The remaining sites include the following, which seem likely to include all of the possible site types that would occur: three lithic scatters and five lithic isolate locations; two sites with flaked and ground stone; three with pictographs; two with rock alignments, one in conjunction with other materials; four locations with single or multiple caves or rock shelters, with a variety of artifactual material; and five sites with several types of artifacts, including possible habitations. Human remains are reported at three locations, including some at sites with other materials.

The 1960s survey sites have been plotted on 15-minute USGS quadrangles; but in many cases, little information about the sites is available at this time. Locations of all known sites recorded at or below elevation 3860 feet are used in the analysis.

Although the lake's beach area has been intensively used and sites are reported near or just above elevation 3800 feet, most of the recorded sites are above elevation 3840 or 3860 feet. Many are along the drainages that flow into the lake. USGS records for Pyramid Lake are not complete, but in all records between 1867 and 1917 (13 years, 19 readings), the elevation is above 3860 feet. In 1871, the elevation was 3884 feet. Elevations declined from that point through 1960. Between November 1950 and September 1960, with multiple readings each year, the highest elevation was 3810 feet, with most readings below elevation 3805 feet. The lowest reading recorded through 2000 was on February 6 and March 6, 1967, at elevation 3784 feet.

The levels and fluctuations of prehistoric Lake Lahontan (of which the Pyramid Lake area was a part) are beyond the scope of this study, but clearly major fluctuations occurred during the late Holocene, the period of occupation by prehistoric groups described in the Cultural Resources Appendix. Base camps for fishing, and perhaps for other purposes, may well have been located near receding or advancing shorelines, which would have been inundated by subsequent higher lake elevations.

17. Lahontan Reservoir

Twenty-nine cultural resources were identified around the perimeter of Lahontan Reservoir. Reservoir operations for irrigation purposes can cause elevation to fluctuate dramatically, particularly in very dry years, when the difference between high and low elevation has been 58 feet. Most sites around the reservoir are prehistoric in nature. In addition to the Lahontan townsite, assorted historic trash dumps and foundations also exist.

II. Environmental Consequences

Modifying operations of Truckee River reservoirs could affect the water surface elevation of lakes and reservoirs and the quantity, quality, timing, and duration of river/tributary flows, which could affect cultural resources located within or near these water bodies. This analysis evaluates environmental consequences on cultural resources using the following indicator:

- Submergence or exposure of cultural resources within specific site areas, as measured by changes in elevation.

All elevations in this analysis are rounded to the nearest whole number because cultural resource surveys never record site elevations in fractions of a foot. For example, 5840.51 feet mean sea level is rounded to 5841 feet msl, while 5840.50 feet msl is rounded to 5840 feet msl.

A. Summary of Effects

The resources of the Truckee River and its tributaries have been used by humans for centuries, and one drainage has been the focus of human management since the mid-1850s. This continued use has affected previously developed cultural resources sites. Flooding, and to a lesser extent, intervening drought, also affected these resources. The effects of historic flows on cultural resources equal or exceed any that would occur under the proposed alternatives, in which overflow of the banks is rare.

Effects on cultural resource sites on land around the perimeter of lakes or on banks of watercourses above the maximum elevation are virtually the same under the alternatives as under current operations and are not usually discussed as a part of alternative analysis. Such effects include collection of artifacts, or destruction by driving across, digging holes in, or clearing site areas for campsites.

Because of the lack of specific information regarding location or extent of some sites, it is difficult to determine the exact effect on some resources. The tables and discussions provide a reasonable view of the kinds of effects and numbers of known sites involved. For more detail on which sites might be affected, see the facility- and reach-specific tables in the Cultural Resources Appendix.

As noted previously, the amount of survey completed for each reach or feature varies substantially. The need for additional survey and for evaluation of known and newly discovered sites within the primary area would be determined by the lead agency in consultation with the California and the Nevada State Historic Preservation Offices.

Table 3.109 summarizes the effects of the alternatives on cultural resources at lakes and reservoirs in the study area.

Table 3.109—Summary of effects on cultural resources at lakes and reservoirs in the study area

		Number [and percentage] of affected cultural resources							
		Current conditions		No Action		LWSA		TROA	
Lake/reservoir	Number of recorded resources in APE	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected
Tahoe	109	34	[31]	34	[31]	34	[31]	34	[31]
Donner	3	2	[67]	2	[67]	2	[67]	2	[67]
Independence	4	3	[75]	3	[75]	3	[75]	3	[75]
Prosser Creek	28	9	[28]	9	[28]	9	[28]	9	[28]
Stampede	26	18	[69]	18	[69]	18	[69]	6	[23]
Boca	16	6	[38]	6	[38]	6	[38]	6	[38]
Pyramid Lake	49	15	[30]	14	[29]	14	[29]	15	[30]
Lahontan	29	13	[45]	13	[45]	13	[45]	13	[45]
Total	264	100	[38]	99	38]	99	[38]	88	[33]

As shown in table 3.109, there is little, if any difference, between the percentages of cultural resources affected under current conditions and the alternatives. One exception is Stampede Reservoir, where, under TROA, one-third fewer cultural resources would be affected than under current conditions and the other two alternatives. Another exception is Pyramid Lake, where one resource could be affected under TROA (and current conditions) but not under the other two alternatives. However, the effect would depend on its precise location and area in relation to projected elevations, and could require further research. Therefore, under TROA, 5 percent fewer cultural resources at lakes and reservoirs would be affected than under current conditions and the other alternatives.

Table 3.110 summarizes the effects of the alternatives on cultural resources along river and stream reaches in the study area.

As shown in table 3.110, there is no difference in the percentage of cultural resources along the river/major tributaries that would be affected under current conditions and the alternatives. The only exception is the Adoth townsite, (noted with an *asterisk in the Derby Diversion Dam to Pyramid Lake reach), which could be affected under TROA and current conditions. The effect would depend on Adoth's exact location and area in relation to maximum flows under TROA, and could require further research.

Although operations model results show that approximately 3 percent more sites would be affected under TROA (and current conditions) than under No Action or LWSA, (especially the three in Nevada reaches), because of the methodological limitations to the collection and interpretation of these data, much of this is speculation based on the best available data.

Table 3.110—Summary of effects on cultural resources along river and stream reaches

Number [and percentage] of affected cultural resources									
		Current		No Action		LWSA		TROA	
Reach	Number of recorded resources in APE	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected
California									
Truckee River Lake Tahoe to Donner Creek	43	5	[12]	5	[12]	5	[12]	5	[12]
Donner Creek: Donner Lake to Truckee River	4	0	[0]	0	[0]	0	[0]	0	[0]
Truckee River: Donner/Boca	26	2	[8]	2	[8]	2	[8]	2	[8]
Independence Creek: Independence Lake to Little Truckee River and Little Truckee River: Independence Creek to Stampede Reservoir	7	2	[28]	2	[28]	2	[28]	2	[28]
Little Truckee River: Stampede Reservoir to Boca Reservoir	11	0	[0]	0	[0]	0	[0]	0	[0]
Prosser Creek: Prosser Creek Reservoir to Truckee River	0	0	[0]	0	[0]	0	[0]	0	[0]
Nevada									
Truckee River: State Line to Lockwood	35	4	[11]	0	[0]	0	[0]	4	[11]
Truckee River: Lockwood to Derby Diversion Dam	23	4	[17]	0	[0]	0	[0]	4	[17]
Truckee River: Derby Diversion Dam to Pyramid Lake	12	1*	[8]	0	[0]	0	[0]	[1]1	[8]
Total	161	18	[11]	9	[6]	9	[6]	18	[11]

* Adoth townsite.

B. Threshold of Significance

For this analysis, an effect on a cultural resource was considered significant if the site would be subjected to fluctuating water elevation, alternately submerging and exposing it.

C. Method of Analysis

This section describes the method of analysis of effects on cultural resources, including the nature of impacts on cultural resources.

1. Nature of Impacts on Cultural Resources

a. Submergence

The proposed action analyzed in this study includes no physical modifications, and, thus, effects on cultural resources are limited to those associated with submergence and exposure. These effects directly relate to elevation (as msl) of lakes and reservoirs in wet, median, and dry hydrologic conditions and stream reaches in wet hydrologic conditions. Flows in wet hydrologic conditions are much more likely to affect those resources than flows in median or dry hydrologic conditions. (Also see "Approach to Analysis.")

Submergence results in scouring and deposition of sediment. (Also see "Sedimentation and Erosion.") It affects cultural resources sites primarily by destroying the context in which they occur by:

- Moving entire sites or individual items from their original location
- Eroding the soil from around the objects, often collapsing items from one time period (strata) into those from another time period, eliminating much of the information the site contained
- Redepositing materials in foreign settings
- Destroying items
- Depositing layers of soil from elsewhere on moved or in-place materials, creating a false context

Permanent submergence in a setting without strong currents may protect or have little or no effect on cultural resources, although examination of these resources is difficult. Alternate exposure and resubmergence is particularly damaging to perishable materials.

Effects of submergence on sites also vary with the type of site. A bedrock mortar or milling stone on a large boulder would not suffer from flooding in the same way that a surface scatter of small flakes or a fire hearth would.

On the other hand, submergence, especially total, can protect cultural resources from the negative impacts of vandalism, looting, and other illegal, scavenger- or collector-oriented activities. (See following discussion.)

b. Exposure and Other Possible Impacts

The lapping action of waves, especially in large, exposed bodies of water subject to wind-fueled current action (e.g., Lake Tahoe or Pyramid Lake), can affect cultural resources. Sites located at water's edge, due to the erosive impact of water continuously moving back and forth, are especially vulnerable under any hydrologic condition.

Exposure of sites in areas of public use abets another type of impact not related to water management: the collection of cultural items by private citizens for personal gain or use. Not only are exposed sites generally subject to greater destruction by natural forces, they are exposed to increasing levels of destruction by human hands, as in use of "mud flats" for dirt bike or all-terrain vehicle usage.

2. Approach to Analysis

To conduct the analysis of effects on cultural resources, two primary pieces of information were necessary: site location and elevation. The first was collected and plotted as described previously, under "Affected Environment." Obtaining the second set of data was more difficult. Data on reservoir storage and flows obtained from the operations model were used to develop the maximum elevation(s) under current conditions and the three alternatives in wet, median, and dry hydrologic conditions for lakes and reservoirs, and wet hydrologic conditions for rivers and major tributaries.

Flows in wet hydrologic conditions only were used to analyze effects on cultural resources along streams because elevation equivalents in median hydrologic conditions cannot be readily converted to reliable elevation numbers (unlike lakes.) Moreover, flows in median hydrologic conditions have no effect on cultural resources located near the top or on the bottom of rivers and tributaries. Additionally, effects, if any, are rare in dry hydrologic conditions, because unless the river or stream channel has been relocated—or if the resources were carried from another location—it is highly unlikely that there are cultural resources located at the bottom of river or stream channels. (See "Surface Water" and the Water Resources Appendix for details of the operations model and the flows used in analysis.)

a. Lakes and Reservoirs

Although differences in elevation in a lake or reservoir *within* a month could affect sites, the lack of daily information did not compromise the analysis. The effects and sites affected would be the same under the clearly defined maximum and minimum elevations within the body of water, although frequent changes in elevation would accelerate effects.

b. Truckee River and Tributaries

To determine the variation within the monthly flow and the difference in elevation, the records of actual daily flows for the month with the highest flow (USGS arithmetic average) during the period of record for a sample of USGS gauges on the Truckee River were reviewed. The results are presented in table 3.111 and appear in the Cultural Resources Appendix as table CRA.1.

Table 3.111—Example of river gauge data (cfs)

Gauge	Month of maximum	Monthly	High daily[1]	Low daily
Truckee	May 1958	2,400 (4.65 feet)[2]	2,920 (5.17 feet)	2,070 (4.32 feet)
Reno	May 1952	5,679 (8.17 feet)	7,630 (9.29 feet)	4,840 (7.7 feet)
Nixon	June 1983	5,398 (8.6 feet)	6,490 (9.2 feet)	3,350 (7.43 feet)

[1] Daily average.
[2] ( ) approximate gauge height of flow.

In these examples, the difference between high daily flow elevation and the maximum monthly flow elevation never differs by more than 1.1 foot, a small amount given the relative accuracy of plotting cultural resources sites.

Effects on cultural resources along streams were analyzed using maximum monthly flows generated from the operations model**.** The maximum monthly flows were then used to develop maximum elevations under current conditions and the alternatives in wet hydrologic conditions**.**

Translating the simulated flow data developed for river reaches into elevation for the Truckee River was not straightforward. The assumptions made and the approach taken follow. USGS gauging stations on the river were matched with points on reaches from the operations model to the extent possible. Elevations for all gauging stations (many recently installed) were plotted to establish the approximate stream elevation at as many points as possible. Approximate slope between stations was determined to decide if it were reasonable to assume an increase in flow of a given number of feet at one point would be approximately the same increase at another point downstream, absent major inflow. Areas of apparently greater slope were addressed separately. Because of the variability in the number of river elevations within reaches, the accuracy of projected elevation is undoubtedly greater in some reaches than others. The least available information is in the Truckee River from Lake Tahoe to Donner Creek, followed by reach from Donner Creek to the Nevada-California State line. In most cases, the height of the simulated maximum flow above zero gauge height at both ends of a reach was very close.

Potential effects on cultural resources at reservoirs and lakes were analyzed as follows:

- Identifying all sites at which elevation(s) are at or below the maximum elevations, with elevation data based on the operations model

- Comparing the elevation of the selected cultural resource sites to the maximum and minimum elevations in wet, median, and dry hydrologic conditions for each lake and reservoir under current conditions and the three alternatives: No Action, LWSA, and TROA

- Noting which sites would be submerged or exposed during the year under each of the three hydrologic conditions, with attention to length of time of exposure and radical change of level, if notable

- Summarizing effects in the three hydrologic conditions under current conditions and the alternatives

Potential effects on cultural resources along the Truckee River, Prosser Creek, and Little Truckee River were analyzed as follows:

- Identifying the maximum seasonal flow in reaches in wet hydrologic conditions generated from the operations model under current conditions and the three alternatives

- Converting the maximum monthly flow data to elevations at the specific gauging stations at both ends of the reach

- Estimating flow elevation at intermediate points within the reach

- Comparing the elevation of sites to estimated flow elevation

- Identifying and noting sites possibly or likely submerged under the maximum elevation, including any relevant information about the sites

See map 3.1 for the reaches of river and tributaries analyzed; to facilitate analysis, some reaches were combined. Also, site and reach-specific tables in the Cultural Resources Appendix are designed to supplement the following analyses.

D. Model Results and Evaluation of Effects

In many cases, submergence and exposure effects resulting from fluctuations in elevations of lakes and reservoirs under LWSA and TROA are the same or similar to those under No Action. Therefore, only differences are described. Additionally, because flows are almost identical under No Action, LWSA, and TROA, the effects under LWSA and TROA in reaches of the Truckee River and its tributaries are the same as under the No Action, in all hydrologic conditions. Again, only differences are described. All elevations indicated are above mean sea level.

Rather than detailing months that effects are most (or least) likely to occur, seasons are used, as shown in table 3.112:

Table 3.112—Seasons as used in cultural resources analysis

Season	Early	Mid	Late
Winter	December	January	February
Spring	March	April	May
Summer	June	July	August
Fall	September	October	November

1. Lake Tahoe

a. Current Conditions

Of the sites listed in the Cultural Resources Appendix, 19 extend to the beach (about elevation 6230 feet) or lie on the beach along or near the water‘s edge. Three are described as going into the water, while two are described as possibly going into the water but are at elevation 6230 feet. One site is described as in the water near the beach (elevation 6225 to 6230 feet). The 1988 survey identified cultural resources along the lake‘s edge below the 6229 foot level; site numbers were not assigned to these, nor have the exact extent or elevations been determined or recorded. Because no cultural material has been recorded on the exposed land above elevation 6230 feet that correlates with these locations, the extent of remaining material within the pool is unknown.

Operations model results show that in wet hydrologic conditions under current conditions, those sites between elevation 6228 and 6230 feet are exposed most of the year. Portions of two sites above elevation 6228 feet are subject to wave action (“Erosion and Other Possible Effects”) all year.

In median hydrologic conditions, elevation averages 6228 feet. Sites above elevation 6227 feet are exposed or in the fluctuation zone, and thus subject to exposure part of the year. Those sites above elevation 6228 feet are exposed all year. Two sites are subject to wave action all year in wet hydrologic conditions.

In dry hydrologic conditions, sites between elevation 6222 and 6229 feet are exposed and submerged respectively. Sites above elevation 6223 feet are exposed or partially exposed in early summer, while sites between elevation 6222 and 6223 feet are exposed or partially exposed fall through spring. Two sites are exposed all year.

b. No Action, LWSA, and TROA

Operations model results show a minimum elevation of 6223 feet in dry hydrologic conditions. When sites are reported as being in shallow water, it is not clear where below elevation 6223 feet they lie. Because all of the sites along the beach lie above elevation 6229 feet (the maximum lake elevation), none would be directly affected under any alternative.

Operations model results show that in wet hydrologic conditions, sites between elevation 6228 and 6229 feet would be exposed in early summer. A portion of two sites would be subject to wave lapping action the entire year.

In median hydrologic conditions, sites above elevation 6227 feet would be exposed or in the fluctuation zone during early winter, and sites between elevation 6227 and 6228 feet would be exposed or in the fluctuation zone the rest of the year. Again, portions of two sites would be subject to wave action all year.

In dry hydrologic conditions, sites above elevation 6222 feet would be exposed or partially exposed in early winter, while those above elevation 6222 feet would be exposed or partially exposed in fall and winter. Two sites would be exposed all year. Portions of these sites could be subject to wave lapping action, depending on water levels.

Because the differences between the maximum and minimum elevations are virtually the same in wet, median, and dry hydrologic conditions—less than one foot—exposure and submergence of all sites is expected to be the same under all alternatives.

2. Truckee River: Lake Tahoe to Donner Creek

a. Current Conditions

Operations model results show that five known sites may be submerged or partially submerged by maximum flows in this reach. Lower flows probably do not affect these sites.

b. No Action, LWSA, and TROA

The maximum flow at the USGS gauge immediately downstream from Lake Tahoe, the upper end of the reach, is 114 cfs. Therefore, the maximum monthly late winter flow of 1,494 cfs in wet hydrologic conditions under all alternatives cannot be directly converted to water surface elevation.

Flow from tributaries in this reach undoubtedly would increase the flow elevation at the Truckee gauge, but no data exist in the operations model for these inflows or for the Truckee gauge. Truckee gauge flows were estimated by subtracting Donner Lake releases from Truckee River flow. The maximum monthly flow at the Truckee gauge is 2,075 cfs in early spring, which is 4.3 feet above zero, or elevation 5862 feet. The water surface elevation along the river was estimated to be at approximately the same level above zero. Five known sites within the primary study area could be submerged only by the highest flows under any of the alternatives.

Sites at the confluence of the Truckee River and its smaller tributaries, such as Squaw Valley, could be affected by combined flows of the river and the tributary, but this is not a result of releases into the Truckee River channel under any alternative.

3. Donner Lake

a. Current Conditions

One site could be affected by fluctuations in lake elevation. A large lithic scatter in Donner Memorial State Park that extends downslope to the maximum projected elevation of 5936 feet is subject to fluctuating elevation in wet and median, hydrologic conditions.

Another site recorded at 5860 feet remains completely submerged under current conditions. It is not known as to whether this site extends up from this elevation.

b. No Action

Operations model results show that fluctuating elevations would affect one site in all hydrologic conditions. In wet and median hydrologic conditions, operations model results show that the elevation fluctuates from below the lower portion of the site up to the portion at the maximum elevation, which would expose the entire site in winter to spring and largely cover it the remainder of the time, subjecting the portion near maximum elevation to potential wave damage. In dry hydrologic conditions, the maximum elevation is below the lowest extent of the site, resulting in exposure all year.

c. LWSA and TROA

As at Lake Tahoe, because operations model results show that the difference between the maximum and minimum elevation for Donner Lake is the same in wet, median, and dry hydrologic conditions—less than a half-foot variant—expected site exposure and submergence are approximately the same under LWSA and TROA as under No Action.

4. Donner Creek: Donner Lake to Truckee River

Operations model results show a maximum flow in this reach of 141 cfs (or elevation 5828 feet) in wet hydrologic conditions under current conditions and the three alternatives. Elevations for three of the four sites recorded along the reach downstream from Donner Memorial State Park are given as 5960 feet. Two of these sites have been excavated and thus require no further consideration. The remaining two sites are above the maximum monthly elevation and would not be affected.

5. Truckee River: Donner Creek to State Line

Operations model results show that in wet hydrologic conditions under current conditions and the alternatives, the maximum monthly flow for the Truckee River from Donner Creek to the Little Truckee River confluence is 2079 cfs (elevation 5862 feet) in late spring. Downstream from the confluence, the maximum monthly flow is 2231 cfs (elevation 5862.1 feet) in early summer.

Three cultural resources are at locations that could be inundated by the maximum monthly flow. It is possible that these sites have been or are being affected by this high flow. Other sites plotted near the river appear to be above the maximum monthly flow elevation. This flow would not affect the Boca Brewery site or the Boca townsite under any of the alternatives.

6. Prosser Creek Reservoir

a. Current Conditions

Nine sites appear to lie partially or completely below the maximum elevation of 5741 feet shown by operations model results. Thus, in wet hydrologic conditions, four sites are submerged all year; three sites are submerged spring through summer and exposed the remainder of the year; and two sites are submerged or in the fluctuation zone in late spring. From late spring through summer, the portions of these sites between elevation 5740 and 5741 feet are submerged or in the fluctuation zone, while other sites are exposed. The lower edge of one site is submerged or in the fluctuation zone from late spring through late summer and exposed the remainder of the year.

In median hydrologic conditions in late spring, three sites are possibly submerged or in the fluctuation zone; these sites are exposed the remainder of the year. The lower portions of two sites are likely in the fluctuation zone in late spring but are exposed the remainder of the year. One site is exposed all year, while four others are submerged all year.

In dry hydrologic conditions, all identified sites are exposed all year.

b. No Action and LWSA

Nine recorded sites appear to lie below the maximum elevation of 5741 feet shown by operations model results. Two sites are partially below the maximum elevation. Five are among the sites located by Elsasser and Shumacher in their 1957 survey of the project area.

At elevation 5741 feet, most sites would be submerged all or part of the time during the summer. In median hydrologic conditions, three sites would be exposed all year, except late spring, when areas up to elevation 5713 feet would be submerged or in the fluctuation zone.

The lower portion of two other sites would be covered in late spring; these sites would be exposed the remainder of the year. One site would be exposed all year, and four sites would be submerged all year.

In dry hydrologic conditions, (elevation 5671 feet), all nine sites would be exposed in late winter. The 69.9 foot difference in elevation between wet and dry hydrologic conditions is the same under current conditions. However, given the length of time the sites have been subjected to substantial annual fluctuations in the elevations, the sites may no longer have retained integrity.

c. TROA

Operations model results show that, under TROA in wet hydrologic conditions, three sites would be submerged all year. Five other sites would be exposed during six months in the winter. Three of these five would be submerged or affected by wave action from late spring to early fall. In early summer, the lower edge of one site would be subject to wave action or submerged. This site would be exposed the remainder of the year.

In median hydrologic conditions, no sites would be submerged all of the time, and only one would be partially submerged. From late spring to mid-summer, operations model results show that the elevation is at or near three sites. As a result, these sites are likely to be subject to wave action and possibly submerged in late spring and exposed the remainder of the year. The extreme lower portions of some sites could also be affected in the same way. One other site would be exposed all year.

In dry hydrologic conditions, all sites above 5695 feet would be exposed in late winter.

Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, Prosser Creek Reservoir operations under TROA would result in no difference in the number and percent of resources affected, when compared to No Action or current conditions (table 3.109).

7. Prosser Creek: Prosser Creek Reservoir to Truckee River

Because no firm site locations are recorded for this area, effects under current conditions and the alternatives cannot be analyzed.

8. Independence Lake

Because only one known historic site is possibly located adjacent to the maximum elevation of the lake, discussion of effects under current conditions is limited. The identified site is reported by the site repository to be several miles from Independence Lake—and well above projected maximum elevations—thus, no impacts are expected. The other three sites are well below the lake's minimum elevation in dry hydrologic conditions, as shown by operations model results, so they would remain submerged under current conditions and all alternatives.

9. Independence Creek: Independence Lake to Little Truckee River *and* Little Truckee River: Independence Creek to Stampede Reservoir

Efforts to determine the elevation of the maximum monthly flow in Independence Creek (105 cfs in wet hydrologic conditions in early summer under current conditions and the alternatives) were not useful. With only one gauging station located 0.4 mile downstream from the dam and a considerable drop in elevation along the reach, no estimate of elevation of the flows at the location of the four cultural resource sites can reasonably be made. The two Hobart historic sites (water wheel and logging camp) were undoubtedly placed to take advantage of the creek flows, and some features would reasonably be at the edge of or in the water. The purposes and exact relation of the prehistoric sites to Independence Creek are unknown.

On the Little Truckee River between Independence Creek and Stampede Reservoir, because no elevation for the one historic site (a berm, CA-SIE-1322) was given, effects under current conditions and the alternatives cannot be analyzed.

10. Stampede Reservoir

a. Current Conditions

Of the 17 sites known to be near or below the maximum elevation, two were recorded by CDPR archeologist and historians in 1991, (Nesbitt, et al., 1991); five by USFS; two others in 1958 and 1966; and the remainder in 1957. One other site, recorded in 1967, may lie below the maximum elevation. The sites recorded in 1957 and 1958–1966 were plotted on USGS 30-minute quadrangles replotted on 7 1/2-minute quadrangles. For this analysis, these were plotted by legal description to the quarter/quarter section. Two sites were partially excavated in 1967 and, thus, may require no further attention. Most of the sites are described as flake or flake and tool scatters, mostly basalt. Three of these have other material as well. No elevations are given for six sites.

Operations model results show a maximum elevation of 5949 feet in mid-summer. Therefore, in wet hydrologic conditions under current conditions, 13 sites are submerged all year; a portion of one site between elevation 5942 and 5880 feet is submerged all year, while the portion of the site between elevation 5942 and 5948 feet is in the fluctuation zone from spring to late summer. The portion of another site between elevation 5945 and 5948 feet is in the fluctuation zone from spring through late summer and exposed the remainder of the year. Three sites appear to be subject to wave action when the elevation is 5948 feet.

In median hydrologic conditions (maximum elevation 5933 feet), 11 sites are submerged all year. For two sites, a portion is submerged all year, a portion is in the fluctuation zone, and a portion is exposed all year. Another site probably is subject to wave action from early fall to mid-winter and is submerged the rest of the year.

In dry hydrologic conditions (maximum elevation 5824 feet), 11 sites are exposed all year, and no sites are submerged all year. Portions of three sites between elevation 5832 and 5800 feet are exposed in late winter and early spring, in rising and receding water the remainder of the year, and the portions located between elevation 5832 to 5840 feet are exposed or in a area subject to wave action all year. Another site is exposed in late winter and early spring and is in rising and receding water the remainder of the year.

b. No Action and LWSA

Operations model results show a maximum elevation of 5948 feet in mid-summer in wet hydrologic conditions. At that elevation, most sites would be submerged the entire year. A portion of another would be entirely submerged all year; the remainder of the site would be in the fluctuation zone from spring through summer. Portions of one other site would be in the fluctuation zone from spring through summer and exposed the remainder of the year.

In median hydrologic conditions (maximum elevation 5933 feet), one site would be submerged the entire year. A portion of one site would be submerged, a portion would be in the fluctuation zone, and a portion would be exposed all year. A portion of another site would be submerged the entire year. One site would be exposed, except for late spring, while three others would be exposed all year.

In dry hydrologic conditions (maximum elevation 5834 feet), 10 sites would be exposed and one site would be submerged all year. Portions of three sites would be exposed all year, while other portions would be subject to elevation changes 11 months of the year. Portions of two sites would be exposed the entire year, and other portions would be exposed all year, except late spring. One site would be exposed all months except in late spring, and would be subject to wave action in early summer.

c. TROA

Operations model results show a maximum elevation of 5949 feet in wet hydrologic conditions under TROA. Therefore, 13 sites would be submerged all year. For another site, one portion would be submerged all year, and another portion would be in the fluctuation zone from spring through summer. A portion of another site would be in the fluctuation zone from spring through summer and exposed the remainder of the year. Two other sites are likely to be subject to wave action when the elevation is 5948 feet.

In median hydrologic conditions (maximum elevation 5941 feet), 11 sites would be submerged all year. A portion of another site would be submerged all year, while other portions would be in the fluctuation zone. One portion of yet another site would be submerged all year, and another portion would be in the fluctuation zone from mid-winter to mid-summer. A portion of one site would be exposed from fall to early winter. Three other sites would be exposed all year.

In dry hydrologic conditions (maximum elevation 5884 feet), 19 sites and almost all of two others would be submerged all year. The upper portions of these two sites would be in the fluctuation zone. Three other sites would be exposed or in the fluctuation zone in late winter to early spring and submerged the remainder of the year. Portions of two other sites would be submerged or in the fluctuation zone all year, with a portion of one exposed all year. Four sites would be exposed all year.

It is clear that Stampede Reservoir's recorded cultural resources would benefit under TROA, compared to No Action and current conditions. Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, under TROA, only one-third of recorded cultural resources would be affected, when compared to the other alternatives (table 3.109).

11. Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show a maximum monthly flow of 973 cfs (estimated elevation of 5620 feet) in wet hydrologic conditions under TROA for this reach of the Little Truckee for the gauge located one mile upstream of Boca Reservoir and projected upstream and downstream. All cultural resources recorded in this reach are above this projected elevation. Therefore, no sites on this reach would be affected under current conditions or the three alternatives.

12. Boca Reservoir

a. Current Conditions

No professional survey to identify cultural resources was conducted within the reservoir pool before construction of Boca Dam. Thus, the effects on only five sites identified near or within the maximum elevation located in conjunction with specific USFS actions or general surveys after construction of the dam are discussed. The effects on other sites which almost certainly exist below the maximum elevation cannot be specifically addressed, although they would be similar to the effects on similar sites at other reservoirs.

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions under current conditions. At this elevation, five sites are exposed from fall through early spring. For the remaining period (spring through summer), portions of these sites are submerged. One site is submerged all year.

In median hydrologic conditions (maximum elevation 5575 feet) five sites are exposed for 8 months and submerged or partially submerged from mid-spring to mid-summer, when the portions below elevation 5605 feet are submerged. The other site likely is submerged all year.

In dry hydrologic conditions (maximum elevation 5521 feet), five sites are exposed all year, and the other is completely or partially submerged.

b. No Action and LWSA

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions. At this elevation, most sites would remain exposed from late spring to early summer. During the remaining period, portions of sites would be submerged or subjected to wave action. One site would be submerged year-round.

In median hydrologic conditions (maximum elevation 5573 feet), five sites would be exposed for 8 months and submerged or partially submerged from mid-spring to mid-summer, when the portions below elevation 5605 feet would submerged. The other site would be submerged all year. In dry hydrologic conditions (maximum elevation 5523 feet), all Boca Reservoir sites, except one, would be exposed in mid-winter.

c. TROA

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions under TROA. At this elevation, five sites would be exposed for 6 months. In the other 6 months, portions of all five sites would be submerged or in the fluctuation zone. Another site also would be submerged. In median hydrologic conditions (maximum elevation 5588 feet), two sites would be exposed for 8 months and covered or partially covered from spring to mid-summer, when portions below elevation 5605 feet would be submerged. Another site would be submerged all year. In dry hydrologic conditions (maximum elevation 5531 feet), five sites would be exposed all year, and another would be submerged.

Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, Boca Reservoir operations under TROA would result in no difference in the number and percent of resources affected, when compared to No Action or current conditions (table 3.109).

13. Trophy/Mayberry/Oxbow/Spice

a. Current Conditions and TROA

Discussion of resources in this reach of the river is divided into segments based on USGS gauge locations. The elevation for the maximum flow for the upper end of the segment of the reach between the State line and Reno (3,563 cfs in wet hydrologic conditions in mid-spring) is 5160 feet under current conditions. The estimated river elevation at Verdi, where sites begin for the reach, is 4830 to 4840 feet. For the segment of the reach beginning at Reno, the elevation for the maximum flow (3,513 cfs in wet hydrologic conditions in mid-spring) is 4439 feet. At the Vista gauge near Lockwood, the elevation for the maximum flow (3,679 cfs in wet hydrologic conditions in mid-spring) is 4407 feet.

There is a possibility, but no recorded evidence, that four cultural resource sites may be affected by these flows, which are less or functionally equal to maximum flows under the alternatives. These sites include two between Verdi and the Mogul gauging station, and two between the Mogul gauge and the Reno gauge, just above the surface of the water.

b. No Action and LWSA

There are no projected effects to cultural resources under No Action and LWSA in this reach.

14. Lockwood

a. Current Conditions and TROA

Portions of two sites lie along the river between the Vista gauge and just downstream from the Tracy gauge. The lower portion of one site is reported to have been destroyed largely through gravel operations. The remaining portion is above projected maximum flow elevation. The other site has also been greatly damaged. Based on the flow elevation at Tracy, approximately 2.5 miles downstream, these sites could be affected under current conditions and TROA.

Between the Tracy gauge and Derby Diversion Dam, portions of two sites may lie within the flow elevations shown by operations model results for current conditions and TROA. The first is an isolate out of context, and the other is reported to be disturbed. Because of these factors, these sites are likely to be only mildly affected, if at all, under current conditions and TROA.

b. No Action and LWSA

Because operations model results show flows under No Action and LWSA are less than under current conditions and TROA, no effects are likely.

15. Nixon

a. Current Conditions and TROA

Of the 12 listed sites, six stand unrecorded, so it is impossible to know precisely what these sites are and where they are located. Only the Adoth townsite appears to lie just below the estimated high flow elevation of 4185 feet and could be partially inundated under TROA; however, there is no evidence of flooding reported with the site information.

b. No Action and LWSA

Because operations model results show flows under No Action and LWSA are less than under current conditions and TROA, no effects are likely.

16. Pyramid Lake

a. Current Conditions

As discussed under “Affected Environment,” a large number of sites were recorded on the Pyramid Lake Reservation in the mid-1960s by Dr. Donald Tuohy, with others added through compliance work over the years. The 1960s survey sites have been plotted on 15-minute quadrangles, but, in many cases, little information about the sites is available.

Fifteen sites or portions of sites are known to lie within the maximum elevation under current conditions. Two of these sites were human internments that have been disinterred, and one was an isolated basket that has been collected and is not considered further here. Basic information is available for four of the remaining sites: two are lithic scatters; one is a multifeatured site whose features extend upslope from 3800 to 3890 feet; and the other is a fishing camp and possible burial site which extends below elevation 3800 feet into the lake. No site record is currently available for this last site, and status of investigations of the features is unknown.

Operations model results show a maximum elevation of 3852 feet in wet hydrologic conditions under current conditions. At this elevation, 11 of the sites or site locations are submerged the entire year. Portions of two large sites are affected differently. For one site, the portion below elevation 3846 feet is submerged all year, while the portion between elevation 3846 and 3848 feet is in the fluctuation zone, and the portion above elevation 3848 feet is exposed all year. For the other site, the portion below 3846 feet is submerged all year; the portion between 3846 and 3848 feet is in the fluctuation zone; and the portion above elevation 3848 feet is exposed all year. One other site is exposed the entire year.

In median hydrologic conditions (maximum elevation 3837 feet), nine sites are submerged, and three sites are exposed all year. One site is submerged in late spring and early summer and exposed the remainder of the year. A portion of another site between elevation 3800 and 3828 feet is submerged all year; the portion between elevation 3828 and 3830 feet is in the fluctuation zone; and the portion above elevation 3830 feet is exposed all year.

In dry hydrologic conditions (maximum elevation 3822 feet), ten sites are exposed and three are submerged all year. For one site, the portion between elevation 3800 and 3806 feet is submerged all year; the portion between elevation 3806 and 3810 feet is in the fluctuation zone; and the portion above elevation 3810 feet is exposed all year.

b. No Action and LWSA

Operations model results show a maximum elevation of 3850 feet in wet hydrologic conditions. At this elevation, 15 sites or portions of sites would be submerged. As discussed under current conditions, two of these sites were human internments that have been disinterred and one was an isolated basket that has been collected and is not considered further here. Basic information is available for five of the remaining sites: two are lithic scatters; one, a multi-feature site whose features extend upslope from elevation 3800 to 3890 feet; one, a U-shaped rock wall; and one, a fishing camp and possible burial site that extends below elevation 3800 feet into the lake. No site record is currently available for this last site, and status of investigations of the features is unknown.

In median hydrologic conditions (maximum elevation 3835 feet), ten sites would be submerged all year, while three others would be exposed all year. At another site, portions would be submerged all year, portions would be in the fluctuation zone, and portions would be exposed all year.

In dry hydrologic conditions (maximum elevation 3820 feet) three sites would be submerged all year. Portions of another site would be subject to fluctuating elevations. All remaining sites would be exposed all year.

c. TROA

In wet hydrologic conditions (maximum elevation 3853 feet) all of the sites that would be submerged under No Action also would be submerged under TROA. Portions of two others would be submerged, exposed, or in the fluctuation zone.

In median hydrologic conditions (maximum elevation 3839 feet) the same sites that would be submerged under No Action would be submerged under TROA, but fluctuation and exposure of the sites would begin at elevation 3839 feet.

In dry hydrologic conditions (maximum elevation 3822 feet) the same sites submerged under No Action would submerged under TROA. Portions of one site still would be subject to fluctuation or exposure but at different elevations than under No Action.

17. Lahontan Reservoir

a. Current Conditions

Although Lahontan Reservoir receives irrigation water from the Truckee River via the Truckee Canal, it is not a part of the primary study area. It is, however, part of the secondary study area. Twenty-nine cultural resources adjacent to the lake’s perimeter (or close to) were identified in recent follow up research.

Operations model results show that under current conditions and the three alternatives**,** the reservoir’s 4163-foot maximum elevation from mid-spring to early summer in wet hydrologic conditions inundates many of the prehistoric sites, most of which were excavated in the mid-1970s. At this elevation, ten sites are inundated, with two or three more partially covered. Although most of these sites were excavated, there is a chance that some materials may remain. It is possible that other sites remain undiscovered.

In median and dry hydrologic conditions (when Lahontan Reservoir’s elevation is at 4147 and 4113 feet, respectively), it is possible that more prehistoric and historic sites may be uncovered. Many of the reservoir’s known sites are well above the 4163-foot elevation, however, and would, therefore, be unaffected.

b. No Action, LWSA, and TROA

Operations model results show that in wet hydrologic conditions under all alternatives, the reservoir's maximum monthly elevation from mid-spring to early summer is 4163 feet—the same as under current conditions. Therefore, effects on cultural resources would be the same as under current conditions.

In median hydrologic conditions (maximum elevation 4146 feet) elevation vary less than one-half foot among the three alternatives. Effects on cultural resources would be the same as under current conditions.

In dry hydrologic conditions, (maximum elevation 4106 feet, or 57 feet lower than in wet hydrologic conditions), all sites, except one, would be exposed. Two sites have no elevation records, and it is possible that more sites could be uncovered.

Finally, operations model results show that the elevation of Lahontan Reservoir fluctuates less than two-thirds of a foot in wet or dry hydrologic conditions. Thus, the hundreds of recorded cultural resource sites located downstream from Lahontan Dam in the Carson River valley would not be affected. Because of this, these resources are not considered further here.

III. Mitigation

No mitigation is expected. Mitigation under any alternative would occur only if cultural resources are present that are eligible for the NRHP and they are being adversely affected by lake/reservoir operations or land uses or are being damaged by natural agents.

Reclamation's policy is to seek to avoid impacts to cultural resources whenever possible. If an action is planned that could adversely affect an archeological, historical, or traditional cultural property site, then Reclamation will investigate options to avoid the site. However, if avoidance is not possible, protective or mitigative measures will be developed and considered.

Cultural resources management actions will be planned and implemented consistent with consultation requirements defined in 36 Code of Federal Regulations 800, using methods consistent with the Secretary of the Interior's Standards and Guidelines.''

If mitigation is necessary, the lead agency, working in coordination with other involved agencies, tribal authorities, California and Nevada State Historic Preservation Offices, and the Advisory Council on Historic Preservation, will develop a programmatic agreement that will detail any requirements needed to mitigate and resolve adverse effects to cultural resources that may result from implementation of TROA or any alternatives.

INDIAN TRUST RESOURCES

I. Affected Environment

Indian trust resources are legal interests in property or natural resources held in trust by the United States for Indian Tribes or individuals. The Secretary is the trustee for the United States on behalf of Indian Tribes. All Interior bureaus share the Secretary's duty to act responsibly to protect and maintain Indian trust resources reserved by or granted to Indian Tribes or Indian individuals by treaties, statutes, and Executive orders. These rights are sometimes further interpreted through court decisions and regulations. Examples of trust resources are lands, minerals, hunting and fishing rights, and water rights. Interior carries out its activities in a manner that protects trust resources and avoids adverse impacts when possible. When adverse impacts cannot be avoided, appropriate mitigation or compensation is to be provided in consultation with the affected Tribes and/or individuals.

Indian trust resources were assessed in consultation with the following tribes in the study area: Pyramid Lake Paiute Tribe—Pyramid Lake Indian Reservation (which includes Pyramid Lake) in Nevada; Reno-Sparks Indian Colony—Reno and Hungry Valley, in Nevada; Fallon Paiute-Shoshone Tribes—Fallon Paiute-Shoshone Reservation and Fallon Colony in Nevada; and Washoe Tribe of Nevada and California.

Trust resources of these Tribes include land, water rights, and fish and wildlife; incomes are derived from these resources. The Tribes are concerned with regional water quality and quantity, water distribution, fish and wildlife, and wetlands.

A. Pyramid Lake Indian Reservation

The formal recognition of the trust relationship between the Pyramid Tribe and the United States can be based on the 1859 withdrawal for Indian use of "a tract of land in the northern portion of the valley of the Truckee River, including Pyramid Lake." After subsequent surveys, an Executive order was issued in March 1875 that further acknowledged the reservation of the Pyramid Lake Paiutes. The reservation presently covers 475,085 acres.

P.L. 101-618 affirmed that "all existing property rights or interests, all of the trust land within the exterior boundaries of the Pyramid Lake Indian Reservation shall be permanently held by the United States for the sole use and benefit of the Pyramid Tribe (Section 210[b][1])." This legislation also recognizes Anaho Island as a part of the reservation and affirms tribal ownership of the Pyramid Lake lakebed and the beds and banks of the lower Truckee River.

B. Reno-Sparks Indian Colony

The Reno-Sparks Indian Colony was created in 1916, when 20 acres were set aside in Reno for use by members of the Northern Paiute, Washoe, and Western Shoshone people. An additional 8 acres were added later. Recently, the colony acquired 1,920 acres in Hungry Valley north of Reno. The land is used primarily for residential purposes.

C. Fallon Indian Reservation and Colony

The Fallon Paiute-Shoshone Indian Reservation is located in Churchill County in west-central Nevada, approximately 10 mile northeast of Fallon and 65 miles east of Reno and Carson City. The reservation was created following the General Allotment Act of 1887, when members of the Paiute and Shoshone Tribes were allotted about 31,360 acres in the Lahontan Valley. The lands were located in an area that would become part of the Carson Division of the Newlands Project. In 1906, an agreement was made in which Tribal members would exchange their original 160-acre allotments of nonirrigable lands for 10-acre allotments of irrigable lands with paid up water rights. A 1907 order by Interior reserved 4,640 acres on behalf of Tribal members who had relinquished their original allotments. An additional 840 acres adjoining the north boundary of the reservation were set aside in 1917. Water was first delivered to the allotted lands between 1908 and 1910. Currently, 5,513 of the 8,156 acres of the reservation are water righted. Approximately 1,800-3,175 acres have been irrigated. The Fallon Indian Colony was established with 40 acres, with an additional 20 acres added in 1958; Colony land is used for residential and commercial purposes.

D. Washoe Tribe of Nevada and California

The Washoe Tribe of Nevada and California is a federally recognized Indian tribe organized pursuant to the Indian Reorganization Act of June 18, 1934, as amended. The Tribal office is located in Gardnerville, Nevada. The Washoe Tribe has four communities, three in Nevada (Stewart, Carson, and Dresslerville), and one in California (Woodfords). There is also a Washoe community located within the Reno-Sparks Indian Colony. The Washoe Tribe has jurisdiction over trust allotments in both Nevada and California, with additional Tribal Trust parcels located in Alpine, Placer, Sierra, Douglas, Carson, and Washoe Counties; it has cultural interests at and near Lake Tahoe but does not exercise any water rights in the Lake Tahoe or Truckee River basins. Tribal history extends an estimated 9,000 years in the Lake Tahoe basin and adjacent east and west slopes and valleys of the Sierra Nevada. The present day Washoe Tribe has deep roots in the past, radiating from Lake Tahoe, a spiritual and cultural center, and encompassing an area that stretches from Honey Lake to Mono Lake.

E. Water Rights

1. Pyramid Tribe

The Federal actions that set aside Pyramid Lake Indian Reservation explicitly reserved Pyramid Lake for the Tribe's benefit. Water rights for the reservation were claimed by Interior in 1913, at the same time Interior was claiming water for the Newlands Project. When the *Orr Ditch* decree was finally issued in 1944, the Pyramid Tribe was given an appropriation date of 1859, senior to all other appropriators. Under the *Orr Ditch* decree, the Pyramid Tribe was allocated for irrigation an amount not to exceed 4.71 acre-feet per acre for 3,130 acres of bottomland farm (14,742 acre-feet) (Claim No. 1) and another 5.59 acre-feet per acre for 2,745 acres of benchlands (15,345 acre-feet) (Claim No. 2). Other than irrigation, no additional water was allocated for the fish or fish habitat in Pyramid Lake or the lower Truckee River.

Over the years, the Tribe has actively worked to protect Pyramid Lake and increase inflow to the lake. With the elevation of Pyramid Lake falling and flows diminishing, the Tribe, in 1973, sought to reopen the *Orr Ditch* decree to obtain additional water rights for the lake and its fishery. The Tribe alleged that the Federal Government had breached its trust responsibility when it defended water rights for the Newlands Project and did not diligently defend Tribal water rights for all purposes. Following lengthy litigation, the U.S. Supreme Court ruled in 1983 that the *Orr Ditch* decree was final and binding.

When Interior implemented operating criteria for the Newlands Project in 1967, the Tribe intervened, claiming that the Secretary was taking his trust responsibilities too lightly. The Secretary was advised that his trust responsibilities included conserving water for the Tribe. Interim implementation of the Newlands Project's Operating Criteria and Procedures decreased diversions from the Truckee River; thus allowing additional water to flow into Pyramid Lake. Additionally, Stampede Reservoir and, to a lesser degree, Prosser Creek Reservoir, are operated to supplement unregulated Truckee River flows for the benefit of Pyramid Lake fishes.

2. Fallon Paiute-Shoshone Tribes

The Fallon Tribes entered into a settlement agreement that was ratified by Congress as Title I of P.L. 101-618, or the Fallon Paiute-Shoshone Indian Tribes Water Rights Settlement Act of 1990. Section 103 of P.L. 101-618 limits annual water use on the reservation to 10,587.5 acre-feet (equivalent to 3,025 acres). It also, however, permits the Tribes to acquire up to 2,415.3 acres of land and up to 8,453.55 acre-feet of water rights. These water rights may be used for irrigation, fish and wildlife, M&I, recreation, or water quality purposes, or for any other beneficial use subject to applicable laws of the State of Nevada.

An expanded irrigation system was envisioned by P.L. 95-337 and enacted by the Congress in 1978; however, the construction of this system was not pursued and was superseded by a financial settlement as part of P.L. 101-618. BIA entered into an agreement with FWS in 1995 to acquire water rights for reservation wetlands; under that agreement, 1,613.4 acre-feet of water rights have been acquired. Water rights on and appurtenant to the reservation are served by Newlands Project facilities pursuant to OCAP.

3. Reno-Sparks Indian Colony

Members of the Reno-Sparks Indian Colony believe they may have rights to about 30 acre-feet of water under the *Orr Ditch* decree.

F. Fish and Wildlife

1. Pyramid Tribe

The Pyramid Lake fishery remains one of the cultural mainstays of the Pyramid Tribe. To protect the fishery, the Tribe maintains two hatcheries; is working cooperatively with Federal, State, and private agencies to protect spawning areas and improve river access for spawning, as noted below; and seeks more inflow to Pyramid Lake, as noted previously. The Tribal fishery program operates hatcheries at Sutcliffe and Numana. Tribal hatcheries raise both the threatened LCT and endangered cui-ui. LCT hatcheries support a world-class fishery; the cui-ui hatchery is a “fail-safe” operation to maintain the strain in case of catastrophic event.

The Tribe uses a portion of the interest from the principle of the $25-million Pyramid Lake Paiute Fisheries Fund, provided under section 208 of P.L. 101-618, for management of the Pyramid Lake fishery. As part of endangered and threatened species recovery efforts, the Federal Government, in consultation and coordination with the Pyramid Tribe, is developing a plan for rehabilitating lower Truckee River riparian habitat to enhance fish passage and spawning. Improvements have occurred to Marble Bluff Dam facilities. Along with conserving fish, the Pyramid Tribe manages and controls fishing and hunting rights on the reservation.

2. Fallon Paiute-Shoshone Tribes

The Tribe has dedicated reservation acreage to be used for wetland habitat for wildlife.

G. Trust Income

P.L. 101-618 established the $43-million Fallon Paiute-Shoshone Tribal Settlement Fund, the $25-million Pyramid Lake Paiute Fisheries Fund, and the $40-million Pyramid Lake Paiute Economic Development Fund. Interest on the Fallon Paiute-Shoshone Tribal Settlement Fund may be spent according to the Fallon Tribes’ investment and management plan for this fund. The Pyramid Tribe has complete discretion to invest and manage the Pyramid Lake Paiute Economic Development Fund; however, funds are not available to the Tribe until TROA becomes effective.

II. Environmental Consequences

Modifying operations of Truckee River reservoirs could affect Indian trust resources. This section evaluates potential effects on the Indian trust resources of water rights and fish and wildlife. No land resources of any tribe would be directly affected under any of the action alternatives.

A. Pyramid Tribe

Lower Truckee River flows and discharge to Pyramid Lake would be greater under TROA. With greater flow and the capacity to manage such water, TROA would: assist in improving lower river water quality; enhance the elevation of Pyramid Lake; enhance the riparian canopy in and stabilize the lower river; enhance recreational opportunities at Pyramid Lake; enhance spawning opportunities for cui-ui; and enhance river habitat for Pyramid Lake fishes. In addition, the exercise of Lower Truckee River agricultural and M&I water rights, including those of the Pyramid Tribe, would continue to be satisfied under all alternatives. Therefore, TROA would generally have beneficial effects on these trust resources. (Trust resources of the Pyramid Tribe are addressed in greater detail in "Surface Water," "Water Quality," "Sedimentation and Erosion," "Biological Resources," "Recreation," "Economic Environment," "Social Environment," and "Cultural Resources" in this chapter)

B. Reno-Sparks Indian Colony

Implementation of any of the action alternatives would have no effect on the exercise of Truckee River water rights. To the extent that the Colony has such water rights, TROA would have no effect on this trust resource.

C. Fallon Paiute-Shoshone Tribes

The Carson Division water supply is minimally affected by any of the action alternatives. The water rights on Fallon Indian Reservation are fully served to a 56 percent supply year, which condition is not exceeded according to operations model results. Therefore, the exercise of water rights of the Tribes and individual Indians on Fallon Indian Reservation are satisfied under all alternatives, and TROA would have no effect on this trust resource. (Lahontan Reservoir storage and releases are addressed in greater detail in "Surface Water" in this chapter.)

D. Washoe Tribe

TROA would not affect flows of the Carson River and would have no effect on land and water resources in the Lake Tahoe basin. Therefore, TROA would have no effect on these trust resources. (Lake Tahoe resources are addressed in greater detail in "Water Quality" and "Sedimentation and Erosion" in this chapter.)

E. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

AESTHETIC RESOURCES

This section describes aesthetic resources, i.e., the visual character and visual resources of the study area. Modifying reservoir operations in the Truckee River basin could affect lake and reservoir water elevations and the quantity, timing, and duration of flows, which could, in turn, affect the visual character of the area.

Aesthetics has been defined as the study or theory of beauty and the psychological responses to it (SWRCB, 2003). For this study, information was adapted from the U.S. Forest Service Visual Management System inventory and analysis conducted for Tahoe and Humboldt/Toiyabe National Forest portions of the study area and from the BLM Visual Resource Management System applicable to portions of the study area east of Reno.

This section generally describes the visual character and visual resources of the study area, with focus on State and nationally designated scenic highways, shoreline views, and on-river views.

I. Affected Environment

A. Lake Tahoe, Truckee River to the Nevada State Line, Including Donner Lake, Prosser Creek Reservoir, Independence Lake, and Stampede and Boca Reservoirs

This portion of the study area lies on the eastern slope of the Sierra Nevada Landscape Province. It is characterized by summits of high altitude peaks that descend across gently sloping dark blue-green forests of moderately rugged terrain dissected by deeply incised river canyons. Most of the drainages generally run towards the Truckee River with minor lateral drainages. Because of the rugged terrain, viewing other drainages is difficult.

For the purpose of evaluating aesthetic resources, three landscape zones can generally be characterized within this portion of the study area. These are the high elevation zone, montane-sub-alpine zone, and lower elevation “front country” (Reuter, et al., 2000). The high alpine zone ranges in elevation from about 7,000 to 11,000 feet. This zone provides mostly background views seen at long distances from areas affected by Truckee River operations and offers outstanding scenic quality. The high elevation zone is characterized by gray and tan peaks with dense pockets of dark green mixed conifers and lighter green aspen stands. There are also meadows, streams, waterfalls, and glacial lakes.

The montane-sub-alpine zone lies below the high elevation zone and is characterized by moderately steep to steep terrain with a homogenous texture of dark-green forest interspersed with rock outcroppings. Elevations for this zone are 3000 to 7000 feet. Large open meadows are visible. Lake Tahoe, Donner Lake, and Prosser Creek, Stampede, and Boca Reservoirs lie within this zone. Landscape variety is generally low to medium but the screening ability (related to the dense forest canopy) is generally high.

The lower elevation “front country” zone ranges in elevation from about 1000 to 3000 feet. This zone is dominated by brush fields interspersed with oaks, bull or gray pine and ponderosa pine. Forested areas are light colored, open and sparse. Landscape variety is generally low with a low screening ability because of the open nature of the country and relatively light, smaller bushes and shrubs.

B. Truckee River from Reno to Pyramid Lake, Lahontan Reservoir, Portions of Carson River

This portion of the study area is characterized by viewsheds consisting of low-lying high desert landscape intermixed with numerous mountain ranges and hills. These contrasting viewsheds provide an exceptional display of open space and mountain scenery that enhance the aesthetic quality of the area. The mountainous portions are comprised of highly differential rock formations, large expanses of light grey granite, and a diversity of high desert adapted vegetation. Views of the mountain ranges are highly valued.

Lower elevations include numerous alluvial fans and cones, which form at the mouth of canyons draining the mountains and higher hills. These expansive deposition areas form an important and visually interesting transition between the foothills and higher elevations, and the valley floors. The alluvial fans are comprised of washes and braided streams that support plant habitats adding to the diverse visual character.

The valley floors are comprised of a mix of soil, sand, and rocks. In many areas, riparian corridors consisting of intermittent or permanently flowing streams host a diversity of tall trees, willows, and a profusion of grasses and shrubs. These areas provide a visual contrast to the surrounding monotone grays, tans, and browns. Riparian corridors are visually interesting and stimulating to the scenic viewer. In the spring, the valley floors are frequently covered with wildflowers, providing vivid colors and visual interest.

C. Historic Trends

The visual quality of most of the study area has been altered as a result of landscape modifications associated with timber harvest, road construction, community developments, utility rights-of-way, dams, and other multiple use management activities. Some modifications such as the construction of reservoirs have actually enhanced the visual quality by introducing water features into the characteristic landscape.

Most of the pre-1900 visual disturbances within the study area have disappeared with the exception of scattered railroad grades, mines, and mine tailing piles. One of the most significant visual affects from these early years was the evolution of cross-country trails and wagon routes into the present-day transportation system. From 1920 to 1940, timber harvesting, construction of roads and railroads, and fire suppression activities significantly influenced the visual landscape of the area. Additionally, hydroelectric development resulted in reservoirs, dams, powerhouses, roads, transmission lines, and recreation facilities. More recently developed recreational facilities have altered the landscape. Major fires, especially in the higher elevations, have also resulted in drastic changes to the visual landscape with long-term effects on visual quality (SWRCB, 2003).

D. USFS Visual Management System

In the 1970s, USFS developed the Visual Management System (VMS) to manage the scenic resources on America's National Forests. USFS considers the visual environment as a basic resource of national forest lands to receive equal consideration with other basic multiple use resources such as oil, wildlife, timber, and water. VMS is a methodology for: (1) inventorying the visual resource; (2) establishing management objectives for the visual resource; (3) assessing visual impacts associated with proposed actions. Those portions of the study area within Tahoe National Forest and Humboldt/Toiyabe National Forests have been inventoried and management direction in the form of Visual Quality Objectives (VQO) has been developed in their Forest Long Range Management Plans. Following is a description of the five possible VQO designations within the study area.

E. BLM Visual Management System

- BLM has the responsibility to maintain the scenic values of the public lands under its jurisdiction. To this end, BLM developed a Visual Resource Management System (VRM) as a tool to manage its visual resources.

VRM provides a way to identify and evaluate scenic values to determine the appropriate levels of management and to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings. VRM consists of two stages, inventory and analysis.

The inventory stage involves identifying the visual resources of an area and assigning them to inventory classes. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. The process is described in *BLM Handbook H-8410-1, Visual Resource Inventory*. The results of the visual resource inventory become an important component of BLM's Resource Management Plan (RMP) for the area. An RMP establishes how the public lands will be used and allocated for different purposes. Visual values are considered throughout RMP, and the area's visual resources are then assigned to management classes with established objectives:

Class I Objective: To preserve the existing character of the landscape; the level of change to the characteristic landscape should be very low and must not attract attention

Class II Objective: To retain the existing character of the landscape; the level of change to the characteristic landscape should be low

Class III Objective: To partially retain the existing character of the landscape; the level of change to the characteristic landscape should be moderate.

Class IV Objective: To provide for management activities which require major modification of the existing character of the landscape; the level of change to the characteristic landscape can be high.

The analysis stage involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required. A visual contrast rating process is used, which involves comparing project features with major features in the existing landscape using the basic design elements of form, line, color, and texture. This process is described in *BLM Handbook H-8431-1, Visual Resource Contrast Rating*. The analysis can then be used as a guide for resolving visual impacts. BLM managers can decide whether to accept or deny project proposals or attach mitigation stipulations to the proposal.

Most of the BLM administered lands within the study area (generally east of Reno) have not been inventoried and rated; those that have been, especially adjacent to I-80, from Reno to Fernley, are Class III Objective. Plans call for BLM to inventory and rate all public lands within Churchhill County.

F. California Environmental Quality Act

CEQA Guidelines provides the following four criteria to evaluate the significance of visual quality impacts:

- Negative impacts on a scenic vista
- Damage to scenic resources within a state scenic highway
- Degradation of the visual character or quality of a site and its surroundings
- Creation of a new source of substantial light or glare affecting views

G. Scenic Corridors

California Department of Transportation—California Scenic Highways Program: The California Scenic Highways Program was created by the State legislature in 1963 to preserve and protect scenic highway corridors from change that would reduce the aesthetic value of lands adjacent to highways. There is no designated California Scenic Highway within the study area.

Nevada Department of Transportation—Nevada Scenic Byway Program: Nevada Scenic Byway Program was established in 1994 to promote and protect the State's most remarkable roads for travelers. To be designated, the stretch of land covered by the roadway must be rich in visual beauty as well as cultural and historical significance. The following roadways within the study area are Nevada Scenic Byways:

- **Pyramid Lake Scenic Byway:** This is the only byway in the nation sponsored by Native Americans. Pyramid Lake is surrounded by a relatively barren desert. Its color changes from green to turquoise to deep blue. Its most striking feature is a pyramidal rock that rises 400 feet above the lake surface. The byway is 37 miles long and incorporates State Routes 445, 446, and 447.

- **Lake Tahoe—East Shore Drive Scenic Byway:** Surrounded by national forest lands and state parks, Lake Tahoe possesses spectacular scenery. East Shore Drive provides spacious views of Lake Tahoe basin. The pristine lake is surrounded by the snowcapped Sierra Nevada. The byway is 72 miles long. State Route 28 portion of the Scenic Byway passes through portions of the study area.

Federal Highway Administration—National Scenic Byways Program: This program was established to designate "All American Road" (a roadway that is a destination unto itself) or "National Scenic Byway" (a roadway that possesses outstanding qualities that exemplify regional characteristics). Pyramid Lake Scenic Byway and Lake Tahoe and East Shore Drive Scenic Byway discussed above are both designated National Scenic Byways.

U.S. Forest Service—National Scenic Byways Program: Roadways of scenic importance that pass through national forests are eligible for inclusion in this program. There is no USFS designated National Scenic Byway within or near the study area.

Bureau of Land Management—Back Country Byways: Back County Byways are usually travel routes in more remote areas that are designated as special areas because of their outstanding scenic qualities. There is no designated Back Country Byway within or near the study area.

Scenic Roads or Corridors Designated through County Planning: While counties within the study area have designations for outstanding scenic resources within their county comprehensive or general planning processes, it is determined that potential impacts from implementation of any of the alternatives under consideration would have no impact on any county scenic corridors.

II. Environmental Consequences

The following indicators were used to evaluate the effects of the alternatives on aesthetic resources:

- State and nationally designated scenic highways
- Shoreline views
- On-river views

As explained in Section II.C, "Reservoir Storage and Releases," in "Surface Water," operations model results show that total end-of-month reservoir storage under TROA is greater than under No Action, LWSA, and current conditions—primarily in Prosser Creek, Stampede, and Boca Reservoirs—as the result of storage of Credit Waters. Operations model results show that, under TROA, Lake Tahoe storage in wet and dry hydrologic conditions is slightly less and in median conditions slightly more than under No Action or current conditions because of Credit Water operations. Such small differences in storage would have a similarly small effect on lake elevation. As explained in Section II.E, "Pyramid Lake," in "Surface Water," operations model results show that elevation of Pyramid Lake under TROA is higher than under No Action or current conditions because of greater inflow. As explained in Section II.D, "Flows," in "Surface Water," operations model results show that average monthly flow in wet, median, and dry hydrologic conditions under current conditions, No Action, LWSA, and TROA varies seasonally at each location.

A. State and Nationally Designated Scenic Highways

The Pyramid Lake Scenic Byway and Lake Tahoe East Shore Drive Scenic Byway are the only two designated scenic highways within the study area. As generally explained above, effects on the aesthetic resources from implementation of TROA would be beneficial; effects under any alternative or current conditions would be similar and minimal.

B. Shoreline Views

Over the long term, modeling shows that the elevation of Pyramid Lake will generally increase. However, seasonal fluctuation in lake level resulting from fluctuating inflow would result in a temporary visual "ring" of lighter colored rock and soil along the shoreline. This ring would occur to some degree under all alternatives, including No Action. Generally the months with the lowest flows (potential effects on the visual resource) are in the winter, which coincide with the lowest numbers of visitors driving the Pyramid Lake Scenic Byway.

Likewise, seasonal fluctuation of lake and reservoir levels in the study area resulting from fluctuating flows would result in temporary visual "rings" of lighter colored rock and soil along their shorelines. These rings would occur to some degree under all alternatives, including No Action. Again, the months with the lowest flows (potential effects on the visual resource) are in the fall and winter (with a couple of exceptions occurring in late summer) which coincide with the lowest numbers of visitors.

C. On-River Views

The effects to the river aesthetic resources from implementation of the alternatives are much different than for lakes and reservoirs, and are generally more subjective. As river flow fluctuates, visual changes occur. Lower flows generally result in the exposure of more boulders, river banks, and gravels. Some people prefer the slower, meandering, lazy flows; others prefer the cascading, rushing, pounding flows experienced during periods of high water. The following statement summarizes the effects of implementing the alternatives on on-river views:

There is little difference among the alternatives. Each alternative encompasses period of higher and lower flows, potentially affecting the appearance of the river. For some visitors, this will have a negative consequence. For others, it will serve to enhance the visual characteristics of the area.

NEWLANDS PROJECT OPERATIONS

The water supply for the Newlands Project is obtained from the Carson and Truckee Rivers. The Carson River is the primary water source for the Carson Division of the Newlands Project. Use of Carson River water is governed by the *Alpine* decree. Some of the water in the Carson River is diverted upstream of Lahontan Reservoir by urban and agricultural users in California and Nevada. Truckee River water is diverted into the Truckee Canal at Derby Diversion Dam for irrigation in the Truckee Division and for delivery to Lahontan Reservoir. Water stored in Lahontan Reservoir is released primarily to satisfy the exercise of water rights in the Carson Division. During dry periods, diversions from the Truckee River comprise a greater proportion of the water supply for the Carson Division than during average periods.

Newlands Project OCAP has been promulgated to meet project irrigation requirements consistent with the *Orr Ditch* and *Alpine* decrees while minimizing use of Truckee River water and maximizing use of Carson River water. Those decrees specify maximum annual water duties in the Newlands Project of 3.5 and 4.5 acre-feet per acre on bottom and bench lands, respectively. OCAP allows for local control of project operations to the maximum extent possible while fulfilling the Secretary's responsibilities under the *Orr Ditch* and *Alpine* decrees and Federal reclamation law and addressing the Secretary's trust responsibilities to the Pyramid Tribe and Fallon Paiute-Shoshone Tribes and obligations under ESA.

Truckee River water is diverted as necessary to satisfy the exercise of Truckee Division water rights consistent with OCAP. For the Carson Division, forecasting techniques—which include information on Truckee River and Carson River runoff, Carson Division demand, and reservoir evaporation and seepage losses -- are used to estimate the quantity of Truckee River water necessary to be diverted to meet monthly Lahontan Reservoir storage targets. Variable end-of-month January through June Lahontan Reservoir storage targets are identified in OCAP, with the objective of achieving a specified storage at the end of June (e.g., 186,000 acre-feet based on an annual Carson Division demand of approximately 268,700 acre-feet). From July through December, Truckee River water may be diverted to Lahontan Reservoir only when reservoir storage is, or is forecast to be, less than the monthly target. Monthly storage targets (in acre-feet) for July through December (based on the annual 268,700-acre-foot demand) are: July -156,000; August - 96,000; September - 60,000; October - 48,000; November - 70,000; and December - 97,000. Generally, diversion of Truckee River water to the Truckee Division will vary directly with demand; diversion of Truckee River water to Lahontan Reservoir for use on the Carson Division will vary directly with demand but depend in large part on Carson River inflow to Lahontan Reservoir (e.g., if the storage target is met or exceeded with Carson River water, diversion of Truckee River water to Lahontan Reservoir is terminated).

I. Potential Effects of the Alternatives

Future changes in the disposition and exercise of Truckee Division and Carson Division water rights are assumed to occur independently of TROA. Diversion of Truckee River water to satisfy a portion of the future Newlands Project water demand (described earlier in this chapter in "Surface Water") will continue to be regulated by OCAP. The potential effects of TROA on the Newlands Project, therefore, can be measured most objectively by comparing the quantity of Truckee River water available for diversion at Derby Diversion Dam and resulting Truckee Canal inflow to Lahontan Reservoir, Lahontan Reservoir storage, and Lahontan Reservoir releases to the lower Carson River under the various alternatives. A summary of operations model results for the identified parameters is presented in table 3.113; this information was previously presented in "Surface Water."

Table 3.113—Parameters related to Newlands Project operations (average annual, in acre-feet)

	No Action	LWSA	TROA
Diversion to Truckee Canal	51,810	51,670	51,780
Truckee Canal inflow to Lahontan Reservoir	43,840	43,720	43,750
Lahontan Reservoir storage (end of June)	225,280	225,150	224,820
Lahontan Reservoir releases (to Carson Division)	303,400	303,290	303,360

Operations model results show little difference between TROA and the other alternatives. Slightly less water is provided under TROA because the holders of upstream senior Truckee River water rights would be able to maintain more of their water in storage. Effects on Newlands Project water use would not be discernible on a long-term basis, as average annual releases from Lahontan Reservoir are similar under TROA and No Action (a difference of 40 acre-feet, or approximately 0.0001 per cent of the total); agriculture and wetlands uses would not be affected; Indian trust resources on Fallon Indian Reservation would not be affected. Newlands Project groundwater resources in the study area would be affected primarily to the extent of and in proportion to differences in the amount of Truckee River water diverted to the Truckee Canal to flow to Lahontan Reservoir, as shown in table 3.113. Differences in canal flow would affect slightly the amount of seepage to the shallow aquifer adjacent to the canal and also Lahontan Reservoir releases to the Carson Division. The minor reductions in Truckee Canal discharge and Lahontan Reservoir releases for irrigation on the Carson Division would likely have no measurable effect on groundwater resources on the Newlands Project.

The lower Carson River does not cause sedimentation or erosion problems in most years because water from the river is usually routed through the 381 miles of canals and laterals of the Carson Division. A function of irrigation demand, Lahontan Reservoir releases are nearly identical under all alternatives, and TROA would have little effect on the dynamics of sedimentation or erosion at Lahontan Dam or in the lower Carson River or Carson Division.

The operations model was used to determine the amount of available surface acres at Lahontan Reservoir for water-based recreation during the 7-month recreation season in wet, median, and dry hydrologic conditions (table 3.114), and inferences were made about how recreationists might respond to changes in surface acreage. As Lahontan Reservoir elevation (and, thus, surface acreage) decreases, mud flats develop, boat access is restricted, and the quality of the fishing experience declines, thus attracting fewer recreationists. For the three representative hydrologic conditions, Lahontan Reservoir elevation and, thus, quality of the recreation experience are similar for the three alternatives, and so TROA would have no measurable effect on recreation compared to No Action.

Table 3.114—Average surface acreage of Lahontan Reservoir during recreation season

Hydrologic condition	No Action	LWSA	TROA
Wet	12,520	12,529	12,520
Median	6,604	6,600	6,588
Dry	3,673	3,659	3,651

On the basis of the analysis of recreation at Lahontan Reservoir and releases to serve Newlands Project water rights, there would be little or no economic impact from TROA compared to No Action. For biological resources, TROA, compared to No Action, would have little or no effect on fish in Lahontan Reservoir relative to minimum pool maintenance or spawning habitat. TROA would have no effect relative to predator access to bird-nesting islands or on the prey base of bald eagles. As noted previously, operations model results show that the elevation (or storage) of and releases from Lahontan Reservoir are similar under all of the alternatives. Thus, the recorded cultural resource sites located downstream from Lahontan Dam would not be affected by TROA. These results indicate that, compared to No Action, TROA would have no measurable effects on Newlands Project operations, summer recreation at Lahontan Reservoir, or on local groundwater recharge linked to the availability of Truckee Canal discharge or Lahontan Reservoir releases.

For TCID's Lahontan Dam hydroelectric powerplants, both generation and gross revenues under TROA are similar to those under No Action in all hydrologic conditions and about 3 percent less than under current conditions in all hydrologic conditions. Such differences in gross revenue would not significantly impact the regional economy. As noted in Section G.2, "Carson Division Shortages and Lahontan Dam Hydroelectric Power Generation," in "Economic Environment," comparison of the hydroelectric power generation for the shortage years indicates gross revenues would be 9 to 15 percent less under the alternatives than under current conditions. The effect on the regional economy would not be significant because other sources in the regional power grid could provide additional required power. Analysis shows that hydroelectric power generation and gross revenues under TROA would be slightly less under than under No Action (less than 1 percent), which should not significantly affect the profitability of TCID's hydroelectric power operations or the regional economy.

As noted in "Surface Water," Section F, "Exercise of Water Rights to Meet Demand," Newlands Project supplies from the Truckee River in the future are less than under current conditions because Carson Division demand is less and water rights in the Truckee River basin are more fully exercised. As noted in Section G.1, "Carson Division Shortages and Agricultural Production," in "Economic Environment," effects would be the same under all the alternatives compared to current conditions. Compared to No Action, shortages are 0.1 percent less under TROA and would not have a significant effect on the regional economy.

II. Credit Water Operations

A similar section summarizing analysis of selected Newlands Project Credit Water (NPCW) operations for No Action, LWSA, and TROA was also included in the revised DEIS/EIR. The range of potential effects in that analysis was limited by a narrow modeling interpretation of Newlands credit water operations. Neither No Action nor LWSA included such credit water operations provided for in OCAP, and establishment of NPCW was predicated on Sample California Guidelines objectives. (It is recognized here that those guidelines are not mandatory, and only offer targets for stream habitat benefits.) Operations model results for the TROA alternative in the analysis of this document are based on a scenario in which establishment of NPCW was predicated on the ability to forecast the release of NPCW during July without exceeding sample California Guidelines (non-mandatory) maximum discharge objectives of 600 cfs from Lake Tahoe, 150 cfs from Prosser Creek Reservoir, 250 cfs from Stampede Reservoir, and a maximum flow objective of 600 cfs in the Truckee River downstream from the Little Truckee River. In that scenario, NPCW was stored in Truckee River reservoirs and not released before July 1. Model results show a release of NPCW in 21 of the 100 years, with a maximum storage of 1,300 acre-feet. In addition to the environmental effects described in the preceding section, the TROA alternative incorporating this NPCW operation also contributed to increased seasonal flow and enhanced water quality in the Truckee River as well as enhanced habitat conditions in the lower Truckee River.

This final EIS/EIR also includes analysis of a broader range of potential Newlands Project credit operations by adding scenarios for (1) No Action with Newlands credit storage under OCAP (NAC) and (2) expanded Newlands credit storage under TROA up to 50,000 acre-feet (TROA-EC). (See Section 3.H.1, "Expanded Newlands Project Credit Water Storage.") OCAP contains provisions for credit water operation that allow for the retention in Stampede Reservoir of potential diversions to the Lahontan Reservoir prior to the end of June (in order to avoid exceeding the end-of-June storage target for Lahontan Reservoir) for release as necessary thereafter through the remainder of the irrigation season. Reclamation policy implementing those provisions was issued in

June 2006; these provisions are described in chapter 2. Additionally, in the expanded Newlands credit water operations section, No Action and TROA are modeled with the California Guidelines storage restriction as voluntary rather than mandatory.

As presented in figure 3.30 in "Surface Water," operations model results show that Carson Division shortages occur in the same 9 years and are of similar magnitude under TROA, No Action, and NAC. Under TROA-EC, one additional shortage year (of 8,000 acre-feet) occurs, and, in the other 9 shortage years, shortages are the same in 1 year and greater in 8 years (differences ranging from 1,000 to 18,000 acre-feet) compared to TROA. Shortages could be greater under expanded credit storage operations because end-of-June Lahontan Reservoir storage targets would be less likely to be exceeded; therefore, the amount of carryover water (i.e., water in excess of monthly storage targets after June) is likely to be less. For this reason, shortages would not occur in years when credit storage is implemented, and the effects of shortage are exacerbated only to the extent that carryover potential is diminished.

Newlands credit operations provisions in OCAP and TROA recognize the variability in precipitation and runoff events and the inherent imprecision in forecasting by:

- Allowing a high runoff event or series of events in the Carson River to fill Lahontan Reservoir sufficiently to achieve (or even exceed) the end-of-June storage target and reduce the likelihood of making unnecessary diversions from the Truckee River that would exceed the storage target or spill

- Allowing NPCW to be released to satisfy the exercise of Carson Division water rights should Carson River inflow to Lahontan Reservoir be insufficient to achieve the end-of-June storage objective that year

- Converting NPCW not required to be diverted to Lahontan Reservoir that year pursuant to OCAP to water for Pyramid Lake fishes and other uses

Additional opportunities for establishing Newlands credit water are provided under TROA compared to OCAP. The potential benefits of Newlands credit operations include the following:

- Greater seasonal storage in Truckee River reservoirs

- Additional Fish Credit Water that could be available for Pyramid Lake fishes

- Greater Truckee River flows during the summer, which would enhance water quality as well as riverine and riparian habitat

- Increased inflow to Pyramid Lake

Implementation of Newlands credit water operations in a given year is discretionary. While such implementation would likely result in less storage in Lahontan Reservoir in that year compared to operations without Newlands credit water, Lahontan Reservoir storage targets would be achieved, at a minimum, consistent with OCAP to the extent that there is sufficient runoff available in that year.

Coordinating release of Newlands credit water with other releases could benefit Newlands Project operations by reducing fluctuation of diversions at Derby Diversion Dam and maintaining a more constant monthly flow in the Truckee Canal. Such coordination could also reduce fluctuation of lower Truckee River flow which would also benefit biological resources in the lower river. Under any Newlands credit scenario, maximizing the use of the Carson River and minimizing use of the Truckee River would be consistent with OCAP.

MINIMUM BYPASS FLOW REQUIREMENTS FOR TMWA'S HYDROELECTRIC DIVERSION DAMS ON THE TRUCKEE RIVER

This section presents a comparison of the effects of bypass flow requirements at TMWA's four run-of-the-river diversion dams on fish flow requirements in the respective bypass reaches of the Truckee River between Little Truckee River and Hunter Creek (reaches 8, 9, and 10 shown on map 3.1) under current conditions and alternatives.[8]

I. Current Conditions, No Action, and LWSA Minimum Bypass Flows

TMWA has *Orr Ditch* decree rights to divert sufficient water[9] from the Truckee River to provide various flow from 327 cfs to 400 cfs to its four hydroelectric powerplants (Farad, Fleish, Verdi, and Washoe) located along the Truckee River between Little Truckee River and Hunter Creek (map 3.2). At each facility, diverted water is conveyed via a flume to a hydroelectric powerplant, where it either passes through turbines or overflows into spillways before discharging back to the river. Under No Action and LWSA, as well as current conditions, TMWA would maintain a minimum bypass flow of 50 cfs at Fleish, Verdi, and Washoe Diversion Dams for the benefit of fish resources in the river immediately downstream. As a condition of reconstructing Farad Diversion Dam, the California State Water Resources Control Board would require TMWA to maintain a bypass flow of 150 cfs or the total flow of the Truckee River, whichever is less, for the benefit of fish resources in the bypass reach. (See Section II, "No Action" and Section III, "LWSA," in chapter 2.) The combined length of the four bypass reaches (8.4 miles) represents about 35 percent of the river reach between Little Truckee River and Hunter Creek, and 7 percent of the entire length of the river.

II. TROA Bypass Flows

The minimum bypass flow under TROA would be 50 cfs at all four diversion dams (section 9.E.1 of the Negotiated Agreement). TROA would, however, provide more operational flexibility in achieving greater bypass flows (section 9.E.2 of the Negotiated Agreement) than under current conditions, No Action, and LWSA by allowing Fish Water, released for the benefit of LCT and cui-ui in the lower Truckee River and Pyramid Lake, to enhance bypass flows for the benefit of fish resources immediately downstream

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[8] It is assumed in this analysis that the Farad Diversion Dam is rebuilt.

[9] TMWA may divert up to 450 cfs at each diversion dam. This includes project water released from Stampede and Prosser Creek Reservoirs for the benefit of LCT and cui-ui.

from the diversion dams[10] (with the United States monetarily compensating TMWA for any net loss in hydroelectric power generation associated with the bypass of Fish Water). Fish Water could also be released specifically to enhance bypass flows above the minimum at the diversion dams if such release benefited LCT or cui-ui.

When Floriston Rates are not being met at the Farad gauge,[11] up to 50 cfs of Fish Water during October–April and up to 150 cfs of Fish Water during May–September could be used to enhance bypass flows above the minimum.[12] The rate at which Fish Water may be released for this purpose depends on the rate at which Fish Credit Water, Other Credit Water owned by the United States, and Newlands Project Credit Water are being captured in storage at the time. (See Section IV, "TROA," in chapter 2.) TROA would not limit the amount of Fish Water that could be used to enhance bypass flows when streamflow, excluding Fish Water, is equal to or greater than Floriston Rates at the Farad gauge.

In addition to Fish Water, section 7.A.6(c) of the Negotiated Agreement would allow California to release California Environmental Credit Water and Additional California Environmental Credit Water to enhance bypass flows at the four diversion dams without restriction. California would compensate TMWA for any loss in hydroelectric generation associated with the bypass of these credit waters.

III. Fish Flow Requirements

Based on the relation of the amount of fish habitat to streamflow, CDFG recommends a minimum flow for fish in the Truckee River between Little Truckee River and Hunter Creek of 150 cfs and an optimum flow of 250 cfs (table 3.38).[13]

IV. Method of Analysis

The potential to achieve minimum bypass flows, minimum fish flows, and optimum fish flows and to enhance bypass flows under current conditions and the alternatives is evaluated by comparing average monthly and average annual bypass flows generated by the operations model. To simplify the presentation, LWSA is not included because the hydrologic assumptions for it are nearly identical to No Action.

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[10] This action is permitted by sections 5.B.6(a)(5), 5.B.8(c), and 9.E.2 of the Negotiated Agreement.

[11] Fish Water released for bypass enhancement, and Fish Water and Fish Credit Water released to compensate for diversion for ice removal from the Highland Ditch are not considered to be part of Floriston Rate water.

[12] Fish Credit Water may not be used for bypass flow enhancement when this condition exists.

[13] CDFG recommended a range of minimum (100 to 200 cfs) and optimum flows (200 to 300 cfs) that vary with season and location – average values are used here to simplify the analysis. While these flows provide the minimum and optimum amounts of habitat for supporting a salmonid population, they are not the minimum for survival.

Table 3.115 presents the bypass flow requirements for the four hydroelectric diversion dams and the water categories used to achieve them under current conditions and the alternatives. While TROA allows water managers (i.e., United States and Pyramid Tribe) flexibility in using Fish Water to enhance bypass flows at the diversion dams, the management strategy that they will employ is not known at this time. Because of the range of potential management strategies under TROA, use of the range's extremes (TROA 50 and TROA 200) is considered sufficient for comparing potential effects of TROA to those of current conditions and No Action.

Table 3.115—Bypass flow requirements and water management strategies under current conditions, No Action, and TROA (TROA 50 and TROA 200) at the four diversion dams

Farad Diversion Dam				
	Minimum bypass (cfs)	**Enhanced bypass (cfs)**	**Total bypass (cfs)**	**Water categories used for bypass flows**
Current conditions	150	0	150	All categories used for minimum
No Action	150	0	150	All categories used for minimum
TROA 50	50	0	50	All categories used for minimum – Fish Water is only released for six-flow regime and may not be used to enhance bypass flows
TROA 200	50	50 Oct-Apr 150 May-Sep	100 200	All categories used for minimum – Fish Water is released to enhance bypass flow
Fleish, Verdi, and Washoe Diversion Dams				
Current conditions	50	0	50	All categories used for minimum
No Action	50	0	50	All categories used for minimum
TROA 50	50	0	50	All categories used for minimum – Fish Water is only released for six-flow regime and may not be used to enhance bypass flows
TROA 200	50	50 Oct-Apr 150 May-Sep	100 200	All categories used for minimum – Fish Water is released to enhance bypass flow

At one extreme is the TROA 50 management scenario, in which Fish Water is not released for bypass flows, but only to achieve the six-flow regime targets in the lower Truckee River—the same manner as Fish Water is managed in the operations model for chapter 3 analyses. (See "Truckee River Operations for Pyramid Lake Fishes" in "Surface Water.") Therefore, the amount of Fish Water present at the diversion dams is incidental to bypass flow targets, and may not be used to enhance bypass flows.

At the other extreme is the TROA 200 management scenario, in which Fish Water is released specifically to enhance bypass flows. Depending on the time of year, up to an additional 50 cfs or 150 cfs could be bypassed at each diversion dam. Fish Water that is bypassed continues to flow to the lower Truckee River where it is used to achieve the six-flow regime targets.

Under TROA 50 and TROA 200, the rate at which Fish Water is released to enhance bypass flows is reduced by the rate at which Fish Credit Water and Newlands Project Credit Water are simultaneously captured in storage.[14]

TROA 200 was not modeled because time did not allow for the extensive reprogramming required of the operations model; therefore, only a qualitative discussion that is based on the availability of Fish Water under TROA (an annual average of about 60,000 acre-feet) is presented. Also, use of California Environmental Credit Water and Additional California Environmental Credit Water is not evaluated because California has not proposed a program to acquire water rights to establish these credit waters.

The diversion dam for Steamboat Ditch (which serves agricultural rights in Truckee Meadows) is located about midway in the 2.4-mile river bypass reach downstream from Fleish Diversion Dam. Since the water right for Fleish hydroelectric powerplant is junior to water rights associated with Steamboat Ditch, there is generally enough water in the river to serve the ditch. Table 3.116 presents the average monthly diversions used in the operations model associated with current conditions and alternatives. Differences in values among current conditions and alternatives reflect anticipated conversion of Truckee Meadows agricultural water rights to M&I use in the future. Since more agricultural water rights would be converted to M&I use under TROA than No Action, less water would be diverted to Steamboat Ditch under TROA.

Table 3.116—Average monthly diversions (cfs) for Steamboat Ditch used in the operations model

	Current conditions	No Action	TROA
April	0.0	9.2	1.8
May	12.4	21.5	4.2
June	57.0	23.3	4.6
July	58.4	25.6	5.1
Aug	57.9	19.7	4.2
Sept.	55.5	17.5	3.4
Oct	13.8	2.9	0.6

[14] Capturing Other Credit Water could also reduce the amount of Fish Water simultaneously bypassed. This water category was not included in the computer simulations because no water rights have been identified to establish it. Adjusted streamflow means total flow less (1) Fish Water released to enhance bypass flows and (2) Fish Water and Fish Credit Water released to compensate for diversions at the Washoe/Highland Ditch diversion facility. (See sections 5.A.8(a) and 9.E.2 of the Negotiated Agreement.)

V. Model Results

Average monthly data simulated by the operations model for current conditions and the alternatives reflect the general runoff pattern of the Truckee River; flows progressively increase through winter, with the greatest flows occurring during spring runoff; flows then progressively decrease through summer and early fall (table 3.117). Though these data indicate that minimum bypass flows under current conditions and the alternatives are achieved on average at each diversion dam, the minimum bypass flow requirement is most critical during late summer when bypass flows rapidly decrease from July through September, a general trend that progressively intensifies downstream. This summer trend reflects diminishing streamflows and a relatively constant demand to divert river water. However, average bypass flows during October do not follow this trend, and are markedly greater than flows during August, September, and November because of reservoir releases for prescribed flood control space. The summer trend is most obvious at Verdi and Washoe Diversion Dams where average bypass flows under current conditions, No Action, and TROA 50 during late summer rarely equal or exceed the minimum fish flow of 150 cfs, thus reducing fish habitat.

Table 3.117—Average monthly bypass flows, based on the 100-year period of analysis, at each of the four diversion dams under current conditions, No Action, and TROA 50

Average monthly bypass flows (cfs)												
Current Conditions												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Farad	214	200	267	357	474	535	790	1240	894	338	184	156
Fleish	203	144	230	342	470	582	867	1301	906	341	171	138
Verdi	158	115	202	317	438	538	802	1231	840	275	108	77
Washoe	144	121	209	326	447	541	777	1185	796	235	84	64
No Action												
Farad	246	201	264	353	466	528	776	1215	866	314	162	152
Fleish	257	142	222	331	456	570	843	1266	911	350	185	154
Verdi	203	114	194	304	423	522	778	1197	843	282	120	90
Washoe	188	118	197	311	426	516	748	1151	797	241	80	58
TROA 50												
Farad	174	109	205	309	434	538	831	1273	869	263	98	68
Fleish	235	124	234	351	486	609	912	1344	938	329	162	131
Verdi	177	114	218	335	459	567	846	1274	868	260	95	66
Washoe	160	119	220	341	460	564	805	1230	823	222	68	59

The only relevant difference between No Action and TROA occurs at Farad Diversion Dam during August and September. Under TROA 50, average bypass flows at Farad during these months are about 50 to 90 cfs less than under No Action. In contrast, TROA

200, because of a potentially large volume of Fish Water in Stampede and Prosser Creek Reservoirs, would likely yield average bypass flows at Farad during these months that are equal to or greater than those under No Action.

Average annual bypass flows simulated by the operations model are displayed in figure 3.37 as exceedence probability, i.e., the likelihood that a value for a certain parameter would be equaled or exceeded during the period of analysis. These data indicate that minimum bypass flows are achieved at all diversion dams under current conditions and the alternatives. However, because the minimum bypass flow at Farad Diversion Dam under current conditions and No Action is 150 cfs, the exceedence probabilities for 100 cfs and 150 cfs are nearly double those under TROA 50. With the exception of flows from 50 to 150 cfs at Farad Diversion Dam under current conditions and No Action, exceedence probabilities for achieving bypass flows greater than 50 cfs diminish appreciably under current conditions and the alternatives.

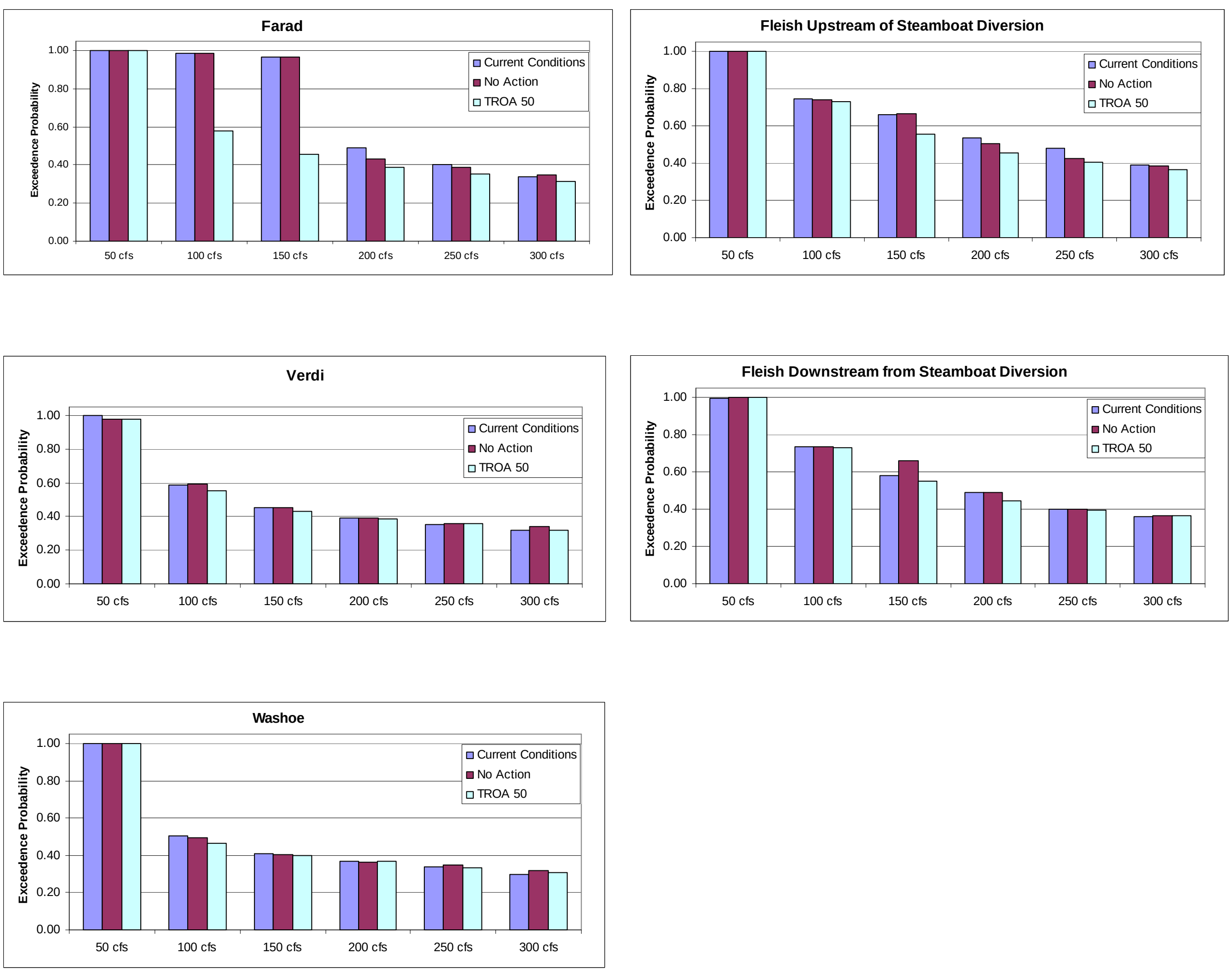

Figure 3.37—Average annual bypass flow exceedence probabilities associated with Farad, Fleish, Verdi, and Washoe Diversion Dams under current conditions and the alternatives.

The success of bypass flows to achieve CDFG minimum (150 cfs) and optimum (250 cfs) fish flows varies among the diversion dams under current conditions and the alternatives. The highest exceedence probability for achieving minimum fish flow is 0.97 at Farad Diversion Dam under current conditions and No Action, and the lowest is 0.40 at Washoe Diversion Dam under TROA 50. The highest exceedence probability for achieving optimum fish flow is 0.48 at Fleish Diversion Dam under current conditions, and the lowest is 0.33 at Washoe Diversion Dam under TROA 50.

With the exception of bypass flows equal to or less than 150 cfs at Farad Diversion Dam under current conditions and No Action, there are generally only slight differences—one or two points—in the average annual exceedence probabilities among current conditions and the alternatives for a given bypass flow. This is especially true for Verdi and Washoe Diversion Dams at all bypass flow values and for all diversion dams at bypass flows of 200 cfs, 250 cfs, and 300 cfs. The greatest difference occurs at Fleish Diversion Dam where No Action is 11 points greater than TROA 50 at a bypass flow of 150 cfs.

Diversions to Steamboat Ditch under current conditions have a notable effect on flows in the Fleish bypass reach. Exceedence probabilities for bypass flows greater than 100 cfs decrease by 3 to 8 points between the upper and lower sections of the bypass reach under current conditions. In contrast, exceedence probabilities for all bypass flows under the alternatives either do not change or decrease by only one or two points between the two sections of the bypass reach, which reflects greater monthly diversions under current conditions than under the alternatives (table 3.117).

Generally, exceedence probabilities under TROA 50 are slightly less than under current conditions and No Action. Lower exceedence probabilities under TROA 50 are due to Credit Water establishment that reduces flows at the diversion dams and to management restrictions under TROA 50 on the use of Fish Water to enhance bypass flows.

It can reasonably be concluded that TROA 200 would yield bypass flow exceedence probabilities at all four diversion dams similar to those at Farad Diversion Dam under No Action and current conditions, thus enhancing fish habitat in the river bypass reaches associated with each diversion dam in comparison to current conditions, No Action, and TROA 50. The higher exceedence probabilities at Fleish, Verdi, and Washoe would be achieved by managing the large volume of Fish Water in Stampede and Prosser Creek Reservoirs specifically to enhance bypass flows at the four diversion dams. Therefore, the range of potential water management scenarios under TROA produces a range of potential impacts.

VI. Discussion

Depending on how water is managed under TROA, the amount of fish habitat in the river associated with the four hydroelectric diversion dams would range from less than under No Action and current conditions in the Farad reach, to the same as or greater than under No Action and current conditions in all four reaches. A minimum bypass requirement of

150 cfs at Farad Diversion Dam under current conditions and No Action has nearly twice the potential for enhancing fish habitat in the Farad reach as under TROA 50, while the potential under TROA 200 would likely be the same as under current condition and No Action. Benefits of the 150 cfs minimum bypass at Farad do not extend downstream to the other diversion dams because the minimum bypass requirement at these three facilities is only 50 cfs. Potential benefits for fish habitat in these three reaches are similar under current conditions, No Action, and TROA 50. Under TROA 200, there would be a net gain in potential benefits for fish habitat in the Little Truckee River - Hunter Creek reach because the same benefits experienced in the Farad reach would extend downstream to the other diversion dams.

Fish habitat enhancement under TROA is possible because of the large amount of Fish Water that could be stored in and released from Stampede and Prosser Creek Reservoirs and provisions that would allow owners of such water to enhance bypass flows at all four diversion dams. The prospects for fish would be further enhanced under TROA 200 by potential releases of California Environmental Credit Water and Additional California Environmental Credit Water to enhance bypass flows.

The benefit of TROA bypass flow provisions (sections 7.A.6(c) and 9.E.2 of the Negotiated Agreement) is that bypass flows need not be static, but may be varied according to the needs of the species (management objectives) in the bypass reach. Because use of Fish Water for bypass flows is at the discretion of the United States and the Pyramid Tribe, and the use of California Environmental Credit Water and Additional California Environmental Credit Water is at the discretion of California, benefits of these water categories can best be realized through cooperative fish resource management among California, Nevada, the United States, and the Pyramid Tribe. Development of integrated or coordinated fish resource management plans and habitat restoration activities would allow for the most diverse, efficient, and beneficial use of Fish Water, Fish Credit Water, California Environmental Credit Water, Additional California Environmental Credit Water, and Joint Program Fish Credit Water. Use of these water categories to enhance bypass flows is likely since it is the objective of FWS and the Pyramid Tribe to re-establish LCT throughout the Truckee River.

The wide range of potential water management scenarios indicates that TROA could have a wide range of impacts on the riverine environment; not only in the river reaches associated with the hydroelectric diversion dams, but throughout the length of the river and its tributaries. When Fish Water is managed under TROA to achieve the six-flow regime (as in the operations model), TROA would, with the exception of the Farad reach which is less than two percent of the river length, either maintain the status quo or significantly enhance fish habitat in the river from Lake Tahoe to Pyramid Lake and portions of three tributaries, including Independence Creek ("Fish In Truckee River and Affected Tributaries") as well as benefit threatened and endangered fishes of Pyramid Lake. (See "Cui- ui" and "Lahontan Cutthroat Trout.") An additional benefit of TROA, though not fully analyzed in this final EIS/EIR because water managers have yet to develop the necessary plans, is the flexibility it allows in the use of Fish Water and Fish Credit Water to improve riverine conditions (e.g., water quality) and reservoir releases (e.g., ramping changes; sections 5.B.6, 5.B.7(h), 5.B.8, 8.K, 9.C, and 9.E.2 of the Negotiated Agreement) for fish resources. As such, TROA would provide benefits to fish in the Truckee River and portions of three tributaries that are not provided under current conditions and No Action. These benefits more than offset the reduced potential to enhance fish habitat in the Farad reach.

Maintenance of the 150 cfs minimum bypass requirement at Farad Diversion Dam under current conditions and No Action would likely cause a reduction, if not elimination, of power generation at the Farad hydroelectric powerplant during many months of the year. Power generation at the other plants would not be affected because the minimum bypass flow requirement under TROA would be the same as under No Action or current conditions. TROA 200 would not affect power generation at the four river sites because Fish Water would be a supplemental release to the river, i.e., it would not reduce diversions to the hydroelectric powerplants.

WATER RIGHT PETITIONS AND APPLICATIONS

As noted in chapter 1, Reclamation, WCWCD, and TMWA have filed two water appropriation applications, four petitions for change, and two time extension petitions (petitions and applications) with SWRCB. (See the SWRCB Notice of Petitions and Water Appropriation Applications Appendix for greater detail.) The purposes of the two applications are to: (1) allow the full capacity of Stampede Reservoir to be used, (2) remove the maximum withdrawal restriction from Prosser Creek Reservoir, and (3) allow an October 1 through August 10 diversion period for Prosser Creek Reservoir. The four change petitions—for each of Prosser Creek, Boca, and Stampede Reservoirs and Independence Lake,—and the two water appropriation applications seek to include common points of diversion[15], rediversion[16], and redistribution[17] of storage, places of use, and purposes of use so that water can be exchanged, stored, and diverted efficiently among these reservoirs, along with Donner Lake and Lake Tahoe, to implement TROA. The two time extension petitions filed for Stampede Reservoir by Reclamation seek additional time to develop the water right associated with Permit No. 11605. Implementation of the operations identified in the proposed petitions and applications is predicated on approval and implementation of TROA; however, implementation of TROA is predicated only on the approval of the proposed change petitions. TROA would supersede all requirements of any agreements concerning the operation of Truckee River reservoirs, including those of TRA and TPEA, and would become the sole operating agreement for these reservoirs.

I. Existing Water Right Licenses and Permits

A. Prosser Creek—Application No. 18006, License No. 10180, Water Right Holder: Reclamation

This license is for 30,000 acre-feet of storage from April 10 to August 10 of each year. It restricts the maximum withdrawal from storage in any one year to 20,162 acre-feet. The point of diversion to storage is at Prosser Creek Dam, in Section 30, Township (T) 18 North (N), Range (R) 17 East (E), MDB&M (Mount Diablo Baseline & Meridian). The purposes of use are irrigation, domestic, municipal, industrial, fish culture, and

[15] "Point of diversion" means the point on a natural watercourse where water is initially taken under control (i.e., either diverted away from the watercourse in a conduit or placed into seasonal storage in a reservoir at the point of diversion) under a water right for the purpose of making a beneficial use of water.

[16] "Point of rediversion" means a point on a natural watercourse where water that was previously taken under control—under a water right for the purpose of making a beneficial use of water—is taken under control again (i.e., either diverted away from the watercourse in a conduit or placed into seasonal storage in a reservoir at the point of rediversion). This water was either released from seasonal storage upstream or imported into the watercourse on which the point of rediversion is located.

[17] "Redistribution" means that a quantity of water, which would have been or is physically stored in a reservoir under a license (or permit), may be stored in another reservoir under the same license (or permit).

recreation. The place of use is at the reservoir (in California) and in Truckee Meadows and the Newlands Project in Nevada. As required in the license, the project is operated primarily to allow water, which might not otherwise be available from Lake Tahoe to help meet Floriston Rates, to be released from Lake Tahoe in exchange for a like amount of water to be stored in Prosser Creek Reservoir. This is done under TPEA (described in chapter 2). The only other water stored in Prosser Creek Reservoir is used for the conservation of threatened and endangered fishes of Pyramid Lake.

B. Boca Reservoir—Application No. 5169, License No. 3723, Water Right Holder: WCWCD

This license is for 40,850 acre-feet of storage from about October 1 of each year to about July 1 of the succeeding year. The point of diversion to storage is at the dam in Section 21, T18N, R17E, MDB&M. There are numerous points of rediversion in Nevada. The purposes of use are irrigation and domestic. The place of use is WCWCD in Nevada. The reservoir is used to store water that can be released to help achieve Floriston Rates, and for flood control.

C. Stampede Reservoir—Application No. 15673, Permit No. 11605, Water Right Holder: Reclamation

This permit is for 126,000 acre-feet of storage from January 1 to December 31 of each year, and for 350 cfs of direct diversion from about April 1 to about November 1 of each year. The point of diversion is at Stampede Dam in Section 28, T19N, R17E, MDB&M. There are numerous points of rediversion in Nevada. The purposes of use are domestic, municipal, industrial, irrigation, flood control, fish culture, and recreation. Hydroelectric power is generated at the dam incidental to releases made for the approved purposes of use. Places of use are Truckee Meadows and the Newlands Project in Nevada. The reservoir also provides a measure of flood control. Stampede Reservoir currently stores Project Water. SWRCB conditioned the permit as follows:

> "If and when an interstate compact covering the distribution and use of the waters of the Truckee and Carson Rivers is approved by the Legislatures of the States of California and Nevada and is consented to by Congress, the operation of Stampede Reservoir shall be in conformance with such compact, and the terms and conditions set forth in these permits which are in conflict thereto shall not apply. The Board retains jurisdiction for the purpose of amending the terms of these permits to conform to the terms of such compact." (State Water Resources Control Board, Decision No. D 913, September 25, 1958)

In 1982, the Ninth Circuit Court of Appeals upheld the ruling of the United States District Court for the District of Nevada that the Secretary shall use storage in Stampede Reservoir for the conservation of threatened and endangered fishes of Pyramid Lake because their status under the Endangered Species Act of 1973 took precedence over any obligation for delivery of water for irrigation and M&I uses. This ruling guides current operations of Stampede Reservoir.

D. Independence Lake—Application No. 9247, License No. 4196, Water Right Holder: TMWA

This license is for 17,500 acre-feet of storage from about December 1 of each year to about July 1 of the succeeding year. The point of diversion is at the dam in Section 35, T19N, R15E, MDB&M. There are several points of rediversion in Nevada. The purpose of use is municipal. The place of use is the cities of Reno and Sparks, Nevada. TMWA also claims a pre-1914 appropriative water right, and holds a separate license for generation of hydroelectric power; however, neither of these rights is part of the change petition.

II. Petitions and Applications

Approval of the change petitions would retain existing points of diversion and rediversion, places of use, and purposes of use for the four reservoirs, and would (1) redistribute storage in Boca Reservoir, Stampede Reservoir, and Independence Lake; (2) add points of diversion and rediversion; (3) expand the place of use to provide for a common place of use under each license and permit; and (4) add purposes of use so that each license and permit has the same purposes of use, except that Independence Lake is not used for flood control purposes. Approval of the two appropriation applications would allow (1) the full capacity of Stampede Reservoir to be used, (2) removal of the maximum withdrawal restriction from Prosser Creek Reservoir, and (3) an October 1 through August 10 diversion period for Prosser Creek Reservoir. Approval of the two time extension petitions for Stampede Reservoir would allow time to develop this water right pursuant to TROA.

Under TROA and the change petitions necessary to implement TROA that are analyzed in this EIS/EIR, water may be stored in each Truckee River Reservoir via three mechanisms: (1) diversion to storage of Project Water, which is the current use of the reservoir, (2) exchanges from other reservoirs, and (3) diversion to storage in lieu of the exercise of direct diversion water rights. Project Water includes unappropriated water that would be stored as a result of approving the applications. Other reservoirs from which exchanges would be made, exclusive of the subject reservoir, are Lake Tahoe, Donner Lake, Prosser Creek Reservoir, Independence Lake, Stampede Reservoir, and Boca Reservoir. Direct diversion water rights would be available from existing or purchased water rights in California or Nevada.

At any time, water could be stored by any or all of these mechanisms. Annual diversions to storage of Project Water could be no more than what is currently allowed in the SWRCB permit/license for the specific reservoir, as supplemented by the applications.

While this Project Water is being stored, exchanges into and out of a reservoir could be made multiple times, each up to the extent the reservoir has unused storage space. Similarly, diversions to storage in lieu of direct diversions could be made multiple times, utilizing unused storage, and subsequently released to serve the use specified for the direct diversion, or exchanged to another reservoir to later serve that use.

A. Change Petitions for Stampede (No. 15673), Boca (No. 5169), and Prosser Creek Reservoirs (No. 18006), and Independence Lake (No. 9247)

Stampede, Boca, and Independence Dams would have common upstream and downstream points of diversion, rediversion, and redistribution. Prosser Creek Dam would continue to be the diversion point for Prosser Creek Reservoir. Numerous common points of rediversion would be added downstream from Independence and Prosser Creek Dams to Pyramid Lake, including Derby Diversion Dam and the Newlands Project. In general, expanded places of use would include the upper Truckee River basin, Truckee Meadows, Fernley area, Newlands Project, and Pyramid Lake Indian Reservation. (For more details about the places of use, see table D and Map No. 320-208-189A-1 in the SWRCB Notice of Petitions and Water Appropriation Applications Appendix.) This expansion of the place of use would allow for potential exchanges of Project Water among the reservoirs in accordance with TROA. Incidental power generation would be authorized at the Stampede, Farad, Fleish, Verdi, and Washoe hydroelectric powerplants. (The Stampede hydroelectric powerplant is not included in the Prosser Creek Reservoir change petition.) Purposes of use would be expanded so that water from the four reservoirs has the following common uses: municipal, domestic, industrial, irrigation, stock watering, fish and wildlife protection/enhancement, fish culture, hydropower generation, instream water quality enhancement, recreation, conservation of Pyramid Lake fishes, and, except for Independence Lake, flood control.

B. Stampede Reservoir—Application No. 31487

This application would supplement the current permit (No. 11605) for Stampede Reservoir. If approved, the total combined amount of water that could be taken from January 1 through December 31 by direct diversion at the rate of 350 cfs and diversion to storage would be 226,500 acre-feet, which represents an increase of 100,000 acre-feet over the amount under the current permit for the reservoir.

Water available for diversion to storage under this application would be water in the Little Truckee River basin upstream of Stampede Reservoir that would otherwise flow to Pyramid Lake. In accordance with TROA, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

C. Prosser Creek Reservoir—Application No. 31488

This application would supplement the current license (No. 10180) for Prosser Creek Reservoir. Its approval would remove the existing maximum withdrawal of 20,162 acre-feet in any one year and would change the filling period from April 10–August 10 to October 1–August 10, while continuing to allow a maximum annual storage of 30,000 acre-feet as under the existing license. This would increase the potential annual withdrawal from the reservoir by 9,800 acre-feet.

Water available for diversion to storage under this application would be water in the Prosser Creek basin upstream of Prosser Creek Reservoir that would otherwise flow to Pyramid Lake. In accordance with TROA, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

D. Time Extension Petitions (No. 15673)

The two time extensions are necessary to develop the water right associated with Permit No. 11605 (including Application No. 31487 supplement) and to put such water to full beneficial use. A 10-year time extension petition was granted in 1982, and Reclamation petitioned for another 10-year extension in 1992, but the request was placed on hold while TROA negotiations continued. The current petition (No. 15673) seeks approval of the 1992 petition and requests an additional 10-year extension. The total time extension from 1982, including the 10-year extension already granted and two 10-year extensions requested, would be 30 years, effective to 2012.

III. Evaluation Process

SWRCB must consider a number of factors when acting on a change petition:

- That the proposed change will not injure any other legal user of water (California Water Code [CWC] section 1702)
- That the proposed change will not in effect initiate a new right (California Code of Regulations [CCR] title 23, section 791)
- That the intended use is beneficial

SWRCB must also consider a number of factors when acting on an application to appropriate water:

- That unappropriated water is available for appropriation (CWC section 1375(d)).

- The instream flows required to protect beneficial uses of water, including uses identified in a water quality control plan (*Id*. section 1243.5). Beneficial uses include the use of water for recreation and the preservation and enhancement of fish and wildlife (*Id*. section 1243).

- That the water use, method of use, and method of diversion are reasonable, in accordance with article X, section 2 of the California Constitution. (Also see CWC section 275.)

- The effect of the project on public trust resources and protection of those resources where feasible.

Evaluation of the environmental effects of the above actions should consider the following:

- Effects of changes in flows as they relate to fishery, riparian habitat, and water quality issues.

- Effects of adding to places of use.

- Effects of adding purposes of use.

- Miscellaneous: Economic or social effects of a project shall not be treated as a significant effect on the environment, but may be used to determine the significance of the physical changes caused by the project (CCR, title 14, section 15131(a)-(b)).

IV. Summary of Effects

This section presents a compilation of environmental information required by CEQA and additional information provided to assist SWRCB in its decision making process, as described in "Evaluation Process," taken from other sections of this EIS/EIR.

A. Change Petitions that are Implemented with TROA

1. No Injury to Any Other Legal User of Water

By incorporating existing storage priorities and capacities for Project and Private Waters in their respective reservoirs, TROA would not impair or conflict with the exercise of vested or perfected *Orr Ditch* decree water rights or interfere with flood control and dam safety criteria. As discussed in chapter 1 and required by the Settlement Act, TROA must "ensure that water is stored in and released from Truckee River facilities to satisfy the exercise of water rights in conformance with the *Orr Ditch* and *Truckee River General Electric* decrees." TROA Section 1.C protects owners of vested and perfected water rights and provides compensation if implementation of TROA results in an owner "not receiving the amount of water to which that owner is legally entitled." The one exception is that, since TROA would call for the modification of the *Orr Ditch* and *Truckee River General Electric* decrees, some parties signing TROA voluntarily agree to operations that prevent the full exercise of their water rights. An example is that the United States and Pyramid Tribe must sometimes, under TROA, reduce diversions to Stampede Reservoir storage to allow greater releases to meet higher minimum instream flows than are currently required. Such parties are not claiming injury since they obtain other benefits from storing water under TROA.

Section 204(c)(1) of the Settlement Act and TROA section 6.C assign diversions in the Truckee River basin in California the fourth highest priority, which is higher than the priority of any diversions to the reservoirs specified in the change petitions and applications. An exception in the Settlement Act is that diversions in California initiated after 1990 for commercial, irrigated agriculture are assigned a priority junior to all beneficial uses in Nevada. In any case, the Settlement Act and TROA would preclude water use in the Truckee River basin in California that exceeds the interstate allocation of 32,000 acre-feet per year of which 10,000 acre-feet per year may be surface water use.

In addition, any legal user of water may obtain storage in the subject reservoirs under TROA, provided they agree to comply with its provisions (TROA sections 7.A.2(b) and 7.G), and thus realize the benefits associated with such opportunities for storage and increased operational flexibility in exercising their water right.

2. Does Not in Effect Initiate a New Right

The four change petitions would add common purposes of use and common points of diversion, redistribution, and rediversion. Other terms in the existing permits would not change, except as may be granted by approval of the two applications.

3. That the Intended Use is Beneficial

The change petitions would aggregate existing purposes of use that have been previously approved for the four subject reservoirs, making these purposes of use applicable to all four reservoirs. These beneficial uses are described throughout this chapter.

4. Effects on Changes in Flows as they Relate to Fishery, Riparian Habitat, and Water Quality Issues

Granting the change petitions necessary to implement TROA would have no overall adverse effect on the riverine environment. When Fish Water is managed under TROA to achieve the six-flow regime in the lower reach of the Truckee River, TROA would, with the exception of the Farad reach (which is less than 2 percent of the river length), either maintain the status quo or significantly enhance fish habitat in the river from Lake Tahoe to Pyramid Lake and portions of three tributaries, including Independence Creek. (See "Fish in Truckee River and Affected Tributaries.") As such, TROA would provide benefits to fish in the Truckee River and portions of three tributaries that are not provided under current conditions and No Action. These benefits more than offset the reduced potential to enhance fish habitat in the Farad reach.

Though the minimum bypass flow under TROA (50 cfs) would be the same at all four Truckee River hydroelectric diversion dams, TROA would provide more operational flexibility in achieving bypass flows greater than 50 cfs than under LWSA, No Action, and current conditions. The benefit of the TROA bypass flow provisions is that minimum bypass amounts need not be static, but may be varied (managed) according to the needs of the species (management objectives) in the bypass reach. (See "Minimum Bypass Flow Requirements for TMWA's Hydroelectric Diversion Dams on the Truckee River.")

Article Nine of TROA requires minimum releases from the reservoirs that equal or exceed existing minimum releases. Article Nine also requires exchanges of water among reservoirs when there is low risk to TROA parties in accordance with existing water rights to further increase reservoir releases to those recommended by CDFG. The resulting benefits to instream flows are described in "Fish in Truckee River and Affected Tributaries."

TROA would have no adverse effects on endangered or threatened species under any hydrologic condition when compared to No Action or current conditions, and would have significant beneficial effects to both cui-ui and LCT (tables 3.60-3.70). Results of analyses on special status species associated with riparian or riverine habitats are discussed in "Habitat for Other Special Status Animal Species;" no adverse effect would result from TROA in any hydrologic condition.

Depending on the reach and the hydrologic condition, TROA either would have no effect or would have a significant beneficial effect on riparian habitats and associated wildlife along the mainstem of the Truckee River when compared to No Action and current conditions (table 3.66). TROA would have a significant beneficial effect on riparian habitats and associated wildlife along most tributary reaches in all hydrologic conditions and would have no effect along a few tributary reaches compared to No Action and current conditions (table 3.67).

5. Effects on Adding Places and Purposes of Use

Consolidating places and purposes of use under each license and permit would have no adverse effect because they are already, as an aggregate, common to the existing licenses and permit. Water right owners and the environment would benefit from having common places and purposes of use for Boca, Prosser Creek, and Stampede Reservoirs and Independence Lake because that would allow Credit Waters to be stored in and exchanged among these reservoirs, along with Lake Tahoe and Donner Lake. Also, Project Waters and Private Waters could be stored in and exchanged among the facilities. These operations would increase the availability of such waters for their beneficial uses and, in so doing, many benefits of TROA as described in this chapter would be realized. To allow implementation of TROA, new places and purposes of use are required in California and Nevada.

6. Economic and Social Effects

The economic and social effects of TROA are described in the "Economic Environment" and "Social Environment" sections of this chapter.

7. Other Environmental Effects

Other environmental effects at Prosser Creek, Stampede, and Boca Reservoirs and Independence Lake related to the petitions and applications are summarized as follows.

a. Prosser Creek Reservoir/Creek

Operations model results show that, in wet hydrologic conditions, Prosser Creek Reservoir releases are the same under TROA as under No Action or current conditions. In median hydrologic conditions, storage under TROA generally is greater from April through September than under No Action or current conditions; in Prosser Creek, flows are less in May and June, but much greater in September and October than under No Action or current conditions. In dry hydrologic conditions, storage under TROA is much greater and releases are less in May and June than under current conditions. Releases under TROA are much greater in September and October than under No Action or current conditions.

With approval of the change petitions, preferred flows in Prosser Creek for rainbow trout would be achieved 10 percent more frequently under TROA than under No Action or current conditions. (See "Fish in Truckee River and Affected Tributaries.") As a result, spawning, incubation, and rearing of rainbow trout would be enhanced in this reach.

Operations model results show that, under TROA, Prosser Creek Reservoir storage is below the minimum threshold for fish survival in about half as many years as under No Action and in nearly 30 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs, Fish Survival Based on Minimum Storage Thresholds.") As a result, with approval of the change petitions, fish mortality would be substantially less under TROA, which would be a significant beneficial effect.

TROA would have no effect on riparian and wetland vegetation in Prosser Creek Reservoir. Operations model results show that reservoir storage is slightly less under TROA during August and September in wet hydrologic conditions than under No Action or current conditions. (See "Reservoir Storage and Releases" in "Surface Water.") Several years of wet hydrologic conditions may, therefore, allow the temporary expansion of emergent wetlands in the basin of the reservoir. Storage in median and dry hydrologic conditions under TROA is well within the existing operational basin of the reservoir and would not result in a significant adverse effect on existing riparian or wetland vegetation.

b. Stampede Reservoir/Little Truckee River

Operations model results show that, under TROA, Stampede Reservoir storage in wet hydrologic conditions is greater from May through September, and releases are greater from September through December than under No Action or current conditions. In median hydrologic conditions, storage under TROA is much greater than under No Action or current conditions, while releases are less from November through August, but much greater in October. In dry hydrologic conditions, storage and releases under TROA are much greater year-round than under No Action or current conditions. With approval of the change petitions, minimum flows for brown trout would be sustained more frequently under TROA than under No Action or current conditions.

Under TROA, Stampede Reservoir storage is below the minimum threshold for fish survival in 9 percent fewer years than under No Action and in nearly 13 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs.") As a result, with approval of the change petitions, fish mortality would be substantially less, which would be a significant beneficial effect. (See "Fish in Lakes and Reservoirs.")

Stampede Reservoir provides foraging habitat for migrating waterfowl, primarily on islands within the reservoir. In wet and median hydrologic conditions, TROA would have no significant effect on shallow water foraging habitat for waterfowl and shorebirds when compared to No Action or current conditions. In dry hydrologic conditions, with approval of the change petitions and applications, nearly 80 percent more shallow water foraging habitat would be available under TROA than under current conditions, which would be a significant beneficial effect. (See "Waterfowl and Shorebirds.") Under TROA, predator access to islands in Stampede Reservoir would occur in about 50 percent fewer years with approval of the change petitions and applications than under No Action or current conditions; again, this would be a significant beneficial effect. Under TROA, island bird nests would be inundated about 5 percent more frequently than under No Action and about 20 percent more frequently than under current conditions, which would have the potential to adversely affect local, but not regional, Canada goose nesting success.

The small amount of riparian and wetland vegetation at Stampede Reservoir occurs where the Little Truckee River and Sagehen Creek enter the reservoir. The complexity of the topography and substrate characteristics make it difficult to predict the actual pattern of change that might occur, but, because of soil porosity, no significant adverse effect on riparian and wetland vegetation is expected.

c. Boca Reservoir

Operations model results show that, under TROA, in wet hydrologic conditions, reservoir storage is greater from October through December and less in August than under No Action or current conditions. In median hydrologic conditions, storage under TROA is greater from August through March and, in dry hydrologic conditions, greater year-round than under No Action or current conditions.

Under TROA, Boca Reservoir storage is below the minimum threshold for fish survival in 33 percent fewer years than under No Action and in 35 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs.") As a result, with the approval of the change petitions, fish mortality would be substantially less under TROA, which would be a significant beneficial effect. Operations model results show slightly less reservoir storage from July through September under TROA in wet hydrologic conditions than under No Action or current conditions. (See “Reservoir Storage and Releases” in “Surface Water.”) Several years of wet hydrologic conditions may, therefore, allow the temporary expansion of emergent wetlands into the operational basin of the reservoir. Storage in median and dry hydrologic conditions under TROA is well within the existing operational basin of the reservoir and would not result in a significant adverse effect on existing riparian or wetland vegetation.

d. Independence Lake and Creek

Operations model results show that, under TROA, Independence Lake storage and releases generally are the same as under No Action. However, in dry hydrologic conditions, storage is greater from July through September and less from November through June; releases are greater from May through September. Approval of the change petitions would result in a number of potential benefits to fish resources at Independence Lake that would not occur otherwise. For example, Article Five of TROA allows Joint Program Fish Credit Water, Fish Credit Water, and Fish Water in Stampede and Boca Reservoirs to be exchanged for Private Water in Independence Lake for the conservation of LCT in the lake. TMWA would allow CDFG to maintain access through the delta at the upper end of the lake for migrating fish. Also, TROA could improve the timing and duration of flows in Independence Creek during summer months.

No minimum threshold for fish survival has been established for Independence Lake. Except for certain months in dry hydrologic conditions, operations model results show similar storage under all hydrologic conditions; thus, no effect on lake fish is expected. The average total area of shallow water fish spawning habitat is the same under TROA and No Action in wet and median hydrologic conditions and differs by less than 8 percent in dry hydrologic conditions, which is not a significant effect. Spawning habitat under TROA is the same as under current conditions. (See “Fish in Lakes and Reservoirs.”) Because Independence Lake provides limited habitat for waterfowl and shorebirds, no significant effects would be expected on these resources under TROA.

Preferred flows for rainbow trout likely would occur more frequently with approval of the change petitions. (See “Fish in Truckee River and Affected Tributaries.”) Lethal flow conditions would occur significantly less frequently, and rainbow trout spawning, incubation, and rearing would be enhanced.

B. Water Appropriation Applications that may be Implemented with TROA

1. Unappropriated Water Available for Appropriation

Water available for diversion to storage under Application No. 31487 (Stampede Reservoir) would be water in the Little Truckee River basin upstream of Stampede Reservoir that would otherwise flow to Pyramid Lake. The application seeks to allow use of the full capacity of the existing reservoir for the purpose of storing Project Water and Fish Credit Water in accordance with TROA and, in turn, would expand the benefits derived from TROA. As such, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights and would not constrain or limit the operation of other Truckee River reservoirs.

Application No. 31488 (Prosser Creek Reservoir) proposes to expand the storage season and to change the maximum withdrawal amount from Prosser Creek Reservoir to the maximum storage of the reservoir in accordance with TROA. The application seeks to allow use of the full capacity of the existing reservoir in accordance with TROA and, in turn, would expand the benefits derived from TROA. Water available for diversion to storage under this application would be water in the Prosser Creek basin upstream of Prosser Creek Reservoir that would otherwise flow to Pyramid Lake. As such, the priority storage of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

2. Instream Flows Required to Protect Beneficial Uses of Water

Article Nine of TROA requires minimum releases from the reservoirs that equal or exceed existing minimum releases. Article Nine also requires exchanges of water among reservoirs, when they may be done with low risk to TROA parties in accordance with existing water rights, to further increase reservoir releases to those recommended by CDFG. Approving the applications would provide additional storage of Fish Credit Water, which must be made available for such exchanges to better meet the recommended releases. The resulting benefits to instream flows are described in the "Biological Resources" section of this chapter.

3. That the Water Use, Method of Use, and Method of Diversion are Reasonable

In determining what constitutes a reasonable use of water or method of use or diversion, the totality of the circumstances must be reviewed along with the specific facts of each case. Water use, method of use, and method of diversion associated with the applications are reasonable because approval of the applications and implementation of TROA would allow (1) water rights to be exercised more effectively and efficiently and (2) reservoirs to be operated more effectively and efficiently in that currently unused reservoir storage space would be used. In addition to better meeting the storage and diversion objectives of water rights holders, uses of water stored and released under these applications would provide benefits to aquatic resources in the Truckee River and in three of its major tributaries. (See Section IV, "TROA," in chapter 2 and table 2.6, along with "Biological Resources" sections in this chapter for details.)

Beneficial uses of water proposed under these applications, as well as those under the proposed change petitions, simply consolidate existing purposes of use, which have been previously approved for the subject reservoirs.

4. The Effect of the Applications on Public Trust Resources and Protection of Those Resources Where Feasible

The California public trust doctrine, as set forth in *National Audubon Society* v. *Superior Court of Alpine County*, 33 Cal. 3d. 419, 658 P.2d 709 (1983), requires the State to protect public trust resources, such as fish and wildlife, recreation, and environmental values. The State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and no water right holder has a vested right to use water in a manner harmful to the trust. Section 1.A.3 of TROA re-affirms this public trust by stating: "this Agreement is intended to implement California's responsibilities under the public trust doctrine as set forth in *National Audubon Society v. Superior Court of Alpine County* . . . by coordinating operation of Truckee River Reservoirs, Donner Lake and Independence Lake, by supporting recreation and instream flows, and by providing for consultation with California, which will aid in balancing among public trust uses while meeting all other requirements of the Settlement Act." Since the two applications are conditioned on the implementation of TROA, California's responsibility under the public trust doctrine is assured.

The public trust doctrine has been understood to protect, among other things, public access, aesthetic values, ecology, fish and wildlife, habitat, and recreation. TROA would benefit and enhance these protected resources. For example, TROA provides for the establishment of Credit Water, certain categories of which would be used by California and others to enhance instream flows. TROA also provides for a habitat restoration fund to be used over 30 years by California, Nevada, and Pyramid Tribe to restore riverine habitat in the Truckee River system. Other ecological benefits are discussed in the "Biological Resources" sections of this chapter. TROA would not alter public access to the reservoirs. Other categories of Credit Water would enhance aesthetic values, especially for recreationists using these reservoirs. (See "Aesthetic Resources.") Additional storage at Prosser Creek Reservoir would increase visitor usage above that under No Action or current conditions. Use of boat ramps would be the same with or without TROA. Flows for recreational fishing in Prosser Creek would be slightly better under TROA than under No Action or current conditions. Recreational usage at Stampede Reservoir under TROA would be slightly greater than under No Action or current conditions.

5. Effects on Changes in Flows as they Relate to Fishery, Riparian Habitat, and Water Quality Issues

The effects on fishery, riparian habitat, and water quality issues are discussed under "Change Petitions that are Implemented with TROA" and in the "Biological Resources" sections of this chapter.

6. Economic and Social Effects

The economic and social effects of TROA are described in the "Economic Environment" and "Social Environment" sections of this chapter.

C. Time Extension Petitions

Since 1978, the Secretary has used storage in Stampede Reservoir for the conservation of threatened and endangered fishes of Pyramid Lake. Stampede Reservoir is managed for flood control and, to the maximum extent possible, to comply with the Secretary's obligation to Pyramid Lake fishes. This operation is expected to continue until and after TROA becomes effective.

The project includes Reclamation's petitions for two 10-year extensions of time to put the water under the Stampede permit to full beneficial use and to implement the requested change petitions. Approval of the time extensions would not result in an adverse change in the existing environment because Reclamation is already putting the full amount of water under its permit to beneficial use. Thus, the existing environment already includes those existing operations. There is no other environmental impact associated with a potential approval of the time extension petitions, other than any impacts associated with the change petitions that would be made possible by the extension of time. The impacts associated with those change petitions are fully documented herein.

GROWTH-INDUCING IMPACTS

Section 21100(b)(5) of CEQA requires an EIR to discuss the growth-inducing impact of a proposed project. Section 15126.2(d) of the CEQA Guidelines clarifies this requirement, stating that an EIR must address “the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment.”

Under CEQA, growth-inducing impacts must not be assumed to be necessarily beneficial, detrimental, or of little significance to the environment. Induced growth is considered a significant impact only if it affects, directly or indirectly, the ability of agencies to provide needed public services or if it can be demonstrated that the potential growth, in some other way, significantly affects the environment. The goal of the EIS/EIR in this regard, therefore, is one of disclosure.

Generally speaking, a project is considered growth inducing when it:

- Directly or indirectly fosters (1) economic growth, (2) employment opportunities, (3) population growth, or (4) additional housing.
- Removes obstacles to growth.
- Burdens community infrastructure and service facilities (e.g., transportation, fire and police protection, schools, recreation facilities).
- Encourages or facilitates other activities that could significantly affect the environment.

In addition, NEPA regulations require an EIS to consider the potential indirect impacts of a proposed project. Indirect effects of an action include those that occur later in time or a distance away but that are still reasonably foreseeable (CEQ Guidelines section 1508.8(b)).

This section also notes that indirect effects can include “growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.”

Future population levels and water demands used in this final EIS/EIR are based on projections made by State and regional service and planning entities responsible for planning for M&I water supply and demand in the Lake Tahoe and Truckee River basins. For Truckee Meadows, these entities are Washoe County and Truckee Meadows Water Authority. For the California and other Nevada portions of the Lake Tahoe and Truckee River basins, these entities are California Department of Finance, CDWR, TRPA, NDWR, Fernley, and the Pyramid Tribe. These entities have prepared extensive studies and reports variously forecasting the study area's economy, population, and resources. These studies and reports have been approved and adopted by the respective agencies, in cooperation with local jurisdictions, as the most likely scenarios for growth in these regions. Projections made by local planning entities indicate that population growth during the study period would be the same with or without the Federal action (TROA). Therefore, implementation of TROA would not be growth-inducing in the Lake Tahoe or Truckee River basins.

Although sources of water or mechanisms to meet water demands might differ among the alternatives, population growth and resulting water demand are projected to be the same under No Action, LWSA, and TROA. (See "Surface Water" and "Social Environment.") The projected changes are within the parameters of planning for growth within the study area, including land use, transportation, housing, schools, public services, environmental resources, and infrastructure. (Note: While planning efforts generally do not extend 26 years into the future, descriptions of all alternatives comport with projected population trends and projected changes do not achieve the threshold of substantial impact.)

ENVIRONMENTAL JUSTICE

I. United States

Executive Order 12898 (1994), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Environmental justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities.

II. California

Section 65040.12 of the California Government Code defines environmental justice as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies."

Under California's CEQA Guidelines, economic or social information may be included in an EIR, or may be presented in whatever form the agency desires. Economic or social effects of a project shall not be treated as significant effects on the environment (State of California CEQA Guidelines, Section 15131).

It is the policy of the California Resources Agency that the fair treatment of people of all races, cultures, and incomes shall be fully considered during the planning, decision-making, development, and implementation of all Resources Agency programs, policies, and activities. The intent of this policy is to ensure that members of the public, including minority and low-income populations, are informed of opportunities to participate in the development and implementation of all Resources Agency programs, policies, and activities and that they are not discriminated against, treated unfairly, or caused to experience disproportionately high and adverse human health or environmental effects from environmental decisions.

The mission of the California Environmental Protection Agency and its boards, departments, and offices is to accord the highest respect and value to every individual and community by developing and conducting its public health and environmental protection programs, policies, and activities in a manner that promotes equity and affords fair treatment, accessibility, and protection for all Californians, regardless of race, age, culture, income, or geographic location.

III. Conclusion

This section addresses potential environmental justice concerns in accordance with Federal and California environmental justice laws and policies.

As identified in Chapter 5, “Consultation and Coordination,” public involvement (i.e., consultation and coordination with potentially affected publics) has continued throughout the EIS/EIR process for the proposed action. A review of “Economic Environment,” “Social Environment,” and “Indian Trust Resources” sections in this chapter 3 has shown that neither LWSA nor TROA involves facility construction, population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. Consequently, it is concluded that implementing LWSA or TROA would have no adverse human health or environmental effects on minority or low-income populations as defined by environmental justice policies and directives.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are assumed to be long-term impacts to resources which would be affected by implementation of one of the action alternatives. Because the action alternatives involve only modifying reservoir operations, no unavoidable adverse impacts are expected.

RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

In the short run, implementing TROA is projected to cause operational changes that will result in more system flexibility to meet long-term future needs. Because of exchange and storage agreements that are components of TROA, a more assured long-term drought water supply for Truckee Meadows would be obtained, and improved flow conditions would be possible for the endangered and threatened Pyramid Lake fishes and aquatic species in general. California's allocation of water for M&I purposes in the long-term will be assured and can be utilized in the short term to improve environmental conditions in the Truckee River.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments are considered to be the permanent reduction or loss of a resource. No irreversible and irretrievable commitments of resources would occur under any of the alternatives.

Chapter 4

CUMULATIVE EFFECTS

This chapter addresses cumulative effects (CE) in the study area.

Of the numerous past, present, and reasonably foreseeable future actions identified in this cumulative effects analysis, the Truckee River Operating Agreement (TROA) is unique insofar as it relates to modifying reservoir operations. None of the other actions considered in this chapter has the objective, capacity, or legal authority to effect integrated management of major reservoirs in the Truckee River basin—specifically, rules for storing, exchanging, and releasing water. Some of the actions may, however, directly determine, to some degree, release schedules (amount and timing) for water stored pursuant to TROA (primarily Credit Water) based on water rights and beneficial uses, in addition to certain releases required for flood control, dam safety, and emergency purposes.

TROA is required by law to ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of water rights in conformance with the *Orr Ditch* and *Truckee River General Electric* decrees, except for those rights that are voluntarily relinquished; much of the analysis in this document relates to water rights issues. TROA would allow latitude in reservoir operations and exercise of water rights within recognized institutional authorities (State water law, judicial decrees, etc.). In addition, TROA imposes no restrictions on urban planning or limitations on community development; rather, it is a tool for managing water resources in response to changing demands and conditions. Because no new water rights would be created by TROA and certain limitations on water use would be implemented, many of the cumulative effects of actions related to resources potentially affected by TROA are already presented in chapter 3. Some of these effects are repeated in this cumulative effects analysis to provide perspective on future conditions.

In the following analysis, identified potential future actions are grouped by category because they may affect the same water rights or water resources but to varying degrees depending on how they are exercised or distributed. In addition to those previously addressed effects, this analysis focuses on those past, present, and reasonably foreseeable future actions that would (1) cumulatively affect streamflows associated with beneficial uses or (2) develop water supplies in the study area.

I. Definition of Cumulative Effects

Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such actions (40 Code of Federal Regulations [CFR] section 1508.7)."

California Environmental Quality Act (CEQA) section 15355 defines cumulative impacts as follows:

> Two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts:
>
> - The individual effects may be changes resulting from a single project or a number of separate projects.
>
> - The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

This chapter briefly describes the major categories of actions in the study area that have a connection with TROA and their potential cumulative effects on affected resources. A connection with TROA is defined as an action that is:

- In the study area
- Affecting the use of Truckee River water
- Having environmental linkages to Truckee River operations

Section II describes the methodology used for the cumulative effects analysis. Section III identifies actions associated with Public Law (P.L.) 101-618. Section IV describes the U.S. Department of the Interior's (Interior) Water 2025 initiative. Section V addresses the following seven action categories:

- **Urban development and land use**: Increasing populations increase demand for municipal and industrial (M&I) water and, as urban areas expand, agricultural lands are developed into residential and commercial properties.

- **Water rights acquisitions and transfers**: As demands for water for M&I, environmental, and water quality uses increase, acquisition of agricultural water rights continues.

- **M&I water plans**: Communities have developed and are developing water resources plans that address water rights transfers and groundwater use.

- **Ecosystem restoration**: Site-specific restoration projects are being implemented, and additional projects are likely to be implemented in the future.

- **Flood control**: Government entities are implementing flood control measures in portions of the study area.

- **Water quality**: Water quality standards have been developed and entities are taking actions to meet those standards.

- **Climate**: Seasonal water availability may shift due to climate change.

Section VI presents an analysis of the potential cumulative effects of each action category for each alternative and each affected resource (in the year 2033). Study area resources are analyzed using the same indicators and methodology presented in chapter 3. Finally, section VII presents a conclusion based on the analysis.

II.   Methodology for Analyzing Cumulative Effects

This section describes the methodology for analyzing cumulative effects.

A.   Identify Actions

Requests were sent to resource management agencies and other entities for information on ongoing, planned, or proposed actions related to water resources in the study area. Based on responses to the requests, more than 150 actions were identified as potential future actions to address in this cumulative effects analysis. Those actions were then differentiated as to those:

- Included in the operations model and related environmental analyses or considered as part of the past cumulative effects or current conditions. These actions are discussed in chapter 3, and are not considered further in this analysis.

- Meeting all of the criteria listed in section II.B and considered further in this analysis.

The Cumulative Effects Appendix lists all of the actions identified in the study area (identified with a CE reference number) and how they were addressed in the cumulative effects analysis.

B. Criteria

The following criteria were used to determine which of the more than 150 actions merited further analysis relative to cumulative effects:

1. Reasonably Foreseeable (Actions that are Likely to Happen)

CEQ regulations describe cumulative effects analysis in terms of "actions," rather than "proposals." Considering Cumulative Effects (page 19) states, "Commonly, analysts only include those plans for actions which are funded or for which other NEPA analyses are being prepared" (CEQ, 1997). This guideline was expanded to include actions for which positive responses to the following questions could be made:

- Is the action likely to occur?
- Does the action have an identified sponsor proposing it?
- Does the action have identified sources of funding?
- Has the action initiated NEPA compliance or other regulatory procedures?
- Is the action defined in enough detail to allow meaningful analysis?

2. Relevance (Actions that Relate to TROA)

Considering Cumulative Effects (page 19) also states, "In general, actions can be excluded from analysis of cumulative effects if the action will not affect resources that are the subject for the cumulative effects analysis." Actions for which positive responses to the following questions could be made were included in the analysis:

- Does the action have aspects that are not already analyzed under the No Action Alternative (No Action)?

- Is the action defined in enough detail to determine if there would be any potential effect on indicators used in the analysis of the alternatives?

- Does the action affect any of the indicators used in the analysis of the alternatives?

3. Magnitude

Section 15130(a) of CEQA states, "An EIR (environmental impact report) shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable." Minor actions were not considered further; a minor action related to several similar actions was considered in the aggregate.

4. Determination

For the purpose of this analysis, implementation of TROA is considered significant if, in concert with other described past, present, or reasonably foreseeable future actions, it would exacerbate the declining status of an identified resource (i.e., a resource that is already adversely affected) or create a condition in which an effect is initially minor but is part of an irreversible declining trend.

III. Actions Authorized by P.L. 101-618

Title II of P.L. 101-618, the Truckee-Carson-Pyramid Lake Water Settlement Act of 1990 (Settlement Act), was enacted by the Congress to provide the authorities and mechanisms for resolving a number of issues involving water resources and water rights in the Truckee and Carson River basins, among other matters, including negotiation of TROA. The purposes of Title II are detailed in chapter 1.

This section presents an overview of the status of selected actions authorized by Title II of P.L. 101-618 and the relation of each to TROA with regard to cumulative effects. (Note: Interstate water allocation [section 204] is related to TROA [section 205], the proposed action, and so is not analyzed separately.)

1. 206(a)(1) Water Rights Acquisition Program for Lahontan Valley Wetlands

Status: The U.S. Fish and Wildlife Service (FWS) released a final environmental impact statement (EIS) in September 1996 and a record of decision (ROD) in November 1996 that described and analyzed a program to purchase up to 75,000 acre feet of water from the Carson Division of the Newlands Project for Lahontan Valley wetlands Water Rights Acquisition Program (WRAP), as referenced earlier in this document (FWS, 1996). In addition to water rights, water needed to sustain the wetlands may come from water leasing, reservoir spills, irrigation drain water, water use reductions at Naval Air Station Fallon (NASF), groundwater pumping, or water purchases from segment 7 of the Carson River (upstream of Lahontan Reservoir).

Through a partnership of FWS, Nevada, The Nature Conservancy, Nevada Waterfowl Association (NWA), Bureau of Indian Affairs (BIA), and Bureau of Reclamation (Reclamation), about 34,400 acre-feet of water rights from the Carson Division have been acquired for Lahontan Valley wetlands as of June 2007: 23,800 acre-feet by FWS, 1,800 acre-feet by BIA, and 8,800 acre-feet by Nevada and NWA. Most purchases in the Carson Division have occurred at the edges of the Newlands Project near Stillwater NWR and Carson Lake. FWS has purchased 4,300 acre-feet from segment 7 of the Carson River and received 2,900 acre-feet from NASF. Water rights are purchased from willing sellers at appraised market value. Acquired water rights are currently transferred and exercised at Stillwater NWR at the consumptive use rate of 2.99 acre-feet per acre per year (compared to the entitlement of 3.5 and 4.5 acre-feet per acre per year for bottom and bench lands, respectively).

Potential Impacts: The WRAP ROD states, “The preferred alternative will result in the least amount of water rights purchased from the Carson Division. Under this alternative, the Service will rely more heavily on other water resources to fulfill the objective.” None of the alternatives analyzed in this final EIS/EIR would affect the measures implemented to achieve the WRAP objective. To the extent that additional water rights are acquired, transferred, and exercised at the consumptive use rate, Carson Division demand would decrease accordingly and, in some years, reduce demand for Truckee River water, in accordance with Operating Criteria and Procedures (OCAP) for the Newlands Project. To the extent that reduced demand would increase flow in the lower Truckee River, TROA would provide opportunity to use such water to establish Credit Water to be managed for the benefit of Pyramid Lake fishes (i.e., cui-ui and Lahontan cutthroat trout [LCT]) and related resources. TROA in combination with this action would not, however, affect the exercise or priority of Newlands Project water rights, which would continue to be served consistent with OCAP, or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

2. 206(b) Expansion of Stillwater National Wildlife Refuge

Status: Stillwater National Wildlife Refuge (NWR) has made recommendations regarding expansion of its authorized boundary for acquiring an interest in land. The proposed revised boundary would incorporate the area formerly known as the Stillwater Wildlife Management Area (WMA), Fallon NWR, and 32 sections south and north of Stillwater WMA. Lands acquired within the expanded boundary would be managed to restore and maintain the natural biological diversity associated with the lower Carson River and its delta, the sand dune complex along the southern shore of the Carson Sink, and salt desert shrub lands of Carson Desert. A ROD has been completed. FWS recently approved a Comprehensive Conservation Plan (CCP) to guide the management of the expanded refuge. To date, there has been no legislative action on the proposed expanded boundary, and legislation appears unlikely at this time. CCP requires most of the refuge's water to be delivered during early summer rather than under an agricultural delivery pattern as in the past. The effect of such a delivery pattern on Pyramid Lake fishes has yet to be determined.

Potential Impacts: The only effect relative to TROA could be a modification of the water demand pattern, which could increase spring and early summer diversions from the Truckee River to achieve Lahontan Reservoir storage targets, in accordance with OCAP, and modify the storage and release pattern of water dedicated for the benefit of Pyramid Lake fishes if such management is not detrimental to Pyramid Lake fishes or trust resources of the Pyramid Lake Pauite Tribe of Indians (Pyramid Tribe). TROA in combination with this action would not, however, affect the exercise of Newlands Project water rights, which would continue to be served consistent with OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

3. 206(c) Naval Air Station Fallon to Develop Land Use Management Plan

Status: NASF has developed a Land Use Management Plan for conserving water used on lands surrounding the air base. P.L. 101-618 requires transfer of any excess water rights identified in the plan to the Secretary of the Interior (Secretary) for the benefit of Pyramid

Lake fishes or wetlands in Lahontan Valley; as specified in section 207(e), such additional flows are intended to offset any reduction in flows attributed to the interstate allocation authorized in section 204. Though Pyramid Lake fishes would have priority to use this water for the conservation of the species in accordance with the ESA, such benefits from this excess water may not be realized until TROA is implemented, as specified in section 210(a)(2)(A). In the meantime, the excess water is being used on Stillwater NWR.

Potential Impacts: Disposition of this water may affect the amount and timing of water diverted from the Truckee River to the Newlands Project via the Truckee Canal in certain years. Such diversions or lack thereof would be coordinated to ensure maximum benefits for endangered and threatened species and wetland habitat and to avoid adverse impacts to trust resources of the Pyramid Tribe. TROA in combination with this action would not, however, affect the exercise of Newlands Project water rights, which would continue to be served consistent with OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

4. 206(d) Interior and Nevada may Share Cost of Protecting Lahontan Valley Wetlands

Status: Status of agreement is uncertain.

Potential Impacts: This is a coordination action only and there would be no cumulative effect from implementation concurrent with TROA.

5. 206(e) Transfer of Carson Lake and Pasture to Nevada

Status: The Secretary is authorized to negotiate an agreement to transfer Carson Lake and Pasture to Nevada. The agreement to transfer the 30,000-acre wetland to Nevada was signed on October 28, 2004. The duty of water rights transferred to these wetlands will be 2.99 acre-feet per acre unless and until determined otherwise by the court in a final ruling.

Potential Impacts: The outcome of any final court ruling (3.5 versus 2.99 acre-feet per acre) could affect the timing and quantity of water diverted from the Truckee River to Lahontan Reservoir to achieve monthly storage targets. TROA in combination with this action would not, however, affect the exercise of Newlands Project water rights, which would continue to be served pursuant to OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets. Such transfer would not affect the capacity to store, exchange, or release water from Truckee River reservoirs under TROA.

6. 206(f) Lahontan Valley and Pyramid Lake Fish and Wildlife Fund

Status: Net payments for storage of water in upstream Federal reservoirs (i.e., amounts in excess of Stampede Reservoir) will be deposited to the Lahontan Valley and Pyramid

Lake Fish and Wildlife Fund (LVPLFWF) for use on a 50/50 basis for (1) the Lahontan Valley wetlands restoration program and (2) protection and restoration of the Pyramid Lake fishery. The fund can also accept and fund projects from donations and projects funded by Nevada, although no such contributions have been received. The fund has been established, but deposits to date have been minimal and no related programs have been implemented. The amount of net payments under TROA will be the subject of future negotiations, but is expected to be positive (it is currently negative).

Potential Impacts: Within 2 years or so after TROA enters into effect, and subject to appropriations, additional funds likely would be available for restoration of Lahontan Valley wetlands and Pyramid Lake fishes. For Lahontan Valley wetlands, this restoration could take the form of physical restoration activities such as modifications of diking, installation of control structures, planting or removal of certain plants or animal species, and acquisition of water rights. In the case of water rights acquisitions, additional funds could potentially accelerate to some degree the rate of acquisition of water rights, but would not change the ultimate goal of 75,000 acre-feet of prime water rights available for the wetlands. For Pyramid Lake, funds could be used for such actions as fish spawning, rearing, stocking, placement, passage, research, and habitat improvement, including the acquisition of water rights. The amount of funding and the extent of acceleration are speculative at this time, and the extent of benefits or effects would depend on the magnitude of the fund as well as specific projects selected for funding. TROA would provide a mechanism to store Credit Water if, and to the extent, the fund were used to acquire water rights for the benefit of Pyramid Lake fishes.

7. 206(g) Transfer of Indian Lakes to Nevada or Churchill County

Status: The Secretary is authorized to negotiate an agreement to transfer Indian Lakes to Nevada or Churchill County. There is no proposal to implement this action.

Potential Impacts: TROA would not affect the transfer of Indian Lakes, and such transfer would not affect the capacity to store, exchange, or release Credit Water from Truckee River reservoirs under TROA.

8. 207(a) Develop and Implement Recovery Plans for Cui-Ui and LCT

Status: Recovery plans initially developed in early-mid 90s. FWS intends to create a new plan for both species; LCT Short-Term Action Plan for Truckee River has been approved.

Potential Impacts: FWS is testing water management options and recovery objectives, including the 6-flow regime for cui-ui and LCT. TROA would provide a mechanism to store, exchange, and release Credit Water to assist in achieving identified flows for the benefit of Pyramid Lake fishes.

9. 207(b) Incorporate Truckee River Rehabilitation Plan into U.S. Army Corps of Engineers Reconnaissance Level Study

Status: Pyramid Tribe and U.S. Army Corps of Engineers (COE) are still negotiating the plan. Because no specific actions have been identified, no CE analysis is necessary.

Potential Impacts: Several plans have been proposed over the years, but none has been adopted or financed. TROA would provide a mechanism to store, exchange, and release Credit Water to assist in achieving identified flows for the benefit of Pyramid Lake fishes, which could be coordinated with other flow requirements for the lower Truckee River.

10. 207(c) Water Acquisition Program for Cui-Ui and LCT

Status: No specific acquisition program has been developed.

Potential Impacts: Were a specific acquisition program proposed, TROA would provide a mechanism to store, exchange, and release Credit Water for the benefit of Pyramid Lake fishes to the extent water rights were acquired for that purpose. However, no such acquisition program is currently proposed or planned.

11. 208(a)(2) Pyramid Lake Fisheries Fund

Status: Established in the early 1990s ($25 million). Interest used to operate and maintain Tribal fishery program.

Potential Impacts: Feedback from operation of Tribal fishery program could be incorporated in the flow regime selection process to develop flows for the lower Truckee River to benefit Pyramid Lake fishes.

12. 208(a)(3) Pyramid Lake Paiute Economic Development Fund

Status: $40 million was appropriated for the fund (during 1993-97). Fund may not be used until TROA is implemented. A plan for using the fund has not been developed.

Potential Impacts: To the extent that management of Credit Water under TROA would benefit Pyramid Lake fishes and lower Truckee River riparian habitat, plans could be developed to capitalize on those benefits using a portion of the development fund.

13. 209(a) Expansion of Newlands Project Purpose

Status: In addition to agriculture, Newlands Project may also be operated for fish and wildlife, M&I, recreation, and water quality with valid water rights.

Potential Impacts: No new water rights or additional demand would be created by this provision, and no additional environmental effects relative to TROA would be expected from this provision in the absence of any specific proposal.

14. 209(b) Project Efficiency Study

Status: Reclamation completed this study in 1994.

Potential Impacts: No CE analysis required because this was a study only and no action has been proposed.

15. 209(d) Water Banking

Status: Potential development of agreements to allow project water right holders to carry over water for drought protection.

Potential Impacts: No CE analysis required because no water banking program is proposed or planned.

16. 209(e) Recreation Study

Status: Potential study to identify measures to benefit recreational use of Lahontan Reservoir and downstream.

Potential Impacts: No CE analysis required because no study has been planned.

17. 209(f) Effluent Reuse Feasibility Study

Status: Potential study of application of sewage effluent on refuges and wetlands.

Potential Impacts: No CE analysis required because no study has been planned.

18. 209(h) Settlement of Claims (Recoupment)

Status: On February 16, 2005, the United States District Court for the District of Nevada entered a judgment in favor of the United States and the Pyramid Tribe, and against Truckee-Carson Irrigation District (TCID), for the repayment of 197,152 acre-feet of water to the Truckee River in equal installments over twenty years, at 2 percent interest in kind on the unpaid balance. At the time of publication of this final EIS/EIR, appeals of this judgment to the United States Court of Appeals for the Ninth Circuit were pending. In the meantime, the Federal Water Master is supervising, under direction from the District Court, the implementation of the judgment.

Potential Impacts: No CE analysis is required because the implementation of a judgment is not an action subject to NEPA or CEQA. TROA would not affect the implementation of the judgment, and no effects relative to TROA would be expected.

19. 209(j) OCAP

Status: Regulations governing long-term operations of the Newlands Project (43 CFR part 418) were revised most recently on December 18, 1997. Environmental analysis of implementation of OCAP was addressed most recently in the EIS for the Newlands Project Proposed OCAP (Reclamation, 1987) and the Environmental Assessment for Newlands Project Proposed OCAP (Interior, 1997).

Potential Impacts: TROA would not affect the priority of Newlands Project water rights, calculation of Newlands Project maximum allowable diversion, or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve OCAP monthly storage targets; therefore, it would have no significant cumulative effect on implementation of OCAP. No modification would be required to accommodate implementation of Newlands Project Credit Water (NPCW) as described in TROA. No significant impacts to the Newlands Project would be anticipated because any future modification to OCAP would be required to be consistent with its guiding principles, including providing "water deliveries sufficient to meet water right entitlements of Project water users." The effects of NPCW implemented in conjunction with OCAP for current conditions and alternatives including TROA are analyzed in sections F and H in "Surface Water" in chapter 3.

20. 210(a) Claim Settlement

Status: A number of actions are interdependent with the effectiveness of TROA:

- Dismissal of water claims or other resolution is a prerequisite for implementing other actions associated with P.L. 101-618.
- TROA must be approved before several actions may take place (section 204; section 206(c); section 207(c) and (d); and section 208(a)(3)).
- Section 204 and TROA may not take effect until the Pyramid Tribe's claim to the remaining waters of the Truckee River has been resolved.

Potential Impacts: No additional cumulative effects beyond those described in the analysis in this section would be expected from this action.

21. 210(b)(2) Management of Anaho Island

Status: The Pyramid Tribe and FWS reached an agreement in early 1990s.

Potential Impacts: TROA would provide a mechanism to store, exchange, and release Credit Water to assist in achieving identified flows for the benefit of Pyramid Lake fishes, which could be coordinated with management of Anaho Island to benefit indigenous biological resources.

22. 210(b)(3) Beds and Banks of the Lower Truckee River

Status: Nevada and the Pyramid Tribe reached an agreement on ownership in early 1990s.

Potential Impacts: This action would not affect the exercise of water rights, and no effects relative to TROA would be expected.

23. 210(b)(16) Address Water Purchase Impacts to Domestic Uses of Groundwater

Status: The Secretary, in consultation with Nevada and affected local interests, is directed to undertake appropriate measures to address significant adverse impacts, identified in studies authorized by the Settlement Act, on domestic uses of groundwater directly resulting from water purchases authorized by the Settlement Act. The only water purchases to date authorized by the Settlement Act have occurred pursuant to section 206(a); that purchase program was analyzed in the WRAP EIS, which found that there would be no significant adverse impacts on domestic uses of groundwater in Lahontan Valley. Since the WRAP EIS was published, the U.S. Geological Survey (USGS) has continued to study groundwater in Lahontan Valley, and no significant adverse impacts on domestic uses of groundwater have been identified from the WRAP program. USGS has published the following related studies: Nora B. Herrera, Ralph L. Seiler, and David E. Prudic, *Conceptual Evaluation of Ground-Water Flow and Simulated Effects of Changing Irrigation Practices on the Shallow Aquifer in the Fallon and Stillwater Areas, Churchill County, Nevada*, USGS Water-Resources Investigations Report 99-4191 (2000); Patrick A. Glancy, *Geohydrology of the Basalt and Unconsolidated Sedimentary Aquifers in the Fallon Area, Churchill County, Nevada*, USGS Water-Supply Paper 2263 (1986); Michael S. Lico and Ralph L. Seiler, *Ground-Water Quality and Geochemistry, Carson Desert, Western Nevada*, USGS Open-File Report 94-31 (1994); and Douglas K. Maurer, Ann K. Johnson, and Alan H. Welch, *Hydrogeology and Potential Effects of Changes in Water Use, Carson Desert Agricultural Area, Churchill County, Nevada*, USGS Water-Supply Paper 2436 (1996).

Potential Impacts: Because no significant adverse impacts to domestic uses of groundwater have been identified for this action authorized by the Settlement Act, no measures to address such impacts have been proposed, and there is, therefore, no action to consider in conjunction with TROA. The effects of TROA in conjunction with WRAP was also addressed previously in section III (1), 206(a)(1) “Water Rights Acquisition Program for Lahontan Valley Wetlands.

24. 210(b)(18) Exchange of Public Lands for Interests in Land and Water Rights

Status: Authorizes the Secretary to exchange public lands in Nevada for interests in land and water rights within or next to the Pyramid Tribe’s reservation. No land or water rights exchange program is proposed or planned.

Potential Impacts: No CE analysis required because no land or water rights exchange program is proposed or planned.

IV. Water 2025 Initiative

Water 2025 is an Interior problem-solving initiative being developed to address water conflicts. Water 2025 will encourage voluntary water banks and other market-based measures, improve technology for water conservation and efficiency, and remove institutional barriers to promote cooperation and collaboration among Federal, State, Tribal, and private organizations (CE#: GS-TN-1). Reclamation has several ongoing initiatives within the study area primarily focused on more efficient management of water and improved technology.

Truckee-Carson Irrigation District/Fernley: Automation of Gilpin Wasteway - Automate 3 of 5 gates and implement telemetry at Gilpin Wasteway to improve the operations of the Truckee Canal, especially in emergency situations if a breach occurs.

Desert Research Institute (DRI): **Carson River Optimization**: Develop a forecasting model applicable to water management issues in the Carson River. The product is an integrated model that includes a hydrologic model of the Carson River above Genoa and a channel routing model of the Carson River from Genoa to Fort Churchill.

DRI - Truckee Canal Automation: Develop and evaluate a methodology for automation of check and diversion structures along the Truckee Canal. The expected product is a model of automated operations including equipment specifications and water quantity/quality effectiveness study.

DRI: Several projects are proposed to optimize Truckee River operations based on TROA:

- Studies of real time hydrologic data acquisition, storage and usage to improve water supply and use inputs to the Decision Support System (DSS).

- Identify and quantify return flows to the Truckee River to improve the return flow data inputs into the collaborative DSS.

- Development, testing, and implementation of tools to optimize the operations of the Truckee River using high resolution estimates of hydrologic variables from National Weather Service and National Aeronautics and Space Administration data products.

- Development, testing, and implementation of tools to provide operational guidance to Reclamation streamflow forecasters aimed at optimizing the operations of the Truckee River.

Potential Impacts: The potential for increased water delivery and distribution efficiency, improved real-time forecasting, and improved water management facilities could lead to water savings. Any such water savings would provide additional opportunities to create and store Credit Water under TROA that could be managed to provide benefits to aquatic and riparian resources as well as to the water owner.

V. Effects of Other Water Resource-Related Actions

Many proposed and potential future actions related to water resources were identified for this part of the cumulative effects analysis. As noted previously, however, only a small portion of these actions would relate to or directly affect water management or reservoir operations in the study area. Therefore, only the most reasonably foreseeable future water-resource related actions or group of actions are described under each of the seven action categories. As appropriate, modeling of these actions or groups of actions for the chapter 3 analysis is discussed. In addition, a brief assessment of the potential individual effect of each action on affected resources (as identified in chapter 3) is presented, followed by an assessment of the effect of the action on resources in conjunction with TROA (i.e., cumulative effect). This information is then used in section VI to evaluate more broadly the cumulative effects of the action categories relative to the alternatives and affected resources (in the year 2033).

A. Urban Development and Land Use Changes

Local populations are increasing in the study area, primarily in urban areas. Urban areas (e.g., Truckee, Truckee Meadows, and Fernley) are expanding and encroaching on rural areas. Some of the urban development is occurring in “rural areas,” which are developing into satellite commuter communities. Some recreation-based areas (e.g., ski resorts) also are expanding. This urban development has caused a broad range of infrastructure and land use changes affecting wastewater treatment, transportation, water quality and rehabilitation drainage, and recreation sites. As urban areas expand, agricultural lands are developed into residential and commercial properties. Modeling addresses land use changes indirectly, as these changes may affect water quality and quantity and timing of flows. Water quality (point and nonpoint source pollution) is incorporated in the Watershed Analysis Risk Management Framework (WARMF) model (projected through the year 2020) and is addressed in “Water Quality” in chapter 3. Narrative treatment of development and land use is presented in “Social Environment” In chapter 3.

1. Urban Development Plans

Cities and counties in California and Nevada have urban development plans to accommodate future development, including the following:

- The Martis Valley, California, Community Plan projects that the portion of the plan area identified in the Placer County final EIR (including more than 6,000 homes and infrastructure) could be 37 to 53 percent fully developed by 2020 (CE#: UD-TC-3).

- The town of Truckee, California, General Land Use Development Plan, proposes to redevelop the downtown area, subdivide undeveloped areas into lots between ½ and 10 acres, and develop other sections at 6-12 dwelling units per acre. The Truckee-Donner Public Utility District Master Water Plan takes into account development identified in the General Plan.

- The draft 2002 Truckee Meadows, Nevada, Regional Plan projects 35 percent of the development will be in the already urbanized area within the McCarran Boulevard "beltway," and no more than 64 percent will be outside McCarran Boulevard. The 5-year revision of this plan is in process (CE#: UD-LT-1, UD-TC-1, UD-TC-2, UD-TC-3, UD-TN-1).

- Numerous development projects (e.g., aggregate pits, buildings, residential units) are proposed for unincorporated areas, for example, on lands along the Truckee River in Storey County, Nevada (CE#: UD-TN-5).

- The Pyramid Tribe has drafted an Overall Economic Development Plan that anticipates continued development in the Wadsworth, Sutcliffe, and Nixon, Nevada areas. This draft plan includes the Wadsworth Master Plan for Drinking Water and Wastewater Treatment and will include feasibility studies for Sutcliffe and Nixon.

Potential Impacts: TROA would have no direct effect on community planning activities. Additional impervious surfaces would increase urban stormwater runoff; change runoff patterns and amounts from lawn irrigation and other urban uses; increase discharge of pollutants from development, domestic land uses, roads, and commercial facilities; and reduce groundwater recharge. With increased discharges, wastewater treatment facilities would still be required to meet water quality standards. Additional sources of water could be required to supplement the lower Truckee River flow to maintain or enhance water quality and riparian and riverine habitat.

TROA would provide opportunities to store and release water dedicated for water quality use directly within defined criteria. Other water, particularly that dedicated for Pyramid Lake fishes, indirectly could provide similar water quality benefits. TROA would not, however, affect the direction or strategy of local planning agencies or the implementation of development plans.

2. Transportation Improvements

Several projects are proposed for the Lake Tahoe and Truckee River basins to improve transportation by rehabilitating or widening roads, with possible rehabilitation of drainage.

Potential Impacts: Widening roads or increasing impermeable surfaces may change the magnitude and timing of runoff. Road and drainage rehabilitation could affect water quality by reducing or increasing pollutant loads. Intercepting and consolidating drains could allow for water treatment or could become a point source for pollution. These actions may potentially degrade water quality with or without TROA; conditions that arise as a result of precipitation or runoff events would be outside the water management capabilities of TROA.

3. Ski Resorts

Operations and facilities are likely to expand at ski resorts, such as Squaw Valley (CE#: SR-TC-1) and Mount Rose/Slide Mountain (CE#: SR-TN-1).

Potential Impacts: Snowmaking, pond expansion, and increased water demands would increase local groundwater and surface water use as well as facilities for water treatment and disposal. TROA would contain provisions related to accounting for water used for snowmaking but would have no direct effect on ski resort operations.

B. Water Rights Acquisitions and Transfer

Demands for water to meet recovery objectives for threatened and endangered species and to meet the recreational and M&I demands of an increasing population are increasing. These increased demands are being met by acquiring agricultural water rights. As agricultural water rights are acquired and transferred and lands are taken out of production, there are fewer irrigated acres in the Truckee River basin, and the associated agricultural demand is decreasing.

A number of measures could be implemented individually or collectively to promote efficient use of irrigation water on remaining agricultural lands in the basin. Improved efficiency would reduce diversions from the Truckee River and increase water availability for other beneficial uses, including river flow and discharge to Pyramid Lake. The list of possible measures includes the following:

Technical

- Employing land leveling to allow more uniform application of water to flood-irrigated fields
- Installing surge irrigation to improve water distribution
- Using sprinklers to allow more uniform application of water to flood-irrigated fields
- Installing low-energy, precision application sprinklers to reduce evaporation and loss from wind drift

- Using furrow diking to promote soil infiltration and reduce runoff
- Using drip irrigation to reduce evaporation

Managerial

- Improving irrigation scheduling and operations
- Applying water when most crucial to crop yield
- Using water-conserving tillage and field preparation methods
- Improving canal and equipment maintenance
- Recycling drain and tail water

Institutional

- Reducing irrigation subsidies and/or introducing conservation-oriented pricing
- Fostering rural infrastructure for private-sector dissemination of effective technologies
- Improving training and extension efforts

Agronomic

- Selecting crop varieties with high yields per volume of transpired water
- Intercropping to maximize use of soil moisture
- Matching crops to climate and water availability
- Sequencing crops to maximize production
- Selecting drought-tolerant crops
- Modeling for water rights acquisitions assumes that the pending water rights in California are limited to the allocation amount for TROA and a greater amount for No Action and the Local Water Supply Alternative (LWSA), and that inactive Newlands Project water rights are retired in accordance with current State law (Assembly Bill [AB] 380).

1. California Surface Water Rights Applications

Surface water rights applications are active before the California State Water Resources Control Board (SWRCB). There are 11 applications with a total face value of 56,612 acre-feet in the Lake Tahoe basin and 11 applications with a total face value of 17,715 acre-feet in the Truckee River basin (CE#: WS-LT-2 and WS-TC-1).

Potential Impacts: In California, current surface water and groundwater use is 18,700 acre-feet in the Lake Tahoe basin and 10,370 acre-feet (of which 2,800 acre-feet is surface water use) in the Truckee River basin. The operations model assumes that, under TROA, California future water use will be 23,000 acre-feet in the Lake Tahoe basin and 22,700 acre- feet (of which 4,300 acre-feet is surface water use) in the Truckee River basin. In both basins, the water rights applications exceed projected use in 2033. Use of additional surface water rights (i.e., beyond those modeled for future conditions) could further affect the magnitude and timing of diversions from the Truckee River; the degree of the effect would depend on the amount granted. If these applications were granted and the water consumptively used, Truckee River water supplies could be affected, increasing the effects of drought and reducing water supply in the Nevada portion of the basin as well as the Newlands Project and Lahontan Valley wetlands. The elevation of Pyramid Lake would further decline, and Pyramid Lake fishes would be further jeopardized.

While it is reasonable to assume that SWRCB would approve some additional applications in the absence of TROA, it is unlikely to approve all of the applications. The interstate allocation caps the total water use in California at 23,000 acre-feet in the Lake Tahoe basin and 32,000 acre-feet (of which no more than 10,000 acre-feet may be surface water) in the Truckee River basin. In the Nevada portion of the Lake Tahoe basin, usage is assumed to be limited to the allocation amount of 11,000 acre-feet under both current and 2033 conditions. See chapter 2.

2. Assembly Bill 380

Nevada established the AB 380 program to resolve protests associated with Newlands Project water rights under challenge on grounds of forfeiture or abandonment, with the objective of retiring 6,500 acres of such water rights. A Finding of No Significant Impact (FONSI) for AB 380 was signed by Reclamation on September 12, 2000. The program expired on June 30, 2006, and, while the 6,500-acre objective was not achieved, the program did permanently retire approximately 4,580 acres (CE#: GS-TN-8).

Potential Impacts: TROA would have no adverse cumulative effect on this program. To the extent that reduced demand for the Newlands Project would increase flow in the lower Truckee River, TROA would provide opportunity to use such water to establish Credit Water to be managed for the benefit of Pyramid Lake fishes and related resources. TROA in combination with this action would not, however, affect the exercise or priority of Newlands Project water rights, which would continue to be served consistent with OCAP, or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

3. Desert Terminal Lakes

In 2002, P.L. 107-171, the Farm Security and Rural Investment Act of 2002 (Farm Bill) was passed by Congress. Section 2507 of P.L. 107-171 (Desert Terminal Lakes) and subsequent clarifying legislation appropriated $200 million to Reclamation for the purpose of providing water to the at-risk desert terminal lakes of Pyramid, Summit, and Walker in Nevada. The legislation stated that “funds shall. . .be used. . .to provide water to at-risk natural desert terminal lakes” and that the funds cannot be used to purchase or lease water rights.

a. Truckee River Restoration Projects

Truckee River Restoration Projects implemented by Reno, The Nature Conservancy, Sparks, Washoe County, and Bureau of Land Management (BLM). In addition to the project work described below, this project includes the transfer of 250 acre-feet of water to the river. An approved secondary water right on the reclaimed water from the Truckee Meadows Water Reclamation Facility (TMWRF) allows for land application of up to 6,700 acre feet. Based upon a State Engineer ruling, this is the average amount of water pumped from groundwater wells in Truckee Meadows that goes to TMWRF through the waste stream. The groundwater component is not required to be placed in the Truckee River. Consequently, this portion of the reclaimed water is approved for irrigation projects (golf courses, grass hay production and landscaping) in Truckee Meadows.

The cities recognize that more water in the river is needed downstream from Derby Diversion Dam to improve aquatic habitat. At least 250 acre-feet of this groundwater component is to be dedicated for release to the Truckee River. The cities will seek a change in the place of use for the TMWRF groundwater component to the Truckee River and Pyramid Lake. The beneficial use for this water in the Truckee River will become a nonconsumptive use, which will ensure that the water will benefit the river and flow to the lake. The intent is to augment river flow during a 3-month period from August to October when Truckee River water is being diverted at Derby Diversion Dam to the Truckee Canal in accordance with OCAP.

Potential Impacts: A program to enhance water supplies to desert terminal lakes could provide more water in the lower Truckee River to flow to Pyramid Lake. The opportunity for more water to Pyramid Lake could provide additional opportunities to create and store Credit Water under TROA that could be managed to provide benefits to aquatic and riparian resources in Pyramid Lake as well as the length of the Truckee River (i.e., from the point of release to discharge to Pyramid Lake).

b. Channel-and-Flood Plain Restoration at Mustang, 102 Ranch, and Lockwood

This restoration entails excavating new meanders to restore sinuosity, decrease slope and reconnect the river to the flood plain. It also entails re-creation of oxbow wetlands that once existed but were lost to various human activities. Riffles will be constructed in the channel using rock brought to the sites. Following construction, an intensive revegetation effort will be implemented using native plants. Following the replanting effort is a 3-year plant establishment period of intensive irrigation, weed and herbivory control, and general maintenance of the revegetation area.

Potential Impacts: This type of restoration will yield a broad array of ecosystem benefits to aquatic and terrestrial species, including key fish and bird species. It will improve water quality and indirectly enhance flows to Pyramid Lake. TROA would provide a mechanism to store, exchange, and release Credit Water to assist in achieving identified flows for the benefit of lower river aquatic and riparian habitat, which could be coordinated with other flow requirements for the lower Truckee River.

c. Below Derby Low Flow Channel

The project is to augment the fishway at Derby Diversion Dam by providing a continuous geomorphically correct, riparian-canopy shaded, low-flow channel in the Truckee River below the fishway. The purpose of the low-flow channel with shade canopy downstream from Derby Diversion Dam is to enhance the aquatic and riparian habitats by improving fish access and water quality and increasing the amount of riparian canopy.

Potential Impacts: The proposed project may result in lowering water temperatures, which will reduce evaporative losses in these reaches of the river and increase dissolved oxygen, thus resulting in higher quality habitat for fish and aquatic organisms. These benefits will be realized most during low flow conditions. The project is also expected to increase species richness as a result of increasing the riparian canopy. TROA would provide a mechanism to store, exchange, and release Credit Water to assist in achieving identified flows for the benefit of Pyramid Lake fishes and lower river riparian habitat, which could be coordinated with other flow requirements for the lower Truckee River. Feedback from operation of this project, along with the Derby Diversion Dam fish passage facility, could be incorporated in the flow regime selection process to develop flows to provide further benefits to biological resources.

d. Pyramid Lake Fisheries Hatchery Water Use Recovery

Pyramid Lake Fisheries operates and maintains five hatcheries dedicated to its fish recovery program. Pyramid Lake Fisheries pumps approximately 5 million gallons per day through its hatcheries during the 11-month fish growing season (April–February). The hatcheries use an unusual recycling system that removes and converts waste products; but after two to four passes, the water becomes unsuitable for fish, mainly due to loss of oxygen. This water is then diverted to large evaporation ponds, or in one case, evaporation ponds leading to a constructed wetland on the river.

The purpose of this project is to provide more water to Pyramid Lake by increasing hatchery water use efficiency and completing small-scale restoration to Hardscrabble Creek as a means to deliver recovered water to Pyramid Lake. This project will increase the number of times the same water can be used and divert the treated water back to the lake directly or to the lake via Hardscrabble Creek. Water savings result by reducing water pumped from the shallow aquifer that would then move to the lake (result of increasing the number of times the water can be used), and saving water that would otherwise be evaporated and sending that water to the lake. Estimated water savings are 890 acre-feet per year.

Potential Impacts: By providing additional water to Pyramid Lake, the cumulative effect of this beneficial project would add to the beneficial effects of TROA for Pyramid Lake fishes. A reduced or eliminated diversion to the constructed wetland would diminish its value for wetland-associated species, but would be offset to some degree by the restoration of Hardscrabble Creek. This project would not substantially affect the beneficial effects of TROA on riparian and wetland habitats.

C. M&I Water Demand

M&I demands include municipal, industrial, commercial, power, and mining. The study area in California and Nevada has seen substantial increases in population, residential development, and commercial and industrial projects in recent years, and this trend is expected to continue. M&I demand for water increases as the population increases. Conservation measures to reduce per capita demand and extend water supplies are being implemented and are expected to expand in the future. The operations model includes M&I demands associated with projected populations for the year 2033 and amounts supplied by surface and groundwater sources. See “Surface Water” in chapter 3.

1. M&I Water Plans and Projects

a. Coldstream Canyon, California

This project involves development of a water extraction facility for bottled water in Coldstream Canyon, California. Wells and permit are in place (CE#: WS-TC-3). The project has been dormant for several years, and Placer County Planning Agency has asked the proponent to withdraw the proposal.

Potential Impacts: This project could reduce flow in Cold Creek, a tributary to Donner Creek downstream from Donner Lake. Minimum releases from Donner Lake are 2 or 3 cubic feet per second (cfs), depending on the flow from Cold Creek. Reduced flow in Cold Creek could lead to the higher minimum release requirement, which would result in a slight reduction in Donner Lake storage (a release of 1 cfs for 90 days is 178 acre-feet), which may affect local recreation. There would be no cumulative effect of this action implemented concurrent with TROA.

b. Fernley, Nevada

The city of Fernley is proposing to construct a water treatment plant beginning January 2008 to treat groundwater from city wells. This water will be treated to remove arsenic by January 2009 to comply with the Environmental Protection Agency’s (EPA) Arsenic Rule. The plant will be located on city property and will have an initial capacity of 20 million gallons per day with space provided to expand to 30 million gallons per day. Treated water will be stored in 1.5-million-gallon clear tanks for distribution. Future plans include surface water treatment at this plant (CE#: WS-TN-5).

Potential Impacts: Depending on the method selected for delivery of water to satisfy the exercise of acquired Truckee Division water rights, the amount and timing of water diverted from the Truckee River to the Truckee Canal could be affected, which could, in turn, affect opportunities to create and store Credit Water under TROA that could be managed to provide benefits to aquatic and riparian resources as well as to the water owner. To the extent that such water may be Credit Stored for Fernley, it would be managed and released to satisfy Fernley's increasing M&I water demand. Also, see Section G, "Optional Scenarios," in "Surface Water" in chapter 3.

c. Pyramid Lake Indian Reservation, Nevada

The Pyramid Tribe has drafted an Overall Economic Development Plan that includes plans to improve municipal water systems in Nixon, Sutcliffe, and Wadsworth, Nevada. Included in the plan is the Wadsworth Master Plan for Drinking Water and Waste Water Treatment. The Pyramid Tribe is awaiting Public Utility authority before proceeding. A water feasibility study for Nixon and Sutcliffe also will be included in the overall plan.

Potential Impacts: TROA would have no direct adverse cumulative effect on development of local water systems, though water management options under TROA that benefit riverine and riparian habitat in the lower Truckee River could provide indirect benefits to water quality and quantity. Feedback from operation of this project, along with other flow-related projects, could be incorporated in the flow regime selection process to provide further benefits to biological resources. Improvements to rural water systems would benefit groundwater and surface water resources.

d. Churchill County, Nevada

The *Final Report, Churchill County Water Resource Plan: 25 Year 2000-2025: 50 Year 2000-2050* (Water Research & Development, Inc., 2003) recommends, in part, the following measures (CE#: WS-LV-1):

- Continue use of historic groundwater resources for quasi-municipal development
- Continue to require new quasi-municipal development to provide water rights as per the county water right dedication ordinance
- Require new quasi-municipal development to provide appropriate water and wastewater systems, and dedicate them to the county
- Establish a utility division within Churchill County to operate the newly created water and wastewater system

- Establish processes and procedures to acquire and operate private water and wastewater systems

In its *Final Water Resource Plan Update* (2007), Churchill County identifies ownership and operation of a small community water system and construction of a larger county system to replace other smaller systems. Also, it affirms reliance on local groundwater from Newlands Project recharge to support near-term urban development and its objective to acquire and import groundwater from Dixie Valley to meet its long-term M&I water demands. The *Churchill County Water Resource Protection Policy* (December 7, 2006) is intended to ensure a long-term local water supply through management of resources and protection of water rights.

Potential Impacts: TROA would have no direct effect on development of local water systems or on water rights on the Newlands Project. TROA would not affect the exercise of Newlands Project water rights, which would continue to be served consistent with OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve OCAP monthly storage targets. Any changes in Newlands Project water demand occasioned by M&I water development could affect diversions to the Truckee Canal and opportunities to store Credit Water, which could, in turn, affect related benefits for Pyramid Lake fishes and the lower Truckee River. Water importation should have no effect on Truckee River water demand or supply and so should be neutral relative to implementation of TROA.

e. Washoe County, Nevada

Washoe County is developing and implementing the *Washoe County Comprehensive Regional Water Management Plan* (Washoe County, 2004). Washoe County reports that:

> Nevada Law, Nevada Revised Statutes (NRS) 540A.150.2 requires that the Washoe County Comprehensive Regional Water Management Plan be consistent with and carry out or support the carrying out of all aspects of P.L. 101-618, 104 Statute 3324. The adopted plan as amended complies with this provision in the law. The plan and the current update (in progress) assume that TROA will be implemented. The adopted plan includes a definition for TROA in the glossary, a description in the constraints section and specific discussion in several other places, including sections on water resources, effluent reuse, instream flows, conservation, drought storage and drought yield (CE#: PW-TN-7).

Potential Impacts: Because provisions of TROA that relate to local water management would be recognized in the regional plan, local planning and operations under TROA would likely be coordinated to avoid impacts.

f. South Truckee Meadows Water Treatment Plant

Washoe County proposes to construct a water treatment plant with a build-out capacity of 12 million gallons per day to treat poor quality water diverted from Galena, Whites, Steamboat, and Thomas Creeks. The South Truckee Meadows Plan is intended to back up the use of creek water rights with existing rights to groundwater, and is not a conservation plan. Water will be pumped from poor-quality areas and treated in the water treatment facility built to treat the creek rights. The effluent from the South Truckee Meadows wastewater plant is not returned to the river and does not have to be made up because the county will only divert the consumptive use fraction of the creek rights (CE#: WS-TN-1).

Potential Impacts: TROA would have no direct effect on construction of water systems. While the method, location, quality, and quantity of discharge of treated wastewater could affect water management options under TROA to achieve flow and water quality objectives in the Truckee River, this plan not increase discharge to the Truckee River or affect water management decisions under TROA relative to water quality in the river.

g. North Valleys Water Importation Project

Two independent water supply companies have applied for rights-of-way across public lands for a pipeline, wells, and other infrastructure in order to import 11,500 acre-feet of water from a basin adjacent to the Truckee River basin for M&I use (CE#: WS-TN-3).

BLM issued a ROD granting rights-of-way for the Fish Springs Ranch, LLC, and the Intermountain Water Supply Ltd. projects on May 31, 2006 and June 23, 2006, respectively. The Pyramid Tribe subsequently filed a lawsuit challenging BLM's ROD under NEPA. The Pyramid Tribe and Fish Springs Ranch, LLC, have reached a proposed agreement to resolve various environmental issues and claims by the Pyramid Tribe relative to the project proposed by Fish Springs Ranch, LLC; that agreement is now under review by the United States. An agreement with Intermountain Water Supply is anticipated that will limit delivery of the supplied water to basins that do not drain to the Truckee River basin.

Potential Impacts: Absent agreements addressing project operations, although this water is proposed for use outside the Truckee River basin, groundwater withdrawal in adjacent basins could slightly reduce local inflow to Pyramid Lake, and discharge of additional treated wastewater to the Truckee River could incrementally diminish water quality in the lower Truckee River and have a detrimental effect on Pyramid Lake, both to an unknown degree. To the extent such impacts are realized, they could reduce the efficacy of TROA in providing benefits to biological resources in the lower Truckee River and Pyramid Lake. With agreements among the parties, to the extent that the effects of groundwater pumping and treated wastewater discharge do not affect the Truckee River basin, this action is not expected to affect implementation of, or the benefits to be derived from, TROA. TROA would not affect implementation of this project.

h. Aqua Trac

Aqua Trac, LLC has filed permits with Reclamation and BLM for the purpose of developing water source wells and a water transportation system to provide potable water to Fernley and the surrounding area. The project proposes to construct up to nine new water source wells in the Granite Springs Valley in Pershing County; 28 miles of 48-inch pipeline with appurtenances, from the Granite Springs area, northwest of Jessup and the Humboldt Sink to Fernley; and an electric substation with 60-kilovolt electric service lines.

Potential Impacts: Inter-basin transfer of water to a water-limited area would accommodate and promote urban development. Such development would likely cause non-point source pollution through surface runoff and point source pollution through discharge of treated wastewater, which could affect surface and groundwater water quality and quantity. Treated effluent could increase flow in receiving waters through direct discharge and could increase groundwater supply through seepage. To the extent that this project would reduce demand on the Truckee River, water savings would provide additional opportunities to create and store Credit Water that would be managed under TROA with its associated potential benefits. Benefits would accrue to owners of the Credit Water as well as to aquatic and riparian resources downstream from Credit Water storage facilities.

2. Groundwater Development Actions for M&I Demands

As water demands increase, groundwater becomes a more likely additional water source. Some areas depend entirely on groundwater, while many areas use groundwater as a supplemental water source in dry years. The Nevada State Engineer restricts the amount of groundwater use to the natural yield of the groundwater basin.

a. Squaw Valley, California

Squaw Valley, California, Public Service District water demand is projected to be 1,600 gallons per minute. The district has constructed two wells that will provide an annual production of 1,640 acre-feet sustained yield (CE#: WS-TC-2).

Potential Impacts: TROA would have no effect on this action. To the extent this project would reduce the discharge of Squaw Creek, it could affect the opportunity to store and manage Credit Water under TROA and reduce identified benefits. If well production is within the limits of sustainable yield, it should have no effect on creek flow.

b. Maximizing South Truckee Meadows Well Field

South Truckee Meadows well field pumping capacity could be increased to 9,500 acre-feet per year for M&I water. Average pumping would be 6,900 acre-feet per year; the maximum amount would be used during droughts (CE#: WS-TN-2).

Potential Impacts: To the extent this action would reduce tributary discharge to the Truckee River, it could affect the opportunity store and manage Credit Water under ‘TROA and reduce identified benefits. TROA would have no direct effect on local water development.

c. Well Field Near Wadsworth, Nevada

A municipal water supply well field and system would be constructed near Wadsworth to serve non-Tribal and Tribal areas in the Fernley and Wadsworth areas (CE#: WS-TN-6).

Potential Impacts: This action may potentially substitute groundwater use for some surface water use. Depending on location of wells, quantity of water pumped, and surface water exchange provisions, groundwater withdrawals could reduce surface water flows in the Truckee River, and so could reduce opportunities to store and manage Credit Water under TROA. Development of additional water supplies could promote local urban development, which could affect water quality in the lower Truckee River through point and non-point discharges. To the extent that water quality is diminished as a result of urban development, opportunities for water management under TROA could become more limited. TROA would have no direct effect on local water development.

d. Carson River upstream of Lahontan Reservoir

Rapid and extensive urban development in the Carson River basin, particularly in Dayton Valley and Carson Valley, has created an increasing demand for M&I water. To meet that demand, water purveyors have filed a large number of applications with the Nevada State Engineer to transfer groundwater and *Alpine* decree surface water rights in the vicinity of the Carson River. Protests have been filed by the Pyramid Tribe and Churchill County.

Potential Impacts: To the extent that such applications are approved, junior rights are exercised, and annual or seasonal Carson River discharge to Lahontan Reservoir is diminished, this set of actions could reduce water availability for downstream water right owners, particularly those dependent on the Newlands Project supply, and could increase Newlands Project demand on the Truckee River in order to meet Lahontan Reservoir storage targets pursuant to OCAP. Any resulting reduction in lower Truckee River flow could reduce opportunities to store and manage Credit Waters dedicated to benefit Pyramid Lake fishes and other biological resources in and along the Truckee River.

D. Ecosystem Restoration

Human activities have degraded riparian, wetland, and lake and river habitats in the study area. Past development often did not consider ecosystem impacts. Site-specific projects to improve some of these degraded areas have been implemented and proposed; these projects likely will continue. The operations model did not incorporate assumptions about ecosystem restoration projects or diversion structure improvements.

1. Tahoe Regional Planning Agency

The Tahoe Regional Planning Agency (TRPA) is implementing the Lake Tahoe Environmental Improvement Program for erosion control, wetlands restoration, forest health projects, and similar efforts needed to control algae growth and other factors believed to cause the deterioration of overall water quality of the lake (CE#: WP-LT-2). Also, see "Water Quality Trends" in this chapter.

Potential Impacts: Projects would result in protection of several Tahoe yellow cress sites and would restore wetland, riparian, and lake habitats. TROA would not affect implementation of any projects in watersheds tributary to Lake Tahoe.

2. Restoring Stream Banks and Riparian and Wetland Habitats

The following site-specific restoration projects have been identified:

- The Nature Conservancy is restoring river channels and wetlands on purchased lands, such as the McCarran Ranch (CE#: HR-TN-1).
- Washoe-Storey Conservation District's Steamboat Creek Restoration Plan proposes to restore up to 2.2 miles of Steamboat Creek (CE#: HR-TN-8).
- Recreation areas managed by California Department of Parks and Recreation (such as Tahoe State Recreation Area) are restoring native vegetation, removing non-native plants, and implementing Best Management Practices (BMP) to control erosion (CE#: HR-LT-5).
- The Pyramid Tribe and FWS are cooperating on a program to reestablish cottonwoods and the riparian canopy along the lower Truckee River.

Potential Impacts: Project goals include enhanced water quality, habitat improvements, flood attenuation, and increased recreation opportunities, which could improve water quality, riparian habitat, and other habitat. TROA could enhance the benefits of riparian and riverine improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases. TROA provides for a habitat restoration fund but does not specify projects. Depending on the amount of revenues deposited in the fund, implementation of TROA could accelerate restoration activities associated with cui-ui, LCT, and Lahontan Valley wetlands.

3. Improving Diversion Structures

Improvements to water diversion facilities and structures to facilitate fish passage and improve water diversion efficiency are proposed.

a. Truckee Meadows Water Authority

Truckee Meadows Water Authority (TMWA) proposes to replace the Glendale Diversion structure and riprap. The existing structure in Truckee Meadows diverts up to 25 million gallons per day. The new structure will divert up to 37.5 million gallons per day, which is the existing plant capacity (CE#: GS-TN-6). TMWA submitted a permit application to COE for this project in September 2006.

Potential Impacts: The structure will incorporate a water bypass to benefit fish habitat in the Truckee River between the diversion and Pyramid Lake. This action may potentially enhance recreation opportunities and promote sediment transport. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

b. Sierra Pacific Power Company

Sierra Pacific Power Company (Sierra Pacific) is obligated to replace Farad Diversion Dam (which washed out in 1997) for TMWA. The project includes a fish passage structure at Floriston and access roads (CE#: IP-TC-1).

Potential Impacts: The new dam will divert water into the hydroelectric powerplant more efficiently. This project may improve recreational opportunities for rafting and kayaking. Improved fish passage would be mitigation for construction of the new diversion. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

c. Derby Diversion Dam

Reclamation completed construction of a fish passage facility at Derby Diversion Dam and will add a fish screen, expected to be completed in 2007. The fish screen project is in abeyance until funding is secured (CE#: HR-TN-9).

Potential Impacts: Passage benefits resident and migratory fish, assists in recovery of cui-ui and LCT, and provides cultural and economic benefits to the Pyramid Tribe. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

4. Wildfire/Fuels Management

Most of the forested land along the Truckee River west of Reno is U.S. Forest Service (USFS) land. The Truckee River and its tributaries flow through three national forests: Lake Tahoe Basin Management Unit; Tahoe National Forest; and Humboldt-Toiyabe National Forest. Fire/fuels management on adjacent land is outside the scope of the proposed action, which relates to reservoir management.

Wildfires can cause erosion that affects water quality; effects can be significant if the wildfire covers a large area, and increases with the steepness of the ground. In addition, runoff and subsequent storage in lakes and reservoirs would likely increase after a wildfire due to surface sheet flow and subsurface flow increases because vegetation is no longer present to hold or transpire water. Such increases in runoff and storage could affect flood control operations.

Management of forested areas for all three national forests is regulated by the *Sierra Nevada Forest Plan Amendment; Final Supplemental Environmental Impact Statement ROD*, U.S. Department of Agriculture, USFS, January 2004. It addresses existing fire risk, healthy forest fuels management plan, and catastrophic fires.

There are numerous management strategies in the 2004 Plan Amendment for the various areas and conditions in the Sierra Nevada. The Fire and Fuels Management Strategy "applies a strategic approach for locating fuels treatments across broad landscapes." The fuels treatment strategies in the Plan Amendment are designed to reintroduce fire, reduce fuel levels, and mitigate the consequences of large damaging wildfires, as well as allow fire managers to control fires and set priorities that protect firefighters, the public, property, and natural resources. The landscape-level fuels treatment strategies are designed to limit wildland fire extent, modify fire behavior, and improve ecosystems.

Proposed fuels treatment activities are planned to be accomplished over the next 20-25 years. Resource effects, including effects to water quality and quantity, of USFS planned management strategies are described in the Sierra Nevada Framework.

Fire risk on forested land also may be affected by private landowners along the upper Truckee River and its tributaries. Private land ownership is small compared to Federal land ownership of forested lands, and potential effects from wildfire are much less. There is no coordinated "land management" plan that directs fuels management of forest stands on private lands; information about fire/fuels management on private land is available from California Department of Forestry.

Forested lands along the Truckee River downstream from Truckee Meadows occur as small amounts of scattered cottonwood stands immediately adjacent to the river with minimal fire risk. The majority of the land is scrub sagebrush. Land ownership is mostly private, with checkerboard BLM ownership on the north side of the river, some Reclamation lands around Derby Diversion Dam, and the Pyramid Lake Indian Reservation on a portion of the lower Truckee River. Private lands do not have coordinated fire management plans; BLM land management practices would not be expected to alter or affect fire risk along this section of the Truckee River. Reservation land management practices are not expected to affect fire risk.

Potential Impacts: TROA cumulatively combined with other management activities in the Truckee River basin would have no effects on fuels management practices on Federal lands. There would also be no cumulative effects on the number or severity of wildfires or on firefighting activities in the watershed. Ongoing fuels management practices on USFS land, including forest thinning and reduction of fuel loadings, would reduce potential cumulative impacts of large wildfires that remove vegetation resulting in increased surface sheet flows and subsurface flows into the rivers and reservoirs. While water quality degradation from wildfires would combine with other management activities in the watershed that degrade water quality, the cumulative impact is unknown due to the inability to predict number and size of wildfires that might occur in the future.

E. Flood Control

Current flood control criteria are an integral part of current conditions and all alternatives. The following flood control measures are identified:

- COE is considering flood control and restoration projects under the Truckee River Management Project (previously the Truckee Meadows Flood Control Project CE#: PW-TN-5).

- COE currently is conducting a multi-year study to consider several possibilities for the Martis Creek Reservoir, ranging from complete rebuilding to removing the dam.

- Washoe County is considering constructing flood control facilities on tributaries (CE#: PW-TN-6).

- The 6,700 acre-feet of water rights mentioned as part of a separate agreement in section 1.E.4 of TROA can be used, pursuant to section 113 of P.L. 109-103, Energy and Water Development Act of 2006, for local match to support expenditures required for the Truckee Meadows Flood Project, including re-vegetation, and reestablishment and maintenance of riverine and riparian habitat of the lower Truckee River and Pyramid Lake.

Potential Impacts: TROA would not affect any flood control criteria or operations. No construction is associated with TROA. Habitat maintenance and protection accomplished through flood control projects could allow greater flexibility in the management and release of Credit Waters established pursuant to TROA.

F. Water Quality

In the early 20th century, the mining and timber industries caused Truckee River water quality to decline drastically and become a serious human health and environmental problem. Over the years, many water quality problems have been identified and corrected. A variety of Federal and State water quality standards have been developed, and entities are acting to meet those standards. The Pyramid Tribe recently approved water quality standards for the lower Truckee River and Pyramid Lake. Projects and programs are being implemented to improve water quality. As development continues, additional and advanced measures will be needed. The operations model calculates flow and does not make any assumptions regarding water quality; stormwater is modeled as part of runoff to the river, and the Truckee River Water Quality Settlement Agreement (WQSA) is implemented relative to water storage and release. The WARMF model assumes changes in point source loading from the Tahoe-Truckee Sanitation Agency water reclamation facility (TTSA) and TMWRF, and that treated wastewater discharge will be proportionate to the future population (year 2033); it incorporates conditions of the Total Maximum Daily Load (TMDL) program.

1. Wastewater and Stormwater Discharge Permits

California and Nevada have wastewater discharge permit programs in place. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. EPA and COE jointly administer the program. Stormwater discharge permits are a developing trend. Effects on water quality will depend on compliance with and enforcement of regulations.

a. Lahontan Regional Water Quality Control Board

The Lahontan Regional Water Quality Control Board (LRWQCB) has more than 270 permit applications active in the Lake Tahoe basin and 49 active in the Truckee River basin in California. Most of these are stormwater, and most are related to temporary construction permits. LRWQCB requires applicants to comply with water quality standards. Monitoring is not required for all projects, but it is required for ski areas (CE#: WQ-TC-1 and WQ-LT-1).

Potential Impacts: Unless effects of wastewater discharge are totally mitigated, some adverse effects to water quality from these and future projects may occur. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

b. Nevada Division of Environmental Protection

Nevada Division of Environmental Protection (NDEP) has more than 15 wastewater or stormwater permit applications identified in Truckee Meadows (CE#: WP-TN-1).

Potential Impacts: Unless the effects of wastewater discharge are totally mitigated, some adverse effects to water quality from these and future projects may occur. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

c. SWRCB

SWRCB issued a National Pollutant Discharge Elimination System (NPDES) permit to Caltrans for its construction program. The permit regulates discharges from projects with soil disturbance of 1 acre or more. Caltrans requires contractors to prepare and implement Water Pollution Control Plans for projects causing soil disturbance of less than 1 acre (CE#: PW-LT-3).

Potential Impacts: Effects would depend on how BMPs and mitigation are implemented. TROA would not affect implementation of this program.

d. Nevada Department of Transportation

Nevada Department of Transportation has been issued a blanket NPDES permit (NV-0023329) from the Nevada Division of Environmental Protection for discharges to municipal separate storm sewer systems in the Truckee River basin in Nevada (CE#: WP-LT-4).

Potential Impacts: BMP may potentially improve the quality of stormwater drainage. TROA would not affect implementation of this program.

e. Stormwater Control Programs in Nevada

The cities of Reno and Sparks, Washoe County, and the Nevada Department of Transportation adopted the Truckee Meadows Stormwater Quality Management Program in December 2001 to control stormwater quality and comply with the Phase 1 NPDES permit. The program addresses point source pollution from stormwater.

Washoe County is implementing stormwater pollution controls Phase II, including construction and post-construction BMP, industrial permitting and inspections, monitoring for illegal discharge, and prevention. This program addresses nonpoint source pollution from stormwater (CE#: WQ-TN-1).

Potential Impacts: Stormwater management is anticipated to reduce urban stormwater pollutants to the Truckee River and tributaries in Truckee Meadows. TROA would not affect implementation of this program.

f. Water Treatment Plants

The following water treatment plant actions have been proposed:

- Washoe County proposes to construct a potable water treatment plant to treat water from Galena, Whites, Steamboat, and Thomas Creeks. The total peak capacity at build-out would be 12 million gallons per day. Maximum withdrawal in any given year would be 7,600 acre-feet. This project would treat groundwater that does not currently meet drinking water standards (CE#: WQ-TN-5).

- TMWRF is expanding its treatment capacity to 51.2 million gallons per day to meet planned treatment demand for the region (CE#: WW-TN-1).

- The Pyramid Tribe is planning to develop a consolidated wastewater system for Nixon (CE#: WW-TN-6).

- Washoe County and the Pyramid Tribe propose to construct a wastewater treatment plant and sewer collection system to serve both private and Tribal areas of Wadsworth, Nevada (CE#: WW-TN-3).

Potential Impacts: These activities may potentially improve river water quality. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

g. *Washoe County Sewer Interceptor*

Washoe County and Reno are constructing a sewer interceptor to provide service to the Verdi/Lawton area to transport wastewater to TMWRF for treatment (CE#: WW-TN-2).

Potential Impacts: The interceptor would remove septic system discharge to groundwater that eventually reaches the Truckee River and transport this wastewater to existing facilities for treatment. This project could change the timing of flows, which may potentially improve water quality and quantity and reduce nitrogen loading to the Truckee River. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

h. *South Truckee Meadows Water Reclamation Facility*

South Truckee Meadows Water Reclamation Facility project proposes expanding the facility to treat up to 11,000 acre-feet of wastewater per year (CE#: WS-TN-1).

Potential Impacts: This facility does not discharge to the Truckee River. All effluent would be reused for irrigation and industrial purposes. TROA would have no effect on this action.

2. Other Water Quality Improvement Projects

With most point sources having been identified and being addressed under existing programs, future programs are likely to emphasize nonpoint source pollution (e.g., stormwater) control.

a. *TRPA*

TRPA is implementing the Environmental Improvement Program for erosion control, wetlands restoration, forest health projects, and similar efforts to control algae growth and other factors believed to cause the deterioration of water clarity and overall water quality of Lake Tahoe (CE#: WP-LT-2).

Potential Impacts: These projects could improve quality of water draining to Lake Tahoe. TROA would not affect the implementation of projects in watersheds tributary to Lake Tahoe.

b. *LRWQB*

LRWQB identified actions to improve water quality at Squaw Valley. Squaw Valley Ski Corporation will undertake these actions through the year 2011 (CE#: WP-TC-2).

Potential Impacts: These actions could reduce erosion and sediment discharge to Squaw Creek. TROA would not affect the implementation of projects on tributaries to the Truckee River.

c. Idlewild Park, Nevada

Reno proposes to make improvements to the Idlewild Park pond by dredging a channel through the lower pond to improve habitat for fish and installing an aerator for water circulation. The pond drains to the Truckee River (CE#: HR-TN-10).

Potential Impacts: These actions may improve water quality and fish habitat in the pond, but may potentially create a point source for nutrient loading to the Truckee River. TROA would have no direct effect on this action.

d. Ski Resort Runoff Control

Alpine Meadows (CE#: WP-TC-1), Sherwood Cliffs (CE#: SR-LT-2), and Squaw Valley (CE#: WP-TC-2) are retrofitting parking lots for erosion control and stormwater runoff.

Potential Impacts: By controlling erosion and stormwater runoff, these and similar projects may potentially improve water quality in tributaries to the Truckee River. TROA would have no direct effect on this action.

e. Golf Course Relocation

Reclamation and Tahoe Regional Planning Agency are preparing an EIS/EIR for the Upper Truckee River Restoration and Golf Course Relocation Project in El Dorado County. The Golf Course Relocation Project is a restoration project along the reach of the Upper Truckee River that extends from its entry point at the southern boundary of Washoe Meadows State Park to that point just west of U.S. Highway 50 where the river exits Lake Valley State Recreation Area. The property involved includes the Lake Tahoe Golf Course.

The Golf Course Relocation Project is intended to restore, to the extent feasible, ecosystem functioning in terms of ecological processes and aquatic and riparian habitat quality and to reduce erosion and improve water quality, including reduction of the reach’s contribution of suspended sediment and nutrient loading in the Upper Truckee River and Lake Tahoe. It is intended to maintain golf recreation opportunity and quality of play at a championship level.

Potential Impacts: This relocation project is intended to improve water quality in the Lake Tahoe basin, but is not expected to affect the water supply in Lake Tahoe subject to management under TROA.

3. TMDL Program

Section 303(d) of the Federal Clean Water Act requires States to undertake specific activities to protect the quality of their rivers, streams, lakes, and estuaries, and to develop and update a list of water bodies that do not meet water quality standards. Section 305(b) requires States to conduct biennial assessments of the Nation's water resources to identify and list those waters that are not achieving water quality standards. The resulting list is referred to as the 303(d) list. The list provides the States a way to identify problems and develop and implement pollution control plans to protect beneficial uses and attain applicable water quality goals. Section 303(d) requires the development of a pollution control plan called a "Total Maximum Daily Load" or TMDL for each identified water body and associated pollutant.

TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards. It allocates pollutant loadings to point and non-point sources such that standards will be met. Point sources include discharges from waste-water treatment plants, industrial facilities, and some stormwater collection systems. Nonpoint sources include runoff from farms, rangelands, timberlands, and urban areas.

For stream segments and water bodies that are not 303(d)-listed, Federal antidegradation regulations provide that, where degradation of water quality is permitted in exchange for socioeconomic benefits, beneficial uses must still be fully protected. An EPA document (EPA A841-F-94-006, August 2004) that summarizes Truckee River TMDLs for total nitrogen, total phosphorus, and total dissolved solids can be viewed at <http://www.epa.gov/OWOW/tmdl/cs13/cs13.htm>.

In California, LRWQCB has local responsibility for developing standards that protect the beneficial uses of water bodies and rivers. Its current 303(d) list can be viewed at <http://www.swrcb.ca.gov/tmdl/docs/2002reg6303dlist.pdf>. LRWQCB identified water quality problems and potential sources of pollutants for the Truckee River and Lake Tahoe hydrologic units. It is in the process of developing a TMDL to assess the water quality problems and sources of pollutant discharges, and to identify pollutant load reductions needed to attain water quality protection goals.

In Nevada, the Truckee River is 303(d)-listed for total phosphorus, total nitrogen, total dissolved solids, and turbidity; NDEP incorporated those TMDLs in the NPDES permit for TMWRF in 1994. As a result of noncompliance with the permit limit for total nitrogen, NDEP issued a Finding of Alleged Violation and Order to TMWRF on November 14, 1997. Nevada's current 303(d) list can be viewed at <http://ndep.nv.gov/bwqp/303list.pdf>. This list shows temperature, total phosphorus, and turbidity for various reaches of the Truckee River in Nevada.

Potential Impacts: The increasing population and urban development trend in the Lake Tahoe and Truckee River basin results in more point source and nonpoint source loadings to the Truckee River. As population increases, wastewater treatment plants upgrade to accommodate more wastewater, as required under the NPDES permitting process.

Nonpoint source loadings tend to increase due to more nonpermeable surfaces, such as asphalt parking lots, which contain, for example, fluids leaked from automobiles, which are flushed directly into water bodies during storm events. BMPs for nonpoint sources tend to be more cost-effective than additional point source reductions. Therefore, some pollution reduction trading among stakeholders is typically proposed to reduce costs. Stormwater BMPs tend to be cost effective and desirable as they reduce the "first flush effect" of nutrients and organics from the watershed and may help prevent flooding as well. Many streams in the Lake Tahoe and Truckee River basins are section 303(d)-listed for sedimentation and siltation. Current TRPA regulations have reduced the problems associated with shoreline protection facilities at Lake Tahoe. Stream restoration plans on Snow Creek, Trout Creek, and the Truckee River should reduce sedimentation and erosion in the future. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

4. WQSA

The Truckee River Water Quality Settlement Agreement, signed in October 1996, provided for the acquisition of Truckee River water rights and augmentation of the flow of the Truckee River to improve water quality and habitat conditions, increase nutrient assimilative capacity of the Truckee River, and reduce nonpoint source pollutant loading. WQSA calls for acquisition of $24 million of Truckee River water rights, with the Federal government and the local governments each responsible for the expenditure of $12 million. The local governments have initiated their acquisition program and have already purchased more than 2,800 acre-feet of water rights. The analysis completed for the combined case in the WQSA draft EIS assumes 12,600 acre-feet of Truckee River water rights are acquired from Truckee Division, 1,500 acre-feet from the Truckee River corridor, and 2,900 acre-feet from Truckee Meadows. As of October 31, 2006, 4,537.54 acre-feet of Truckee Division water rights had been purchased pursuant to WQSA. The water associated with water rights acquired would be stored in Truckee River reservoirs when possible and generally released during periods of low flow (June-September) to improve water quality in the lower Truckee River. This action was analyzed in an EIS (BIA, 2002), with a ROD completed in December 2002 (CE#: WQ-TN-6).

Potential Impacts: Opportunity to store water associated with water rights acquired pursuant to WQSA is currently limited by reservoir operations and so, although such water may flow to Pyramid Lake, there is little opportunity to manage it to achieve the maximum benefits identified in WQSA. Implementation of TROA would allow a greater opportunity to store WQSA water (as Water Quality Credit Water) and manage its release to achieve the maximum benefits identified in WQSA as well as other riverine and riparian benefits that would be promoted by ensuring streamflow along the entire course of the Truckee River.

G. Global Climate Change

Recent research on global climate change indicates that the climate of the western United States may gradually become warmer as the century progresses (Lettenmaier and Gan, 1990; Snyder et al., 2002). Temperature increases could cause less snow and more rain during winter, reducing snowpack that feeds streams during warm months. In addition, the frequency of hot summer days could increase, thus increasing water demands. Climate change models, however, do not indicate a measurable climate change for the northern Sierra Nevada (including the Lake Tahoe and Truckee River basins) until well after the end of the period of analysis. Snowpack and streamflows are expected to remain relatively unchanged up to the year 2033. The specific effects of global climate change on water resource management in the future are uncertain. Climate change could result in altered snowpack accumulation and melting, runoff patterns, water supply, sea level, floods and droughts, water demands, water temperature, plant and animal life including livestock, hydroelectric power generation, wildfires, recreation, water quality, soil moisture, groundwater, and ecosystems.

There is currently a gap in the understanding of the specific effects associated with global climate change on local water systems. Changes in the timing and distribution of precipitation and runoff can create greater uncertainty, potentially requiring changes to the management of the water system. There is a need for improved runoff prediction and other scientific information to support water management decisions.

Water managers will continue to evaluate climate change and study ways of incorporating flexibility into the system to respond to climate change By enhancing coordination and improving reservoir operation efficiencies, TROA would provide opportunities to address potential climate change impacts (CE#: GC-1).

VI. Cumulative Effects on Affected Resources

In this section, the action categories described and evaluated in section V are evaluated in the context of the effects of TROA on individual resources (summarized from chapter 3). A narrative summary presents the potential cumulative effects of TROA on each affected resource. Discussions for LWSA and TROA are not presented in instances where the cumulative effect is the same as that described for No Action; discussions for LWSA or TROA are only presented where the cumulative effect differs from No Action.

A. Surface Water

As presented in chapter 3, operations under TROA generally would increase the amount of water in storage in Truckee River reservoirs through the establishment of Credit Water; Credit Water establishment generally would reduce Truckee River flows during the higher runoff months for release during the lower flow months, although Credit Water could be released when requested consistent with the provisions of TROA. TROA would not create new water resources or water rights.

1. Comparison of Alternatives by Action Category

The following section summarizes the potential cumulative effects of TROA and the other alternatives on water resources according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: The current planned rate and pattern of urban and land development is expected to continue until the water demands and population levels associated with the year 2033 are achieved. Demographic or planning changes could alter the current water use rate; such changes would either hasten or delay the time of achievement of those demand levels. Expansion of nonpermeable surfaces would reduce groundwater recharge potential in and increase stormwater runoff from developing urban areas.

b. Water Rights Acquisitions and Transfers

No Action:

- Because the interstate allocation of Lake Tahoe and upper Truckee River basin water as provided in P.L. 101-618 would not be effective, there would be no codified maximum diversions under all water rights in the basins for California or Nevada, which could lead to priority conflicts between water users in the two States. If California water consumption increased above the P.L. 101-618 limits effective with TROA, commensurate increases in water shortages could occur in Nevada, which would be felt most keenly by the lower Truckee River, Pyramid Lake, Newlands Project, and Lahontan Valley wetlands, which tend to have more junior water rights than Truckee Meadows; drought conditions in Truckee Meadows also could be exacerbated.

- Existing *Orr Ditch* decree agricultural water rights would continue to be acquired and transferred to urban areas for M&I use.

- Applications for transfer of *Alpine* decree groundwater and surface water rights would seek to develop local water supplies to satisfy the increasing M&I demand related to urban expansion. Downstream effects would depend on amount and priority of rights transferred; any decrease in Carson River discharge to Lahontan Reservoir could increase diversion of Truckee River water to the Newlands Project.

LWSA: Same as under No Action.

TROA:

- The interstate allocation would be in place, thereby codifying the maximum diversions under all water rights in the basins for California and Nevada.

- Disposition of *Orr Ditch* decree water rights would be similar to that under No Action. Adverse downstream effects from exceeding the limits, as described under No Action, would be avoided.

- Disposition of *Alpine* decree water rights would be similar to that under No Action. Increased diversions from the Truckee River to the Newlands Project could reduce opportunities to store and manage Credit Waters.

c. M&I Water

No Action: Demographic or planning changes could alter the current water use rate; such changes would either hasten or delay the time of achievement of M&I demand associated with the year 2033. Surface water and groundwater supplies would continue to be used to varying degrees, depending on developing water use trends; the combination of measures would be the cumulative but unknown effect. Development rates may be higher or lower, and, thus, demands may be achieved earlier or later than 2033. Once M&I demands for the various population centers exceed the projected year 2033 levels, additional water supplies (e.g., pumping and recharging local aquifers, importing surface and groundwater, converting agricultural water rights to M&I use, pumping Sparks Marina Lake, and/or increased water conservation) would be required.

TROA: Demographic and planning variables related to M&I demand would be the same as under No Action. Measures to supply M&I water up to the year 2033 demand levels would be implemented as specified in TROA. Additional water supplies to satisfy M&I demands or increased water conservation once demands exceed the projected year 2033 levels would be required and developed from available sources.

d. Ecosystem Restoration

No Action: Ecosystem restoration projects could change the morphology of the river channel, providing deeper pools and narrower channels than currently exist, which would reduce evaporation. Restoration of riparian vegetation may increase consumptive use of river water; this could be offset in part by cooler temperatures associated with additional shading.

TROA: TROA would include a provision for funding a habitat restoration fund to plan and implement fish habitat restoration or maintenance projects in the Truckee River basin proposed by California, Nevada, and the Pyramid Tribe. Such funds could be leveraged with other funding, donations, or grants to supplement or expand other proposed.

e. Flood Control

No Action: Continuation of existing flood control criteria would not affect water resources in the Truckee River basin; implementation of planned or potential flood control measures could have an effect but to an unknown degree.

f. Water Quality

No Action: Waste and stormwater discharge permits would not affect water supply. Any potential land application for treated wastewater would require purchasing water rights to offset the surface water portion of potential loss.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

The availability of water resources in the study area is determined to a great degree by the vagaries of weather. TROA would have no significant cumulative effect on the total quantity of water resources in the study area because no new water rights or water resources would be created, and procedures for the exercise of existing water rights (and for storage and release of related Credit Waters) using available water resources (storage and unregulated flow) would be specified in TROA. The general pattern for the exercise of water rights to create Credit Waters would reflect the runoff pattern and likely be the same under any future scenario, although the amount for the various categories could vary depending on the amount of annual runoff and priority of the respective water rights. Exchange and release of the various Credit Waters would be flexible and be determined in large part by intended benefits to be achieved for the respective Credit Waters.

B. Groundwater

Article 10 of TROA would include criteria for wells drilled in the Truckee River basin in California to minimize short-term reductions of surface streamflows. As presented in chapter 3, because TROA would affect only the timing of Truckee River reservoir releases but not the quantity, it would only have minor effects (either beneficial or adverse) on groundwater recharge in the study area.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on groundwater according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Urban development in former agricultural areas could decrease infiltration of surface water into the aquifer, depending on the extent of non-permeable surfaces (e.g., paving) and lawn watering. Reduced flow in or closure of canals could also reduce recharge potential.

b. Water Rights Acquisitions and Transfers

No Action: Absent interstate rules or supply limitations governing the issuance of water rights by California and Nevada, additional use of Lake Tahoe and upper Truckee River basin water could reduce Truckee River supply currently available for diversion to canals; this could reduce seepage losses that contribute to groundwater recharge.

TROA: The interstate allocation would codify the maximum upper basin diversions and would be as analyzed in chapter 3.

c. M&I Water

No Action: Use of groundwater beyond that assumed for the future could lower local water tables. Streams with nearby wells that are in the shallow alluvial aquifers could have greater stream seepage loss.

LWSA: Similar to No Action with slightly more groundwater use in dry years and with additional aquifer recharge component.

d. Ecosystem Restoration

No Action: Restoration of deep-rooted riparian vegetation may increase consumptive use of groundwater; this could be offset in part by cooler temperatures and reduced evaporation associated with additional shading.

e. Flood Control

No Action: Flood attenuation projects could enhance opportunities for groundwater recharge by increasing infiltration.

f. Water Quality

No Action: Replacing septic systems with wastewater treatment could slightly decrease groundwater infiltration and slightly improve groundwater quality. Land application of treated wastewater could promote groundwater recharge.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would not implement or affect any current or proposed groundwater development or management plan; it would, however, through implementation of the interstate allocation, and the provisions of Article 10 of TROA, condition groundwater development and codify the maximum upper basin diversions

C. Water Quality

As presented in chapter 3, TROA would have no significant adverse effect on achievement of California water quality standards for the Truckee River from Lake Tahoe to Reno (with specific reference to operations of TTSA) with the major benefit to water quality occurring during dry years. Also, TROA would have no significant effect on achievement of Nevada water quality standards for the Truckee River from Reno to Pyramid Lake (with specific reference to operations of TMWRF) with the major benefit to water quality in dry years.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on water quality according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Point and nonpoint sources of pollution would generally increase as population increases. Effects would depend on location of development and extent of management and treatment of flows.

TROA: Trend of increase in discharges with population increase would continue. Opportunity would exist to manage streamflows to achieve standards more often in dry conditions.

b. Water Rights Acquisitions and Transfers

No Action: Effects on water quality would depend on timing, amount, and location of additional diversions in the upper Truckee River basin.

TROA: The interstate allocation would codify the maximum upper basin diversions.

c. M&I Water

No Action: Wastewater volumes or loadings in excess of the planned capacity of treatment plants would require upgrading or expansion of existing facilities or construction of additional facilities.

TROA: Credit Waters under TROA would allow flexibility to manage streamflows to enhance Truckee River water quality.

d. Ecosystem Restoration

No Action: Restoration projects could reduce local water temperature, increase dissolved oxygen, and reduce nutrients and sediment transport.

TROA: Additional benefits could accrue from use of LVPLFWF and habitat restoration fund.

e. Flood Control

No Action: BMP would attenuate nutrient, organic, and pollutant loading in the Truckee River basin.

f. Water Quality

No Action: Expansion/improvement of wastewater treatment facilities and effective discharge permit system could assist in meeting water quality standards.

TROA: Management of dedicated Credit Water releases could further improve water quality.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

Water quality in the Truckee River is largely affected by high runoff events that suspend sediments and associated salts and nutrients—events that would not be influenced by reservoir operations pursuant to TROA—and by point and nonpoint discharges, particularly in median or dry conditions. Water quality is increasingly affected by urban development, such as construction of impermeable surfaces, leakage of fluids from vehicles, and increased storm and wastewater treatment plant discharges. TROA would not affect the amount of storm or wastewater treated by a facility, degree of treatment, or quality of (or water quality parameter loadings by) its discharge. Water quality standards (e.g., TMDL) are established to protect current and planned future uses of water bodies, and are predicated on likely future flow regimes to provide adequate dilution for components of permitted discharges. Such standards are reviewed regularly to respond to changing social values and environmental conditions and to ensure that recognized beneficial uses are protected.

Generally, establishment of Credit Water in Truckee River reservoirs would reduce Truckee River flow associated with Floriston Rates; this would most likely occur from late winter to late spring or early summer. Such a reduction in conjunction with increased wastewater discharges in the California portion of the basin (from TTSA, for example) could cause concentrations of water quality constituents of concern to violate standards in certain months. Credit water releases during the lower flow months (late summer and early fall) would provide a source of dilution water and increase the likelihood that water quality standards would be met at those times; most Credit Water releases would flow to Nevada and a large portion would flow to Pyramid Lake. In addition to providing dilution for TTSA discharges, such water would also dilute the discharge from TMWRF. TROA would contain provisions to maintain specified minimum flows in the Truckee River downstream from Truckee Meadows and Derby Diversion Dam. In addition, release of Credit Water dedicated for water quality purposes (pursuant to WQSA) in the lower Truckee River could not be diverted (and, thus, it would flow all the way to Pyramid Lake) and so would provide dilution for discharges all the way from the point of release.

Also, there is a potential for Credit Water dedicated for Pyramid Lake fishes to be released consistent with recovery and habitat restoration plans to provide an additional water quality benefit.

Establishment of water quality standards and implementation of water treatment measures would be beyond the purview of TROA. Because of the capacity of TROA for flexible water management and requirements for certain minimum flows for the purpose of water quality, and the opportunities for water rights owners and water managers to coordinate releases of Credit Waters to provide multiple instream benefits, TROA, in conjunction with identified future actions relative to treatment facilities, could affect seasonal flows but would not have a significant effect on water quality in the study area. Water quality would be protected to the extent that TROA operations and dedicated Credit Water allow. Future reviews of water quality standards could identify a need for more or less stringent standards, which could require different water management strategies. The flexibility included in TROA would provide water managers additional opportunities to modify flows to implement those strategies. Development and implementation of advanced water treatment technologies could also improve the quality or reduce the loading from storm and wastewater treatment facilities and further enhance the water management flexibility of TROA.

D. Sedimentation and Erosion

As presented in chapter 3, TROA would have no significant effect on erosion and resulting sedimentation in the study area; reservoir storage and streamflows would occur within the ranges of current operations. Erosion resulting from urban development would not be related to TROA. No manmade induced degradation of any water quality parameters, including erosion and sedimentation, would occur at Lake Tahoe.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on sedimentation and erosion according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: There is a potential for increased erosion and resulting sedimentation due to land disturbance and alteration of local stormwater runoff. Effects would depend on location and extent of development as well as efficacy of river restoration projects.

b. Water Rights Acquisitions and Transfers

No Action: Diversion of water to use would not affect dynamics of erosion and sedimentation.

c. M&I Water

No Action: Reduction of agricultural return flows would reduce sedimentation and turbidity.

d. Ecosystem Restoration

No Action: Restoration projects could reduce erosion and sediment transport throughout the basin.

TROA: Additional benefits could accrue from use of LVPLFWF and habitat restoration fund.

e. Flood Control

No Action: COE flood control and restoration projects on the Truckee River could reduce erosion and sedimentation.

f. Water Quality

No Action:

- California and Nevada's plans to implement section 303(d) of the Clean Water Act could reduce sediment and erosion in the Truckee River basin.

- Implementation of waste and stormwater discharge plans for Truckee Meadows would reduce stormwater flows and thereby reduce erosion.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

No additional effects relative to erosion and water management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to erosion and sedimentation could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

E. Fish

As presented in chapter 3, TROA would have no significant adverse effect on brown or rainbow trout in the study area, and would have beneficial effects relative to preferred flows for those species and would reduce the likelihood of flushing or stranding flows in certain stream reaches. (Pyramid Lake fishes are addressed under "Special Status Species.")

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on fish according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Effects would be related directly to impacts on habitat-related resources such as streamflow, water quality, sedimentation, and riparian canopy, and inversely related to recreation.

b. Water Rights Acquisitions and Transfers

No Action: Effects on fish would depend on timing, amount, and location of additional diversions in the upper basin.

c. M&I Water

No Action: If M&I demands exceed projected amounts, lower streamflows could adversely affect fish populations.

TROA: TROA could enhance seasonal fish habitat through management of dedicated Credit Water releases.

d. Ecosystem Restoration

No Action: Restoration projects could enhance fish habitat throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.

TROA: Additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).

e. Flood Control

No Action: Flood control could have little effect or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.

f. Water Quality

No Action: Reduction in loading to streams could enhance habitat conditions.

TROA: TROA operations could enhance seasonal fish habitat through management of dedicated Credit Water releases.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would not adversely affect any current or proposed fishery management plan and would have no adverse cumulative effect on fish or fishery resources in the study area. Direct benefits of TROA to fish populations relate to management of releases of dedicated Credit Waters to provide spawning habitat and to maintain or enhance stream flows for water quality purposes; sustained flow management strategies would also assist in maintaining and enhancing riverine and riparian habitat to benefit fish species as well as other plant and wildlife species. Also, exchanging dedicated Credit Waters among all reservoirs could assist in redistributing water and releases to benefit local fish populations in reservoirs as well as streams. Indirect benefits of TROA relative to fish and fishery resources could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and efficacy of projects selected. TROA could also facilitate implementation of revised flow regimes for fish and fishery resources to the extent that Credit Water is available for that purpose.

F. Waterfowl and Shorebirds

As presented in chapter 3, TROA would have no significant adverse effect on waterfowl or shorebirds in the study area.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on waterfowl and shorebirds according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Effects would be related directly to habitat-related resources such as streamflow, storage, water quality, and riparian canopy, and inversely related to recreation.

b. Water Rights Acquisitions and Transfers

No Action: Reservoir storage and related waterfowl habitat would not be affected.

TROA: TROA operations would likely maintain greater storage in reservoirs than under No Action.

c. M&I Water

No Action: Effects on waterfowl and shorebirds would depend on changes in volume and timing of reservoir storage and releases.

d. Ecosystem Restoration

No Action: Benefits would accrue from projects dedicated to wetlands restoration.

e. Flood Control

No Action: Some benefits could accrue from flood attenuation projects that promote wetlands.

f. Water Quality

No Action: Reduction in loading to impoundments could enhance habitat conditions.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would not affect any current or proposed waterfowl or shorebird management plan and would have no cumulative effect on those resources in the study area. No additional effects relative to waterfowl or shorebird management were identified, and, so, no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to waterfowl or shorebird resources could accrue as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

G. Riparian Habitat and Riparian-Associated Wildlife

As presented in chapter 3, TROA would have no significant effect on riparian habitat and riparian-associated wildlife in the study area. TROA generally would provide benefits to these resources along reaches of the Truckee River, particularly in dry and extremely dry hydrologic conditions.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on riparian habitat and riparian-associated wildlife according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: As riparian habitats within Truckee Meadows and Truckee urban areas have already been substantially affected, future degradation would be limited. Additional loss of riparian habitats along tributaries would be possible if not mitigated.

b. Water Rights Acquisitions and Transfers

No Action: Effects on riparian habitat would depend on timing, amount, and location of additional diversions in the upper basin.

TROA: TROA operations could enhance habitat conditions through management of dedicated Credit Water releases.

c. M&I Water

No Action: If M&I demands exceed projected amounts, effects on riparian habitats and associated species along upstream reaches of Truckee River likely would be adverse.

TROA: TROA operations could enhance habitat conditions through management of dedicated Credit Water releases.

d. Ecosystem Restoration

No Action: Restoration projects could enhance riparian habitat throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.

TROA: Additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).

e. Flood Control

No Action: Flood control could have little effect or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.

f. Water Quality

No Action: Reduction in loading to streams could enhance habitat conditions.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would have no significant adverse effect on riparian habitat and associated species and would directly benefit those resources in the study area. Cumulative effects of TROA relative to riparian habitat and associated species also would likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

H. Special Status Species

As presented in chapter 3, TROA would have no significant adverse effect on special status species in the study area. In particular, TROA would generally provide benefits to cui-ui in the lower Truckee River and Pyramid Lake and LCT in the Truckee River by providing additional inflow to Pyramid Lake and improving riparian and riverine habitat in and along the river, particularly in dry and extremely dry hydrologic conditions. The extent of Tahoe yellow cress habitat would be about the same under TROA as under No Action. Effects on other wildlife and plant species would be as described for other biological resources.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on special status species according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Effects would be related directly to impacts on habitat-related resources such as streamflow, water quality, sedimentation, and riparian canopy, and inversely related to recreation.

b. Water Rights Acquisitions and Transfers

No Action: Effects on special status species would depend on timing, amount, and location of additional diversions in the upper basin.

TROA: TROA operations could enhance habitat through management of dedicated Credit Water releases.

c. M&I Water

No Action: If M&I demands exceed projected amounts, effects on special status species along upstream reaches of Truckee River likely would be adverse.

TROA: TROA would provide better assurance of meeting water needs, and operations could enhance habitat through management of dedicated Credit Water releases.

d. Ecosystem Restoration

No Action: Restoration projects could enhance special status species throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.

TROA: Additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).

e. Flood Control

No Action: Flood control could have little effect, or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.

f. Water Quality

No Action: Reduction in loading to water bodies could enhance habitat conditions.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would have no significant adverse effect on special status species and would directly benefit those resources in the study area. Cumulative effects of TROA relative to riverine and riparian habitat and associated species would also likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected. Projects that improve habitat conditions in, and provide additional water to, the lower Truckee River and Pyramid Lake would provide direct benefits for the conservation of Pyramid Lake fishes.

I. Cumulative Effects on Recreation by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on recreation in the study area.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on recreation according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Expanding populations and urban areas would restrict access to recreation sites and increase crowding and competition for the local resources; quality of the recreation experience would depend, in part, on resource management agencies.

TROA: Recreational pool targets in TROA, enhancement of minimum streamflows (releases), and the use of dedicated resource Credit Water could help meet some of the increased demands for recreation as the population increases, particularly in dry hydrologic conditions.

b. Water Rights Acquisitions and Transfers

No Action: Effects on recreation would depend on timing, amount, and location of additional diversions in the upper basin.

TROA: TROA operations would maintain greater upstream reservoir storage and enhance streamflows through minimum flows and management of Credit Water releases. Effects on Lahontan Reservoir would be minimal.

c. M&I Water

No Action: Effects on recreation would depend on activity, location, season, and demographic trends.

d. Ecosystem Restoration

No Action: Beneficial effects could accrue from additional areas for angling and river boating access, and enhanced fish habitat could enhance the angling experience.

TROA: Implementation of additional projects using LVPLFWF and habitat restoration fund and management of dedicated Credit Water releases could provide additional benefits.

e. Flood Control

No Action: Flood control projects could be developed to provide recreation opportunities, access, and facilities.

f. Water Quality

No Action: Several projects in the study area could improve river water quality and, thus, enhance the quality of the recreation experience.

TROA: Management of dedicated Credit Water releases could further enhance reservoir and stream-based recreation.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would not affect any current or proposed recreation management plan and would have no direct cumulative effect on recreation in the study area. No additional effects relative to fish or fishery management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to recreation could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

J. Cumulative Effects on Economic Environment by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on the economic environment in the study area. Any reduction in hydroelectric power revenues would be compensated pursuant to provisions of TROA.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on the economic environment considered together with the actions previously identified according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Local economies and urban development likely would respond to regional economic and demographic trends.

b. Water Rights Acquisitions and Transfers

No Action: No additional impacts would be expected because of the assumed demographic trend.

c. M&I Water

No Action: No additional impacts would be expected because of the assumed demographic trend.

d. Ecosystem Restoration

No Action: Local economies would benefit to the extent that recreation is enhanced.

e. Flood Control

No Action: Benefits could accrue from avoidance of property damage or loss.

f. Water Quality

No Action: Water quality projects could incrementally aid the regional economy by reducing costs of environmental improvement projects and promoting recreation.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

TROA would have no direct cumulative effect on the economic environment in the study area. While indirect benefits of TROA as identified in the recreation section could enhance local economies, no significant cumulative effects would be anticipated.

K. Cumulative Effects on Social Environment by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on the social environment in the study area. Trends in water use changes, M&I demands, and urban development are projected to reflect the trend of population increase. TROA would not promote population growth, but would provide a more secure M&I drought supply than the other alternatives.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on the social environment according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Regional and local plans would be designed to accommodate projected increase in population. However, the M&I drought supply could require restrictive conservation measures

TROA: TROA would provide a more secure M&I drought supply for Truckee Meadows.

b. Water Rights Acquisitions and Transfers

No Action: Regional and local plans would be designed to accommodate projected increase in population.

c. M&I Water

No Action: M&I water demand is based on projected population.

d. Ecosystem Restoration

No Action: Aesthetic appeal of stream reaches could be enhanced, but to an unmeasurable degree.

TROA: Implementation of additional projects using LVPLFWF and habitat restoration fund could further enhance the aesthetic appeal of the Truckee River.

e. Flood Control

No Action: Measures could enhance aesthetic appeal and provide a sense of public safety.

f. Water Quality

No Action: Aesthetic appeal of stream reaches could be enhanced.

TROA: Management of dedicated Credit Water releases could further enhance water quality, particularly during the summer.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

As presented in chapter 3, TROA would have no direct cumulative effect on the social environment in the study area. Indirect benefits of TROA as identified in the riparian habitat section could enhance the aesthetic qualities of the study area, and no significant cumulative effects would be anticipated.

L. Cultural Resources

As presented in chapter 3, TROA would have no significant adverse effect on cultural resources in the study area.

1. Comparison of Alternatives by Action Category

The following section summarizes the cumulative effects of TROA and the other alternatives on cultural resources according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

a. Urban Development and Land Use

No Action: Most known cultural resources have either been mitigated or protected in urban areas or are distant from areas designated for development. If National Register of Historic Places (NRHP) properties or NRHP-eligible properties would be threatened by any proposed development, the responsible entities—governmental or private—must consult with the State Historic Preservation Office (SHPO) to negotiate protective measures.

b. Water Rights Acquisitions and Transfers

No Action: Acquisitions, transfers, or exercise of water rights would not affect cultural resources.

c. M&I Water

No Action: No direct effects to known or unknown cultural resources have been identified.

d. Ecosystem Restoration

No Action: Effects would occur if any proposed restoration action(s) would threaten known or unknown cultural resources.

e. Flood Control

No Action: Potential actions could expose or submerge resources, but to an unknown degree.

f. Water Quality

No Action: No cumulative effects are identified for the period of analysis.

g. Climate

No Action: No cumulative effects from climate change are identified for the period of analysis.

2. Potential Cumulative Effects of TROA

As presented in chapter 3, TROA would have no direct cumulative effect on cultural resources in the study area. Indirect benefits of TROA as identified in the riparian habitat section could stabilize stream banks in the study area and help protect cultural resources, and no significant cumulative effects would be anticipated.

M. Indian Trust Resources

TROA would have no significant adverse effect on Indian trust resources, particularly with respect to biological resources in the lower Truckee River and Pyramid Lake, i.e., Pyramid Lake fishes and riparian habitat and associated species, and would directly benefit those resources in the study area. TROA would have no effect on water rights on Fallon Indian Reservation. Cumulative effects of TROA relative to Indian trust resources also would likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

VII. Conclusion

TROA would allow parties to exercise water rights for their respective benefits individually while still in a prescribed, regulated, coordinated, and collaborative manner. The fact that substantial operational flexibility is provided in the exercise of existing water rights would allow opportunity to tailor operations to maximize (or at least enhance) benefits for specified resources. By creating credit storage and using existing facilities more flexibly, TROA would allow opportunity to plan (i.e., store water) for future situations. By not constructing facilities, only providing operational flexibility, TROA would not preclude future (and technologically more advanced) measures to provide additional water or improve water quality from being implemented. TROA also would allow opportunity to enhance benefits for economic, social, biological, and trust resources in the study area, which previously had no water rights or had water rights of junior priority. Establishment of the habitat restoration fund (firm amount) and opportunity to add measurably to LVPLFWF (variable amount) could assist in restoring, enhancing, and protecting environmental values and processes long affected by more narrowly focused operations. As no significant adverse cumulative effects have been identified for the implementation of TROA within the context of the proposed Negotiated Agreement and TROA would have beneficial effects on resources in the study area, no mitigation would be necessary and none is proposed.

Chapter 5

CONSULTATION AND COORDINATION

This chapter serves as the public involvement summary report of activities on the environmental compliance process pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). It also includes information on consultation and coordination activities.

I. Study Participants

As discussed in chapter 1, the co-lead agencies for this study are the U.S. Department of the Interior (Interior) and California. This document was prepared by three Interior bureaus—Bureau of Reclamation (Reclamation), Fish and Wildlife Service (FWS), and Bureau of Indian Affairs—and by California Department of Water Resources (CDWR).

A. Signatories

The following entities participated in the negotiation and development of TROA and are the anticipated signatories (those identified by * are mandatory signatories):

- Interior*
- California*
- Nevada*
- Truckee Meadows Water Authority*
- Pyramid Lake Paiute Tribe of Indians (Pyramid Tribe)*
- Sierra Pacific Power Company (Sierra Pacific)
- Washoe County Water County District
- City of Reno, Nevada
- City of Sparks, Nevada
- City of Fernley, Nevada
- Washoe County, Nevada
- Sierra Valley Water Company
- Carson-Truckee Water Conservancy District
- North Tahoe Public Utility District
- Truckee Donner Public Utility District

B. Cooperating/Responsible Agencies

Most of the following are cooperating or responsible agencies and have jurisdiction by law over some aspect of TROA or contributed special expertise to the environmental impact statement/environmental impact report (EIS/EIR):

- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Forest Service
- U.S. Geological Survey
- Bureau of Land Management
- California Department of Fish and Game
- California State Water Resources Control Board
- California State Lands Commission
- Lahontan Regional Water Quality Control Board
- California State Historic Preservation Officer
- Nevada Department of Conservation and Natural Resources
  - Nevada Division of Water Resources
- Nevada Department of Wildlife
- Nevada State Historic Preservation Office
- Washoe County, Nevada
- Truckee Meadows Water Authority
- Tahoe Regional Planning Agency

C. Interested Parties

The following non-Federal agencies and entities with an interest in the Truckee River and reservoir operations or with technical expertise contributed to the EIS/EIR:

- Truckee-Carson Irrigation District
- Churchill County, Nevada
- Fallon, Nevada
- Carson Water Subconservancy District
- Lahontan Valley Environmental Alliance
- Newlands Water Protective Association
- Lyon County, Nevada
- California Resources Agency
- Del Oro (Donner Lake) Water Company
- Glenshire Mutual Water Company
- South Tahoe Public Utility District
- Truckee River Basin Water Group
  - Tahoe-Truckee Sanitation Agency

- Town of Truckee
- Nevada County
- Placer County
- Sierra County
- North Tahoe Public Utility District
- Tahoe City Public Utility District
- Truckee Donner Public Utility District
- Truckee Donner Recreation and Park District
- Northstar Community Service District
- Sierra Valley Water Company
- Alpine Springs County Water District
- Squaw Valley Mutual Water Company
- Squaw Valley Public Service District
- Poulsen Water Company
- Placer County Water Agency
- Tahoe Resource Conservation District

II. Agency Consultation

Concurrent with preparation of this document, agency coordination and consultation have been or are in the process of being conducted and are described in this section.

A. Fish and Wildlife Coordination Act Consultation

The Fish and Wildlife Coordination Act (FWCA) requires Federal agencies to coordinate with FWS and State wildlife agencies during the planning of new projects or for modifications of existing projects so that wildlife conservation receives equal consideration with other features of such projects throughout the agencies' planning and decision making processes (44 *Federal Register* [FR] 29300). Wildlife resources will be conserved in action agency project planning and approval by minimizing adverse effects, compensating for wildlife resources losses, and enhancing wildlife resource values (44 FR 29307).

Reclamation's objectives regarding fish and wildlife resources are to afford Federal and State fish and wildlife agencies the opportunity to participate actively in planning for projects that could affect fish and wildlife resources, to ensure that the public is fully informed regarding fish and wildlife resource matters and that their views are considered, and to ensure that fish and wildlife resources are fully considered in Reclamation's decisionmaking process by integrating such considerations into project planning, NEPA compliance procedures, financial and economic analyses, authorizing documents, project implementation, and during operation and maintenance of projects. FWCA compliance can be carried out prior to or at the same time Reclamation is complying with NEPA regulations.

Compliance with FWCA requires the following (44 FR 29307):

- Consultation between FWS, State fish and wildlife agencies, and the action agencies
- Opportunity for FWS and State wildlife agencies to report their recommendations
- Consideration of FWCA report recommendations
- Incorporation of the FWCA report as an integral part of the decisionmaking process

Chapters 1 and 2 and the "Biological Resources" sections of chapter 3 of this document, including the sections on mitigation and conservation measures, are the same as would appear in the main body of a draft FWCA report. The only portion not included is a list of nonmandatory enhancement measures to be recommended for implementation should opportunities arise. Implementation of TROA would provide a net benefit for fish and wildlife resources, including federally listed fish species. In coordination with California Department of Fish and Game and Nevada Department of Wildlife, FWS has recommended establishment of an aquatic and biological resources monitoring program as a nonmandatory enhancement measure to facilitate coordination among participating monitoring agencies. The purpose of this monitoring is to document the status and trends of biological resources in stream reaches that are influenced by Truckee River reservoirs as identified in TROA. This coordination will promote informed decisionmaking for managing stream flows and reservoir levels, consistent with the provisions of TROA, for the protection, maintenance, and enhancement of aquatic and riparian biological resources in the subject stream reaches. In combination with TROA itself and the NEPA compliance conducted for it, consideration of this recommendation constitutes full compliance with FWCA.

B. Endangered Species Act Consultation

Section 7 of the Endangered Species Act of 1973, as amended (ESA), prohibits Federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. By consulting with FWS before initiating projects, agencies review their actions to determine if these could adversely affect listed species or their habitat. Through consultation, FWS works with other Federal agencies to help design their programs and projects to conserve listed and proposed species. Regulations for the consultation process can be found at 50 Code of Federal Regulations (CFR) part 402.

Because a number of listed species either occur on Federal lands or are potentially affected by Federal activities, FWS coordination with other Federal agencies is important to species conservation and may help prevent the need to list candidate species.

Consultation with FWS pursuant to Section 7 of ESA is required before the Secretary of the Interior (Secretary) may sign TROA to ensure it will not jeopardize the continued existence of any listed species or destroy or adversely modify its critical habitat. FWS has reviewed the proposed action and concluded that formal consultation is not necessary. A letter from FWS to Reclamation concurring that the proposed action "is not likely to adversely affect cui-ui, Lahontan cutthroat trout, or bald eagle" is included as Attachment H. This terminates the consultation process, and no further ESA compliance is necessary.

The California Endangered Species Act (CESA), California Fish and Game Code Section 2050 *et seq*., imposes similar obligations on California State agencies, and operates in conjunction with the Federal ESA. Species may be listed under both acts (both State and federal laws would apply) or under only one act. Section 2080 of the California Fish and Game Code prohibits the "take" of a plant or animal listed or proposed as threatened, endangered, or rare (rare applies to plants). The California Department Fish and Game (CDFG) administers the act and authorizes "take" through Section 2081 incidental take permits. CESA allows for "take" incidental to otherwise lawful development projects. CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate mitigation planning to offset project caused losses of listed species populations and their essential habitats. The assessment of project effects on species listed under both ESA and CESA is addressed in FWS's Section 7 Concurrence Letter. However, with regard to those species listed only under CESA, CDWR has consulted with CDFG throughout the EIS/EIR process and was involved in the TROA negotiations. CDFG has affirmed that TROA would have no effect on State-listed endangered or threatened species, and that CDWR has satisfied its obligations under CESA.

C. Cultural Resources Consultation

Federal law requires Federal agencies to consider the effects of their undertakings on cultural resources. The National Historic Preservation Act of 1966 (NHPA), as amended, is the basic Federal law governing preservation of cultural resources of national, regional, State, and local significance. Specifically, section 106 of NHPA requires each Federal agency to consider the effect of its actions on "any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register." Furthermore, an agency must give the Advisory Council on Historic Preservation, an independent Federal agency created by the NHPA, an opportunity to comment on any undertakings that could affect historic properties. Procedures for meeting section 106 requirements are defined in 36 CFR 800. Other Federal legislation further promotes and requires the protection of historic and archeological resources by the Federal Government. Among these laws are the Archeological Resources Protection Act of 1979 and the Native American Graves Protection and Repatriation Act of 1990, both as amended.

In 1995, discussions began with the Fallon Paiute-Shoshone Tribes, Pyramid Tribe, Reno-Sparks Indian Colony, and Washoe Tribe regarding traditional cultural properties that may be in the study area. Discussions continue as needs dictate. In May 2003, contact was reinitiated with the Pyramid Lake Paiute Tribal Department of Water Resources to hear new concerns about habitat and spawning issues with the lake's native cui-ui and Lahontan cutthroat trout (LCT). Discussions also were initiated with the Nevada and California State Historic Preservation Offices (SHPO); these discussions are ongoing as needs dictate. For example, requests for any documented cultural resource surveys since 1995 were made with the appropriate regional information centers of the California Historical Resource Information System (a division of the California SHPO), as well as the Nevada SHPO. These findings have been incorporated into this final EIS/EIR.

In compliance with CEQA, in April 2004 Reclamation contacted California's Native American Heritage Commission to request a sacred lands file check for the four California counties in the study area. A records search conducted in June 2004 by the commission of its sacred lands files did not indicate the presence of any American Indian cultural resources or sacred lands in the study area. In its report, the commission included a list of Washoe tribal contacts for future cultural resource or sacred lands consultations, if needed. Contact by Reclamation for the sacred lands file search and California's response meet all cultural resource requirements as directed by CEQA. Known cultural resources and probable impacts are described under "Cultural Resources" in chapter 3; this information is supplemented in the Cultural Resources Appendix. Consultation on significant adverse effects and mitigation related to a final action, if any, will be reinitiated by the responsible entities as necessary. Acceptance of the final EIS/EIR will indicate that Reclamation has fulfilled all of its cultural resources consultation responsibilities under sections 110 and 106 of NHPA, as amended.

D. Indian Trust Resources Consultation

As discussed in chapter 3, Indian trust resources are legal interests in property or natural resources held in trust by the United States for Indian tribes or individuals. The Secretary is the trustee for the United States on behalf of Indian tribes. All Interior agencies share the Secretary's duty to act responsibly to protect and maintain Indian trust resources reserved by or granted to Indian tribes or Indian individuals by treaties, statutes, and Executive orders.

Consultation with individual Indian tribes in the study area includes the following:

- Pyramid Tribe: Pyramid Lake Indian Reservation, which includes Pyramid Lake in Nevada.
- Reno-Sparks Indian Colony: Reno and Hungry Valley in Nevada.
- Fallon Paiute-Shoshone Tribes: Fallon Paiute-Shoshone Reservation and Fallon Colony in Nevada.

- Washoe Tribe of Nevada and California: colonies of Carson City, Dresslerville, Stewart, Washoe Ranch (in Nevada) and Woodsford (in California), Pine Nut allotments (in Nevada), and cultural interests at and near Lake Tahoe.

Known assets and effects are described under “Indian Trust Resources” in chapter 3. Consultation and coordination with the tribes will continue through completion of the NEPA process and during implementation of the Negotiated Agreement.

III. Input to Decisionmaking Process

Input to the decisionmaking process came from several sources, including the policy, legal, and technical representatives of the negotiators of the Negotiated Agreement and the public, including the Truckee River Basin Water Group (TRBWG), a local, community-based group that provides a forum for public participation in the decisionmaking process.

A. Negotiators

The negotiators represent the interests of a broad spectrum of agencies and entities that would be affected by modifying operations of Truckee River reservoirs. The negotiators and various subgroups have met periodically to discuss issues and to prepare and review successive drafts of the Negotiated Agreement. The most recent agreement was completed on August 28, 2007 (i.e., proposed Negotiated Agreement), represented in this document as the TROA Alternative—the proposed action and preferred alternative.

A steering committee, made up of representatives of the negotiators, lead agencies, cooperating agencies, and other participating agencies and organizations, met from May 1992 to 1996. The steering committee was considered a first line of public involvement and provided input from individual member agencies and their publics.

B. Truckee River Basin Water Group

Section 15201 of the CEQA Guidelines states, “Public participation is an essential part of the CEQA process.” To provide a mechanism for such public participation during negotiation of the agreement and preparation of the final EIS/EIR, TRBWG regularly conducts meetings that are open to the public for discussion, review, and comment on agreement-related issues.

Each of the participants represents and comments as part of his or her constituent interest group. The open exchange of information and ideas serves both the community and Federal and State entities whose programs may affect local residents. TRBWG is not an advisory group under the Federal Advisory Committee Act. Input from the group is provided to CDWR and, through it, to the management team and technical analysts.

C. Public Involvement

Public involvement is a process by which interested and affected individuals, organizations, agencies, and governmental entities are consulted and included in the decisionmaking process. The public involvement process is used to solicit public input on issues surrounding the action and alternatives development as well as to inform the public regarding studies performed for the document.

The objectives of the structured public involvement process were initially laid out in a plan of study dated August 1992. Process details were defined in the public involvement plan, a document created early in the course of the study. Public involvement is an ongoing effort, and the plan has been updated to reflect the changes in process in NEPA/CEQA compliance.

1. Scoping Process

An early and open public scoping process is required as part of EIS preparation (49 CFR, part 1501.7) and promoted as part of EIR preparation (California Public Resources Code, section 21082.1). Public scoping is a continuing and integral part of the decision process, environmental review, and documentation for the final EIS/EIR. Scoping is designed to encourage the general public and governmental agencies to:

- Identify issues, concerns, and possible impacts
- Identify existing information sources
- Develop alternatives

a. Notice of Intent/Notice of Preparation

The formal public NEPA/CEQA scoping process began with a publication of a Notice of Intent (Federal) in the FR on July 21, 1991, and publication of a Notice of Preparation (California) on June 27, 1991. At the same time, a news release was issued from Reclamation's Mid-Pacific Regional Office. Both the Notice of Intent and the news release announced locations and times for public scoping meetings.

The Notice of Intent for the revised draft environmental impact statement/environmental impact report (DEIS/EIR) was published in the FR on April 15, 2004, and a Notice of Preparation was published on April 16, 2004. At the same time, a news release was issued from Reclamation’s Mid-Pacific Regional Office. The Notice of Intent, Notice of Preparation, and press release announced the points of contact and a Web site for further information.

b. Public Scoping Meetings

Five public scoping meetings were held July 22-25, 1991, in Truckee and South Lake Tahoe, California; and Reno, Nixon, and Fallon, Nevada. A total of 130 people attended the meetings. Oral comments were recorded, and written comments were received from

13 individuals. The public was specifically asked to identify the issues, concerns, and alternatives to be addressed in the DEIS/EIR. Comments received as a result of the public scoping meetings are contained in the Report on Scoping Comments, TROA, dated November 1991.

Public and agency input received from the scoping meetings was used to define the major public issues related to modifying operations of Truckee River reservoirs. The following were identified as major public issues:

- Endangered, threatened, and candidate species
- General fish and wildlife
- Recreational use
- Water quality

These issues were considered by the negotiators during development of the February 1998 TROA Alternative and alternatives analyzed as part of the Report to the Negotiators. (See chapter 2.)

2. Other Public Meetings

During the course of the studies, other public meetings were held to confirm the analytical approach for major issues and to invite public input into the process of identifying alternatives to be evaluated.

Four public meetings were held August 2-5, 1993, one each in Truckee, California, and Reno, Nixon, and Fallon, Nevada. The purpose of the meetings was to review the public issues, describe the alternatives identification process, and solicit public input on identifying alternatives.

In addition to the public meetings, separate meetings were held in Nixon, Nevada, with representatives of the Pyramid Tribe to ensure a clear understanding of public issues related to the tribe and to identify Indian trust resources. This consultation is a continuing process, as described in chapter 3, “Indian Trust Resources.”

3. Public Meetings and Hearings Following Release of DEIS/EIR

On March 13, 1998, Interior and California released the DEIS/EIR (dated February 1998) for public review and comment. The comment period for this document was originally scheduled to end in May 1998, but was extended through June 29, 1998, at the request of several negotiators.

In March 1998, shortly after release of the document, public information meetings were held at seven locations in the study area to explain the organization, content, and general conclusions of the document. The meetings were held in South Lake Tahoe, Tahoe City, and Truckee, California; and in Nixon, Sparks, Fernley, and Fallon, Nevada.

Public hearings were held in April 1998 to receive public comments on the DEIS/EIR. These hearings were held in Elks Point, Nevada; Truckee, California; Fallon, Nevada; Fernley, Nevada; Nixon, Nevada; and Sparks, Nevada. Written comments on the draft document and proposed action were received through June 1998. In all, 27 public speakers commented at the hearings and 116 comment letters and one phone message were received on the DEIS/EIR.

The comments received on the February 1998 DEIS/EIR were used to help focus and refine the revised DEIS/EIR. Additionally, copies of all comments were provided to the negotiators for their information. Those comments addressing the text of or concepts in the agreement required consideration by the parties because any changes to the agreement had to be accepted by at least the mandatory signatories before they could become part of the proposed action. Comments received on negotiation issues influenced subsequent negotiations. In 2003, TRBWG requested and received copies of the comments under the Freedom of Information Act.

Much effort went into addressing comments received. As a result, numerous modeling changes were made and the scope of the revised DEIS/EIR study was expanded to address a portion of Lahontan Valley.

The comments were divided into two categories: (1) general comments about the NEPA/CEQA process and the DEIS/EIR and (2) comments regarding the agreement and negotiation process. NEPA/CEQA comments were further categorized by resource: hydrology; water quality; sediment, biological resources; recreation; and economic, social, and cultural resources. Table 5.1 summarizes NEPA/CEQA-related comments.

TROA and its authorizing legislation, Public Law (P.L.) 101-618, only allow TROA to be changed in the same manner in which it was negotiated and adopted. Therefore, any amendments to TROA itself (made after it enters into effect) would have to be negotiated and agreed to by the signatories.

Eighty-four comments related to the agreement negotiation process were submitted during the 1998 comment period. Comments focused on the following:

- Depletion (measuring depletion impacts)
- Donner Lake issues (surface elevation, fish habitat and flows, lake ownership)
- Flood potential and flood control (flood control plans, set-back distance, groundwater development)
- Instream flows and fish/wildlife issues (mandatory minimum instream flows for fish and habitat, LCT recovery plan, ramping of reservoir releases, providing cool water in streams for fish, flow, and temperature monitoring, minimum pools in reservoirs for fish and habitat, impacts to fishery, oversight of releases, penalties for failure to comply with TROA)

Table 5.1—Summary of NEPA/CEQA comments received on DEIS/EIR

Category	Number received	Process-related concerns	Issue considerations
NEPA - related comments	11	Whether the proposed action reviewed by the DEIS/EIR was properly described Completeness of the review process	Local effects Flood control Water rights
Water quality	8	Fuller description of the process used to analyze/model water quality If this detailed information was available to the public	Water quality effects due to erosion Downstream flows Reduced streamflows in dry years
Sediment	10	Accuracy and completeness of the data used Availability of the source (modeling) data	Sediment effects due to early releases Sediment changes may effect LCT spawning/rearing, cui-ui runs, and shoreline erosion
Biological resources	141	Accuracy, completeness and source of the data used Availability of the source (modeling) data Conflicting references/ explanations, apparent discrepancies	Effects on species including: trout (rainbow, LCT and brown), white faced ibis, gulls, ducks, mountain yellow legged frog, bald eagle, geese, marten, osprey, white pelican, and cui-ui Questions related to effects and impacts on Tahoe yellow cress and cottonwood Effects on fish and other water related species, including: releases, stream and river flows, recovery, spawning, water temperature, passage and erosion, and others
Recreation resources	27	Accuracy and completeness of the data or statements	Effects on rafting, boating, windsurfing, fishing, and scenery Effects of increased or decreased flows on recreation activities and economic benefits It was noted that TROA was restricted in what it could do regarding recreation activities in that it may not interfere with the exercise of vested water rights unless those rights are voluntarily relinquished
Economic resources	30	Accuracy and completeness of the data or statements	Whether economic effects were adequately considered in such areas as fishing/recreation, property damage due to flood, logging/sawmill operations, visitation response to water levels, conversion of agriculture rights to municipal and industrial water use, hydroelectric power generation, additional storage for Sierra Pacific, and local economic impacts (versus regional)
Cultural resources	31	Accuracy and completeness of the data used (such comments often focused on whether a location (road, lake, dam, etc.) or term was correctly stated)	Whether a particular analysis was extensive enough in such areas as drainage problems, defining the primary area for the cultural resource, ethnographic consideration, and the effects of secondary natural transformations

- Mitigation (clarify/incorporate process to mitigate significant adverse effects to environment, monitor environmental factors for impacts)

- Negotiation process (insufficient public participation or input; clarify process of identifying potential signatories and negotiating the agreement; Sierra Pacific had undue influence in drafting TROA; having a provision for changing the agreement after it is signed; the process should have included a provision for performance criteria and monitoring)

- Newlands Project (Truckee Canal diversions)

- Hydroelectric power generation (clarify Sierra Pacific's waiver of single-purpose power and compensation for lost power)

- Recreation (minimum reservoir pools for recreation, adequate flows for recreation such as rafting, preserving recreation)

- Relation to other laws (compliance with State laws, P.L. 101-618, and Clean Water Act)

- Water quality (effect on water quality of Lake Tahoe and Truckee River downstream from Lake Tahoe; inadequate guarantees for water quality or on ways to measure impacts, impacts from sedimentation)

- Water rights (increased allocation to California; allocation percentage counted for snowmaking in California; California water spill priority, private ownership rights)

4. Public Meetings and Hearings Following Release of Revised DEIS/EIR

The revised DEIS/EIR for the TROA was filed with the Environmental Protection Agency on August 23, 2004, and the California State Clearinghouse on August 26, 2004. A Notice of Availability and Public Hearings appeared in the FR August 25, 2004. Three news release announcing availability of the document and dates, times, and locations of open house meetings and/or public hearings were released on August 25, September 14, and October 14, 2005. Comments were scheduled to be received by October 29, 2004.

Approximately 400 copies of the revised DEIS/EIR were distributed to Nevada and California members of Congress, State senators, and assembly members; Federal, State, and local government agencies; Indian tribes; entities and organizations; power and water purveyors; environmental groups; libraries; and the general public. Open house public information workshops were held in Fernley and Reno, Nevada, on September 21; in Fallon, Nevada, on September 22; in Kings Beach and Truckee, California, on September 23; and in Nixon, Nevada, on October 1, 2004. The original comment period was extended to December 30, 2004, following requests from the public and several entities. A letter announcing the extension was mailed on October 26, 2004, to each recipient of the revised DEIS/EIR. A news release announcing the extension of the comment period also was released on October 26, 2004. Notice of the comment period extension was published in the FR on November 10, 2004.

A total of 47 comment letters (paper or electronic) were received during the public comment period.

In addition, during the comment period, five public hearings were held: Monday, October 18, 2004, in Reno, Nevada; Tuesday, October 19, 2004, in Fernley, Nevada, and in Nixon, Nevada; Wednesday, October 20, 2004, in Truckee, California; and Thursday, October 21, 2004, in Fallon, Nevada. (A public hearing in Kings Beach, California, on October 21, 2004, was canceled due to a severe snow storm.) Eight speakers gave oral testimony at the first public hearing; one at the second public hearing; two at the third public hearing; none at the fourth hearing; and five at the fifth hearing. A total of nine entities provided *written* public hearing comments; these are included in the hearing record. Copies of the transcripts of the public hearing testimony and written public hearing comments and responses to the comments are included in the Comments and Responses Appendix.

A total of 567 individual comments were identified and addressed. The comment letters, transcripts of the public hearing testimony, and the written public hearing comments are reproduced in the Comments and Response Appendix, followed by responses to the individual comments.

5. Other Public Contact

On December 15, 2004, and January 13, 2005, Reclamation held two meetings at the TCID office in Fallon, Nevada. The purposes of these meetings were to review the revised DEIS/EIR, the Truckee River Operations Model and model runs used for that document, and the Draft Agreement.

The meetings were well-attended by TCID, representatives from Churchill County, Fallon, local interest groups, Nevada Department of Wildlife, and FWS-Stillwater National Wildlife Refuge. On March 17, 2005, a third meeting was held with TCID board members and staff at Fallon, Nevada. The purpose of this meeting was to complete the review of the October 2003 Draft Agreement. This meeting was also requested by TCID and was similarly well-attended.

In addition to the public scoping, meetings, and hearings, numerous contacts were made with the general public and agencies. These personal contacts, telephone calls, and mail provided input into various aspects of the study effort, particularly the cumulative effects analysis contained in chapter 4.

In 2004-05, Reclamation processed two requests for information under the Freedom of Information Act (FOIA) related to this study (FOIA No. BOR-2005-00003 and 4MPR011908).

DISTRIBUTION LIST

*asterisks indicate commenters on the revised draft environmental impact statement/environmental impact report

Congressional Delegations

Nevada

Senators

John Ensign

Harry Reid

Representatives

Shelly Berkley (District 1)

Dean Heller (District 2)

Jon C. Porter (District 3)

California

Senators

Barbara Boxer

Dianne Feinstein

Representatives

Wally Herger (District 2)

Daniel E. Lungren (District 3)

John T. Doolittle (District 4)

Doris Matsui (District 5)

Nevada State Senate

Mark E. Amodei (Capital District)

Bernice Mathews (Washoe District 1)

Mike McGinness (Central Nevada District)

William J. Raggio (Washoe District 3)

Randolph Townsend (Washoe District 4)

Maurice E. Washington (Washoe District 2)

Nevada State Assembly

Bernie Anderson (District 31)
Ty Cobb (District 26)
Tom Grady (District 38)
James Settelmeyer (District 39)
Sheila Leslie (District 27)
John Marvel (District 32)

California State Senate

David Cox (District 1)
Samuel Aanestad (District 4)
Michael Machado (District 5)
Darrell Steinberg (District 6)

California State Assembly

Richard Keene (District 3)
Ted Gaines (District 4)
Roger Niello (District 5)
David Jones (District 9)
Alan Nakanishi (District 10)
Tom Berryhill (District 25)

Federal Government Agencies

Bureau of Indian Affairs
- Office of Trust and Economic Development, Washington, DC
- Western Regional Office, Phoenix, AZ
- Western Nevada Agency, Carson City, NV

Bureau of Land Management,
- Nevada State Office, Reno, NV
- Carson City Field Office, Carson City, NV
- California State Office, Sacramento, CA

Council on Environmental Quality, Washington, DC

Federal Government Agencies – continued

Department of Agriculture
- Forest Service, Washington, DC
  - Humboldt-Toiyabe National Forest, Carson City, NV
  - Truckee Ranger District, Truckee, CA
  - Tahoe National Forest, Nevada City, CA
- Natural Resources Conservation Service
  - National Environmental Coordinator, Washington, DC
  - Carson-Storey County Extension Office, Carson City, NV

Department of the Army
- Corps of Engineers
  - Sacramento District
  - Engineering Division, Water Management Section, Sacramento, CA;
  - Planning Division, Sacramento, CA;
  - Real Estate Division, Sacramento, CA;
  - Nevada Office, Reno, NV

Department of Commerce
- NOAA
  - Office of Policy and Strategic Planning, Washington, DC

Department of Energy
- Office of NEPA Oversight, Washington, DC

Department of Health and Human Services
- Office of the Secretary, Washington, DC

Department of Housing and Urban Development, Washington, DC

Department of the Interior
- Office of Environmental Policy and Compliance, Washington, DC;
  - Oakland, CA
- Office of the Secretary, Washington, DC
- Office of the Solicitor, Washington, DC; Sacramento, CA

Department of the Navy
- Office of the Secretary, Washington, DC
  - Naval Air Station, Fallon, NV
  - Environmental Department, Fallon, NV

Department of Transportation, Washington, DC

Environmental Protection Agency
- Headquarters, Washington, DC
- Carson City, NV
- Region IX, San Francisco, CA

Federal Energy Regulatory Commission, Washington, DC

Federal Highway Administration, Washington, DC

Federal Government Agencies – continued

Fish and Wildlife Service
- California-Nevada Operations Office, Division of Endangered Species, Sacramento, CA
- Sacramento Fish and Wildlife Office, Sacramento, CA
- Nevada Fish and Wildlife Office, Reno, NV
- Stillwater National Wildlife Refuge, Fallon, NV

Geological Survey
- Environmental Affairs Office, Reston, VA
- Nevada State Office, Carson City, NV

Library of Congress, Washington, DC

National Park Service, Washington, DC

Ninth Circuit Nevada District Court Water Master's Office, Reno, NV

Office of Management and Budget
- Associate Director for Natural Resources Program, Washington, DC

Western Area Power Administration
- Sierra Nevada Region, Folsom, CA

State of Nevada Agencies

Department of Conservation and Natural Resources, Carson City*
- Division of Environmental Protection
- Division of State Lands*
- Division of State Parks
- Division of Water Resources
- Natural Heritage Program

Department of Cultural Affairs, Carson City
- State Historic Preservation Office

Department of Transportation
- Environmental Services, Carson City

Department of Wildlife, Reno*

State Clearinghouse, Carson City

State of California Agencies

Board of Equalization, Valuation Division, Sacramento

Department of Justice, Sacramento

Department of Parks and Recreation, Sacramento
- Office of Historic Preservation, Sacramento
- Office of Historical Resources Commission, Sacramento
- Sierra District, Tahoma

State of California Agencies – continued

Regional Water Quality Control Board
- Lahontan Region, South Lake Tahoe*

The Resources Agency, Sacramento
- Department of Fish and Game, Sacramento
- Habitat Conservation Division, Rancho Cordova;
- Sacramento Valley-Central Sierra Region, Rancho Cordova*
- Department of Water Resources
  - Central District, Sacramento, CA
- Fish and Game Commission, Sacramento, CA
- Lands Commission, Sacramento, CA
- Water Commission, Sacramento, CA

Secretary of State
- State Archivist, Sacramento

State Clearinghouse, Sacramento*

Water Resources Control Board
- Division of Water Rights, Sacramento*

County Government Agencies, Nevada

Binder & Associates, Folsom, CA (on behalf of Churchill County)*

Churchill County, Fallon*
- County Manager*
- Board of Commissioners*
- District Attorney*

Douglas County, Minden
- Board of Commissioners

Lyon County, Fernley
- Board of Commissioners

Pershing County, Lovelock
- Board of Commissioners

Storey County, Virginia City
- Board of Commissioners

Washoe County, Reno
- Board of Commissioners*
- Department of Water Resources*

County Government Agencies, California

Alpine County, Markleeville
- Board of Supervisors
- Planning Department

County Government Agencies, California – continued

El Dorado County, Placerville
    Board of Supervisors
Humboldt County, Eureka
    Board of Supervisors
Mariposa County, Mariposa
Nevada County, Nevada City
    Board of Supervisors
Placer County, Auburn*
    Board of Supervisors
Department of Public Works*
    Water Agency
Sierra County, Downieville
    Assessor's Office, Downieville
Board of Supervisors, Sierra City
    Department of Planning and Transportation, Tahoe City

Local Government Agencies, Nevada

Binder & Associates, Folsom, CA (on behalf of city of Fallon)*
City of Fallon*
    Office of the Mayor*
    City Attorney*
City of Fernley
    Office of the Mayor
City of Reno
    Office of the Mayor*
City of Sparks
    Office of the Mayor*
    Department of Public Works

Local Government Agencies, California

City of South Lake Tahoe
    Department of Community Development
    Office of the Mayor
Town of Truckee*
    Office of the Mayor*
Truckee-Donner Recreation and Park District, Truckee

Indian Tribes

Fallon Paiute-Shoshone Tribe, Fallon, NV

Fredericks, Pelcyger and Hester, Louisville, CO (on behalf of Pyramid Lake Paiute Tribe of Indians)*

Pyramid Lake Paiute Tribe of Indians, Nixon, NV*
Pyramid Lake Fisheries*
Department of Environmental Protection
Water Resources

Reno-Sparks Indian Colony, Reno, NV

Washoe Tribe of Nevada/California, Gardnerville, NV

Entities and Organizations

Adams Broadwell Joseph & Cardozo, Sacramento, CA

Bank of Walnut Creek, Walnut Creek, CA*

Bartkiewicz, Kronick and Shanahan, Sacramento, CA

Binder & Associates Consulting, Inc. (on behalf of city of Fallon, Churchill County, TCID), Folsom, CA*

California Academy of Science, San Francisco, CA

California Conservation Corporation, Auburn, CA

California Cultural Arts Foundation, Sacramento, CA; San Francisco, CA

California Farm Bureau Federation, Sacramento, CA

California Fly Fishers Unlimited, Sacramento, CA*

California Redevelopment Association, Sacramento, CA

California School of Fly Fishing, Nevada City, CA

Camp Dresser & McKee, Inc., Tahoe City, CA

Canal Group, Reno, NV

Carollo Engineers, Walnut Creek, CA

Caughlin Ranch Home Owners Association, Reno, NV

CH2M Hill, Sacramento, CA

Chamber of Commerce, Reno, NV

Champions of the Truckee River, Reno, NV

Davis Enterprise, The, Davis, CA

DMB/Highlands Group, LLC, Truckee, CA

Donner Lake Property Association, Reno, NV

Dornbusch and Company, Inc., Berkeley, CA

ECO:LOGIC, Reno, NV

EDAW, Inc., Sacramento, CA

Entities and Organizations – continued

Fredericks, Pelcyger, and Hester, Louisville, CO (on behalf of Pyramid Lake Paiute Tribe of Indians)*

Garcia and Associates, San Anselmo, CA

Golden Pacific Systems, Campbell, CA

Grizzly Peak Fly Fishers, El Cerrito, CA

Earl G. Hagadorn, Consulting Civil Engineer, Tahoe City, CA

Hall's Excavating, Truckee, CA

Hatch and Parent, Santa Barbara, CA

Heavenly Valley Ski Resort, Stateline, NV*

High Sierra Flycasters, Gardnerville, NV

Hoffman, Test, Guinan and Collier, Reno, NV

Hydro Turf Reno, Reno, NV*

Incline Village General Improvement District, Incline Village, NV

King and Taggart Law, Carson City, NV

Kronick, Moskovitz, Tiedemann and Girard, Sacramento, CA

Lahontan LLC, Truckee, CA

Mackedon and McCormick, Fallon, NV

Robert C. Maddox and Associates, Las Vegas, NV

Maguire & Pearce, Esquire, Phoenix, AZ

Martin Lebo, New Bern, NC

Martis Creek LLC, Truckee, CA

MBK Engineers, Sacramento, CA

McQuaid, Bedford and Van Zandt, LLP, San Francisco, CA (on behalf of TCID)*

Mechanics Bank, Richmond, CA*

Moonshine Inc., Truckee, CA

MWH, Sacramento, CA

Native American Heritage Commission, Sacramento, CA

NEA, a Division of Entrix, Inc., Sacramento, CA

Nevada Irrigation District, Grass Valley, CA

Nevada Policy Research Institute, Las Vegas, NV

Nevada Water Resources Association, Reno, NV

Newlands Water Protective Association, Inc., Fallon, NV*

North Lake Tahoe Bonanza, Incline Village, NV

Northstar Ski Area, Truckee, CA

Northwest Economic Associates, Sacramento, CA

Entities and Organizations – continued

Sue Oldham, Attorney for TMWA, Verdi, NV
Orinda Pacific Investment Corporation, Inc., Lafayette, CA
Potlatch Corporation, Larkspur, CA
Poulsen Land Company, Olympic Valley, CA
Principia, Lakewood, CO (on behalf of TCID)*
Pyramid Lake Paiute Tribal Newspaper, Nixon, NV
Pyramid Lake Water Resources, Wadsworth, NV
Rapid Creek Research, Boise, ID
Regional Water Planning Commission, Reno, NV
Reno-Sparks Association of Realtors, Reno, NV*
Reno-Sparks Chamber of Commerce, Sparks, NV*
Reno-Tahoe Airport Authority, Reno, NV
Resource Planning Analysis, Reno, NV
Resource Concepts, Inc., Carson City, NV
Rollston, Henderson, Rasmussen, and Crabb, South Lake Tahoe, CA
Ryder Homes of Nevada, Reno, NV*
SAIC, Sacramento, CA
Sierra Nevada College, Incline Village, NV
Somach, Simmons and Dunn, Sacramento, CA (on behalf of Heavenly Valley Ski Resort)*
Squaw Creek Estates, Olympic Valley, CA
Squaw Valley Ski Resort, Olympic Valley, CA
Stantec, Reno, NV
State of Arizona, Department of Water Resources, Office of the Chief Counsel, Phoenix, AZ
Stetson Engineers, Inc., San Rafael, CA
Systech Engineering, Inc., San Ramon, CA
Tahoe Donner Ski Resort, Truckee, CA
Tahoe Lakefront Owners Association, Tahoe City, CA
Tahoe Regional Planning Agency, Stateline,
Tahoe Truckee Flyfishers, Tahoe City, CA
Teichert Aggregate, Truckee, CA
Trimond Land Company, Truckee, CA
Truckee Donner Recreation and Park District, Truckee, CA
Truckee Falls GP, Rancho Cordova, CA
Truckee Meadows Community College, Sparks, NV

Entities and Organizations – continued

Truckee Meadows Regional Planning Agency, Reno, NV
Truckee River Basin Water Group, Truckee, CA*
Truckee River Fly Casters, Reno, NV
Truckee River Professional Tours, Reno, NV
Truckee River Watershed Council, Reno, NV
University of California, Berkeley; Soquel
University of Nevada, Las Vegas, Las Vegas
University of Nevada, Reno, Reno; Fallon
University of Southern California, Los Angeles
Water Education Foundation, Sacramento, CA
Water Research and Development, Reno, NV
Water System Management Company, Reno, NV
Western Environmental Law Center, Taos, NM
Western Water Alliance, Seattle, WA
Woodburn and Wedge, Reno, NV
Woodward Clyde Consultants, Sacramento, CA
WRC Environmental, Sacramento, CA

Power and Water Purveyors

Alpine Springs County Water District, Tahoe City, CA
Apple Valley Ranchos Water Company, Apple Valley, CA
Association of California Water Agencies, Sacramento, CA
Binder & Associates, Folsom, CA (on behalf of TCID)*
Calaveras County Water District, San Andreas, CA
Carson-Truckee Water Conservancy District, Fallon, NV
Donner Lake Water Company/Del Oro Water Company, Chico, CA
Lahontan Conservation District, Fallon, NV
McQuaid, Bedford and Van Zandt, LLP, San Francisco, CA (on behalf of TCID)*
Northstar Community Services District, Truckee, CA
    Northstar at Tahoe, Truckee, CA
    Northstar at Tahoe Golf Course, Truckee, CA
North Tahoe Public Utilities District, Tahoe Vista, CA
Placer County Water Agency, Auburn, CA*
Sacramento Municipal Utilities District, Sacramento, CA
Squaw Valley Public Service District, Olympic Valley, CA

Power and Water Purveyors – continued

Sierra Pacific Power Company, Reno, NV
Sierra Valley Water Company, Loyalton, CA; Plymouth, CA; Oraeagle, CA*
South Tahoe Public Utilities District, South Lake Tahoe, CA
Squaw Valley Public Service District, Olympic Valley, CA
Tahoe City Public Utilities District, Tahoe City, CA
Tahoe Swiss Village Utilities, Homewood, CA
Tahoe-Truckee Sanitation Agency, Truckee, CA
Truckee-Carson Irrigation District, Fallon, NV*
Truckee Donner Public Utility District, Truckee, CA
Truckee Meadows Water Authority, Reno, NV*
Truckee River Watershed Council, Truckee, CA
Washoe County Water Conservation District, Reno, NV

Environmental Groups

American Fisheries Society, Bethesda, MD
American Rivers, Nevada City, CA
American Water Resources Association, Middleburg,VA
California Natural Resources Group, Fresno, CA
California Trout, Stanford, CA
Center for Watershed and Environmental Sustainability, Reno, NV
Champions of the Truckee River, Reno, NV
Ducks Unlimited, Inc.
    Western Regional Office, Rancho Cordova, CA
Environmental Defense Fund
    National Headquarters, New York, NY
    California Regional Office, Oakland, CA
Friends of Nevada Wilderness, Reno, NV
Friends of Squaw Creek, Olympic Valley, CA
Great Basin Bird Observatory, Reno, NV
Lahontan Valley Environmental Alliance, Fallon, NV*
Lahontan Valley Wetlands Coalition, Reno, CA
League to Save Lake Tahoe, South Lake Tahoe, CA
National Audubon Society
    Lahontan Chapter, Reno, NV
    California State Office, Sacramento, CA
    New York, NY

Environmental Groups – continued

National Water Resources Association, Arlington, VA

National Wildlife Federation, Washington, DC

Natural Resources Defense Council, Inc., San Francisco, CA

Nevada Land Conservancy, Reno, NV

Nevada Waterfowl Association, Reno, NV

Pacific Fishery Management Council, Portland, OR

Restoration Group, Truckee, CA

Save the American River Association, Fair Oaks, CA

Sierra Club
  National Headquarters, San Francisco, CA
  Toiyabe Chapter, Reno, NV*

Sierra Watch, Nevada City, CA

The Fund for Animals, Inc., New York, NY

The Nature Conservancy,
  National Office, Arlington, VA
  Northern Nevada Office, Reno, NV

The Wildlife Society
  Western Section, Sacramento, CA

Trout Unlimited, Arlington, VA

Western Wetlands, Orem, UT

Individuals

Dick Acton, Reno, NV

Bruce Ajari, Tahoe City, CA

Richard Anderson, Truckee, CA*

Mahood Azad, Reno, NV

Bob Baiocchi, Graeagle, CA*

William Bettenberg, Middleton, WI

Ted Birr, Piedmont, CA

Loretta Bonta, Nixon, NV

Robert K. Brorsen, San Mateo, CA*

Robert Buehler, Zepheyr Cove, NV

Dan Cockrum, Truckee, CA

Ralph and Elmira Copeland, Fernley, NV

William Cowan, Reno, NV

Joe Dahl, Fallon, NV

Individuals – continued

Ed DePaoli, Fernley, NV
Daryl Drake, Reno, NV*
Francis E. DuBois III, Fallon, NV
Mary Jo Elpers, Reno, NV
Bruce Gescheider, Reno, NV*
John Guerrero, Wadsworth, NV
Chad Gourley, Farmington, UT
Ron Guerrero, Wadsworth, NV
Carl Gustafson, Olympic Valley, CA
Timothy Hackman, Stockton, CA
Rebecca Harold, Fernley, NV
Fred Haswell, Truckee, CA
Oliver Henderickson, Tahoe City, CA
Jolene Henry, Wadsworth, NV
Norman Hill, Citrus Heights, CA
John Hiscox, Nevada City, CA
Jack Hoffman, Reno, NV
Peter Jeffalone, Carnelian Bay, CA
Sonja Johnson, Fallon, NV
Adrian M. Juncosa, Truckee, CA
Brett Kandt, Reno, NV*
Brian Kempkes, Fairfield, CA
Peter A. Krenkel, Reno, NV
James Lauchland, Lodi, CA
Lee Light, Loyalton, CA
Roy Light, Loyalton, CA
Robie Litchfield, Truckee, CA
Susan Lynn, Reno, NV*
Sue and Stuart Mackie, Reno, NV
Stuart Mackie, Hazen, NV
Richard B. Madden, Larkspur, CA*
Bev and Roy Mapps, Incline Village, NV
Monte Martin, Fernley, NV
Joseph W. Mayer, Sparks, NV*
Bert McCoy, Fernley, NV
Daniel A. McDaniel, Stockton, CA
Mark McLaughlin, Carnelian Bay, CA

Individuals – continued

Denny McLeod, Piedmont, CA*
Jeri Mullins, Truckee, CA
Nancee Murray, Sacramento, CA
David Mutgin, Sutcliffe, CA
Barbara Osborn, Truckee, CA
Mark Palasits, San Francisco, CA
Robbin Palmer, Reno, NV
Al and Carla Pombo, Truckee, CA
Estella Poncho, Wadsworth, NV
Leo Poppoff, Pebble Beach, CA
Charles E. Porter, Truckee, CA
Jay Price, Truckee, CA
Terry Randolph, Carson City, NV
Albert Raney, Hazen, NV
Dan Rechenmacher, Reno, NV
Charles B. Renfrew, San Francisco, CA*
Stuart Richardson, Fallon, NV
David Robertson, Reno, NV
Elmer Rusco, Reno, NV
James L. Ryan, Walnut Creek, CA*
Eric Sandel, Truckee, CA
Bjorn Selinder, Fallon NV
Donald Seney, South Lake Tahoe, CA
Clayton Servilican, Wadsworth, NV
Pete Sferrazza, Reno, NV
Greg Shayley, Olympic Valley, CA
Becky Sheehan, Sacramento, CA
Carol Smith, Nixon, NV
John Snyder, Vail, CO*
William Somer, Pollock Pines, CA
C. G. Spies, Pequabuck, CT
Paul Stanley, Bozeman, MT*
Tom Stephens, Reno, NV
Elizabeth and Ted Stevens, Irvine, CA
Dan St. John, Incline Village, NV
Josh Susman, Truckee, CA
Steven L. Taggart, Granite Bay, CA

Individuals – continued

Marilee Teton, Fernley, NV
Ed Tilzey, Sparks, NV
Peter Towle, Mill Valley, CA*
Michael R. Turnipseed, Carson City, NV
Billie Turpie, Reno, NV
Michael Valentine, Sacramento, CA
Ernest C. Voight, Lafayette, CA*
Greg Vorreyer, Reno, NV
Steve Walker, Minden, NV
David C. Welch, Piedmont, CA*
Roland Westergard, Carson City, NV
Charlie White, Truckee, CA
Murl Williams, Fallon, NV
Alex Willis, Sparks,
John L. Winther, Orinda, CA*
Fred Wright, Sparks, NV
Mitch Wright, Reno, NV
Susan Wright, Nixon, NV
Steve Yates, Reno, NV
David Yardas, Truckee, CA*
Harry York, Reno, NV*
Dave Ziegler, Reno, NV

Libraries – continued

Auburn-Placer County Library, Auburn, CA
California Secretary of State, State Archivist, Sacramento, CA
California State Library, Hayward, CA, Sacramento, CA
California State University, Chico, Chico, CA
California State University, Hayward, CA
California State University, Meriam Library, Chico, CA
Carson City Library, Carson City, NV
Churchill County Public Library, Fallon, NV
Colorado State University Libraries, Fort Collins, CO
Douglas County Public Library, Minden, NV
El Dorado County Library, El Dorado Hills, South Lake Tahoe, CA

Libraries – continued

Fresno County Public Library, Fresno, CA
Library of Congress, Washington, DC
Lyon County Library, Yerington, NV
Natural Resources Library, Washington, DC
Nevada County Law Library, Nevada City, CA
Nevada County Library, Nevada City, CA
Nevada State Library and Archives, Carson City, NV
Nevada State Library, Carson City, NV
Pershing County Public Library, Lovelock, NV
Placer County Law Library, Auburn, CA
Placer County Library, Auburn, CA
Public Utilities Commission, Technical Library
San Francisco Public Library, San Francisco, CA
Sierra County Law Library, Downieville, CA
State Librarian of California, Sacramento, CA
Storey County Public Library, Virginia City, NV
University of California, Berkeley, Doe Library, Berkeley, CA
University of California, Davis, Peter J. Shields Library, Davis, CA
University of Nevada, Reno Library, Reno, NV
University of Nevada, Las Vegas Library, Las Vegas, NV
University of Southern California, Doheny Memorial Library, Los Angeles, CA
Water Resources Center Archives, University of California, Berkeley, CA
Washoe County Public Library, Reno, NV

LIST OF PREPARERS

Name	Qualifications (expertise, professional discipline, experience)	Contribution
Tina Armentrout	Editorial Assistant 21 years professional experience in desktop publishing, document design, and editing	Desktop publishing, document design, and editing
Jim Bailey	B.A. History, Metropolitan State College of Denver; M.A. History, University of Northern Colorado; Ph.D. History, Arizona State University Historian/Cultural Resources Manager 16 years professional experience in archival and published historical research, analysis, writing, editing, and publication; 5 years professional experience in historic preservation and cultural resources management; 30 years experience in photography	Cultural and historic resources analysis
Merlynn Bender, P.E.	B.Sc. Civil Engineering, North Dakota State University; M.Sc. Civil Engineering, University of Minnesota; M.Sc. Environmental Engineering, University of Tennessee Hydraulic Engineer 21 years professional experience in modeling riverine and reservoir water quality, including 15 years of experience in Truckee River water quality and fishery temperature issues	Water quality analysis
Susan Black	B.A. Economics, St. Martin's University Social Science Analyst 23 years professional experience in water resources planning, NEPA compliance, social analysis, and public involvement.	Social environment analysis
Charles Borda	B.A. and M.A. Economics, University of Colorado Economist 26 years professional experience in conducting economic, financial, and regional impact analyses	Economic environment analysis

Name	Qualifications (expertise, professional discipline, experience)	Contribution
Chester C. Buchanan	B.S. Biology, M.S. Zoology, San Diego State University Consultant to Management Team 39 years professional experience as fishery biologist, including 26 years of experience in Truckee River water issues and management of threatened and endangered fishes of Pyramid Lake	Chapter 2; analysis of minimum bypass flow requirements for TMWA's hydroelectric diversion dams on the Truckee River
Roger Burnett, P.E.	B.S. Agricultural Engineering, South Dakota State University Civil Engineer 31 years professional experience in conducting irrigation, drainage, and ground water analyses	Groundwater analysis
*Steve Caicco	B.A. Biology and Geology, Western Washington University; M.S. Botany, University of Idaho Botanist (FWS) 28 years professional experience in endangered species biology, riparian ecology, regional conservation assessment, and botany and plant ecology	Biological resources analysis, including endangered species biology, riparian biology, regional conservation assessment, botany, and plant ecology
Dianne Clark	B.S. Journalism, University of Colorado Technical Writer-Editor 20 years professional experience in managing and editing environmental compliance documents	Document management and editing
*Michael Cooney	B.S. Environmental Resources and M.S. Natural Resources Administration, California State University, Sacramento Environmental Scientist (CDWR) 32 years professional experience in preparing environmental compliance documents	CEQA compliance oversight; global climate change analysis; Donner Lake analysis; SWRCB change petition analysis

* Management Team member.

Name	Qualifications (expertise, professional discipline, experience)	Contribution
Thayne Coulter	B.A. Sociology, Kansas State University Sociologist 37 years professional experience in preparing and managing environmental compliance and planning reports; social impact assessments; and public involvement and decision process teaching, research, analysis, implementation, and documentation	Technical team leader; resource management
Chad DeVore	B.S. Wildland Recreation, University of Idaho Outdoor Recreation Specialist 30 years professional experience in outdoor recreation management, planning, and facilities design	Recreation analysis
Rod Hall, P.E. (deceased)	B.S. Agricultural Engineering, Iowa State University Consultant 35 years professional experience in water operations and modeling	Truckee River Operations Model development
Marlene Johnson	Associate of Business Administration, University of Denver Assistant Resource Manager 21 years professional experience in editing and project management	Resource management assistance
Brenda Kinkel, P.E.	B.S. Civil Engineering, University of Oklahoma Hydraulic Engineer 28 years professional experience in water resources planning, design, and analysis	Water resources analysis
Cassie Klumpp, P.E.	B.S. Landscape Architecture, University of Arizona; M.S. Water Resources Administration, University of Arizona; M.S. Civil Engineering, University of Colorado Hydraulic Engineer 26 years professional experience in river hydraulics, sediment transport, water resources and river restoration	Sedimentation and erosion analysis

Name	Qualifications (expertise, professional discipline, experience)	Contribution
Deena Larsen	B.A. English/Philosophy, University of Northern Colorado; M.A. English, University of Colorado Technical Writer-Editor 16 years professional experience in editing and managing environmental compliance documents	Chapter 4
Sharon Leffel	B.A. Psychology, University of Colorado Editorial Assistant 19 years professional experience in desktop publishing, document design, and editing	Desktop publishing, document design, and editing
Susan Levitsky	B.A. Environmental Biology, University of California, Santa Barbara Staff Environmental Scientist (CDFG) 26 years professional experience in botany, conservation planning, and natural resource administration	Biological resources analysis
*Kenneth L. Parr	B.S. Wildlife Science, Utah State University Reclamation Special Studies Program Manager 26 years professional experience in natural resources management	Study management; Indian trust resources analysis; SWRCB change petition analysis
Tom Scott, P.E.	B.S. Civil Engineering, Iowa State University Hydraulic Engineer 28 years professional experience in water resources planning, design, and analysis	Water resources analysis
*Tom Strekal	B.S. Biology, M.S. Aquatic Biology, Bucknell University Fish and Wildlife Biologist (BIA) 34 years professional experience in aquatic biology, water quality, endangered species management, water resources management and negotiations, and NEPA compliance	Management Team Leader; chapter 1; Indian trust resources analysis; chapter 4; editorial oversight
Jim Whitfield	Visual Resources Specialist 43 years professional experience in mapping, graphics, and computer-aided drawing	Maps and graphics preparation

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Note: Copies of court decrees, court cases, laws, and regulations cited in this final EIS/EIR can be acquired from the Bureau of Reclamation, Carson City, Nevada, or from the State of California, Department of Water Resources, Sacramento, California. For further information, contact:

Mr. Kenneth Parr
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
705 North Plaza Street
Carson City, Nevada 89701
Telephone: 775–882–3436
Fax: 775–882–7592
E-mail: kparr@mp.usbr.gov

or

Mr. Michael Cooney
State of California
Department of Water Resources
901 "P" Street, Suite 313B
Sacramento, California 95814
Telephone: 916–651–0746
Fax: 916–651–0726
E-mail: mikec@water.ca.gov

GLOSSARY

A

accumulate: To create a water category in a reservoir or to increase its storage.

acre-foot: Volume of water (325,853.382 U.S. gallons) that would cover 1 acre to a depth of 1 foot.

active conservation storage: Water storage for later release for uses such as municipal and industrial (M&I), hydropower, or irrigation.

Additional California Environmental Credit Water: A water category under TROA used for non-consumptive, stream, and riparian environmental purposes.

affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action; also, the chapter in an environmental impact statement describing current environmental conditions.

air quality: Measure of the health-related and visual characteristics of the air, often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances.

algae: Mostly aquatic single celled, colonial, or multi-celled plants, containing chlorophyll and lacking stems, roots, and leaves.

algal bloom: Rapid and flourishing growth of algae; often a heavy growth of algae in and on a body of water as a result of high nutrient concentration.

all reservoirs: For this document, the five Federal reservoirs (Lake Tahoe, Prosser Creek Reservoir, Stampede Reservoir, Boca Reservoir, and Martis Creek Reservoir) and the two non-Federal reservoirs (Donner Lake and Independence Lake) in the Truckee River/Lake Tahoe system. (Note: This term is not used in the Draft Agreement or Negotiated Agreement.)

***Alpine* court**: The U.S. District Court that supervises and administers the *Alpine* decree.

alternatives: Courses of action, which may meet the objectives of a proposal at varying levels of accomplishment, and include “no action,” the most likely future conditions without the project or action.

amphibian: A type of vertebrate animal that has a life stage in water and a life stage on land (e.g., salamanders, frogs, and toads).

anchor ice: Ice forming below the surface of a stream, on the streambed, or upon a submerged body or structure.

anoxia: Absence of oxygen.

aquatic: Living or growing in or on the water.

aquifer: Stratum or zone below the surface of the earth containing water.

archaic: In American archeology, a cultural stage following the earliest known human occupation in the New World (about 5,500 B.C. to A.D. 100), characterized by a hunting and gathering lifestyle and seasonal movement to take advantage of a variety of resources.

archeology: Study of human cultures through the recovery and analysis of their material relics.

artifact: A human-made object.

avian: Of, or having to do with, birds.

B

benthic: Bottom of water bodies with particular reference to organisms.

biomass: Total mass or amount of living organisms in a particular area or environment.

biota: Plant and animal life of a region.

bypass (water): Water that is not diverted at a structure and is allowed to continue to flow downstream.

C

California Environmental Credit Water: A water category under TROA, used for non-consumptive, stream and riparian environmental purposes.

California M&I Credit Water: A water category under TROA, used for M&I and groundwater injection for recharge of aquifers in the Truckee River basin in California.

California Species of Special Concern: Species in California which are not Federal- or State-listed as endangered, threatened, or rare, but are declining or so few in number that extirpation is a possibility.

candidate species: Plant or animal species that are not listed but which are undergoing a status review as published in the Federal Register by the U.S. Fish and Wildlife Service as candidates for possible addition to the list of threatened and endangered species.

canid: An animal belonging to the family Canidae, such as coyotes and foxes.

canopy: The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and shrubs.

carnivore: An animal that kills and eats other animals.

cavity excavator: A species that digs or chips out cavities in wood for nesting, roosting, or foraging.

cavity nesters: Animals that nest in cavities.

channelization: Straightening a stream or river so that water travels through the area more quickly.

colonial nesting: Birds (from different species) that nest in close proximity.

colonization: The occupation of a new habitat by a species.

community: A group of interacting populations of plants and animals in a common spatial arrangement at a particular point in time.

concentration: The relative amount of a substance in a solution.

conservation pool: A residual pool maintained in a reservoir to support fish and other aquatic life.

critical drought period: For this document, a hydrologic period during which the available water supplies from the Truckee River are equal to or less than those which existed from 1928 to 1935.

crown cover: The amount of canopy provided in a plant community.

cubic foot per second (cfs): As a rate of flow, a cubic foot of water passing a reference section in 1 second of time.

cultural resource: Any building, site, district, structure, or object significant in history, architecture, archeology, culture, or science.

current conditions: For this document, the existing environmental setting.

cuttings (plants): A piece cut from a plant, such as root or stem, and used for propagation.

D

dabbling ducks: Species of ducks, such as mallard, green-winged teal, gadwall, northern pintail, and American wigeon, that use shallow water areas and feed by tipping tail-up to reach aquatic plants, seeds, or invertebrates.

dead and inactive storage: A category of water in the bottom of Prosser Creek Reservoir and Stampede Reservoir in the amounts of 1,200 acre-feet and 4,600 acre-feet, respectively, which either cannot or will not be withdrawn.

deciduous: Perennial plants, trees, and shrubs that shed their leaves at some time of the year, particularly in the fall.

decomposition: Degradation of organic matter.

delta: A formation created by sediment deposition and/or channel incision at a river mouth from upstream erosion. The delta formed at Pyramid Lake is a result of channel incision.

deposition: The process by which sediments are laid down through the actions of wind, water, ice, or other natural occurrences.

desiccate: To dry up; remove moisture from a substance.

desiccation: The process of drying.

discharge: All water that passes a specific location, expressed in acre-feet per year; relative to a lake or reservoir, discharge includes all water that passes through the outlet facilities, passes over the spillway, is pumped from the reservoir, or seeps through the dam or foundation into the stream downstream from the lake or reservoir.

displacement: To the extent that two or more categories of water cannot be simultaneously stored in the same reservoir, an operation whereby a water category of higher storage priority causes one of lower storage priority to be exchanged, released, or spilled.

dissolved inorganic nitrogen: Nitrogen primarily in the form of nitrite, nitrate, or ammonia.

dissolved oxygen (DO): Amount of free oxygen in water.

diversion: A structure in a river or canal that diverts water from the river or canal to another watercourse.

Draft Agreement: For the purposes of the revised DEIS/EIR, the draft Truckee River Operating Agreement was referred to as the Draft Agreement.

draw down: Lowering a reservoir's water level; process of releasing reservoir storage.

drought period: See critical drought period.

drought situation: When the April 15 runoff forecast for the Truckee River indicates there would not be sufficient unregulated water and Floriston Rate Water to maintain Floriston Rates through the water year or if the elevation of Floriston Rate Water in Lake Tahoe is forecast to drop below 6223.5 feet Lake Tahoe datum before November 15. See critical drought period.

dry water year: A dry water year would exist when the April 15 forecast for the Truckee River indicates there would not be sufficient uncontrolled runoff and Floriston Rate Water storage to maintain Floriston Rates through the water year.

E

ecosystem: Complex system composed of a community of animals and plants as well as the chemical and physical environment.

effluent: A discharge of waste, such as treated sewage.

emergent vegetation: Aquatic plants with most vegetative parts growing above water.

endangered species: In accordance with the federal Endangered Species Act of 1973, as amended, any species in danger of extinction throughout all or a significant portion of its range.

entrainment: To be moved by water motion involuntarily.

ephemeral: Streams or ponds that contain water only for brief periods of time in direct response to precipitation.

epilimnion: The upper layer of a stratified lake (see stratification).

erosion: Refers to soil and the wearing away of the land surface by water, wind, ice, or other physical processes.

eutrophication: Enrichment of a lake or other water body with nutrients, resulting in excessive growth of organisms and depletion of oxygen.

evaporation: Loss of moisture as water vapor.

evapotranspiration: Moisture returned to the air through direct evaporation or transpiration of vegetation.

exotic species: A non-native species that is introduced into an area.

extirpated: A species of plant or animal that is no longer found in a particular area.

F

facilities: Manmade structures, such as dams, canals, spillways, outlet works, and fishways.

facultative: Not required or compulsory for an organism to grow.

fawning: The process of a deer giving birth.

Federal reservoirs: See Truckee River reservoirs.

Fernley Municipal Credit Water: A water category under TROA, used for M&I, local aquifer injection well recharge, re-vegetation of former agricultural lands, local wetlands water quality improvement, or Pyramid Lake fish flow enhancement.

fingerling: A young or small fish.

Fish Credit Water: A water category under TROA, used to benefit cui-ui in lower Truckee River/Pyramid Lake and LCT in the Truckee River basin.

Fish Water: A water category under TROA, comprised of Stampede Project Water and Prosser Project Water.

flood control pool: That portion of reservoir storage space reserved during certain times of the year to capture and temporarily hold flood flows:

Floriston rates: Required rates of flow in the Truckee River, measured at the U.S. Geological Survey stream gauging station at Farad, California, which vary from 300 cfs to 500 cfs, depending on the water elevation of Lake Tahoe and the time of year.

Floriston Rate Water: Project Water stored in Lake Tahoe and Boca Reservoir pursuant to the *Orr Ditch* decree, water exchanged under the Tahoe-Prosser Exchange Agreement (TPEA), and unregulated flow in the Truckee River are used to achieve Floriston Rates.

flushing of fish: Downstream movement of fish because of high water velocity.

Forest Service Sensitive and Watch List Species: A U.S. Forest Service term to indicate plant species of limited distribution.

fry: Life stage of fish between egg and fingerling.

G

gauging station: Specific location on a stream where systematic observations of hydrologic data are obtained through mechanical or electrical means. ("Gauge," "gaging station," and "gage" are variations.)

germination: the development of a seed into a seedling.

groundwater: Water beneath the ground, consisting mostly of surface water that has seeped down.

H

habitat: Area where a plant or animal lives.

harvest (fishery): In a recreational fishery, refers to numbers of fish that are caught and kept.

head cutting: A natural process of active erosion in a water channel caused by an abnormal and abrupt change in channel gradient, which causes a "waterfall" action, which erodes the channel by undercutting the substrate material and causing the collapse of the upper level (head; this "undercut-collapse" process advances up the channel until bedrock is reached.

herbaceous: Refers to vegetation growing close to the ground that does not develop persistent woody tissue, usually lasting for a single growing season.

hydroelectric powerplant: Structure that houses turbines, generators, and associated control equipment, which uses the flow of water to generate electricity.

hydrologic: Pertaining to the quantity, quality, and timing of water.

hydrophytic: A plant that grows in association with standing water or saturated soil (e.g., cattails, bulrushes, sedges, and rushes).

hypolimnetic: Refers to the cold bottom water zone below the thermoline in a lake.

hypolimnion: The lower layer of a stratified lake. (See stratification.)

I

inactive storage: Lake or reservoir storage not available for release without pumping.

incubation: Eggs in the process of hatching.

indicator: A physical, chemical, or biological parameter that is selected to represent characteristics of a broader resource category, particularly for the purpose of evaluating impacts (e.g., a trout species as representative of all game fish species in an area).

indigenous: Native plant or animal species.

in situ: In the site of.

insectivorous: Feeding on insects.

inundate: To cover with water.

invertebrate: An animal lacking a spinal column.

J

Joint Program Fish Credit Water: A water category under TROA. Joint Program Fish Credit Water is a portion of Fish Credit Water managed by California to enhance streamflows in California and recreational pools in all reservoirs.

juvenile: Young animal that has not reached reproductive age.

K

kilowatt (kW): Unit of electric power (capacity) equal to 1,000 watts, or about 1.34 horsepower.

kilowatthour (kWh): Basic unit of electric energy equal to an average of 1 kilowatt of power applied over 1 hour.

L

lacustrine: Of or pertaining to a lake.

lake: A relatively large natural body of standing water.

Lake Tahoe basin: The land area that drains naturally into Lake Tahoe.

Lake Tahoe datum: The elevation reference point at Lake Tahoe Dam for measuring the elevation of Lake Tahoe, assumed to be at an elevation of 6223.00 feet mean sea level.

land bridge: A continuous land connection between two land masses.

larva: The newly hatched, earliest stage of animal that undergoes metamorphosis, differing markedly in form and appearance from the adult.

leaf senescence: Aging of a leaf.

life cycles (aquatic life): The stages through which an organism passes between reproduction by one generation and reproduction by the next.

life history: Life cycles through which organisms pass, with emphasis on reproduction and survival mechanisms.

littoral zone: Pertains to the shallow water area along the edge of a body of water.

loading: The process of adding a substance (such as dissolved nitrogen) to something (such as a body of water).

lower Truckee River: That reach of the Truckee River downstream from Derby Diversion Dam to Pyramid Lake.

M

M&I: Municipal and industrial.

macroinvertebrate: Invertebrate that can be seen by the unaided eye.

mandatory signatory: Each of the five parties required to sign TROA for it to become effective—U.S. Department of the Interior, California, Nevada, Truckee Meadows Water Authority (formerly Sierra Pacific Power Company), and Pyramid Lake Paiute Tribe of Indians

mechanical aeration: Using mechanical means (aerators) to increase dissolved oxygen in bodies of water.

mitigation (measures): Action taken to avoid, reduce the severity of, or eliminate an adverse impact.

minimum supply year: As used in this EIS/EIR, the minimum supply year (or minimum annual supply) is the calendar year with the least supply to serve water rights over the 100-year period of analysis.

Modoc-Great Basin cottonwood-willow riparian forest: An open canopied, broadleafed, deciduous riparian forest dominated by Fremont cottonwood and willows.

Modoc-Great Basin riparian scrub: An open to dense, broadleafed, deciduous shrubby thicket dominated by willow species.

montane black cottonwood riparian forest: A fairly dense, mixed riparian forest dominated by black cottonwood.

montane freshwater marsh: A freshwater marsh found in high elevations with a short growing season due to cold winters.

montane riparian scrub: An open to dense, broadleafed, deciduous shrubby riparian thicket dominated by willow, alder, or dogwood species.

movement corridor: A linear area of primarily continuous vegetation, such as along streamcourses, which provides an avenue for wildlife to disperse from one habitat or geographical area to another, or for seasonal movements between high and low elevations.

N

National Register of Historic Places: A federally maintained register of districts, sites, buildings, structures, architecture, archeology, and culture.

Negotiated Agreement: The TROA document negotiated by the mandatory signatories and others that is the basis for this final EIS/EIR. For the purposes of this final EIS/EIR, TROA refers to both the Negotiated Agreement and proposed action.

Newlands Project Credit Storage: Water temporarily stored in Stampede Reservoir in accordance with the terms of Operating Criteria and Procedures (OCAP) for the Newlands Project (43 CFR 418.20)

Newlands Project Credit Water: A water category under TROA that replaces the term Newlands Project Credit Storage.

nitrogen-fixing: Refers to microorganisms that reduce gaseous nitrogen to ammonia or other compounds.

No Action Alternative: The most likely future conditions without the project or action.

non-Federal reservoirs: Donner and Independence Lakes.

normal water year: A water year when the April 15 runoff forecast for the Truckee River indicates there would be sufficient uncontrolled runoff and Floriston Rate Water storage to maintain Floriston Rates through the water year.

O

***Orr Ditch* court**: The U.S. District Court that supervises and administers the *Orr Ditch* decree.

Other Credit Water: A water category under TROA that is a place holder for categories of credit water not yet identified but which may be proposed after TROA is implemented.

outmigration: The movement of a group of organisms out of an area.

overgrazing: Excessive grazing use of area by livestock, resulting in detrimental impacts to the environment.

overstory: The portion of the trees or shrubs that form the uppermost portion of the canopy layer.

oxbow: A bow-shaped bend in the river, or a bow-shaped lake formed in an abandoned channel of a river.

P

palustrine emergent wetlands: Wetlands dominated by erect, rooted herbaceous hydrophytes, excluding moss and lichens.

palustrine forested wetlands: Wetlands dominated by woody vegetation greater than 20 feet tall.

palustrine scrub/shrub wetlands: Wetlands dominated by woody vegetation less than 20 feet tall.

perennial: Refers to plants that have a life cycle that lasts for more than 2 years.

periphyton: Algae found on rocks and other bottom substrates.

permeable: Having pores or openings that permit liquids or gases to pass, capable of being permeated.

permeate: To diffuse through or penetrate something.

phytoplankton: Algae found in the water column.

planimetry: The measuring of a mapped area.

pond-like area: In this document, refers to cut-off meanders (oxbows) and low-lying areas in the flood plain.

population viability: Probability that a population will persist for a specified period across its range despite normal fluctuations in population and environmental conditions.

precipitation: Liquid or solid water particles that fall from the atmosphere and reach the Earth’s surface, such as drizzle, rain, snow, snow pellets, snow grains, ice crystals, ice pellets, and hail.

predation: The consumption of one organism (the prey) by another (predator).

primary wetlands: Wetlands (see definition of wetlands) located within Stillwater National Wildlife Refuge, Stillwater Wildlife Management Area, Carson Lake and Pasture, and Fallon Indian Reservation (i.e., the Lahontan Valley wetlands designated by P.L. 101-618).

Private Water: Water stored by TMWA in Independence Lake and Donner Lake, and by TCID in Donner Lake.

Project Water: Water stored in Lake Tahoe, Prosser Creek Reservoir, Stampede Reservoir, and Boca Reservoir pursuant to existing storage licenses or permits (e.g., Stampede Project Water).

Project Water in Another Reservoir: A water category under TROA, which has the same use as the initial Project Water.

Prosser Project Water: Project Water stored in Prosser Creek Reservoir pursuant to the existing U.S. storage permit with SWRCB, exchanged under TPEA, released to benefit of Pyramid Lake fishes and to maintain minimum reservoir releases

protective armoring (in relation to streambeds): Natural roughening of a streambed surface by erosion, which protects the fine, erodible materials below.

public involvement: Process of obtaining citizen input into development of planning documents, required in any EIS.

Pyramid Lake fishes: Federally endangered cui-ui and threatened LCT.

Pyramid Tribe Appropriated Water: Water in the Truckee River not subject to vested and perfected rights as of 1984, that was appropriated by the Pyramid Tribe pursuant to Nevada State Engineer Ruling No. 4683.

R

raptor: Any predatory bird that has feet with sharp talons or claws and a hooked beak, such as a falcon, eagle, hawk, or owl.

reach: Any specified length of a stream, river, channel, or other water conveyance.

recruitment: Survival of young plants and animals from birth to a life stage less vulnerable to environmental change.

relative abundance: The density or number of individuals of a particular species relative to other species in an area.

release: The portion of the discharge from a lake or reservoir that supplies identified demands (for diversions, storage, instream flow, flood control) , expressed in cfs.

reptile: Coldblooded vertebrate of the class Reptilia, comprised of turtles, snakes, lizards, and crocodiles.

representative years: For this EIS/EIR, representative years (1986—wet; 1989—median; and 1992—dry) were chosen based on recent operations rather than a long-term record.

reservoir: The storage created by a dam in a natural lake, such as Lake Tahoe, or an artificial lake, including the dam, spillway, and other associated facilities, such as Stampede Reservoir.

resident: A wildlife species commonly found in an area during a particular time; summer, winter, or year round.

riparian: Of, on, or pertaining to the bank of a river, pond, or lake.

riparian corridor: River and streams with their associated vegetation.

riverine: Pertaining to a river.

river stage: River surface elevation at a specified flow.

rodent: Small mammals with large incisors, such as mice, squirrels, and beavers.

roost site: Place where a bat or bird will rest during the day or night, typically protected from weather and predators.

run-of-the-river: River flow in a reach unregulated by hydraulic control or storage structures.

runoff: The surface flow of precipitation on a land area that discharges to a stream, channel or other water collection structure.

S

saline: Water that has measurable salt concentration.

salinity: A measure of the quantity of the total dissolved solids in water.

salmonid: Fish belonging to the family Salmonidae, including salmon, trout, and whitefish.

saplings: Young trees generally between 1 to 4 inches in diameter at breast height.

scour: Water forces removing debris and sediments from a channel.

sediment: Unconsolidated solid material that comes from weathering of rock and is carried by, suspended in, or deposited by water or wind.

self-sustaining: A population of organisms that is maintained by natural means.

Settlement Act: Title II of P.L. 101-618, Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990.

shorebirds: Birds that forage along the edge of lakes, reservoirs, wetlands, and rivers, such as sandpipers, plovers, and killdeer.

shore zone: The land bordering a body of water.

shrubs: Plants with woody stems, generally less than 20 feet tall, such as willows.

significance: CEQ Guidance, 43 CFR section 1508.27, explains that significance requires considerations of the context of the action (society as a whole, the affected region, affected interests, and locality) and intensity (the severity of impact).

site: In archeology, any location of past human activity.

slough: An inlet or backwater swamp, bog, or marsh.

snag: A standing dead tree.

songbird: Small to medium-sized birds that perch and vocalize or “sing,” primarily during the breeding season.

spawn: To lay eggs, especially in reference to fish.

spawning flows: Streamflow necessary for fish spawning; equivalent to riverine fish habitat.

spawning run: The migration of a group of fish for the purpose of spawning.

special status species: For this EIS/EIR, those FWS Species of Concern, California Species of Special Concern, Region 1 Fish and Wildlife Service Species of Management Concern, and Forest Service Sensitive and Watch List Species that may occur within the study area.

species: In taxonomy, a subdivision of a genus that (1) has a high degree of similarity among individuals, (2) is capable of interbreeding only in the species, and (3) shows persistent differences from members of allied species.

species richness: The number of different species in an area.

spill: Any discharge from a lake or reservoir that is not a release.

stock: See strain.

Stampede Project Water: Project Water stored in Stampede Reservoir pursuant to the existing U.S. storage permit with SWRCB and released to benefit Pyramid Lake fishes and to maintain minimum reservoir releases.

strain: A genetically distinct group of fish maintained as a self-sustaining, interbreeding population with definable characteristics, through either artificial or natural production (also called stock).

stranding: The isolation of an organism from its habitat, generally caused by an event such as high flows which then decline, intermittent streamflows, or changes in habitat.

stratification: The formation of separate water layers in a lake or reservoir. In thermal stratification, cold water, which is denser than warm water, sinks, forming a layer at the bottom. In density or salinity stratification, saline water that is denser than fresh water, sinks, forming a layer at the bottom.

streamflow: Water flowing within the bounds of a channel (mostly natural channels). also known generally as “flow.”

submergent vegetation: Plants that grow completely under the water except when flowering.

substrate: Surface on which a plant or animal grows or is attached.

sucker (fish): A freshwater fish belonging to the family Catostomidae, such as cui-ui or Tahoe sucker.

suspension: State in which particles are mixed with a fluid but are not dissolved, or a system made up of small particles kept dispersed by agitation.

T

Tahoe-Prosser Exchange Water: Project Water stored in Prosser Creek Reservoir pursuant to the existing United States storage license with SWRCB and released pursuant to TPEA to make up for Floriston Rate Water previously released to maintain minimum releases from Lake Tahoe.

TCID Private Water: Private Water stored pursuant to the water rights of TCID in Donner Lake for the benefit of TCID.

terminus: The end point of a stream or river, e.g., Pyramid Lake is the terminus of the Truckee River.

terrestrial: Growing or living on land.

thermal stratification: Lake or reservoir waters of different temperature have different density that become partitioned in the water column seasonally.

thermocline: Boundary layer in a thermally stratified lake in which the temperature changes sharply with depth.

threatened species: In accordance with the federal Endangered Species Act of 1973, as amended, any species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

threshold of significance: A quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined.

TMWA Emergency Credit Water: A water category under TROA used for M&I purposes in TMWA's service area during a drought or emergency.

TMWA Interim Storage: Private Water stored in Stampede and Boca Reservoirs in accordance with the Interim Storage Agreement

TMWA M&I Credit Water (Firm and Non-Firm): A water category under TROA used for M&I purposes in TMWA's service area during a drought or emergency.

TMWA Private Water: Private Water stored pursuant to the water rights of TMWA in Independence Lake and Donner Lake for M&I use in TMW's service area (generally Truckee Meadows).

tolerance limits: The upper or lower level of an environmental condition between which an organism is able to survive.

topographic: Measuring and displaying on maps of physical surface features such as rivers, mountains, or roads.

total dissolved solids (TDS): The total concentration of solids (or salts) dissolved in water.

total storage: The volume of a reservoir up to the maximum controllable storage, including dead storage.

traditional cultural property: A site or resource that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community.

transmontane freshwater marsh: Freshwater marsh found in low to mild elevations, subject to low temperatures in the winter, often found adjacent to rivers.

tributary: River or stream flowing into a larger river or stream.

TROA: For the purposes of this final EIS/EIR, TROA refers to both the Negotiated Agreement and the proposed action.

Truckee River basin: Hydrologically and for the purpose of defining the study area, the land area that drains naturally to the Truckee River and its tributaries, and into and including Lake Tahoe (Lake Tahoe basin) and Pyramid Lake; administratively and for the purpose of analysis in this document, the land area that drains naturally to the Truckee River and its tributaries and into Pyramid Lake, but excluding the Lake Tahoe basin.

***Truckee River General Electric* court**: The U.S. District Court that supervises and administers the *Truckee River General Electric* decree.

Truckee River reservoirs: As defined in P.L. 101-618, "the storage provided by the dam at the outlet of Lake Tahoe, Boca Reservoir, Prosser Creek Reservoir, Martis Creek Reservoir, and Stampede Reservoir." Also called Federal reservoirs.

Truckee River system: Includes the Truckee River, all tributaries to the Truckee River, and all reservoirs and lakes associated with the Truckee River, sometimes used interchangeably with "Truckee River basin."

turbidity: Cloudiness of water, measured by how deeply light can penetrate into the water from the surface.

U

undercutting: A process in which a stream, through degradation, cuts its channel into the bed of the valley. Also a bank that has had its base cut away by water and overhangs part of the stream.

unregulated flow: For this document, unregulated flow in a stream means all water that: is runoff downstream from a reservoir; was passed through a reservoir without being stored; was released from a reservoir after being temporarily stored for the purpose of flood control; or was discharged from a tributary without a reservoir.

upper Truckee River basin: For this document, the upper Truckee River Basin is defined as the Truckee River basin in California.

usable storage: The storage normally available between the maximum controllable level and dead storage.

V

vertebrate: An animal having a segmented backbone or vertebral column. Includes mammals, birds, fish, amphibians, and reptiles.

vigor: Refers to plants with healthy growth.

W

water category: a type of water use or storage discussed in the Negotiated Agreement and this document. .

water bird: Any swimming or wading bird, such as loons, pelicans, cormorants, herons, or egrets.

water demand: Refers to requirements for delivery of water, such as M&I, irrigation, hydropower generation, and streamflow.

waterfowl: Swans, geese, and ducks, collectively.

water operations: The management of categories of water stored in a reservoir or flowing in a river to meet specific objectives (such as serve water rights, achieve streamflows), including such techniques as accumulating water in storage, exchanging water categories, and releasing water from storage.

Water Quality Credit Water: Water associated with water rights acquired under the Truckee River Water Quality Settlement Agreement.

Water Quality Water: Water associated with water rights acquired under the Truckee River Water Quality Settlement Agreement.

water table: The depth below which the ground is saturated with water.

water year: The 12-month period beginning October 1 of one year and ending September 30 of the following year and designated by the calendar year in which it ends.

wetland habitat: Habitat provided by standing water (less than 6-feet deep) with or without emergent and aquatic vegetation in wetlands.

wetlands: Lands transitional between aquatic and terrestrial systems where the water table is usually at or near the land surface or the land is covered by shallow water.

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Attachment A

P.L. 101-618

Public Law 101-618

An Act to provide for the settlement of water rights claims of the Fallon Paiute Shoshone Indian Tribes and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Title I—Fallon Paiute Shoshone Tribal Settlement Act

SEC. 101. SHORT TITLE.

This Act may be cited as the "Fallon Paiute Shoshone Indian Tribes Water Rights Settlement Act of 1990".

SEC. 102. SETTLEMENT FUND.

(A) There is hereby established within the Treasury of the United States, the "Fallon Paiute Shoshone Tribal Settlement Fund", hereinafter referred to in the Act as the "Fund".

(B) There is authorized to be appropriated to the Fallon Paiute Shoshone Tribal Settlement Fund $3,000,000 in fiscal year 1992, and $8,000,000 in each year for fiscal years 1993, 1994, 1995, 1996, and 1997 for a total sum of $43,000,000.

(C) (1) The income of the Fund may be obligated and expended only for the following purposes:

(a) Tribal economic development, including development of long-term profit-making opportunities for the Fallon Paiute Shoshone Tribes (hereinafter referred to in the Act as "Tribes") and its tribal members, and the development of employment opportunities for tribal members;

(b) Tribal governmental services and facilities;

(c) Per capita distributions to tribal members;

(d) Rehabilitation and betterment of the irrigation system on the Fallon Paiute Shoshone Indian Reservation (hereinafter referred to in the Act as "Reservation") not including lands added to the Reservation pursuant to the provisions of Public Law 95-337, 92 Stat. 455;

(e) Acquisition of lands, water rights or related property interests located outside the Reservation from willing sellers, and improvement of such lands;

(f) Acquisition of individually-owned land, water rights or related property interests on the Reservation from willing sellers, including those held in trust by the United States.

(2) Except as provided in subsection (C)(3) of this section, the principal of the Fund shall not be obligated or expended.

(3) In obligating and expending funds for the purposes set forth in subsections (C)(1)(d), (C)(1)(e) and (C)(1)(f) of this section, the Tribes may obligate and expend no more than 20 percent of the principal of the Fund, provided that any amounts so obligated and expended from principal must be restored to the principal from repayments of such amounts expended for the purposes identified in this subsection, or from income earned on the remaining principal.

(4) In obligating and expending funds for the purpose set forth in subsection (C)(1)(c), no more than twenty percent of the annual income from the Fund may be obligated or expended for the purpose of providing per capita payments to tribal members.

(D) The Tribes shall invest, manage, and use the monies appropriated to the Fund for the purposes set forth in this section in accordance with the plan developed in consultation with the Secretary under subsection (F) of this section.

(E) Upon the request of the Tribes, the Secretary shall invest the sums deposited in, accruing to, and remaining in the Fund, in interest-bearing deposits and securities in accordance with the Act of June 24, 1938, 52 Stat. 1037, 25 U.S.C. 162a, as amended. All income earned on such investments shall be added to the Fund.

(F) (1) The Tribes shall develop a plan, in consultation with the Secretary, for the investment, management, administration and expenditure of the monies in the Fund, and shall submit the plan to the Secretary. The plan shall set forth the manner in which such monies will be managed, administered and expended for the purposes outlined in subsection (C)(1) of this section. Such plan may be revised and updated by the Tribes in consultation with the Secretary.

(2) The plan shall include a description of a project for the rehabilitation and betterment of the existing irrigation system on the Reservation. The rehabilitation and betterment project shall include measures to increase the efficiency of irrigation deliveries. The Secretary may assist in the development of the rehabilitation and betterment project, and the Tribes shall use their best efforts to implement the project within four years of the time when appropriations authorized in subsection (B) of this section become available.

(3) Upon the request of the Tribes, the Secretary of the Treasury and the Secretary of the Interior shall make available to the Tribes, monies from the Fund to serve any of the purposes set forth in subsection (C)(1) of this section, except that no disbursement shall be made to the Tribes unless and until they adopt the plan required under this section.

(G) The provisions of section 7 of Public Law 93-134, 87 Stat. 468, as amended by section 4 of Public Law 97-458, 96 Stat. 2513, 25 U.S.C. 1407, shall apply to any funds which may be distributed per capita under subsection (C)(1)(c) of this section.

SEC. 103. ACQUISITION AND USE OF LANDS AND WATER RIGHTS.

(A) Title to all lands, water rights and related property interests acquired under section 102(C)(1)(e) within the counties of Churchill and Lyon in the State of Nevada, shall be held in trust by the United States for the Tribes as part of the Reservation, provided that no more than 2,415.3 acres of such acquired lands and no more than 8,453.55 acre feet per year of such water rights shall be held in trust by the United States and become part of the Reservation under this subsection.

(B) Any lands acquired under section 102(C)(1)(e) or (f) shall be subject to the provisions of section 20 of the Act of October 17, 1988, 102 Stat. 2485.

(C) (1) Total annual use of water rights appurtenant to the Reservation which are served by the Newlands Reclamation Project, including Newlands Reclamation Project water rights added to the Reservation under subsection (A) of this section, whether used on the Reservation or transferred and used off the Reservation pursuant to applicable law, shall not exceed the sum of:

(a) 10,587.5 acre feet of water per year, which is the quantum of water rights served by the Newlands Reclamation Project appurtenant to the Fallon Paiute Shoshone Indian Reservation lands that are currently served by irrigation facilities; and

(b) the quantum of active Newlands Reclamation Project water rights currently located outside of the Reservation that may be added to the Reservation or water rights which are acquired by the Secretary and exercised to benefit Reservation wetlands.

(2) The requirements of section 103(C)(1) shall not take effect until the Tribes agree to the limitations on annual use of water rights set forth in subsection (1) of this section.

(D) The Secretary is authorized and directed to reimburse non-Federal entities for reasonable and customary costs for delivery of Newlands Reclamation Project water to serve water rights added to the Reservation under subsection (A) of this section, and to enter into renewable contracts for the payment of such costs, for a term not exceeding forty years.

(E) Subject to the limitation on the quantum of use set forth in subsection (C) of this section, and applicable state law, all water rights appurtenant to the Reservation that are served by the Newlands Reclamation Project, including Newlands Reclamation Project water rights added to the Reservation under subsection (A) of this section, may be used for irrigation, fish and wildlife, municipal and industrial, recreation, or water quality purposes, or for any other beneficial use subject to applicable laws of the State of Nevada. Nothing in this subsection is intended to affect the jurisdiction of the Tribes or the State of Nevada, if any, over the use and transfer of water rights within the Reservation or off the Reservation, or to create any express or implied Federal reserved water right.

(F) (1) The Tribes are authorized to acquire by purchase, by exchange of lands or water rights, or interests therein, including those held in trust for the Tribes, or by gift, any lands or water rights, or interests therein, including those held in trust, located within the Reservation, for any of the following purposes:

(a) Consolidating Reservation landholdings or water rights, including those held in trust;

(b) Eliminating fractionated heirship interests in Reservation lands or water rights, including those held in trust;

(c) Providing land or water rights for any tribal program;

(d) Improving the economy of the Tribes and the economic status of tribal members through the development of industry, recreational facilities, housing projects, or other means; and

(e) General rehabilitation and enhancement of the total resource potential of the Reservation: Provided, That any water rights shall be transferred in compliance with applicable state law.

(2) Title to any lands or water rights, or interests therein, acquired by the Tribes within the counties of Churchill and Lyon in the State of Nevada under the authority of this subsection shall be held by the United States in trust for the Tribes.

SEC. 104. RELEASE OF CLAIMS.

(A) (1) The Secretary of the Treasury and the Secretary of the Interior shall not disburse any monies from the Fund until such time as the following conditions have been met—

(a) the Tribes have released any and all claims they may have against the United States resulting from any failure of the United States to comply with section 7 of Public Law 95-337, 92 Stat. 457;

(b) the Tribes have dismissed with prejudice their claims in Northern Paiute Nation v. United States, Docket No. 87-A, United States Claims Court;

(c) the Tribes have agreed to accept and abide by the limitation on use of water rights served by the Newlands Reclamation Project on the Reservation, as set forth in section 103(C);

(d) the Tribes have dismissed, without prejudice, their claims in Pyramid Lake Paiute Tribe of Indians v. Lujan, No. R-85-197 (D.Nev.) and their objections to the Operating Criteria and Procedures for the Newlands Reclamation Project adopted by the Secretary on April 15, 1988, provided that such dismissal shall not prejudice in any respect the Tribes' right to object in any administrative or judicial proceeding to such Operating Criteria and Procedures, or any revisions thereto, or to assert that any Operating Criteria and Procedures should be changed due to new information, changes in environmental circumstance, changes in project descriptions or other relevant considerations, in accordance with the requirements of all applicable court decrees and applicable statutory requirements;

(e) the Tribes agree to be bound by the plan developed and implemented by the Secretary in accordance with section 106 of this title; and

(f) (1) the Tribes agree to indemnify the United States against monetary claims by any landowners who may hold water rights on the Reservation as of the date of enactment of the Act and who may assert that the provisions of section 103(C) of this title effect an unlawful taking of their rights: Provided, That—

(i) the United States shall defend and resist any such claims at its own expense;

(ii) the Tribes shall be entitled to intervene in any administrative or judicial proceeding on such claims; and

(iii) the United States shall not compromise or settle any such claims without the consent of the Tribes.

(2) The provisions of this section shall not be construed as:

(i) implying that section 103(C) unlawfully takes any water rights;

(ii) conferring jurisdiction on any court or other tribunal to adjudicate any such taking claims;

(iii) waiving any immunities of the United States or the Tribes; or

(iv) otherwise establishing or enhancing any claims to water rights or for the unlawful taking of such rights.

(2) If the appropriations authorized in section 102(B) are not appropriated by the Congress, it shall be deemed that the conditions set forth in this Act have not been satisfied, and the Tribes may rescind their release of claims under this section and its agreement under subsection (c) of this section.

(3) Upon the appropriation of monies authorized in section 102(B) of this Act, and the allocation of such monies to the Fund, section 7 of Public Law 95-337, 92 Stat. 457, shall be repealed.

SEC. 105. LIABILITY OF THE UNITED STATES.

(A) Except with regard to the responsibilities assumed by the United States under section 102(E), and those set forth in section 1301 of the Act of February 12, 1929, 45 Stat. 1164, as amended, U.S.C. 161a, the United States shall not bear any obligation or liability regarding the investment, management, or use of funds by the Tribes.

(B) Except with regard to the responsibilities assumed by the United States under section 102(B), section 102(F)(3), section 103(A), section 103(D), section 103(F)(2), section 104(A)(1), and section 106, the United States shall not bear any obligation or liability for the implementation of the provisions of this Act.

SEC. 106. PLAN FOR THE CLOSURE OF TJ DRAIN.

(A) The Secretary, in consultation with the Tribes and in accordance with applicable law, shall develop and implement a plan for the closure, including if appropriate, modification of components, of the TJ drain system, including the main TJ drain, the TJ-1 drain and the A drain and its sublaterals, in order to address any significant environmental problems with that system and its closure.

(B) The plan shall include measures to provide necessary substitute drainage in accordance with Bureau of Reclamation standards for reservation lands in agricultural production as of the 1990 irrigation season that are served by that system, unless the Tribes and the Secretary agree otherwise.

(C) Implementation of the plan shall not interfere with ongoing agricultural operations.

(D) The United States shall bear all costs for developing and implementing the plan.

(E) There is authorized to be appropriated such sums as may be necessary to carry out the provisions of this section.

SEC. 107. DEFINITIONS.

For the purpose of this title, and for no other purposes—

(A) the term "Fallon Paiute Shoshone Tribal Settlement Fund" or "Fund" means the Fund established under section 102A of this Act to enable the Fallon Paiute Shoshone Tribes to carry out the purposes set forth in section 102(C)(1) of this title;

(B) the term "income" means all interest, dividends, gains and other earnings resulting from the investment of the principal of the Fallon Paiute Shoshone Tribal Settlement Fund, and the earnings resulting from the investment of such income;

(C) the term "principal" means the total sum of monies appropriated to the Fallon Paiute Shoshone Tribal Settlement Fund under section 102(B) of this Act;

(D) the term "Reservation" means the lands set aside for the benefit of the Fallon Paiute Shoshone Tribes by the orders of the Department of the Interior of April 20, 1907, and November 21, 1917, as expanded and confirmed by the Act of August 4, 1978, Public Law 95-337, 92 Stat. 457;

(E) the term "Secretary" means the Secretary of the Department of the Interior;

(F) the term "tribal members" means the enrolled members of the Fallon Paiute Shoshone Tribes; and

(G) the term "Tribe" means the Fallon Paiute–Shoshone Tribe.

Title II—Truckee–Carson–Pyramid Lake Water Settlement

SEC. 201. SHORT TITLE.

This title may be cited as the "Truckee–Carson–Pyramid Lake Water Rights Settlement Act".

SEC. 202. PURPOSES.

The purposes of this title shall be to—

(a) provide for the equitable apportionment of the waters of the Truckee River, Carson River, and Lake Tahoe between the State of California and the State of Nevada;

(b) authorize modifications to the purposes and operation of certain Federal Reclamation project facilities to provide benefits to fish and wildlife, municipal, industrial, and irrigation uses, and recreation;

(c) authorize acquisition of water rights for fish and wildlife;

(d) encourage settlement of litigation and claims;

(e) fulfill Federal trust obligations toward Indian tribes;

(f) fulfill the goals of the Endangered Species Act by promoting the enhancement and recovery of the Pyramid Lake fishery; and

(g) protect significant wetlands from further degradation and enhance the habitat of many species of wildlife which depend on those wetlands, and for other purposes.

SEC. 203. DEFINITIONS.

For the purposes of this title:

(a) the term "Alpine court" means the court having continuing jurisdiction over the Alpine decree;

(b) the term "Alpine decree" means the final decree of the United States District Court for the District of Nevada in United States of America v. Alpine Land and Reservoir Company, Civ. No. D-183, entered December 18, 1980, and any supplements thereto;

(c) the term “Carson River basin” means the area which naturally drains into the Carson River and its tributaries and into the Carson River Sink, but excluding the Humboldt River drainage area;

(d) the term “Fallon Tribe” means the Fallon Paiute–Shoshone Tribe;

(e) the term “Lahontan Valley wetlands” means wetland areas associated with the Stillwater National Wildlife Refuge, Stillwater Wildlife Management Area, Carson Lake and Pasture, and the Fallon Indian Reservation;

(f) the term “Lake Tahoe basin” means the drainage area naturally tributary to Lake Tahoe, including the lake, and including the Truckee River upstream of the intersection between the Truckee River and the western boundary of Section 12, Township 15 North, Range 16 East, Mount Diablo Base and Meridian;

(g) the term “Lower Truckee River” means the Truckee River below Derby Dam;

(h) the term “Operating Agreement” means the agreement to be negotiated between the Secretary and the States of California and Nevada and others, as more fully described in section 205 of this title;

(i) the term “Orr Ditch court” means the court having continuing jurisdiction over the Orr Ditch decree;

(j) the term “Orr Ditch decree” means the decree of the United States District Court for the District of Nevada in United States of America v. Orr Water Ditch Company, et al.—in Equity, Docket No. A3, including, but not limited to the Truckee River Agreement;

(k) the term “Preliminary Settlement Agreement as Modified by the Ratification Agreement” means the document with the title “Ratification Agreement by the United States of America”, including Exhibit “1” attached thereto, submitted to the Chairman, Subcommittee on Water and Power, Committee on Energy and Natural Resources, United States Senate, by the Assistant Secretary for Water and Science, United States Department of the Interior, on August 2, 1990, as may be amended under the terms thereof. A copy of this agreement is included in the report of the Committee on Energy and Natural Resources as Appendix 1 to the Committee’s report accompanying S. 1554;

(l) the term “Pyramid Lake fishery” means two fish species found in Pyramid Lake, the cui-ui (Chasmistes cujus) and the Lahontan cutthroat trout (Salmo clarki henshawi);

(m) the term “Pyramid Lake Tribe” means the Pyramid Lake Paiute Tribe;

(n) the term “Secretary” means the Secretary of the Interior;

(o) the term “Truckee River Agreement” means a certain agreement dated July 1, 1935 and entered into by the United States of America, Truckee–Carson Irrigation District, Washoe County Water Conservation District, Sierra Pacific Power Company, and other users of the waters of the Truckee River;

(p) the term “Truckee River basin” means the area which naturally drains into the Truckee River and its tributaries and into Pyramid Lake, including that lake, but excluding the Lake Tahoe basin;

(q) the term “Truckee River General Electric court” means the United States District Court for the Eastern District of California court having continuing jurisdiction over the Truckee River General Electric decree;

(r) the term “Truckee River General Electric decree” means the decree entered June 4, 1915, by the United States District Court for the Northern District of California in United States of America v. Truckee River General Electric Co., No. 14861, which case was transferred to the United States District Court for the Eastern District of California on February 9, 1968, and is now designated No. S-643;

(s) the term “Truckee River reservoirs” means the storage provided by the dam at the outlet of Lake Tahoe, Boca Reservoir, Prosser Creek Reservoir, Martis Reservoir, and Stampede Reservoir; and

(t) the term "1948 Tripartite Agreement" means the agreement between the Truckee–Carson Irrigation District, the Nevada State Board of Fish and Game Commissioners, and the United States Fish and Wildlife Service regarding the establishment, development, operation, and maintenance of Stillwater National Wildlife Refuge and Management Area, dated November 26, 1948.

SEC. 204. INTERSTATE ALLOCATION.

(a) **CARSON RIVER.—**

(1) The interstate allocation of waters of the Carson River and its tributaries represented by the Alpine decree is confirmed.

(2) The allocations confirmed in paragraph (1) of this subsection shall not be construed as precluding, foreclosing, or limiting the assertion of any additional right to the waters of the Carson River or its tributaries which were in existence under applicable law as of January 1, 1989, but are not recognized in the Alpine decree. The allocation made in paragraph (1) of this subsection shall be modified to accommodate any such additional rights, and such additional rights, if established, shall be administered in accordance with the terms of the Alpine decree; except that the total amount of such additional allocations shall not exceed 1,300 acre-feet per year by depletion for use in the State of California and 2,131 acre-feet per-year by depletion for use in the State of Nevada. This paragraph shall not be construed to allow any increase in diversions from the Carson River or its tributaries beyond those in existence on December 31, 1992.

(3) If, on or after the date of enactment of this title, all or any portion of the effluent imported from the Lake Tahoe basin into the watershed of the Carson River in California is discontinued by reason of a change in the place of the disposal of such effluent, including underground disposal, to the Truckee River basin or the Lake Tahoe basin, in a manner which results in increasing the available supply of water in the Nevada portion of the Truckee River basin, the allocation to California of the water of the West Fork of the Carson River and its tributaries for use in the State of California shall be augmented by an amount of water which may be diverted to storage, except that such storage:

(A) shall not interfere with other storage or irrigation rights of Segments 4 and 5 of the Carson River, as defined in the Alpine decree;

(B) shall not cause significant adverse effects to fish and wildlife;

(C) shall not exceed 2,000 acre-feet per year, or the quantity by which the available annual supply of water to the Nevada portion of the Truckee River basin is increased, whichever is less; and

(D) shall be available for irrigation use in that or subsequent years, except that the cumulative amount of such storage shall not exceed 2,000 acre-feet in any year.

(4) Storage specified by paragraph (3) of this subsection shall compensate the State of California for any such discontinuance as referred to in such paragraph: Provided, That the augmentation authority by such paragraph shall be used only on lands having appurtenant Alpine decree rights. Use of effluent for the irrigation of lands with appurtenant Alpine decree rights shall not result in the forfeiture or abandonment of all or any part of such appurtenant Alpine decree rights, but use of such wastewater shall not be deemed to create any new or additional water rights. Nothing in this title shall be construed as prohibiting the use of all or any portion of such effluent on any lands within the State of California. Any increased water delivered to the Truckee River shall only be available to satisfy existing rights under the Orr Ditch decree or, as appropriate, to augment inflows to Pyramid Lake.

(5) Nothing in this title shall foreclose the right of either State to study, either jointly or individually, the use of Carson River surface water, which might otherwise be lost to beneficial use, to enable conjunctive use of groundwater. For purposes of this paragraph, beneficial use shall include the use of water on wetlands or wildlife areas within the Carson River basin, as may be permitted under State law.

(6) Nothing in this title shall preclude the State of Nevada, agencies of the State of Nevada, private entities, or individuals from constructing storage facilities within the Carson River basin, except that such storage facilities shall be constructed and operated in accordance with all applicable State and Federal laws and shall not result in the inundation of any portion of the East Fork of the Carson River within California.

(7) The right of any water right owner to seek a change in the beneficial use of water from irrigation to storage for municipal and industrial uses or other beneficial uses, as determined by applicable State law, is unaffected by this title. Water stored for municipal and industrial uses may be diverted to storage in a given year and held for municipal and industrial uses in that year or subsequent years. Such changes and storage shall be in accordance with the Alpine decree and applicable State law.

(8) Interbasin transfers of Carson River water shall be allowed only as provided by applicable State law.

(b) **LAKE TAHOE.—**

(1) Total annual gross diversions for use within the Lake Tahoe basin from all natural sources, including groundwater, and under all water rights in the basin shall not exceed 34,000 acre-feet per year. From this total, 23,000 acre-feet per year are allocated to the State of California for use within the Lake Tahoe basin and 11,000 acre-feet per year are allocated to the State of Nevada for use within the Lake Tahoe basin. Water allocated pursuant to this paragraph may, after use, be exported from the Lake Tahoe basin or reused.

(2) Total annual gross diversions for use allocated pursuant to paragraph (1) of this subsection shall be determined in accordance with the following conditions:

(A) Water diverted and used to make snow within the Lake Tahoe basin shall be charged to the allocation of each State as follows:

(i) the first 600 acre-feet used in California each year and the first 350 acre-feet used each year in Nevada shall not be charged to the gross diversion allocation of either State;

(ii) where water from the Lake Tahoe basin is diverted and used to make snow in excess of the amounts specified in clause (i) of this subparagraph, the percentage of such diversions chargeable to the gross diversion allocations of each State shall be specified in the Operating Agreement; and

(iii) the provisions of paragraph 204(b)(1) notwithstanding, criteria for charging incidental runoff, if any, into the Carson River basin or the Truckee River basin, including the amount and basin to be charged, from use of water in excess of the amount specified in clause (i) of this subparagraph, shall be specified in the Operating Agreement. The amounts of such water, if any, shall be included in each State's report prepared pursuant to paragraph 204(d)(1) of this title.

(B) Unmetered diversion or extraction of water by residences shall, for the purpose of calculating the amount of either State's gross diversion, be conclusively presumed to utilize a gross diversion of four-tenths of one acre-foot per residence per year.

(C) Where water is diverted by a distribution system, as defined in clause (iii) of this subparagraph, the amount of such water that shall be charged to the gross diversion allocation of either California or Nevada shall be measured as follows:

(i) where a water distribution system supplies any municipal, commercial, and/or industrial delivery points (not including fire hydrants, flushing or cleaning points), any one of which is not equipped with a water meter, the gross diversion attributed to that water distribution system shall be measured at the point of diversion or extraction from the source; or

(ii) where all municipal, commercial, and industrial delivery points (not including fire hydrants, flushing or cleaning points) within a water distribution system are equipped with a water meter, the gross diversion attributed to that water distribution system may be measured as the sum of all amounts of water supplied to each such delivery point, provided there is in effect for such water distribution system a water conservation and management plan. Such plan may be either an individual, local plan or an area-wide, regional, or basin-wide plan, except that such plan must be reviewed and found to be reasonable under all relevant circumstances by the State agency responsible for administering water rights, or any other entity delegated such responsibility under State law. Such plan must be reviewed every five years by the agency which prepared it, and implemented in accordance with its adopted schedule, and shall include all elements required by applicable State law and the following:

(a) an estimate of past, current, and projected water use and, to the extent records are available, a segregation of those uses between residential, industrial, and governmental uses;

(b) identification of conservation measures currently adopted and in practice;

(c) a description of alternative conservation measures, including leak detection and prevention and reduction in unaccounted for water, if any, which would improve the efficiency of water use, with an evaluation of the costs, and significant environmental and other impacts of such measures;

(d) a schedule of implementation for proposed actions as indicated by the plan;

(e) a description of the frequency and magnitude of supply deficiencies, including conditions of drought and emergency, and the ability to meet short-term deficiencies;

(f) an evaluation of management of water system pressures and peak demands;

(g) an evaluation of incentives to alter water use practices, including fixture and appliance retrofit programs;

(h) an evaluation of public information and educational programs to promote wise use and eliminate waste;

(i) an evaluation of changes in pricing, rate structure, and regulations; and

(j) an evaluation of alternative water management practices, taking into account economic and non-economic factors (including environmental, social, health, and customer impact), technological factors, and incremental costs of additional supplies.

(iii) As used in this subparagraph, the term “water distribution system” means a point or points of diversion from a water supply source or sources, together with associated piping, which serve a number of identifiable delivery points: Provided, That the distribution system is not operationally interconnected with other distribution systems (except for emergency cross-ties) which are served from other points of diversion. An agency serving municipal and industrial water may have more than one water distribution system.

(iv) If a program for the review of water conservation and management plans as provided in clause (ii) of this subparagraph is not in effect in that portion of the Lake Tahoe basin within a State, all gross diversions within such State shall be measured at the point of diversion.

(D) For the purpose of this subsection, water inflow and infiltration to sewer lines shall not be considered a diversion of water, and such water shall not be charged to the gross diversion allocation of either State.

(E) Regulation of streamflow for the purpose of preserving or enhancing instream beneficial uses shall not be charged to the gross diversion allocation of either State.

(3) The transbasin diversions from the Lake Tahoe basin in Nevada and California identified in this paragraph may be continued, to the extent that such diversions are recognized as vested or perfected rights under the laws of the State where each diversion is made. Unless otherwise provided in this subsection, such diversions are in addition to the other allocations made by this subsection. Such transbasin diversions are the following:

(A) diversion of a maximum of 3,000 acre-feet per year from Marlette Lake for use in Nevada;

(B) diversion of a maximum of 561 acre-feet per year from Lake Tahoe for use in Nevada as set forth in Nevada Permit to Appropriate Water No. 23017, except that such diversion shall count against the allocation to Nevada made by this subsection;

(C) diversion of water from Echo Lake for use in California, pursuant to rights vested under California law; and

(D) diversion of water from North Creek as set forth in the State of Nevada Certificate of Appropriation of Water No. 4217.

The transbasin diversions identified in subparagraph (A), (C), and (D) of this paragraph may be transferred, for use only in the State where the recognized transbasin diversion exists, by lease of the right of use or by conveyance of the right, to the extent to which the right is vested or has been perfected.

Any such transfer shall be subject to the applicable laws of the State in which the right is vested or perfected. The transbasin diversion described in subparagraph (B) of this paragraph may be transferred in accordance with State law. With the exception of the transbasin diversion described in subparagraph (B), all water made available for use within the Lake Tahoe basin as a result of any such transfer shall not be charged against the allocations made by this section, and such water may be depleted.

(c) **TRUCKEE RIVER.—**

(1) There is allocated to the State of California the right to divert or extract, or to utilize any combination thereof, within the Truckee River basin in California the gross amount of 32,000 acre-feet of water per year from all natural sources, including both surface and groundwater, in the Truckee River basin subject to the following terms and conditions:

(A) maximum annual diversion of surface supplies shall not exceed 10,000 acre-feet; except that all diversions of surface supplies for use within California shall be subject to the right to water for use on the Pyramid Lake Indian Reservation in amounts as provided in Claim Nos. 1 and 2 of the Orr Ditch decree, and all such diversions initiated after the date of enactment of this title shall be subject to the right of the Sierra Pacific Power Company or its successor to divert forty (40) cubic feet per second of water for municipal, industrial, and domestic use in the Truckee Meadows in Nevada, as such right is more particularly described in Article V of the Truckee River Agreement;

(B) all new wells drilled after the date of enactment of this title shall be designed to minimize any short-term reductions of surface streamflows to the maximum extent feasible;

(C) any use within the State of Nevada of any Truckee River basin groundwater with a point of extraction within California shall be subordinate to existing and future uses in California, and any such use of water in Nevada shall cease to the extent that it causes extractions to exceed safe yield;

(D) except as otherwise provided in this paragraph, the extraction and use of groundwater pursuant to this subsection shall be subject to all terms and conditions of California law;

(E) determination of safe yield of any groundwater basin in the Truckee River basin in California shall be made by the United States Geological Survey in accordance with California law;

(F) water shall not be diverted from within the Truckee River basin in California for use in California outside the Truckee River basin;

(G) if the Tahoe-Truckee Sanitation Agency or its successor (hereafter "TTSA") changes in whole or in part the place of disposal of its treated wastewater to a place outside the area between Martis Creek and the Truckee River below elevation 5800 NGVD Datum, or changes the existing method of disposing of its wastewater, which change in place or method of disposal reduces the amount or substantially changes the timing of return flows to the Truckee River of the treated wastewater, TTSA shall:

(i) acquire or arrange for the acquisition of preexisting water rights to divert and use water of the Truckee River or its tributaries in California or Nevada and discontinue the diversion and use of water at the preexisting point of diversion and place of use under such rights in a manner legally sufficient to offset such reduction in the amount of return flow or change in timing, and California’s Truckee River basin gross diversion allocation shall continue to be charged the amount of the discontinued diversion; or

(ii) in compliance with California law, extract and discharge into the Truckee River or its tributaries an amount of Truckee River basin groundwater in California sufficient to offset such reduction or change in timing, subject to the following conditions:

(a) extraction and discharge of Truckee River Basin groundwater for purposes of this paragraph shall comply with the terms and conditions of subparagraphs 204(c)(1)(B) and (D) and shall not be deemed use of Truckee River basin groundwater within the State of Nevada within the meaning of subparagraph 204(c)(1)(D); and

(b) California’s Truckee River basin gross diversion allocation shall be charged immediately with the amount of groundwater discharged and, when California’s Truckee River Basin gross diversion allocation equals 22,000 acre-feet or when the total of any reductions resulting from the changes in the place or method of disposal exceed 1000 acre-feet, whichever occurs first, the California Truckee River basin gross diversion allocation shall thereafter be charged with an additional amount of water required to compensate for the return flows which would otherwise have accrued to the Truckee River basin from municipal and industrial use of the discharged groundwater. In no event shall the total of California’s Truckee River gross diversions and extractions exceed 32,000 acre-feet.

(iii) For purposes of this paragraph, the existing method of disposal shall include, in addition to underground leach field disposal, surface spray or sprinkler infiltration of treated wastewater on the site between Martis Creek and the Truckee River referred to in this subsection.

(iv) The provisions of this paragraph requiring the acquisition of water rights or the extraction and discharge of groundwater to offset reductions in the amount or timing of return flow to the Truckee River shall also apply to entities other than TTSA that may treat and dispose of wastewater within the California portion of the Truckee River basin, but only if and to the extent that the treated wastewater is not returned to the Truckee River or its tributaries, as to timing and amount, substantially as if the wastewater had been treated and disposed of by TTSA in its existing place of disposal and by its existing method of disposal. The provisions of this paragraph shall not apply to entities treating and disposing of the wastewater from less than eight dwelling units.

(H) All uses of water for commercial, irrigated agriculture within the Truckee River basin within California initiated after the date of enactment of this title shall not impair and shall be junior and subordinate to all beneficial uses in Nevada, including, but not limited to, the use of water for the maintenance and preservation of the Pyramid Lake fishery. As used in this provision, the term “commercial, irrigated agriculture” shall include traditional commercial irrigated farming operations but shall not include the following uses: irrigated golf courses and other recreational facilities, commercial nurseries, normal silvicultural activities other than commercial tree farms, irrigation under riparian rights on land irrigated at any time prior to the date of enactment of this title, lawns and ornamental shrubbery on parcels which include commercial, residential, governmental, or public buildings, and irrigated areas of two acres or less on parcels which include a residence.

(I) Water diverted within the Truckee River basin and used to make snow shall be charged to California's Truckee River allocation as follows:

(i) the first 225 acre-feet used in California each year shall not be charged to the gross diversion allocation;

(ii) where water from the Truckee River basin is diverted and used to make snow in excess of the amounts specified in clause (i) of this subparagraph, the percentage of such diversions chargeable to such allocation shall be specified in the Operating Agreement; and

(iii) the provision of subparagraph 204(c)(1)(F) notwithstanding, criteria for charging incidental runoff, if any, into the Lake Tahoe basin, including the amount and basin to be charged, from use of water in excess of the amount specified in clause (i) of this subparagraph, shall be specified in the Operating Agreement. The amounts of such water, if any, shall be included in each State's report prepared pursuant to paragraph 204(d)(1).

(J) Unmetered diversion or extraction of water by residences, shall, for the purpose of calculating the amount of California's gross diversion, be conclusively presumed to utilize a gross diversion of four-tenths of one acre-foot per residence per year.

(K) For the purposes of this subsection, water inflow and infiltration to sewer lines is not a diversion of water, and such water shall not be charged to California's Truckee River basin allocation.

(2) There is additionally allocated to California the amount of water decreed to the Sierra Valley Water Company by judgment in the case of United States of America v. Sierra Valley Water Company, United States District Court for the Northern District of California, Civil No. 5597, as limited by said judgment.

(3) There is allocated to the State of Nevada all water in excess of the allocations made in paragraph 204(c)(1) and (2) of this title.

(4) The right to water for use on the Pyramid Lake Indian Reservation in the amounts provided in Claim Nos. 1 and 2 of the Orr Ditch decree is recognized and confirmed. In accordance with and subject to the terms of the Orr Ditch decree and applicable law, the United States, acting for and on behalf of the Pyramid Lake Tribe, and with the agreement of the Pyramid Lake Tribe, or the Pyramid Lake Tribe shall have the right to change points of diversion, place, means, manner, or purpose of use of the water so decreed on the reservation.

(d) **COMPLIANCE.—**

(1) Compliance with the allocations made by this section and with other provisions of this section applicable to each State shall be assured by each State. With the third quarter following the end of each calendar year, each State shall publish a report of water use providing information necessary to determine compliance with the terms and conditions of this section.

(2) The United States District Courts for the Eastern District of California and the District of Nevada shall have jurisdiction to hear and decide any claims by any aggrieved party against the State of California, State of Nevada, or any other party where such claims allege failure to comply with the allocations or any other provision of this section. Normal rules of venue and transfers of cases between Federal courts shall remain in full force and effect. Each State, by accepting the allocations under this section, shall be deemed to have waived any immunity from the jurisdiction of such courts.

(e) **FORFEITURE OR ABANDONMENT.—**The provisions of this section shall not be interpreted to alter or affect the applicability of the law of each State regarding the forfeiture for nonuse or abandonment of any water right established in accordance with State law, nor shall the forfeiture for nonuse or abandonment of water rights under the applicable law of each State affect the allocations to each State made by this title.

(f) **INTERSTATE TRANSFERS.—**

(1) Nothing in this title shall prevent the interstate transfer of water or water rights for use within the Truckee River basin, subject to the following provisions:

(A) Each such interstate transfer shall comply with all State law applicable to transfer of water or water rights, including but not limited to State laws regulating change in point of diversion, place of use, and purpose of use of water, except that such laws must apply equally to interstate and intrastate transfers.

(B) Use of water so transferred shall be charged to the allocation of the State wherein use of water was being made prior to the transfer.

(C) Subject to subparagraph (A) of this paragraph, in addition to the application of State laws intended to prevent injury to other lawful users of water, each State may, to the extent authorized by State law, deny or condition a proposed interstate transfer of water or water rights having a source within the Truckee River basin where the State agency responsible for administering water rights finds, on the basis of substantial evidence that the transfer would have substantial adverse impacts on the environment or overall economy of the area from which the use of the water or water right would be transferred.

(D) Nothing in this paragraph shall be construed to limit the jurisdiction of any court to review any action taken pursuant to this paragraph.

(2) The jurisdiction of the Alpine court to administer, inter alia, interstate transfers of water or water rights on the Carson River under the Alpine decree, pursuant to jurisdiction reserved therein, including any amendment or supplement thereto, is confirmed. Each State may intervene of right in any proceeding before the Alpine court wherein the reserved jurisdiction of that court is invoked with respect to an interstate transfer of water or water rights, and may report to the court findings or decisions concerning the proposed change which have been made by the State agency responsible for administering water rights under any State law applicable to transfers or change in the point of diversion, purpose of use, or place of use of water.

(3) This subsection shall not be construed to authorize the State of California or the State of Nevada to deny or condition a transfer application made by the United States or its agencies if such denial or conditioning would be inconsistent with any clear congressional directive.

(g) **USE OF WATER BY THE UNITED STATES.—**Use of water by the United States of America or any of its agencies or instrumentalities, or by any Indian Tribe shall be charged to the allocation of the State wherein the use is made, except as otherwise provided in subsection (f) of this section.

(h) **COURT DECREES.—**Nothing in this section shall be construed as modifying or terminating any court decree, or the jurisdiction of any court.

(i) **PLACE OF USE TO DETERMINE ALLOCATION.—**Water diverted or extracted in one State for use in the other shall be charged to the allocation under this section of the State in which the water is used, except as otherwise provided in subsection (f) of this section.

(j) **APPLICABILITY OF STATE LAW.—**Nothing in this section shall be construed to alter the applicability of State law or procedures to the water allocated to the States hereunder.

SEC. 205. TRUCKEE RIVER WATER SUPPLY MANAGEMENT.

(a) **OPERATING AGREEMENT.—**

(1) The Secretary shall negotiate an operating agreement (hereafter “Operating Agreement”) with the State of Nevada and the State of California, after consultation with such other parties as may be designated by the Secretary, the State of Nevada or the State of California.

(2) The Operating Agreement shall provide the operation of the Truckee River reservoirs and shall ensure that the reservoirs will be operated to:

(A) satisfy all applicable dam safety and flood control requirements;

(B) provide for the enhancement of spawning flows available in the Lower Truckee River for the Pyramid Lake fishery in a manner consistent with the Secretary's responsibilities under the Endangered Species Act, as amended;

(C) carry out the terms, conditions, and contingencies of the Preliminary Settlement Agreement as modified by the Ratification Agreement. Mitigation necessary to reduce or avoid significant adverse environmental effects, if any, of the implementation of the Preliminary Settlement Agreement as modified by the Ratification Agreement, including instream beneficial uses of water within the Truckee River basin, shall be provided through one or more mitigation agreements which shall be negotiated and executed by the parties to the Preliminary Settlement Agreement as modified by the Ratification agreement and the appropriate agencies of the States of Nevada and California;

(D) ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of water rights in conformance with the Orr Ditch decree and Truckee River General Electric decree, except for those rights that are voluntarily relinquished by the parties to the Preliminary Settlement Agreement as modified by the Ratification Agreement, or by any other persons or entities, or which are transferred pursuant to State law; and

(E) minimize the Secretary's costs associated with operation and maintenance of Stampede Reservoir.

(3) The Operating Agreement may include, but is not limited to, provisions concerning the following subjects:

(A) administration of the Operating Agreement, including but not limited to establishing or designating an agency or court to oversee operation of the Truckee River and Truckee River reservoirs;

(B) means of assuring compliance with the provisions of the Preliminary Settlement Agreement as modified by the Ratification Agreement and the Operating Agreement;

(C) operations of the Truckee River system which will not be changed;

(D) operations and procedures for use of Federal facilities for the purpose of meeting the Secretary's responsibilities under the Endangered Species Act, as amended;

(E) methods to diminish the likelihood of Lake Tahoe dropping below its natural rim and to improve the efficient use of Lake Tahoe water under extreme drought conditions;

(F) procedures for management and operations at the Truckee River reservoirs;

(G) procedures for operation of the Truckee River reservoirs for instream beneficial uses of water within the Truckee River basin;

(H) operation of other reservoirs in the Truckee River basin to the extent that owners of affected storage rights become parties to the Operating Agreement; and

(I) procedures and criteria for implementing California's allocation of Truckee River water.

(4) To enter into effect, the Operating Agreement shall be executed by the Secretary, the State of Nevada, and the State of California and shall be submitted to the Orr Ditch court and the Truckee River General Electric court for approval of any necessary modifications in the provisions of the Orr Ditch decree or the Truckee River General Electric decree. Other affected parties may be offered the opportunity to execute the Operating Agreement.

(5) When an Operating Agreement meeting the requirements of this subsection has been approved by the Secretary, the State of Nevada, and the State of California, the Secretary, pursuant to title 5 of the United States Code, shall promulgate the Operating Agreement, together with such additional measures as have been agreed to by the Secretary, the State of Nevada, and the State of California, as the exclusive Federal regulations governing the Operating Agreement. The Secretary and the other signatories to the Operating Agreement shall, if necessary, develop and implement a plan to mitigate for any significant adverse environmental impacts resulting from the Operating Agreement. Any subsequent changes to the Operating Agreement must be adopted and promulgated in the same manner as the original Operating Agreement. Any changes

which affect the Preliminary Settlement Agreement as modified by the Ratification Agreement must also be approved by the signatories thereto. Judicial review of any such promulgation of the Operating Agreement may be had by any aggrieved party in the United States District Court for the Eastern District of California or the United States District Court for District of Nevada. A request for review must be filed not later than 90 days after the promulgation of the Operating Agreement becomes final, and by a person who participated in the administrative proceedings leading to the final promulgation. The scope of such review shall be limited to the administrative record and the standard of review shall be that prescribed in 5 U.S.C. 706(2)(A)-(D): Provided, That the limits on judicial review in this paragraph shall not apply to any claim based on the provisions of the Endangered Species Act, as amended.

(6) The Secretary shall take such other actions as are necessary to implement the Preliminary Settlement Agreement as modified by the Ratification Agreement and to implement the Operating Agreement, including entering into contracts for the use of space in Truckee River reservoirs for the purposes of storing or exchanging water, subject to the preconditions that the Sierra Pacific Power Company and the Secretary shall have executed a mutually satisfactory agreement for payment by Sierra Pacific Power Company of appropriate amounts for the availability and use of storage capacity in Stampede Reservoir and other reservoirs.

(7) As provided in the Preliminary Settlement Agreement as modified by the Ratification Agreement, firm and non-firm municipal and industrial credit water and the 7,500 acre-feet of fishery credit water in Stampede Reservoir to be available under worse than critical drought conditions shall be used only to supply municipal and industrial needs when drought conditions or emergency or repair conditions exist, or as may be required to be converted to fishery credit water. None of these quantities of water shall be used to serve normal year municipal and industrial needs except when an emergency or repair condition exists.

(8) Subject to the terms and conditions of the Preliminary Settlement Agreement as modified by the Ratification Agreement, all of the fishery credit water established thereunder shall be used by the United States solely for the benefit of the Pyramid Lake fishery.

(9) In negotiating the Operating Agreement, the Secretary shall satisfy the requirements of the National Environmental Policy Act and regulations issued to implement the provisions thereof. The Secretary may not become a party to the Operating Agreement if the Secretary determines that the effects of such action, together with cumulative effects, are likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any designated critical habitat of such species.

(b) **AUTHORIZATION FOR USE OF WASHOE PROJECT FACILITIES, TRUCKEE RIVER STORAGE FACILITIES, AND LAKE TAHOE DAM AND RESERVOIR.—**

(1) The Secretary is authorized to use Washoe Project facilities, Truckee River Storage Project facilities, and Lake Tahoe Dam and Reservoir for the storage of non-project water to fulfill the purposes of this title, including the Preliminary Settlement Agreement as modified by the Ratification Agreement and the Operating Agreement. The Secretary shall collect appropriate charges for such uses.

(2) Payments received by the Secretary pursuant to this subsection and paragraph 205(a)(6) shall be credited annually first to pay the operation and maintenance costs of Stampede Reservoir, then covered into the Lahontan Valley and Pyramid Lake Fish and Wildlife Fund created pursuant to subsection 206(f) of this title, with funds not needed for those purposes, if any, credited to the Reclamation Fund.

(3) The Secretary is authorized to enter into an interim agreement with the Sierra Pacific Power Company and Pyramid Lake Tribe to store water owned by Sierra Pacific Power Company in Stampede Reservoir, except that the amount of such storage shall not exceed 5,000 acre-feet on

September 1 of any year, such agreement shall be superseded by the Preliminary Settlement as modified by the Ratification Agreement and the Operating Agreement upon the entry into effect of those agreements.

(c) **RELEASE OF WASHOE PROJECT REPAYMENT OBLIGATION.—**The Secretary is released from any obligation to secure payment for the costs of constructing Washoe Project facilities, other than the power plant, including those specified in the Act of August 1, 1956, 70 Stat. 775, and under Federal reclamation laws, and such costs are hereby made non-reimbursable. Authority to construct a reservoir at the Watasheamu site, together with other necessary works for impoundment, diversion, and delivery of water, generation and transmission of hydroelectric power, and drainage of lands as conferred to the Secretary in the Act of August 1, 1956, 70 Stat. 775, is hereby revoked.

SEC. 206. WETLANDS PROTECTION.

(a) **AUTHORIZATION TO PURCHASE WATER RIGHTS.—**

(1) The Secretary is authorized and directed, in conjunction with the State of Nevada and such other parties as may provide water and water rights for the purposes of this section, to acquire by purchase or other means water and water rights, with or without the lands to which such rights are appurtenant, and to transfer, hold, and exercise such water and water rights and related interests to sustain, on a long-term average, approximately 25,000 acres of primary wetland habitat within the Lahontan Valley wetlands in accordance with the following provisions of this subsection:

(A) water rights acquired under this subsection shall, to the maximum extent practicable, be used for direct application to such wetlands and shall not be sold, exchanged, or otherwise disposed of except as provided by the National Wildlife Refuge Administration Act and for the benefit of fish and wildlife within the Lahontan Valley;

(B) the Secretary shall select from any water rights acquired pursuant to this subsection those water rights or portions thereof, if not all, that can be transferred to the wetlands referenced in this subsection consistent with subsection 209(b) of this title; and

(C) in implementing this subsection, the Secretary shall consult with the State of Nevada and affected interests. Those water rights or portions thereof, if not at all, which the Secretary selects for transfer shall then be transferred in accordance with applicable court decrees and State law, and shall be used to apply water directly to wetlands. No water rights shall be purchased, however, unless the Secretary expects that the water rights can be so transferred and applied to direct use to a substantial degree.

(2) Acquisition of water rights and related interests pursuant to this subsection shall be subject to the following conditions:

(A) water right purchases shall be only from willing sellers, but the Secretary may target purchases in areas deemed by the Secretary to be most beneficial to such a purchase program;

(B) water rights acquired by the Secretary shall be managed by the Secretary after consultation with the State of Nevada and affected interests, except that any water rights acquired for Fallon Indian Reservation wetlands shall be managed by the Secretary in consultation with the Fallon Tribe; and

(C) prior to acquiring any water or water rights in the State of California for the Lahontan Valley wetlands, the Secretary shall first consult with the Governor of California and shall prepare a record of decision on the basis of such consultations.

(3) The Secretary is authorized to:

(A) use, modify, or extend, on a non-reimbursable basis, Federal water diversion, storage, and conveyance systems to deliver water to wetlands referenced in paragraph (a)(1) of this subsection, including the Fernley Wildlife Management Area;

(B) reimburse non-Federal entities for reasonable and customary costs for operation and maintenance of the Newlands Project associated with the delivery of water in carrying out the provisions of this subsection; and

(C) enter into renewable contracts for the payment of reasonable and customary costs for operation and maintenance of the Newlands Project associated with the delivery of water acquired by the Secretary to benefit the Lahontan Valley wetlands. The contracts shall be for a term not exceeding 40 years. Any such contract shall provide that upon the failure of the Secretary to pay such charges, the United States shall be liable for their payment and other costs provided for in applicable provisions of the contract, subject to the availability of appropriations.

(4) Consistent with fulfillment of the subsection and not as a precondition thereto, the Secretary shall study and report on the social, economic, and environmental effects of the water rights purchase program authorized by this subsection and the water management measures authorized by subsection 206(c). This study may be conducted in coordination with the studies authorized by paragraph 207(c)(5) and subsection 209(c) of this title, and shall be reported to the Committees on Energy and Natural Resources, Environment and Public Works, and Appropriations of the Senate, and the Committees on Interior and Insular Affairs, Merchant Marine and Fisheries, and Appropriations of the House of Representatives not later than three years after the date of enactment of this Act.

(b) **EXPANSION OF STILLWATER NATIONAL WILDLIFE REFUGE.—**

(1) Notwithstanding any other provisions of law, the Secretary shall manage approximately 77,520 acres of Federal land in the State of Nevada, as depicted upon a map entitled "Stillwater National Wildlife Refuge," dated July 16, 1990, and available for inspection in appropriate offices of the United States Fish and Wildlife Service, as a unit of the National Wildlife Refuge System.

(2) The lands identified in paragraph (1) of this subsection shall be known as the Stillwater National Wildlife Refuge and shall be managed by the Secretary through the United States Fish and Wildlife Service for the purposes of:

(A) maintaining and restoring natural biological diversity within the refuge;

(B) providing for the conservation and management of fish and wildlife and their habitats within the refuge;

(C) fulfilling the international treaty obligations of the United States with respect to fish and wildlife; and

(D) providing opportunities for scientific research, environmental education, and fish and wildlife oriented recreation.

(3) The Secretary shall administer all lands, waters, and interests therein transferred under this title in accordance with the provisions of the National Wildlife Refuge System Administration Act of 1966, as amended, except that any activity provided for under the terms of the 1948 Tripartite Agreement may continue under the terms of that agreement until its expiration date, unless such agreement is otherwise terminated. The Secretary may utilize such additional statutory authority as may be available to the Secretary for the conservation and development of wildlife and natural resources, interpretive education, and outdoor recreation as the Secretary deems appropriate to carry out the purposes of this title.

(4) The Secretary is authorized to take such actions as may be necessary to prevent, correct, or mitigate for adverse water quality and fish and wildlife habitat conditions attributable to agricultural drain water originating from lands irrigated by the Newlands Project, except that nothing in this subsection shall be construed to preclude the use of the lands referred to in paragraph (1) of this subsection for Newlands Project drainage purposes. Such actions, if taken with respect to drains located on the Fallon Indian Reservation, shall be taken after consultation with the Fallon Tribe.

(5) Not later than November 26, 1997, after consultation with the State of Nevada and affected local interests, the Secretary shall submit to the Congress recommendations, if any, concerning:

(A) revisions in the boundaries of the Stillwater National Wildlife Refuge as may be appropriate to carry out the purposes of the Stillwater National Wildlife Refuge, and the provisions of subsection 206(a) of this section;

(B) transfer of any other United States Bureau of Reclamation withdrawn public lands within existing wildlife use areas in the Lahontan Valley to the United States Fish and Wildlife Service for addition to the National Wildlife Refuge System; and

(C) identification of those lands currently under the jurisdiction of the United States Fish and Wildlife Service in the Lahontan Valley that no longer warrant continued status as units of the National Wildlife Refuge System, with recommendations for their disposition.

(c) **WATER USE, NAVAL AIR STATION, FALLON, NEVADA.—**

(1) Not later than one year after the date of enactment of this title, the Secretary of the Navy, in consultation with the Secretary, shall undertake a study to develop land management plans or measures to achieve dust control, fire abatement and safety, and foreign object damage control on those lands owned by the United States within the Naval Air Station at Fallon, Nevada, in a manner that, to the maximum extent practicable, reduce direct surface deliveries of water. Water saved or conserved shall be defined as reduced project deliveries relative to the maximum annual headgate delivery entitlement associated with recently irrigated water-righted Navy lands. Recently irrigated water-righted Navy lands shall be determined by the Secretary of the Navy in consultation with the Secretary and the State of Nevada.

(2) The Secretary of the Navy shall promptly select and implement land management plans or measures developed by the study described in paragraph (1) of this subsection upon determining that water savings can be made without impairing the safety of operations at Naval Air Station, Fallon.

(3) All water no longer used and water rights no longer exercised by the Secretary of the Navy as a result of the implementation of the modified land management plan or measures specified by this subsection shall be managed by the Secretary for the benefit of fish and wildlife resources referenced in sections 206 and 207 of this title: Provided, That,

(A) as may be required to fulfill the Secretary’s responsibilities under the Endangered Species Act, as amended, the Secretary shall manage such water and water rights primarily for the conservation of the Pyramid Lake fishery and in a manner which is consistent with the Secretary’s responsibilities under the Endangered Species Act, as amended, and the requirements of applicable operating criteria and procedures for the Newlands Project; and

(B) the Secretary may manage such water or transfer temporarily or permanently some or all of the water rights no longer exercised by the Secretary of the Navy for the benefit of the Lahontan Valley wetlands so long as such management or transfers are consistent with applicable operating criteria and procedures.

(4) The Secretary of the Navy, in consultation with the Secretary of Agriculture and other interested parties, shall fund and implement a demonstration project and test site for the cultivation and development of low-precipitation grasses, shrubs, and other native or appropriate high-desert plant species, including the development of appropriate soil stabilization and land management techniques, with the goal of restoring previously irrigated farmland in the Newlands Project area to a stable and ecologically appropriate dryland condition.

(5) The Secretary shall reimburse appropriate non-Federal entities for reasonable and customary operation and maintenance costs associated with delivery of water that comes under the Secretary’s management pursuant to this subsection.

(6) In carrying out the provisions of this subsection, the Secretary of the Navy and the Secretary shall comply with all applicable provisions of State law and fulfill the Federal trust obligation to the Pyramid Lake Tribe and the Fallon Tribe.

(d) **STATE COST-SHARING.—**The Secretary is authorized to enter into an agreement with the State of Nevada for use by the State of not less than $9 million of State funds for water and water rights acquisitions and other protective measures to benefit Lahontan Valley wetlands. The Secretary's authority under subsection 206(a) is contingent upon the State of Nevada making such sums available pursuant to the terms of the agreement referenced in this subsection.

(e) **TRANSFER OF CARSON LAKE AND PASTURE.—**The Secretary is authorized to convey to the State of Nevada Federal lands in the area known generally as the "Carson Lake and Pasture," as depicted on the map entitled "Carson Lake Area," dated July 16, 1990, for use by the State as a State wildlife refuge. Prior to and as a condition of such transfer, the Secretary and the State of Nevada shall execute an agreement, in consultation with affected local interests, including the operator of the Newlands Project, ensuring that the Carson Lake and Pasture shall be managed in a manner consistent with applicable international agreements and designation of the area as a component of the Western Hemisphere Shorebird Reserve Network. The Secretary shall retain a right of reverter under such conveyance if the terms of the agreement are not observed by the State. The official map shall be on file with the United States Fish and Wildlife Service. Carson Lake and Pasture shall be eligible for receipt of water through Newlands Project facilities.

(f) **LAHONTAN VALLEY AND PYRAMID LAKE FISH AND WILDLIFE FUND.—**

(1) There is hereby established in the Treasury of the United States the "Lahontan Valley and Pyramid Lake Fish and Wildlife Fund" which shall be available for deposit of donations from any source and funds provided under subsections 205(a) and (b), 206(d), and subparagraph 208(a)(2)(C), if any, of this title.

(2) Moneys deposited into this fund shall be available for appropriation to the Secretary for fish and wildlife programs for Lahontan Valley consistent with this section and for protection and restoration of the Pyramid Lake fishery consistent with plans prepared under subsection 207(a) of this title. The Secretary shall endeavor to distribute benefits from this fund on an equal basis between the Pyramid Lake fishery and the Lahontan Valley wetlands, except that moneys deposited into the fund by the State of Nevada or donated by non-Federal entities or individuals for express purposes shall be available only for such purposes and may be expended without further appropriation, and funds deposited under subparagraph 208(a)(2)(C) shall only be available for the benefit of the Pyramid Lake fishery and may be expended without further appropriation.

(g) **INDIAN LAKES AREA.—**The Secretary is authorized to convey to the State of Nevada or Churchill County, Nevada, Federal lands in the area generally known as the Indian Lakes area, as depicted on the map entitled "Indian Lakes Area," dated July 16, 1990, pursuant to an agreement between the Secretary and the State of Nevada or Churchill County, Nevada, as appropriate, for the purposes of fish and wildlife, and recreation. Any activity provided under the terms of the 1948 Tripartite Agreement may continue under the terms of that agreement until its expiration date, unless such agreement is otherwise terminated. The official map shall be on file with the United States Fish and Wildlife Service.

SEC. 207. CUI-UI AND LAHONTAN CUTTHROAT TROUT RECOVERY AND ENHANCEMENT PROGRAM.

(a) **RECOVERY PLANS.—**Pursuant to the Endangered Species Act, as amended, the Secretary shall expeditiously revise, update, and implement plans for the conservation and recovery of the cui-ui and Lahontan cutthroat trout. Such plans shall be completed and updated from time to time as appropriate in accordance with the Endangered Species Act, as amended, and shall include all relevant measures necessary to conserve and recover the species. Such plans and any amendments and revisions thereto shall take into account and be implemented in a manner consistent with the allocations of water to the State of Nevada and the State of California made under section 204 of this title, the Preliminary Settlement Agreement as modified by the Ratification Agreement, and the Operating Agreement, if and when those allocations and agreements enter into effect.

(b) **TRUCKEE RIVER REHABILITATION.—**

(1) The Secretary of the Army, in consultation with and with the assistance of the Pyramid Lake Tribe, State of Nevada, Environmental Protection Agency, the Secretary, and other interested parties, is authorized and directed to incorporate into its ongoing reconnaissance level study of the Truckee River, a study of the rehabilitation of the lower Truckee River to and including the river terminus delta of Pyramid Lake, for the benefit of the Pyramid Lake fishery. Such study shall analyze, among other relevant factors, the feasibility of:

(A) restoring riparian habitat and vegetative cover;

(B) stabilizing the course of the Truckee River to minimize erosion;

(C) improving spawning and migratory habitats for the cui-ui;

(D) improving spawning and migratory habitat for the Lahontan cutthroat trout; and

(E) improving or replacing existing facilities, or creating new facilities, to enable the efficient passage of cui-ui and Lahontan cutthroat trout through or around the delta at the mouth of the Truckee River, and to upstream reaches above Derby Dam, to obtain access to upstream spawning habitat.

(2) There are authorized to be appropriated to the Secretary of the Army such funds as are necessary to supplement the on-going reconnaissance level study, referenced in paragraph (1), to address and report on the activities and facilities described in that paragraph.

(c) **ACQUISITION OF WATER RIGHTS.—**

(1) The Secretary is authorized to acquire water and water rights, with or without the lands to which such rights are appurtenant, and to transfer, hold, and exercise such water and water rights and related interests to assist the conservation and recovery of the Pyramid Lake fishery in accordance with the provisions of this subsection. Water rights acquired under this subsection shall be exercised in a manner consistent with the Operating Agreement and the Preliminary Settlement Agreement as modified by the Ratification Agreement and, to the maximum extent practicable, used for the benefit of the Pyramid Lake fishery and shall not be sold, exchanged, or otherwise disposed of except to the benefit of the Pyramid Lake fishery.

(2) Acquisition of water rights and related interests pursuant to this subsection shall be subject to the following conditions:

(A) water rights acquired must satisfy eligibility criteria adopted by the Secretary;

(B) water right purchases shall be only from willing sellers, but the Secretary may target purchases in areas deemed by the Secretary to be most beneficial to such a purchase program;

(C) prior to acquiring any water or water rights in the State of California for the Pyramid Lake fishery, the Secretary shall first consult with the Governor of California and prepare a record of decision on the basis of such consultation;

(D) all water rights shall be transferred in accordance with any applicable State law; and

(E) water rights acquired by the Secretary shall be managed by the Secretary in consultation with the Pyramid Lake Tribe and affected interests.

(3) Nothing in this subsection shall be construed as limiting or affecting the authority of the Secretary to acquire water and water rights under other applicable laws.

(4) The Secretary is authorized to reimburse non-Federal entities for reasonable and customary costs for operation and maintenance of the Newlands Project associated with the delivery of water in carrying out the provisions of this subsection.

(5) Consistent with fulfillment of this section and not as a precondition thereto, the Secretary shall study and report on the social, economic, and environmental effects of the water rights purchase program authorized by this section. This study may be conducted in coordination with the studies authorized by paragraph 206(a)(4) and subsection 209(c) of this title, and shall be reported to the Committees on Energy and Natural Resources, Environment and Public Works, and Appropriations of the Senate, and the Committees on Interior and Insular Affairs, Merchant Marine and Fisheries, and Appropriations of the House of Representatives not later than three years after the date of enactment of this title.

(d) **USE OF STAMPEDE AND PROSSER RESERVOIRS.—**

(1) The rights of the United States to store water in Stampede Reservoir shall be used by the Secretary for the conservation of the Pyramid Lake fishery, except that such use must be consistent with the Preliminary Settlement Agreement as modified by the Ratification Agreement, the Operating Agreement, and the mitigation agreement specified in subparagraph 205(a)(1)(C) of this title.

(2) The rights of the United States to store water in Prosser Creek Reservoir shall be used by the Secretary as may be required to restore and maintain the Pyramid Lake fishery pursuant to the Endangered Species Act, as amended, except that such use must be consistent with the Tahoe-Prosser Exchange Agreement, the Preliminary Settlement Agreement as modified by the Ratification Agreement, the Operating Agreement, and the mitigation agreement specified in subparagraph 205(a)(1)(C) of this title.

(3) Nothing in this subsection shall prevent exchanges of such water or the use of the water stored in or released from these reservoirs for coordinated non-consumptive purposes, including recreation, instream beneficial uses, and generation of hydro-electric power. Subject to the Secretary's obligations to use water for the Pyramid Lake fishery, the Secretary is authorized to use storage capacity in the Truckee River reservoirs, including Stampede and Prosser Creek reservoirs, for storage of non-project water, including, but not limited to, storage of California's Truckee River basin surface water allocation, through negotiation of appropriate provisions for storage of such water in the Operating Agreement. To the extent it is not necessary for the Pyramid Lake fishery, the Secretary may allow Truckee River reservoir capacity dedicated to Washoe Project water to be used for exchanges of water or water rights, and to enable conjunctive use. In carrying out the provisions of this subsection, the Secretary shall comply with all applicable provisions of State law.

(e) **OFFSETTING FLOWS.—**Additional flows in the Truckee River and to Pyramid Lake resulting from the implementation of subsection 206(c) of this title are intended to offset any reductions in those flows which may be attributable to the allocations to California or Nevada under section 204 of this title or to the waivers in sections 3 and 21 of article II of the Preliminary Settlement Agreement as modified by the Ratification Agreement.

SEC. 208. PYRAMID LAKE FISHERIES AND DEVELOPMENT FUNDS.

(a) **FUNDS ESTABLISHED.—**

(1) There are hereby established within the Treasury of the United States the "Pyramid Lake Paiute Fisheries Fund" and "Pyramid Lake Paiute Economic Development Fund".

(2) There is authorized to be appropriated to the Pyramid Lake Paiute Fisheries Fund $25,000,000.

(A) The principal of the Pyramid Lake Paiute Fisheries Fund shall be unavailable for withdrawal.

(B) Interest earned on the Pyramid Lake Paiute Fisheries Fund shall be available to the Pyramid Lake Tribe only for the purposes of operation and maintenance of fishery facilities at Pyramid Lake, excluding Marble Bluff Dam and Fishway, and for conservation of the Pyramid Lake fishery in accordance with plans prepared by the Pyramid Lake Tribe in consultation with and the concurrence of the United States Fish and Wildlife Service and approved by the Secretary. Of interest earned annually on the principal, 25 percent per year, or an amount which, in the sole judgment of the Secretary of the Treasury, is sufficient to maintain the principal of the fund at $25,000,000 in 1990 constant dollars, whichever is less, shall be retained in the fund as principal and shall not be available for withdrawal. Deposits of earned interest in excess of that amount may be made at the discretion of the Pyramid Lake Tribe, and all such deposits and associated interest shall be available for withdrawal.

(C) All sums deposited in, accruing to, and remaining in the Pyramid Lake Paiute Fishery Fund shall be invested by the Secretary and the Secretary of the Treasury in interest-bearing deposits and securities in accordance with the Act of June 24, 1938, 52 Stat. 1037. Interest earnings not expended, added to principal, or obligated by the Pyramid Lake Tribe in the year in which such earnings accrue to the fund or in the four years that immediately follow shall be credited to the fund established under subsection 206(f) of this title.

(D) Subject to subparagraph (E) of this paragraph, the Secretary and the Secretary of the Treasury shall allocate and make available to the Pyramid Lake Tribe such eligible moneys from the Pyramid Lake Fishery Fund as are requested by the Pyramid Lake Tribe to carry out plans developed under subparagraph (B) of this paragraph.

(E) The Secretary and the Secretary of the Treasury shall not disburse moneys from the Pyramid Lake Paiute Fishery Fund until such time as the following conditions have been met:

(i) The Pyramid Lake Tribe has released any and all claims of any kind whatsoever against the United States for damages to the Pyramid Lake fishery resulting from the Secretary's acts or omissions prior to the date of enactment of this title; and

(ii) The Pyramid Lake Tribe has assumed financial responsibility for operation and maintenance of the fishery facilities located at Pyramid Lake for the benefit of the Pyramid Lake fishery, excluding the Marble Bluff Dam and Fishway.

(3) There is authorized to be appropriated to the Pyramid Lake Paiute Economic Development Fund $40,000,000 in five equal annual installments in the 1993, 1994, 1995, 1996, and 1997 fiscal years.

(A) The principal and interest of the Pyramid Lake Paiute Economic Development Fund shall be available for tribal economic development only in accordance with a plan developed by the Pyramid Lake Tribe in consultation with the Secretary. The objectives of the plan shall be to develop long-term, profit-making opportunities for the Pyramid Lake Tribe and its members, to create optimum employment opportunities for tribal members, and to establish a high quality recreation area at Pyramid Lake using the unique natural and cultural resources of the Pyramid Lake Indian Reservation. The plan shall be consistent with the fishery restoration goals of section 207 of this title. The plan may be revised and updated by the Pyramid Lake Tribe in consultation with the Secretary.

(B) The Pyramid Lake Tribe shall have complete discretion to invest and manage the Pyramid Lake Paiute Economic Development Fund, except that no portion of the principal shall be used to develop, operate, or finance any form of gaming or gambling, except as may be provided by the Indian Gaming Regulatory Act, Public Law 100-497 (102 Stat. 2467), and the United States shall not bear any obligation or liability regarding the investment, management, or use of such funds that the Pyramid Lake Tribe chooses to invest, manage, or use.

(C) If the Pyramid Lake Tribe so requests, all sums deposited in, accruing to, and remaining in the Pyramid Lake Paiute Economic Development Fund shall be invested by the Secretary and the Secretary of the Treasury in interest-bearing deposits and securities in accordance with the Act of June 24, 1938, 52 Stat. 1037. All such interest shall be added to the Pyramid Lake Paiute Economic Development Fund.

(D) The Secretary and the Secretary of the Treasury shall allocate and make available to the Pyramid Lake Tribe such moneys from the Pyramid Lake Economic Development Fund as are requested by the Pyramid Lake Tribe, except that no disbursements shall be made to the Pyramid Lake Tribe unless and until the Pyramid Lake Tribe adopts and submits to the Secretary the economic development plan described in subparagraph (A) of this paragraph, and section 204, the Preliminary Settlement Agreement as modified by the Ratification Agreement, and the Operating Agreement enter into effect in accordance with the terms of subsection 210(a) of this title.

(4) Under no circumstances shall any part of the principal of the funds established under this section be distributed to members of the Pyramid Lake Tribe on a per capita basis.

(5) If, and to the extent that any portion of the sum authorized to be appropriated in paragraph 208(a)(2) is appropriated after fiscal year 1992, or in a lesser amount, there shall be deposited in the Pyramid Lake Paiute Fisheries Fund, subject to appropriations, in addition to the full contribution to the Pyramid Lake Paiute Fisheries Fund, an adjustment representing the interest income as determined by the Secretary in his sole discretion that would have been earned on any unpaid amount had the amount authorized in paragraph 208(a)(2) been appropriated in full for fiscal year 1992.

(6) If and to the extent that any portion of the sums authorized to be appropriated in paragraph 208(a)(3) are appropriated after fiscal years 1993, 1994, 1995, 1996, and 1997, or in lesser amounts than provided by paragraph 208(a)(3), there shall be deposited in the Pyramid Lake Paiute Economic Development Fund, subject to appropriations, in addition to the full contributions to the Pyramid Lake Paiute Economic Development Fund, an adjustment representing the interest income as determined by the Secretary in his sole discretion that would have been earned on any unpaid amounts had the amounts authorized in paragraph 208(a)(3) been appropriated in full for fiscal years 1993, 1994, 1995, 1996, and 1997.

SEC. 209. NEWLANDS PROJECT IMPROVEMENT.

(a) **EXPLANATION OF AUTHORIZED PURPOSES.—**

(1) In addition to the existing irrigation purpose of the Newlands Reclamation Project, the Secretary is authorized to operate and maintain the project for the purposes of:

(A) fish and wildlife, including endangered and threatened species;

(B) municipal and industrial water supply in Lyon and Churchill counties, Nevada, including the Fallon Indian Reservation;

(C) recreation;

(D) water quality; and

(E) any other purposes recognized as beneficial under the law of the State of Nevada.

(2) Additional uses of the Newlands Project made pursuant to this section shall have valid water rights and, if transferred, shall be transferred in accordance with State law.

(b) **TRUCKEE RIVER DIVERSIONS.—**The Secretary shall not implement any provision of this title in a manner that would:

(1) increase diversions of Truckee River water to the Newlands Project over those allowed under applicable operating criteria and procedures; or

(2) conflict with applicable court decrees.

(c) **PROJECT EFFICIENCY STUDY.—**

(1) The Secretary shall study the feasibility of improving the conveyance efficiency of Newlands Project facilities to the extent that, within twelve years after the date of enactment of this title, on average not less than seventy-five percent of actual diversions under applicable operating criteria and procedures shall be delivered to satisfy the exercise of water rights within the Newlands Project for authorized project purposes.

(2) The Secretary shall consider the effects of the measures required to achieve such efficiency on groundwater resources and wetlands in the Newlands Project area. The Secretary shall report the results of such study to the Committees on Energy and Natural Resources,

Environment and Public Works, and Appropriations of the Senate and the Committees on Interior and Insular Affairs, Merchant Marine and Fisheries, and Appropriations of the House of Representatives not later than three years after the date of enactment of this title.

(d) **WATER BANK.—**The Secretary, in consultation with the State of Nevada and the operator of the Newlands Project, is authorized to use and enter into agreements to allow water right holders to use Newlands Project facilities in Nevada, where such facilities are not otherwise committed or required to fulfill project purposes or other Federal obligations, for supplying carryover storage of irrigation and other water for drought protection and other purposes, consistent with subsections (a) and (b) of this section. The use of such water shall be consistent with and subject to applicable State laws.

(e) **RECREATION STUDY.—**The Secretary, in consultation with the State of Nevada, is authorized to conduct a study to identify administrative, operational, and structural measures to benefit recreational use of Lahontan Reservoir and the Carson River downstream of Lahontan Dam. Such study shall be reported to the Committee on Energy and Natural Resources of the Senate and the Committee on Interior and Insular Affairs of the House of Representatives.

(f) **EFFLUENT REUSE STUDY.—**The Secretary, in cooperation with the Administrator of the Environmental Protection Agency, the State of Nevada, and appropriate local entities, shall study the feasibility of reusing municipal wastewater for the purpose of wetland improvement or creation, or other beneficial purposes, in the areas of Fernley, Nevada, the former Lake Winnemucca National Wildlife Refuse, and the Lahontan Valley. The Secretary shall coordinate such studies with other efforts underway to manage wastewater from the Reno and Sparks, Nevada, area to improve Truckee River and Pyramid Lake water quality. Such study shall be reported to the Committees on Energy and Natural Resources, Environment and Public Works, and Appropriations of the Senate and the Committees on Interior and Insular Affairs, Merchant Marine and Fisheries, and Appropriations of the House of Representatives.

(g) **REPAYMENT CANCELLATION.—**Notwithstanding any other provisions of law, the Secretary may cancel all repayment obligations owing to the Bureau of Reclamation by the Truckee-Carson Irrigation District. As a precondition for the Secretary to cancel such obligations, the Truckee-Carson Irrigation District shall agree to collect all such repayment obligations and use such funds for water conservation measures. For the purpose of this subsection and paragraph 209(h)(2), the term "water conservation measures" shall not include repair, modification, or replacement of Derby Dam.

(h) **SETTLEMENT OF CLAIMS.—**

(1) The provisions of subsections 209(d), (e), (f), and (g) of this section shall not become effective unless and until the Truckee-Carson Irrigation District has entered into a settlement agreement with the Secretary concerning claims for recoupment of water diverted in excess of the amounts permitted by applicable operating criteria and procedures.

(2) The provisions of subsection 209(g) of this section shall not become effective unless and until the State of Nevada provides not less than $4,000,000 for use in implementing water conservation measures pursuant to the settlement described in paragraph (1) of this subsection.

(3) The Secretary is authorized to expend such sums as may be required to match equally the sums provided by the State of Nevada under paragraph (2) of this subsection. Such sums shall be available for use only in implementing water conservation measures pursuant to the settlement described in paragraph (1) of this subsection.

(i) **FISH AND WILDLIFE.—**The Secretary shall, insofar as is consistent with project irrigation purposes and applicable operating criteria and procedures, manage existing Newlands Project re-regulatory reservoirs for the purpose of fish and wildlife.

(j) **OPERATING CRITERIA AND PROCEDURES.—**

(1) In carrying out the provisions of this title, the Secretary shall act in a manner that is fully consistent with the decision in the case of Pyramid Lake Paiute Tribe of Indians v. Morton, 354

F.Supp. 252 (D.D.C. 1973).

(2) Notwithstanding any other provision of law, the operating criteria and procedures for the Newlands Reclamation Project adopted by the Secretary on April 15, 1988 shall remain in effect at least through December 31, 1997, unless the Secretary decides, in his sole discretion, that changes are necessary to comply with his obligations, including those under the Endangered Species Act, as amended. Prior to December 31, 1997, no court or administrative tribunal shall have jurisdiction to set aside any of such operating criteria and procedures or to order or direct that they be changed in any way. All actions taken heretofore by the Secretary under any operating criteria and procedures are hereby declared to be valid and shall not be subject to review in any judicial or administrative proceeding, except as set forth in paragraph (3) of this subsection.

(3) The Secretary shall henceforth ensure compliance with all of the provisions of the operating criteria and procedures referenced in paragraph (2) of this subsection or any applicable provision of any other operating criteria or procedures for the Newlands Project previously adopted by the Secretary, and shall, pursuant to subsection 709(h) or judicial proceeding, pursue recoupment of any water diverted from the Truckee River in excess of the amounts permitted by any such operating criteria and procedures. The Secretary shall have exclusive authority and responsibility to pursue such recoupment, except that, if an agreement or order leading to such recoupment is not in effect as of December 31, 1997, any party with standing to pursue such recoupment prior to enactment of this title may pursue such recoupment thereafter. Any agreement or court order between the Secretary and other parties concerning recoupment of Truckee River water diverted in violation of applicable operating criteria and procedures shall be consistent with the requirements of this subsection and the Endangered Species Act, as amended, and shall be submitted for the review and approval of the court exercising jurisdiction over the operating criteria and procedures for the Newlands Project. All interested parties may participate in such review. In any recoupment action brought by any party, other than the Secretary, after December 31, 1997, the only relief available from any court of the United States will be the issuance of a declaratory judgment and injunctive relief directing any unlawful user of water to restore the amount of water unlawfully diverted. In no event shall a court enter any order in such a proceeding that will result in the expenditure of any funds out of the United States Treasury.

SEC. 210. MISCELLANEOUS PROVISIONS.

(a) **CLAIMS SETTLEMENT.—**

(1) The effectiveness of section 204 of this title, the Preliminary Settlement Agreement as modified by the Ratification Agreement, the Operating Agreement, and the Secretary's authority to disburse funds under paragraph 208(a)(3) of this title are contingent upon dismissal with prejudice or other final resolution, with respect to the parties to the Preliminary Settlement Agreement as modified by the Ratification Agreement and the State of Nevada and the Secretary of California, of the following outstanding litigation and proceedings:

(A) Pyramid Lake Paiute Tribe v. California, Civ. S-181-378-RAR-RCB, United States District Court, Eastern District of California.

(B) United States v. Truckee-Carson Irrigation District, Civ. No. R-2987-RCB, United States District Court, District of Nevada.

(C) Pyramid Lake Paiute Tribe v. Lujan, Civ. S-87-1281-LKK, United States District Court, Eastern District of California;

(D) Pyramid Lake Paiute Tribe v. Department of the Navy, Civ. No. R-86-115-BRT in the United States District Court, District of Nevada and Docket No. 88-1650 in the United States Court of Appeals for the Ninth Circuit; and

(E) All pending motions filed by the Tribe in Docket No. E-9530 before the Federal Energy Regulatory Commission.

(2) In addition to any other conditions on the effectiveness of this title set forth in this title, the provisions of:

(A) section 204, subsections 206(c), 207(c) and (d), subparagraph 208(a)(3)(D), and paragraph 210(a)(3) of this title shall not take effect until:

(i) the agreements and regulations required under section 205 of this title, including the Truckee Meadows water conservation plan referenced in the Preliminary Settlement Agreement as modified by the Ratification Agreement, enter into effect;

(ii) the outstanding claims described in paragraph 210(a)(1) have been dismissed with prejudice or otherwise finally resolved;

(B) section 204 of this title, the Preliminary Settlement Agreement as modified by the Ratification Agreement, and the Operating Agreement, shall not take effect until the Pyramid Lake Tribe’s claim to the remaining waters of the Truckee River which are not subject to vested or perfected rights has been finally resolved in a manner satisfactory to the State of Nevada and the Pyramid Lake Tribe; and

(C) section 204 of this title, the Preliminary Settlement Agreement as modified by the Ratification Agreement, the Operating Agreement, and subsection 207(d) shall not take effect until the funds authorized in paragraph 208(a)(3) of this title have been appropriated.

(3) On and after the effective date of section 204 of this title, except as otherwise specifically provided herein, no person or entity who has entered into the Preliminary Settlement Agreement as modified by the Ratification Agreement or the Operating Agreement, or accepted any benefits or payments under this legislation, including any Indian Tribe and the States of California and Nevada, the United States and its officers and agencies may assert in any judicial or administrative proceeding a claim that is inconsistent with the allocations provided in section 204 of this title, or inconsistent or in conflict with the operational criteria for the Truckee River established pursuant to section 205 of this title. No person or entity who does not become a party to the Preliminary Settlement Agreement as modified by the Ratification Agreement or the Operating Agreement may assert in any judicial or administrative proceeding any claim for water or water rights for the Pyramid Lake Tribe, the Pyramid Lake Indian Reservation, or the Pyramid Lake fishery. Any such claims are hereby barred and extinguished and no court of the United States may hear or consider any such claims by such persons or entities.

(b) **GENERAL PROVISIONS.—**

(1) Subject to the provisions of paragraphs (2) and (3) of this subsection, and to all existing property rights or interests, all of the trust land within the exterior boundaries of the Pyramid Lake Indian Reservation shall be permanently held by the United States for the sole use and benefit of the Pyramid Lake Tribe.

(2) Anaho Island in its entirety is hereby recognized as part of the Pyramid Lake Indian Reservation. In recognition of the consent of the Pyramid Lake Tribe evidenced by Resolution No. 19-90 of the Pyramid Lake Paiute Tribal Council, all of Anaho Island shall hereafter be managed and administered by and under the primary jurisdiction of the United States Fish and Wildlife Service as an integral component of the National Wildlife Refuge System for the benefit and protection of colonial nesting species and other migratory birds. Anaho Island National Wildlife Refuge shall be managed by the United States Fish and Wildlife Service in accord with the National Wildlife Refuge System Administration Act, as amended, and other applicable provisions of Federal law. Consistent with the National Wildlife Refuge System Administration Act, as amended, the Director of the United States Fish and Wildlife Service is authorized to enter into cooperative agreements with the Pyramid Lake Tribe regarding Anaho Island National Wildlife Refuge.

(3) Subject to the relinquishment by the legislature of the State of Nevada of any claim the State of Nevada may have to ownership of the beds and banks of the Truckee River within the exterior boundaries of the Pyramid Lake Indian Reservation and of Pyramid Lake, those beds and banks are recognized as part of the Pyramid Lake Indian Reservation and as being held by the

United States in trust for the sole use and benefit of the Pyramid Lake Tribe. Nothing in this subsection shall be deemed to recognize any right, title, or interest of the State of Nevada in those beds and banks which it would not otherwise have. No other provision of this title shall be contingent on the effectiveness of this subsection.

(4) Except as provided in paragraphs (2) and (9) of this subsection, the Pyramid Lake Tribe shall have the sole and exclusive authority to establish rules and regulations governing hunting, fishing, boating, and all forms of water based recreation on all lands within the Pyramid Lake Indian Reservation except fee-patented land, provided that the regulation of such activities on fee-patented land within the Pyramid Lake Indian Reservation shall not be affected by this paragraph. Nothing in this paragraph shall be deemed to recognize or confer any criminal jurisdiction on the Pyramid Lake Tribe or to affect any regulatory jurisdiction of the State of Nevada with respect to any other matters.

(5) The consent of the United States is given to the negotiation and execution of an intergovernmental agreement between the Pyramid Lake Tribe and the State of Nevada, which agreement may also include Washoe County, Nevada, providing for the enforcement by the State of Nevada and Washoe County of the rules and regulations referred to in paragraph (4) adopted by the Pyramid Lake Tribe governing hunting, fishing, boating, and all forms of water based recreation against non-members of the Pyramid Lake Tribe and for State courts or other forums of the State of Nevada or its political subdivisions to exercise civil and criminal jurisdiction over violations of the Pyramid Lake Tribe's rules and regulations allegedly committed by such non-members, except as provided by paragraphs (2) and (9) of this subsection.

(6) The consent of the United States is given to the negotiation and execution of an intergovernmental agreement between the Pyramid Lake Tribe and the State of Nevada, which agreement may also include Washoe County, Nevada, providing for the enforcement of rules and regulations governing hunting, fishing, boating, and all forms of water based recreation on fee-patented land within the Pyramid Lake Indian Reservation, except as provided by paragraphs (2) and (9) of this subsection.

(7) Nothing in this title shall limit or diminish the Federal Government's trust responsibility to any Indian Tribe, except that this provision shall not be interpreted to impose any liability on the United States or its agencies for any damages resulting from actions taken by the Pyramid Lake Paiute Tribe as to which the United States is not a party or with respect to which the United States has no supervisory responsibility.

(8) Subject to the terms, conditions, and contingencies of and relating to the Preliminary Settlement Agreement as modified by the Ratification Agreement, the United States on its own behalf and in its capacity as trustee to the Pyramid Lake Tribe confirms and ratifies the waivers of any right to object to the use and implementation of the water supply measures described in sections 3 and 21 of article II of the Preliminary Settlement Agreement as modified by the Ratification Agreement, and any waivers of sovereign immunity given in connection with that agreement or the Operating Agreement, upon the entry into effect of the Preliminary Settlement Agreement as modified by the Ratification Agreement.

(9) Nothing in this title shall be construed as waiving or altering the requirements of any Federal environmental or wildlife conservation law, including, but not limited to, the Endangered Species Act, as amended, including the consultation and reinitiation of consultation responsibilities of the Secretary under section 7 of the Act, and the National Environmental Policy Act of 1969.

(10) Nothing in this title shall be construed to create an express or implied Federal reserved water right.

(11) Nothing in this title shall subject the United States or any of its agencies or instrumentalities or any Indian Tribe to any State jurisdiction or regulation to which they would not otherwise be subject.

(12) Nothing in this title is intended to abrogate the jurisdiction of or required approvals by the Nevada State Engineer or the California State Water Resources Control Board.

(13) Nothing in this title is intended to affect the power of the Orr Ditch court or the Alpine court to ensure that the owners of vested or perfected Truckee River water rights receive the amount of water to which they are entitled under the Orr Ditch decree or the Alpine decree. Nothing in this title is intended to alter or conflict with any vested and preferred right of any person or entity to use the water of the Truckee River or its tributaries, including, but not limited to, the rights of landowners within the Newlands Project for delivery of the water of the Truckee River to Derby Dam and for the diversion of such waters at Derby Dam pursuant to the Orr Ditch decree or any applicable law.

(14) No single provision or combination of provisions in this title, including interstate allocations under section 204, or associated agreements which may adversely affect inflows of water to Pyramid Lake shall form the basis for additional claims of water to benefit Pyramid Lake, the Pyramid Lake fishery, or lands within the Pyramid Lake Indian Reservation.

(15) Nothing in this title shall affect any claim of Federal reserved water rights, if any, to the Carson River or its tributaries for the benefit of lands within the Fallon Indian Reservation.

(16) The Secretary, in consultation with the State of Nevada and affected local interests, shall undertake appropriate measures to address significant adverse impacts, identified by studies authorized by this title, on domestic uses of groundwater directly resulting from the water purchases authorized by this title.

(17) It is hereby declared that after August 26, 1935, and prior to the date of enactment of this title, there was no construction within the meaning of section 23(b) of the Federal Power Act, as amended, at the four run-of-river hydroelectric project works owned by Sierra Pacific Power Company and located on the Truckee River. Notwithstanding any other provision of law, after the date of enactment of this title, development of additional generating capacity at such project works that is accomplished through replacement of turbine generators and increases in effective head shall not constitute construction within the meaning of section 23(b) of the Federal Power Act, as amended: Provided, That such development may not change the location of or increase any existing impoundments and may not require diversions of water in excess of existing water rights for such project works: And provided further, That the diversions of water for the operation of such project works shall be consistent with the Preliminary Settlement Agreement as modified by the Ratification Agreement, and the Operating Agreement. The Secretary shall take into account the monetary value of this provision to the Sierra Pacific Power Company in calculating the storage charge referred to in paragraph 205(a)(6).

(18) The Secretary is authorized, in accordance with this section and applicable provisions of existing law, to exchange surveyed public lands in Nevada for interests in fee patented lands, water rights, or surface rights to lands within or contiguous to the exterior boundaries of the Pyramid Lake Indian Reservation. The values of the lands or interests therein exchanged by the Secretary under this paragraph shall be substantially equal, but the Secretary is authorized to accept monetary payments from the owners of such fee patented lands, water rights, or surface rights as circumstances may require in order to compensate for any difference in value. Any such payments shall be deposited to the Treasury. The value of improvements on land to be exchanged shall be given due consideration and an appropriate allowance shall be made therefor in the valuation. Title to lands or any interest therein acquired by the Secretary pursuant to this subsection shall be taken in the name of the United States in trust for the Pyramid Lake Tribe and shall be added to the Pyramid Lake Indian Reservation.

(c) **APPROPRIATIONS AUTHORIZED.—**There are authorized to be appropriated such sums as may be required to implement the provisions of this title.

Attachment B

Preliminary Settlement Agreement

PRELIMINARY SETTLEMENT AGREEMENT

WHEREAS, on May 23, 1989, the Pyramid Lake Paiute Tribe of Indians (Tribe) and Sierra Pacific Power Company (Sierra) entered into a Preliminary Settlement Agreement, which contemplates the use of federally owned storage reservoirs in the Truckee River Basin in California for storage of the waters available under the described water rights for fishery and municipal and industrial purposes;

WHEREAS, a condition of the effectiveness of the Preliminary Settlement Agreement (see paragraph 29(g) of Article III of the Preliminary Settlement Agreement) is that the United States would become a party to the agreement and accept, approve and become bound by all of its terms and conditions to the same extent as the Tribe; and

WHEREAS, the United States has reviewed the terms and conditions of that Preliminary Settlement Agreement and found them to be generally acceptable.

NOW THEREFORE, the United States by its authorized official, ratifies, confirms and agrees by this instrument to become a party to that Agreement, and, subject to the following clarifications and understandings, accepts, approves, and agrees to be bound by said terms and conditions to the same extent as the Tribe:

A. Attached hereto and incorporated herein as Exhibit A is a clarified and revised Preliminary Settlement Agreement which includes the revisions to be made to that Agreement as a result of this ratification. The United States shall be bound only by the terms of Exhibit A and not by any other version of the Preliminary Settlement Agreement.

B. (1) The United States reserves the right to cancel in full and withdraw this Ratification Agreement if either the Tribe or Sierra attempts to rely upon condition (a) of Section 29 of Article III of the Preliminary Settlement in whole or in part.

(2) The Operating Agreement referred to in paragraph 29(f) of Article III of the Preliminary Settlement Agreement shall be construed to refer to the Operating Agreement, if any, required by Title II of the "Truckee-Carson-Pyramid Lake Water Rights Settlement Act."

(3) As to subsection (j) of Section 29 of Article III of the Preliminary Settlement Agreement, the United States shall not be bound by any of the provisions thereof in any respect unless and until it, through an authorized official, enters into a binding agreement relating to the subject matter thereof, but only to such extent and not otherwise. The discretion of the United States or its officers to enter into any such agreement shall not be impaired or affected in any degree by these provisions, and it shall remain discretionary with the United States as to whether to enter into any such Agreement and which terms such Agreement, if any, shall include, subject to the terms, conditions and limitations of all applicable laws.

C. Sierra Pacific and the Tribe must agree in carrying out the terms and provisions of this Agreement to abide by and comply with all applicable state and federal laws and to abide by all lawful regulations issued by the Secretary.

EXHIBIT "A"
PRELIMINARY SETTLEMENT AGREEMENT

THIS AGREEMENT is entered into this 23rd day of May, 1989, between the Pyramid Lake Paiute Tribe of Indians ("Tribe") and Sierra Pacific Power Company ("Sierra").

I. RECITALS

1. The cui-ui *(Chasmistes cujus)* is officially classified as an endangered species. It is the only pure species remaining in its genus, Chasmistes, and is found only in the Pyramid Lake/Lower Truckee River ecosystem in Nevada.
2. The Lahontan cutthroat trout *(Salmo clarki henshawi)* is officially classified as a threatened species. It is found in the Pyramid Lake/Truckee River ecosystem as well as other lakes, streams and rivers in the Great Basin.
3. The Tribe is organized under Section 16 of the Act of June 18, 1934 (25 U.S.C. 476) and governs the Pyramid Lake Indian Reservation which includes Pyramid Lake and a large portion of the Lower Truckee River.
4. The Tribe desires to increase flows in the Lower Truckee River in the spring and early summer months to improve Spawning Flows in the Lower Truckee River for the endangered cui-ui and the threatened Lahontan cutthroat trout.
5. Sierra serves water to the Cities of Reno and Sparks and unincorporated portions of Washoe County and also provides electricity to northern Nevada and portions of east central, California.
6. In addition to its other power generating facilities, Sierra owns and operates four run of the river hydroelectric plants on the Truckee River above Reno. Sierra owns and utilizes water rights for these hydroelectric plants utilizing water which is released from or passed through Lake Tahoe and other Truckee River reservoirs.
7. Sierra owns and utilizes substantial Truckee River water rights to provide water for municipal, industrial and domestic (M&I) purposes within its service area. Sierra also participates with the local governments of Reno, Sparks and Washoe County in an acquisition program approved by the Public Service Commission of Nevada to acquire agricultural water rights in the Truckee River Basin and to change them to M&I purposes.

8. The water rights acquired, owned and utilized by Sierra are sufficient to provide water for M&I use within its service area in most years. Sierra needs additional storage, however, to insure an adequate supply of water under Drought Conditions.

9. The parties hereto and others are involved in negotiations and in supporting enactment of proposed congressional settlement legislation which, if finalized and enacted, will provide for:

(a) Allocation of the waters of the Lake Tahoe, Truckee River and Carson River Basins;

(b) The purchase of water for the wetlands in the Lahontan Valley and possibly other wetlands;

(c) The development and implementation of a mitigation and enhancement program for the cui-ui and Lahontan cutthroat trout;

(d) A fund for the economic development of the Pyramid Lake Indian Reservation;

(e) The resolution of existing litigation and the avoidance of future litigation; and

(f) Authorization and agreement for the operation of the Truckee River Reservoirs, including Lake Tahoe.

10. In order for the negotiations and proposed settlement legislation to progress, it is necessary for the parties hereto to enter into this Preliminary Agreement concerning the utilization of water rights and the operation of the Truckee River Reservoirs to provide greater Spawning Flows in the Lower Truckee River and an adequate supply of water for Sierra's Service Area under Drought Conditions.

II. DEFINITIONS

As used in this Preliminary Agreement:

1. "Critical Drought Period" means a hydrologic period during which the water supplies available from the Truckee River are limited to the same or similar extent as the water supplies available from the Truckee River under a repetition of hydrologic conditions which existed from 1928 to 1935.

2. "Drought Conditions" means conditions under which Sierra's Normal Water Supplies are not sufficient to satisfy Sierra's normal water year demand, but in no event shall Drought Conditions exist when a Drought Situation does not also exist.

3. "Drought Situation" means a situation under which it appears, based on the April 1 seasonal Truckee River runoff forecast and assuming median precipitation after April 1, either that there will not be sufficient unregulated natural runoff and pooled water in storage in the Truckee River Reservoirs to meet the Floriston Rates through the following October 31, or that the level of Lake Tahoe, excluding all Firm M&I, Non-Firm M&I and Fishery Credit Water, will be below 6223.5 feet Lake Tahoe Datum on or before the following November 15.

4. "Emergency or Repair Conditions" means an unexpected circumstance when the demands of Sierra's water customers cannot be met from Sierra's Normal Water Supplies or a scheduled alteration or repair which prevents the use of some or all of Sierra's Normal Water Supplies to meet the demands of Sierra's water customers.

5. "Firm M&I Credit Water" means the water that is stored in Stampede Reservoir and can be utilized under the terms and conditions of this Agreement for the purpose of providing water under Drought Conditions or Emergency or Repair Conditions for M&I purposes within Sierra's Service Area and which shall not spill or be subject to evaporation losses unless it is the only remaining water in Stampede Reservoir.

6. "Fishery Credit Water" means the water that can be stored and utilized under the terms and conditions of this Agreement for the benefit of the Pyramid Lake Fishery.

7. "Floriston Rates" means the rate of flow of the Truckee River at the head of the diversion penstock at Floriston, California (but measured at the USGS Stream Gaging Station near Farad, California) consisting of an average flow of 500 cubic feet of water per second each day during the period commencing March 1 and ending September 30 of any year and an average flow of 400 cubic feet of water per second each day during the period commencing October 1 and ending the last day of the next following February of any year.

8. "Former Agricultural Water Right" means a water right from the Truckee River and its tributaries which Sierra now has or will acquire as described in Section 2 of Article III of this Agreement and which was originally established for agricultural use and has been or will be acquired or leased and transferred to or otherwise provided for M&I use.

9. "Lower Truckee River" means the Truckee River below Derby Dam.

10. "M&I" means municipal, industrial and domestic.

11. "Non-Firm M&I Credit Water" means any water other than Firm M&I Credit Water that can be stored in any Truckee River Reservoir and utilized under the terms and conditions of this Agreement under Drought Conditions or Emergency or Repair Conditions for M&I purposes within Sierra's Service Area.

12. "Orr Ditch Decree" means the Final Decree entered on September 8, 1944, in the case of United States *v.* Orr Water Ditch Co., *et al.*, Equity No. A-3, in the United States District Court for the District of Nevada.

13. "Prosser Creek Fishery Water" means the water in Prosser Creek Reservoir that may be committed by the United States for the benefit of the Pyramid Lake Fishery and is not needed to carry out the Tahoe-Prosser Exchange pursuant to the Agreement of June 15, 1959.

14. "Pyramid Lake Fishery" means the two primary species found in Pyramid Lake, the cui-ui *(Chasmistes cujus)* and the Lahontan cutthroat trout *(Salmo Clarki henshawi)*.

15. "Remaining Waters of the Truckee River" means the waters of the Truckee River system other than the following: (i) the waters of the Lake Tahoe Basin allocated to California and Nevada; (ii) the waters of the Truckee River and its tributaries allocated to California; and (iii) the waters of the Truckee River and its tributaries allocated to Nevada to which valid and perfected rights attach under applicable law.

16. "Sierra's Normal Water Supplies" means the water sources and supplies Sierra has and would have to meet the M&I needs of its customers in the absence of this Agreement, including the water sources and supplies described in Section 2

of Article III of this Agreement and any supplies obtained or developed pursuant to Section 3 of this Agreement, but excluding all of the water sources and supplies described in Section 21 of Article III of this Agreement and 7,500 acre feet of water above the outlet facilities of Independence Lake.

17. "Sierra's Privately Owned Stored Water" means the stored water which Sierra now has or may hereafter acquire the right to use in Donner Lake and Independence Lake.

18. "Sierra's Service Area" means the retail and wholesale certificated boundaries as may be established from time to time by the Public Service Commission of Nevada as the territory in which Sierra is entitled to sell or to distribute water.

19. "Spawning Flows in the Lower Truckee River" means the water which provides suitable conditions for fish passage, maintaining habitat, attracting, egg-taking, spawning and/or nursing of cui-ui and/or Lahontan cutthroat trout in the Lower Truckee River.

20. "Stampede Project Water" means the water that is currently captured and impounded in Stampede Reservoir and is released to support Spawning Flows in the Lower Truckee River.

21. "Truckee River Agreement" means the Agreement dated July 1, 1935, which was approved, adopted and incorporated in the Orr Ditch Decree.

22. "Truckee River General Electric Co. Decree" means the Final Decree entered on June 4, 1915 in the case of United States *v.* Truckee River General Electric Co., No. 14861, in the United States District Court for the Northern District of California which was transferred on February 9, 1968 to the United States District Court for the Eastern District of California and is now designated No. S-643.

23. "Truckee River Reservoirs" means the storage provided by the dam at the outlet of Lake Tahoe, Boca Reservoir, Prosser Creek Reservoir and Stampede Reservoir.

III. AGREEMENT

Section 1. Waiver of Single Purpose Hydroelectric Water. For purposes of this Agreement only, Sierra agrees to waive its rights to require releases or pass throughs of water from the Truckee River Reservoirs solely for the generation of hydroelectric power pursuant to the Truckee River General Electric Co. Decree and Claim Nos. 5, 6, 7, 8 and 9 of the Orr Ditch Decree. The water to which Sierra's rights are waived pursuant to this Section shall become Fishery Credit Water subject to the limitations set forth in Section 27 of Article III of this Agreement and shall be held in storage in the Truckee River Reservoirs and released for the sole use and benefit of the Pyramid Lake Fishery.

Section 2. Water Rights Required for New Service Commitments. Sierra agrees that it will not issue new service commitments unless such commitments are accompanied by such water rights provided directly to Sierra or through a municipal entity as are necessary to meet the new water service requirement. Sierra shall require new service commitments which rely on surface water rights to provide water rights at the rate of not less than 1.72 acre feet of water rights for every acre foot of commitment until such time as Sierra has committed to the amount of water needed to meet a normal year demand of 80,000 acre feet within Sierra's Service Area. After the amount of water is provided to meet Sierra's normal year commitment of 80,000 acre feet and until such time as Sierra has committed to the amounts of water required to meet a normal water year demand of 119,000 acre feet within Sierra's Service Area, the water rights provided to meet new service commitments in reliance upon surface water rights may be reduced to not less than 1 acre foot of water rights for every acre foot of new service commitment; provided, however, that if Sierra is able to develop the water supply referred to in Section 3(b) of Article III of this Agreement, then the ratio of new service commitments in reliance on surface water rights shall be not less than 1.11 acre feet of water rights for every acre foot of new service commitment.

Section 3. Development of Additional M&I Water Supplies. Sierra agrees to use its best efforts to implement the following measures on a schedule to be agreed upon in the operating agreement referred to in Section 29(f) of Article III of this Agreement, to the extent legally, technically and economically feasible, to help meet the water supply demands of its customers as Sierra's total normal year water demand increases to a maximum normal year demand of 119,000 acre feet:

(a) Development of the capacity to pump 2,000 acre feet of water annually from the Sparks pit source under Drought Conditions or Emergency or Repair Conditions;

(b) The right to develop an additional 3,000 acre feet annually of groundwater from the Truckee Meadows groundwater basin (over and above the currently approved 12,616 acre feet of groundwater available from the Truckee Meadows groundwater basin); and

(c) Acquisition and utilization of the right of the Truckee-Carson Irrigation District to store and use water in Donner Lake.

The Tribe and the United States waive any and all rights or claims they may have to object to Sierra's implementation and use of the water supply measures described in this Section or Section 21 of Article III.

The measures described in Sections 3(a) and 3(c) of Article III shall not be included in, and shall be in addition to, the water rights Sierra obtains to meet new service commitments pursuant to Section 2 of Article III of this Agreement.

Section 4. Storage of Firm and Non-Firm M&I Credit Water in Truckee River Reservoirs. Sierra shall have the right to establish Firm and Non-Firm M&I Credit Water by utilizing the Truckee River Reservoirs to store or retain its Privately Owned Stored Water and the consumptive use portion of Former Agricultural Water Rights which are not utilized to supply the demands of its customers in any given year for later use under Drought Conditions or Emergency or Repair Conditions for M&I purposes. Such water may be accumulated in those Reservoirs or may be transferred between those Reservoirs through acre foot for acre foot exchanges. Sierra agrees to use the full extent of the consumptive use portion of its Former Agricultural Water Rights which are not utilized to supply the demands of its customers in any given year to establish Firm or Non-Firm M&I Credit Water pursuant to the terms and conditions of this Agreement.

Section 5. Use of Firm and Non-Firm M&I Credit Water. Sierra may use Firm M&I Credit Water and Non-Firm M&I Credit Water to supply the demands of its customers under Drought Conditions to meet its normal water year demand, up to a maximum of 119,000 acre feet, less the sum of the quantities of water actually conserved through the implementation of the measures required by Section 29(e) of Article III of this Agreement and the additional water supplies described in Section 3 of Article III of this Agreement and implemented in accordance with the operating agreement described in Section 29(f) of Article III of this Agreement. Sierra also may use Firm M&I Credit Water and Non-Firm M&I Credit Water to meet the demands of its customers under Emergency or Repair Conditions.

Section 6. Calculation of Base Amounts of Firm and Non-Firm M&I Credit Water. The base amount of Firm M&I Credit Water Sierra may store pursuant to Section 4 of Article III of this Agreement shall vary from 2,000 acre feet to 12,000 acre feet in relation to the amount of water needed to satisfy the normal water demand of Sierra's customers as shown on Exhibit "A". The base amount of Non-Firm M&I Credit Water Sierra may store pursuant to Section 4 of Article III of this Agreement shall vary from 4,000 acre feet to 20,000 acre feet in relation to the amount of water needed to satisfy the normal water year demand of Sierra's customers as shown on Exhibit "B" and as the amount of water depleted from the Truckee River, its tributaries and groundwater basins within California increases as shown on Exhibit "C". The amount of Non-Firm M&I Credit Water shown on Exhibit "B" shall be multiplied by the percentage factor shown on Exhibit "C" for the amount of water being depleted in a normal year from the Truckee River, its tributaries and groundwater basins within California at the time the calculation is made. The product so obtained shall be the base amount of Non-Firm M&I Credit Water which Sierra may store pursuant to Section 4 of Article III of this Agreement; provided, however, that the base amount of Non-Firm M&I Credit Water which Sierra may store shall not be less than 4,000 acre feet. Sierra may commence storing Firm and Non-Firm M&I Credit Water pursuant to the provisions of this Agreement when this Agreement becomes effective.

Section 7. Status of M&I Credit Water. All of Sierra's M&I Credit Water stored in Stampede Reservoir at any given time up to the base amount of Firm M&I Credit Water determined in accordance with Section 6 of Article III of this Agreement shall be considered Firm M&I Credit Water and shall have all of the attributes of Firm M&I Credit Water. All of Sierra's remaining M&I Credit Water stored in Stampede Reservoir and all of its M&I Credit Water in other Truckee River Reservoirs shall be considered Non-Firm M&I Credit Water.

Section 8. Annual Adjustment of M&I Credit Water. The amounts of Firm and Non-Firm M&I Credit Water in storage in the Truckee River Reservoirs shall be adjusted once annually not later than April 15 of each year based upon whether or not a Drought Situation exists utilizing the April 1 seasonal runoff forecast. Following that annual adjustment, during the ensuing 12 months and whether or not a Drought Situation exists, Sierra shall have the right to utilize the available space in the Truckee River Reservoirs to store its Privately Owned Stored water and the consumptive use portion of Former Agricultural Water Rights which are not needed to supply the demands of its customers to establish additional amounts of M&I Credit Storage in excess of the base amounts of Firm and Non-Firm M&I Credit Water set forth in Section 6 of Article III of this Agreement.

Section 9. Exchanges to Permit Firm M&I Credit Water to be Stored in Stampede Reservoir and to Avoid Unnecessary Spill or Displacement. The Tribe, the United States and Sierra agree to make exchanges and to take such other measures as are necessary to permit Firm M&I Credit Water to be stored in Stampede Reservoir up to the base amount determined in accordance with Section 6 of Article III and to insure, to the maximum extent possible, that Firm M&I Credit Water, Non-Firm M&I Credit Water, Fishery Credit Water and Stampede Project Water will be available at the appropriate times and will not be displaced or caused to spill.

Section 10. Storage Priorities -- Non-Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation does not exist, the Tribe and the United States agree as follows: (a) that Sierra shall have the first right to store Firm M&I Credit Water in Stampede Reservoir from the following July 1 through December 31 up to the base amount determined in accordance with Section 6 of Article III of this Agreement; (b) that Sierra may displace Fishery Credit Water in Stampede Reservoir and may displace Stampede Project Water from July 1 through the following December 31 of each year to the extent necessary to achieve and not exceed the base amount of Firm M&I Credit Water in storage; and (c) that Sierra may accumulate additional Non-Firm M&I Credit Water in Truckee River Reservoirs other than Stampede Reservoir to the extent Sierra's total Firm M&I Credit Water is less than the base amount of Firm M&I Credit Water determined pursuant to Section 6 of Article III. Such additional Non-Firm M&I Credit Water may displace Fishery Credit Water from July 1 through the following December 31, shall spill or be reduced for precautionary drawdowns after Fishery Credit Water and shall share the net evaporation losses proportionately with any other water in all such reservoirs except Lake Tahoe.

Section 11. Conversion of M&I Credit Water to Fishery Credit Water -- Non-Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation does not exist, the amount of Non-Firm M&I Credit Water established in accordance with Section 8 of Article III of this Agreement in excess of the base amount determined in accordance with Section 6 of Article III of this Agreement shall become Fishery Credit Water. Sierra shall have the right to determine and identify the location of the excess Non-Firm M&I Credit Water stored in the Truckee River Reservoirs which shall become Fishery Credit Water.

Section 12. Credit Storage Rules -- Non-Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation does not exist, then for the ensuing 12 months, the following rules shall apply: (a) the Fishery Credit water and Non-Firm M&I Credit Water shall share the net evaporation losses proportionately with any other water in Truckee River Reservoirs other than Lake Tahoe; (b) Non-Firm M&I Credit Water shall be the first water to spill from Stampede Reservoir; and (c) except as provided in Section 10 of Article III of this Agreement, Non-Firm M&I Credit Water and Fishery Credit Water shall spill or be reduced for precautionary drawdowns proportionately from all other Truckee River Reservoirs.

Section 13. Displacement of Fishery Credit Water and Stampede Project Water -- Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation exists, the Tribe and the United States agree as follows: (a) to allow Sierra to displace Fishery Credit Water in Stampede Reservoir or Stampede Project Water from April 15 to July 1 to the extent necessary to enable Sierra to store up to 6,000 acre feet of the consumptive use portion of Former Agricultural Water Rights; (b) to allow Sierra to displace Fishery Credit Water in Stampede Reservoir or Stampede Project Water from July 1 to the following April 1 to the extent necessary to enable Sierra to store the base amounts of Firm and Non-Firm M&I Credit Water determined in accordance with Section 6 of Article III of this Agreement, except that for this purpose only the base amount of Non-Firm M&I Credit Water shall not be adjusted by the Exhibit "C" percentage reduction based upon the amount of water depleted from the Truckee River and its tributaries and groundwater basins in California; and (c) to allow Sierra to displace Fishery Credit Water in Truckee River Reservoirs other than Stampede Reservoir to the extent necessary to enable Sierra to increase the amounts of Firm and Non-Firm M&I Credit Water to the maximum extent possible without regard to the limitations of Section 6 of Article III of this Agreement.

Section 14. Carryover of Firm and Non-Firm M&I Credit Storage -- Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation exists, Sierra shall have the right to retain and carry over until the following year all of its Firm M&I Credit Water up to the base amount determined in accordance with Section 6 of Article III and all of its Non-Firm M&I Credit Water including the excess Non-Firm M&I Credit Water established in accordance with Sections 8 and 13 of Article III of this Agreement. All such excess Non-Firm M&I Credit Water may be retained and carried over and may continue to be increased pursuant to Sections 8 and 13 of Article III of this Agreement until, based upon a subsequent April 1 seasonal runoff forecast, a Drought Situation no longer exists.

Section 15. Credit Storage Rules -- Drought Situation. Whenever, based upon the April 1 seasonal runoff forecast, a Drought Situation exists, for the ensuing 12 months the Fishery Credit Water in all Truckee River Reservoirs in which it is stored shall be the first water to spill or be reduced for precautionary drawdowns. Non-Firm M&I Credit Water and Fishery Credit Water shall share the net evaporation losses proportionately from all Truckee River Reservoirs in which they are stored except Lake Tahoe.

Section 16. Use of Sierra's Privately Owned Stored Water. Sierra's Privately Owned Stored Water may be used to supply the demands of its customers in normal water years, under Drought Conditions and under Emergency or Repair Conditions. Sierra agrees to use all available Donner Lake water and all but 7,500 acre feet of its water above the outlet facilities of Independence Lake before using any Firm M&I or Non-Firm M&I Credit Water or the remaining 7,500 acre feet in Independence Lake to meet the needs of its customers under Drought Conditions or Emergency or Repair Conditions. Except as provided in Section 22 of Article III of this Agreement, all of Sierra's Privately Owned Stored Water that is not carried over or used to meet the demands of its customers in normal water years, under Drought Conditions or under Emergency or Repair Conditions shall be used if legally and physically possible to establish Firm or Non-Firm M&I Credit Water pursuant to the terms and conditions of this Agreement.

Section 17. Sierra to Control Privately Owned Stored Water. The quantities of Firm and Non-Firm M&I Credit Water stored, held and used pursuant to this Agreement shall not include, and shall be in addition to, the quantities of Sierra's Privately Owned Stored Water in Donner Lake and Independence Lake at any given time. Sierra retains the sole right to control and manage Sierra's Privately Owned Stored Water in Donner Lake and Independence Lake subject to all applicable laws, conditions and regulations.

Section 18. Exchanges of Fishery Credit Water and Prosser Creek Fishery Water to Enable Storage of M&I Credit Water in Stampede Reservoir. The Tribe and the United States agree to allow exchanges of their rights to store and use Fishery Credit Water and Prosser Creek Fishery Water for Sierra's right to store and use Non-Firm M&I Credit Water so as to enable Sierra to store the maximum amount of its Firm M&I Credit Water and Non-Firm M&I Credit Water in Stampede Reservoir. When releases of Stampede Project Water would otherwise be made, the Tribe and the United States agree to allow exchanges to enable Sierra to create Firm or Non-Firm M&I Credit Water in Stampede Reservoir.

Section 19. Additional Voluntary Exchanges of Credit Water. The Tribe, the United States and Sierra may agree to additional voluntary exchanges involving their respective rights and their Fishery, Firm M&I and Non-Firm M&I Credit Water as they may deem desirable and in furtherance of the objectives of this Agreement.

Section 20. Use of Fishery Credit Water. Subject to the provisions of Section 22 of Article III, all of the Fishery Credit Water established pursuant to this Agreement shall be stored in Truckee River Reservoirs and shall be utilized to provide Spawning Flows in the Lower Truckee River.

Section 21. Additional Water -- Worse Than Critical Drought Period. To meet the demands of its customers in the event of water supply conditions which are worse than those experienced during the Critical Drought Period, after exhausting Sierra's Normal Water Supplies, the 7,500 acre feet of water above the outlet facilities of Independence Lake to the extent permissible under then applicable law, and all Firm and Non-Firm M&I Credit Water, Sierra shall have the right to obtain sufficient water to meet its normal year water demand, up to a maximum of 119,000 acre feet, less the sum of the quantities of water conserved through the implementation of Section 29(e) of Article III of this Agreement and the additional water supplies described in Section 3 of this Agreement, from the following sources in the following order:

(a) Pump up to 5,000 acre feet of water from below the outlet works of Independence Lake to the extent permitted after making all necessary applications for such use; provided that if such water is not made available at the time required to satisfy the demands of Sierra's customers, Sierra may utilize the water supplies available in Section 21(b) of Article III of this Agreement to the extent required;

(b) Utilize as necessary a maximum of 7,500 acre feet of Fishery Credit Water in Stampede Reservoir; and

(c) Pump water from Lake Tahoe in accordance with, and to the extent permissible under, then applicable law.

Section 22. Establishment of Fishery Credit Water for Worse Than Critical Drought Period. As soon as practicable after this Agreement becomes effective, the Tribe and the United States agree to take all measures necessary to provide and hold in Stampede Reservoir the 7,500 acre feet of Fishery Credit Water referred to in Section 21(b) of Article III of this Agreement subject to the same terms and conditions as Firm M&I Credit Water utilizing the first Fishery Credit Water obtained pursuant to Section 11 of Article III of this Agreement. Once the 7,500 acre feet is in storage, it shall not be used for the benefit of the Pyramid Lake Fishery, and spill and evaporation losses and minimum instream flow requirements shall not be charged against it unless it is the only water in Stampede Reservoir.

Sierra may, at its option, fill the 7,500 acre feet provided in Section 21(b) of Article III directly from Sierra's Privately Owned Stored Water. Any of the water referred to in Section 21(b) of Article III that is used by Sierra shall be replaced by the Tribe and the United States as soon as practicable.

Section 23. Credit Water To Have Attributes of Privately Owned Stored Water. All Fishery Credit Water and Firm and Non-Firm M&I Credit Water stored pursuant to this Agreement shall have all the attributes of privately owned stored water under the Truckee River Agreement.

Section 24. Development of Additional M&I Water Supplies Above 119,000 Acre Feet of Demand. Sierra may obtain additional supplies of water to meet the demands of its customers above 119,000 acre feet per year, either after normal demand reaches 119,000 acre feet or prior thereto, through: (i) the acquisition of water rights in addition to those provided under Sections 2 and 3 of Article III of this Agreement; (ii) the utilization of water from hydrologic basins outside the Truckee River Basin; (iii) the development of Truckee River groundwater basins in Nevada beyond the 15,616 acre foot supply referenced in Section 3 of Article III of this Agreement to the extent that Sierra has added customers through expansion of the boundaries of its Service Area and acquired a water supply adequate to meet full demands of the new Service Area both in normal water years and during Drought Conditions; and (iv) the implementation of other measures. Any supplies developed pursuant to this Section shall not adversely affect the rights secured to the Tribe or the United States under this Agreement, any right of the Tribe or the United States to the Remaining Waters of the Truckee River, any rights secured to the Tribe or the United States under the settlement legislation which may be enacted by the Congress, or any other rights that the United States or the Tribe may claim. Such supplies must also comply with such state, local and federal permits and approvals as may be required under the then existing and applicable laws, rules and regulations. Provided, however, that the water supplies made available to Sierra pursuant to other Sections of this Agreement may only be used to the extent provided in Sections 5, 16 and 21 of Article III of this Agreement.

Section 25. Use of Water Outside Truckee River Basin. Sierra may utilize outside of the Truckee River Basin any of its existing Truckee River water rights or any such rights that it may acquire in the future. For any use of water outside the Truckee River Basin, except the approximately 3,000 acre feet of water committed to the Stead, Silver Lake and Golden Valley areas prior to the date of this Agreement, additional water rights shall be acquired in order to insure that return flows to the Truckee River are no less than they would have been if the water had been used in the Truckee River Basin.

Section 26. Additional Measures to Carry Out Agreement. Sierra, the United States and the Tribe agree to do those things as may be reasonably necessary to carry out the terms and conditions of this Agreement.

Section 27. Protection of Existing Perfected Rights. Nothing in this Agreement shall be construed to:

(a) Alter or conflict with any recognized and perfected right of any other person or entity to use the waters of the Truckee River or its tributaries including, but not limited to, the rights of landowners within the Newlands Project for delivery of the waters of the Truckee River to Derby Dam and for diversion of such waters at Derby Dam pursuant to the Orr Ditch Decree or any applicable law;

(b) Affect the right of Sierra to acquire and use for M&I purposes in accordance with this Agreement any recognized and perfected rights to waters of the Truckee River or its tributaries held by any person or entity;

(c) Affect Sierra's right to generate power at its hydroelectric plants on the Truckee River with any water rights it has or may acquire other than the rights to require releases of water from the Truckee River Reservoirs solely for hydroelectric power generation which are waived pursuant to Section 1 of Article III of this Agreement;

(d) Affect the quantity of water that is retained or carried over in storage in, or released from, the Truckee River Reservoirs pursuant to the Orr Ditch Decree and the Truckee River Agreement to satisfy the non-hydroelectric water rights recognized in the Orr Ditch Decree except for the consumptive use portion of Former Agricultural Water Rights which may be stored pursuant to the provisions of this Agreement;

(e) Affect the operation of any Truckee River Reservoirs to satisfy any applicable dam safety or flood control requirements;

(f) Affect the implementation of the Tahoe-Prosser Exchange Agreement of June 15, 1959;

(g) Result in an abandonment or forfeiture of the water rights of any party hereto; or

(h) Evidence any intention of any party hereto to abandon or forfeit any water rights.

Section 28. Water Master May Require Releases of Credit Water to Protect Existing Perfected Rights. Nothing in this Agreement is intended to affect the power of the Orr Ditch Court and the Water Master under the administrative provisions of the Orr Ditch Decree to ensure that the owners of the recognized and perfected Truckee River water rights receive the amount of water to which they are entitled under the Orr Ditch Decree. To the extent that implementation of this Agreement results in owners not receiving the amount of water to which they are legally entitled under the Orr Ditch Decree, the United States, the Tribe and Sierra Pacific agree that the owners' water will be made up through releases of water stored in Truckee River Reservoirs pursuant to this Agreement utilizing the water of the party or parties benefitting from such storage.

Section 29. Conditions for Agreement to be Effective and Operative. The provisions of this Agreement shall not take effect and this Agreement shall not be operative unless and until each of the following has occurred:

(a) The Congress of the United States has enacted, and the President of the United States has signed, Pyramid Lake and Truckee River settlement legislation whose terms and provisions are satisfactory to the Tribe and Sierra;

(b) The Legislature of Nevada has enacted, and the Governor of Nevada has signed, legislation which repeals or substantially modifies N.R.S. 704.230 to permit installation of water meters on all old and new residences within Sierra's Service Area, excluding existing unmetered apartments and condominium units or complexes which have all outdoor irrigation use metered, and to permit water rates based on the amount of water delivered to each customer;

(c) A plan for financing and installing water meters in Sierra's Service Area has received required governmental approvals and there are no foreseeable obstacles to its implementation;

(d) Sierra has proposed, and the Nevada Public Service Commission has approved, an inverted block water rate structure which provides financial incentives for the conservation of water by Sierra's residential customers;

(e) All required governmental approvals have been obtained for a mandatory water conservation plan designed to produce annual water savings of 10 percent or more during the ensuing year whenever it appears, based on the April 1 seasonal Truckee River runoff forecast, that a Drought Situation exists;

(f) An operating agreement has been executed at least by the United States, the Tribe and Sierra whose provisions include: (i) all of the necessary details required for the administration and implementation of this Agreement; and (ii) the consequences in the event that any provisions of this Agreement cannot be fulfilled for reasons that are beyond the control of the parties hereto such as, by way of example, final outcomes of administrative proceedings or litigation involving other parties which are not consistent with the terms or conditions of this Agreement;

(g) The United States becomes a party to this Agreement and accepts, approves and becomes bound by all of its terms and conditions to the same extent as the Tribe;

(h) All contracts and governmental approvals required to carry out the terms and provisions of this Agreement and the operating agreement, including, without limitation, contracts for the use of space in Truckee River Reservoirs for purposes of storing and exchanging water as provided in this Agreement have been executed;

(i) This Agreement and the operating agreement referred to in subsection (f) above have been submitted to the Court in United States *v.* Orr Water Ditch Co., Equity No. A-3, (D.Nev.), and by the Court in United States *v.* Truckee River General Electric Company, Civil No. 14861 (now S-643) (E.D. Cal.), and found to be consistent with those Decrees or is otherwise approved.

(j) Sierra and the United States have reached agreement on: (i) the compensation Sierra shall pay to the United States for the right to use the storage capacity in the Truckee River Reservoirs; (ii) arrangements to compensate Sierra for the reduction in the amount of hydroelectric power generated at its four run of the river hydroelectric plants on the Truckee River above Reno which will result from the implementation of this Agreement; and (iii) indemnification with respect to water damage resulting from the operation of the dam and controlling works at the outlet of Lake Tahoe; and

(k) All pending litigation or the portions of pending litigation involving the Tribe, Sierra and the United States have been resolved to their mutual satisfaction.

At an appropriate time, the Tribe the United States and Sierra agree to execute a written document which shall either confirm or deny that the conditions set forth in this Section have been satisfied.

Section 30. Notices. All notices and other communications required or permitted to be given by this Agreement must be in writing and will be deemed given on the day when delivered in person or on the third business day after the day on which mailed from within the United States of America by certified or registered mail, return receipt requested, postage prepaid, addressed as follows:

If to the Tribe:	Pyramid Lake Paiute Tribal Chairman P.O. Box 256 Nixon, Nevada 89424
If to Sierra:	Philip G. Seges Senior Vice President Sierra Pacific Power Company P.O. Box 10100 Reno, Nevada 89520
If to United States:	Lahontan Basin Project Manager P.O. Box 640 705 North Plaza Carson City, Nevada 89702

or to such other place as either party may from time to time designate in a written notice to the other.

Section 31. Captions For Convenience Only. The captions of the Sections of this Agreement are for convenience only and shall not in any way affect the construction of the terms and conditions of this Agreement.

Section 32. Entire Agreement. This Agreement contains the entire agreement between the parties hereto and there are no promises, agreements, conditions, undertakings, warranties, or representations, oral or written, express or implied, between them other than as herein set forth. No change or modification of this Agreement or of any of the provisions hereof shall be valid or effective unless the same is in writing and signed by the parties hereto. No alleged or contended waiver of any of the provisions of this Agreement shall be valid or effective unless signed in writing by the party against whom it is sought to be enforced.

EXHIBIT A

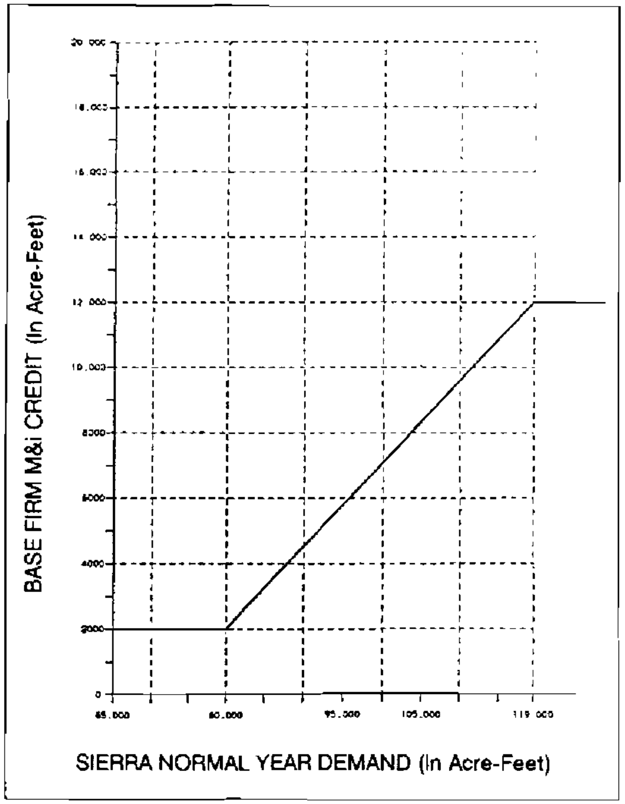


EXHIBIT B

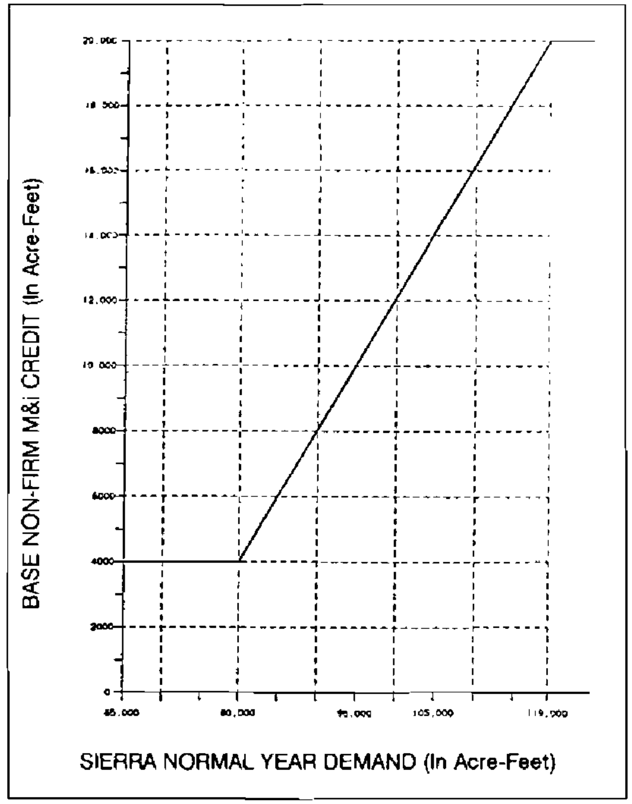
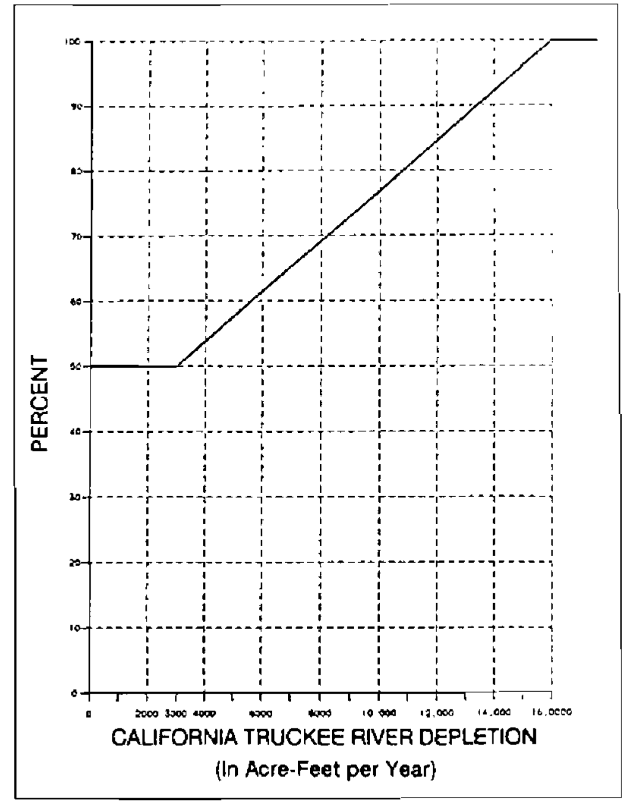


EXHIBIT C



Attachment C

March 12, 2003, letter from the Truckee Meadows Water Authority: TROA EIS/EIR Planning Assumptions

TRUCKEE MEADOWS WATER
AUTHORITY

P.O. Box 30013, Reno, Nevada 89520-3013

RECEIVED
WESTERN NEVADA AGENCY
2003 JUL 28 PM 2:45

12 March 2003

Tom Strekal, Bureau of Indian Affairs
Western Nevada Agency
1677 Hot Springs Road
Carson City, NV 89706

RE: TROA EIS/EIR Planning Assumptions

Dear Tom:

This letter describes local planning and facility assumptions to be used for the Truckee River Operating Agreement (TROA) EIS/EIR. The local governmental entities preparing this letter are responsible for land use, water supply, and wastewater planning and implementation of TROA water supply to be used by the Truckee Meadows Water Authority (TMWA) the successor to the water division of Sierra Pacific Power Company. Three of these entities, Reno, Sparks and Washoe County, are also parties to the Truckee River Water Quality Settlement Agreement (WQSA). Collectively, the undersigned agencies have the responsibility for all of these issues in the Washoe County area and recommend that the following assumptions should be relied upon when developing the EIS/EIR for TROA. This letter describes general conditions applicable to all of the alternatives. It also provides our recommendations concerning water supply and wastewater assumptions to include in the Local Water Supply Alternative (LWSA), as the likely future case without TROA, and the No Action Alternative (NAA).

Population and Water Demand Projections

The population forecast for Washoe County and the TMWA wholesale and retail service areas is presented in the following table along with the TMWA water demand forecast. These forecasts have been developed by TMWA and are incorporated into its November 5, 2002 draft 2005-2025 Water Resource Plan. TMWA will continue to serve much of the growth in Washoe County directly or through its various wholesale arrangements, including utilities managed by Washoe County. The wholesale areas served by TMWA are a combination of systems, some of which are solely supplied by TMWA and others use multiple resources to supply their customers.

Washoe County and TMWA Population Forecast and TMWA Water Demand Forecast

Year	Washoe County Population (persons)	Retail and Wholesale TMWA Service Area Population (persons)	TMWA Water Demand (AF/Year)
2000	339,486	284,147	82,173
2001	347,391	290,763	84,017
2002	355,390	297,458	86,055
2003	363,385	304,150	87,454
2004	370,443	310,058	87,674
2005	377,049	315,587	87,928
2006	383,618	321,085	88,305
2007	390,067	326,483	88,810
2008	396,486	331,855	89,438
2009	402,872	337,201	90,169
2010	409,152	342,457	90,975
2011	415,291	347,595	91,773
2012	421,266	352,596	93,266
2013	427,075	357,458	94,724
2014	432,730	362,192	96,148
2015	438,233	366,798	97,541
2016	443,581	371,273	98,902
2017	448,767	375,614	100,230
2018	453,862	379,879	101,537
2019	458,885	384,083	102,828
2020	463,838	388,229	104,106
2021	468,724	392,318	105,370
2022	473,540	396,349	106,620
2023	478,280	400,316	107,855
2024	482,939	404,216	109,073
2025	487,515	408,046	110,273
2026	492,739	412,419	111,455
2027	497,880	416,721	112,617
2028	502,932	420,950	113,760
2029	507,892	425,101	114,882
2030	512,756	429,172	115,982
2031	517,521	433,160	117,060
2032	522,182	437,062	118,115
2033	526,737	440,874	119,145
2034	531,181	444,594	120,150
2035	535,512	448,219	121,130
2036	539,725	451,745	122,083
2037	543,818	455,171	123,008
2038	547,786	458,493	123,906
2039	551,628	461,708	124,775
2040	555,339	464,814	125,615

The population estimates through 2022 are based upon an econometric model of Washoe County employment with the addition of a constraint upon the availability of developable land. The water demand projections are based upon estimated residential, commercial and industrial development that would correspond to the population and employment projections, using current consumption rates. Adjustments to consumption rates include conservative estimates of water savings to be achieved from conservation measures and water metering. The population and demand estimation procedure is more fully described in the TMWA resource plan that will be published later this year. Following 2022, the population and demand projections are linearly extrapolated.

Recommended Planning Horizon for EIS/EIR

In accordance with the Preliminary Settlement Agreement (PSA) and TROA, the planning horizon applicable for study of the "full implementation" investigations in the TROA EIS/EIR is the year when the projected development and population place a demand upon TMWA's normal-year water supply, as defined in TROA, of 119,000 acre-feet per year. This planning horizon is appropriate for both the TROA and non-TROA conditions. Similar levels of non-drought water conservation are envisioned under both TROA and non-TROA conditions. The TROA Alternative, NAA and LWSA share the same population and demand projection. The alternatives may have differing abilities to meet the projected demands as described later in this letter.

Based upon these population and water demand projections, the planning horizon for the TROA EIS/EIR is approximately the year 2033. The Washoe County population and employment not served by the TMWA retail and wholesale water supply will be served by other water resources and wastewater facilities. The population, land use and employment, and the corresponding water supply and wastewater management for these non-TMWA served areas are not anticipated to vary between the EIS/EIR alternatives.

Wastewater Quantity

Of the 119,000 acre-feet/year of water supply projected to be provided by TMWA to its wholesale and retail service area in the year 2033 (the planning horizon for the EIR/EIS as recommended above), the effluent associated with 3,000 acre-feet of demand to serve a portion of the North Valleys area (outside the Truckee River basin) is not required to be returned to the Truckee River basin. Such 3,000 acre-feet of North Valley's export of water is expected to be approximately the same under each of the alternatives in the EIS/EIR (TROA, LWSA, and NAA) and not subject to any return flow requirements.

Treated wastewater associated with the remaining 116,000 acre-feet of Truckee basin water consumption is estimated as 48% of water supply for all EIS/EIR alternatives based upon the 10-year (1992-2001) average ratio of effluent to supply. This assumption results in the following:

Annual Effluent Quantity = 48% of 116,000 ac-ft = 55,680 ac-ft/year

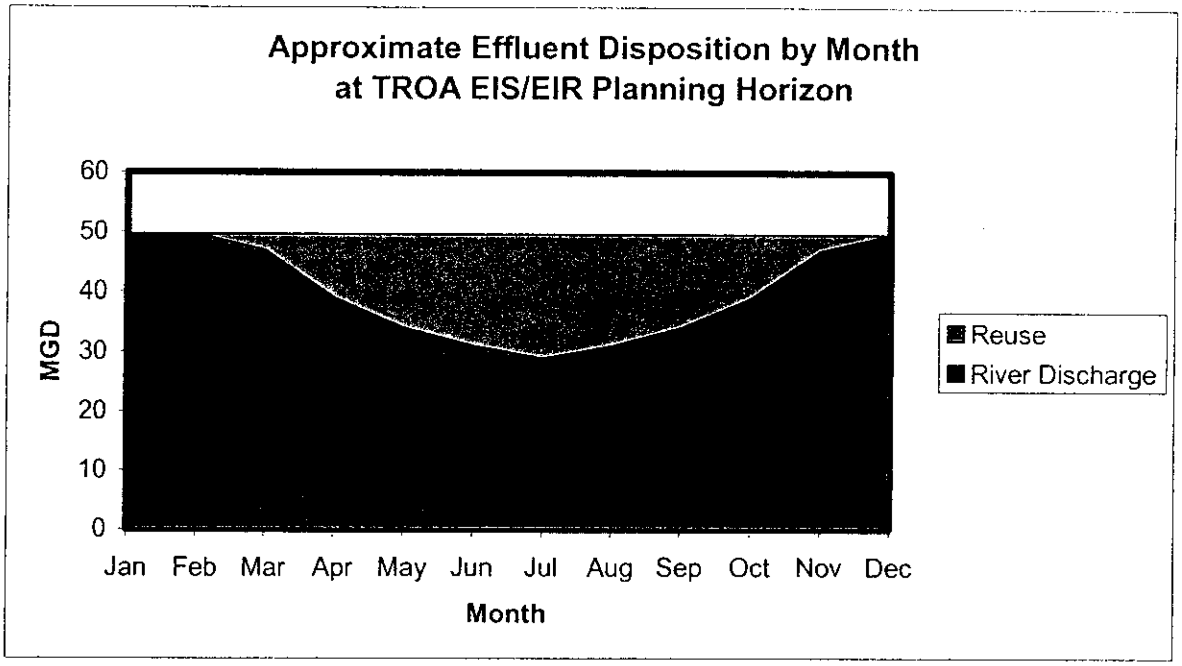
Wastewater Discharge to Truckee River and Reuse

Pursuant to relevant Nevada State Engineer's rulings and other agreements, wastewater effluent generated from the use of groundwater is not required to be returned to the Truckee River under the TROA, LWSA or NAA alternatives. However, pursuant to 1.E.4 of TROA, the Pyramid Lake Paiute Tribe ("PLPT") has reserved its rights to object to the use of groundwater for effluent reuse; if PLPT were successful in its protest of the use of groundwater for effluent reuse by requiring return flow, then the 6700 acre feet of additional water quality water provided under TROA (as described on the next page) would not be used as water quality water, but instead would be part of the flow in the river available to all downstream users.

Based upon 48 percent of the 15,950 acre-feet of groundwater pumping by TMWA, 7,656 acre-feet of effluent is attributable to the use of TMWA groundwater rights and may be reused without providing return flows to the Truckee River.

The present discharge permit for the Truckee Meadows Water Reclamation Facility (TMWRF) allows a monthly average of 40 mgd of effluent to be discharged to the Truckee River. Assuming a constant daily discharge throughout the year for volume calculation purposes, this is equivalent to 44,800 acre-feet per year. Operationally, the TMWRF discharge to the Truckee River is assumed to be approximately 29 to 32 mgd in the summer months and 49.7 mgd in the winter months. The 10,880 acre-feet (55,680 less 44,800) of the effluent not discharged to the Truckee River will be used for landscape irrigation (such as parks, road medians, and golf courses) and agricultural irrigation (such as the UNR experiment station) in the Truckee Meadows and Spanish Springs Valley areas during the irrigation season. The 44,800 acre-foot portion of the effluent not used to meet reuse demands will be discharged to the Truckee River.

The following graph is an approximate representation of the monthly disposition of the wastewater effluent associated with the retail and wholesale water supply provided by TMWA in 2033. River discharge of effluent originating from the TMWA water supply is anticipated to only occur from TMWRF. Effluent reuse will be provided by multiple facilities, including TMWRF.



It is assumed the portion of the effluent reuse that is not associated with the groundwater component of the TMWA water supply (under each of the EIS/EIR alternatives) will require return flow water rights to be acquired and left in the Truckee River to be available to serve downstream water rights. This quantity can be determined as follows assuming a year-round constant discharge:

Annual effluent quantity	55,680 acre-feet
Less 40 mgd river discharge	- 44,800 acre-feet
Total amount of effluent reuse	=10,880 acre-feet
Less groundwater component	- 7,656 acre-feet
Surface water component of reuse water	= 3,224 acre-feet

The 3,224 acre-feet of reuse is to be replaced by an assumed (1 for 1) acquisition of Truckee Meadows water rights in each of the EIS/EIR alternatives. In normal years these replacement water rights will remain in the river and are not required to be stored under any of the alternatives. In dry years, no replacement water is required for effluent reuse because credit water and POSW, which do not require return flow, are used to support water supplies to meet demands. As part of TROA, Reno/Sparks/Washoe County will acquire an additional 6,700 acre-feet of Truckee Meadows water rights to be managed for water quality under the provisions of the WQSA. Under LWSA and NAA, Reno/Sparks/Washoe County would not acquire 6,700 acre-feet of Truckee Meadows water rights.

Water Right Acquisition to Serve TMWA Water Demands

Under TROA, approximately 93,550 acre-feet of irrigation water rights (referred to as "changed diversion rights" in TROA) will be needed to meet a TROA planning horizon demand of 119,000 acre-feet. This amount of acquired and transferred irrigation right is in conformance with TROA Sections 4.B.2, 4.B.3, and 4.B.4. The 93,550 acre-feet include an estimate that between June 30, 2002, and October 20, 2004, approximately 438 acre-feet of irrigation right acquisition will be associated with the Section 4.B.2(a) temporary suspension of the 0.11 acre-foot requirement.

In accordance with the 1989 statutes of Nevada, Chapter 617 ("AB 900"), water rights held by TMWA that are associated with a reduction in customer demand that may result from implementation of the residential water meter retrofit program under TROA cannot be allocated to normal year water service for future customers. Under non-TROA conditions (LWSA and NAA), it is anticipated that the TROA Section 4.B.2(b) requirement to acquire the 0.11 acre-foot component would not be continued when making commitments for new water service. Since the provisions of TROA and AB 900 would not be implemented under LWSA and NAA, conserved resources can be utilized to provide water for additional customers without providing additional water rights.

For these two reasons, LWSA and NAA will require fewer irrigation water rights to be acquired than the TROA alternative. LWSA requires 83,030 acre-feet of irrigation water rights to be acquired and transferred to M&I use by TMWA.

Under each of the alternatives, the water rights acquisitions will be implemented through developer dedications to TMWA or to Washoe County for the benefit of TMWA. The acquired water rights will be derived from a mixture of existing decreed agricultural water rights in the Truckee Meadows, Verdi, Spanish Springs and Tracy areas that may or may not be attached to water righted land. The proportions of water rights from each basin and their present uses will be determined by developer choices in the market place and are not expected to vary among the alternatives.

Presently, TMWA holds and has commitments against 51,206 acre-feet of acquired irrigation rights for the service of its current commitments of 87,173 acre-feet. It also holds 5,970 acre-feet of water rights in reserve for projects that have not yet received "will serve" letters. In each of the alternatives, the TMWA reserved water rights plus developer dedications will be used to reach the respective total irrigation water rights quantities stated in the first and third paragraphs of this section. Because TROA Sections 4.B.3 and 4.B.4 do not apply to NAA and LWSA, water rights associated with such TROA provisions and held by TMWA would be used to develop other drought supply alternatives to meet normal and dry-year water service demands for future customers under NAA and LWSA

TMWA Water Supply Assumptions

For each alternative, the EIS/EIR operation studies may vary slightly in terms of monthly quantities and timing in the tables that appear in following sections of this letter. Such variations may result from different assumptions regarding water demand and water supply (such as Newlands Project demand, cui-ui operation, etc. that are not yet fully identified and scheduled) that will be used when the EIS/EIR operation studies are conducted.

TROA Alternative

It is assumed under TROA that TMWA's water supplies will also include:

- Acquisition of TCID's share of Donner Lake
- TROA credit storage (the Interim Contract is superceded)
- Groundwater pumping up to 15,950 acre-feet in a year.

Previous investigations assumed that during dry years the TMWA conservation programs would reduce water demand by 10 percent below the normal year demand. However, since the previous EIS/EIR investigations, a normal year conservation program has been developed, approved and is being implemented. This program satisfies the 10 percent conservation commitment included in the Preliminary Settlement Agreement. Because such normal year conservation is greater than previously assumed, it is realistic to assume that dry-year conservation under TROA can be somewhat less than an additional 10 percent. For these studies it is recommended that dry-year conservation range between one percent during the winter and seven percent during the summer. This provides an annual dry-year conservation of less than five percent.

TMWA's demand will be supplied during normal water supply years utilizing 12,570 acre-feet of groundwater pumping, Hunter Creek Orr Ditch decree based diversion rights and Truckee River Orr Ditch decree based diversion rights. During a typical normal year, the TMWA water demand will be served approximately as shown in the following tabulation.

TROA Alternative – TMWA Normal-Year Water Supplies to Serve Customer Demand (units in acre-feet)

	Groundwtr Pumping	Groundwtr Recharge Pumping	Hunter Creek	40 cfs M&I Right	Supply From Acquired Irrigation Rights	POSW	Credit Storage	TOTAL SUPPLY
	----a----	----b----	----c----	----d----	----e----	----f----	----g----	----h----
Jan	0	0	350	2,430	3,710	0	0	6,490
Feb	0	0	330	2,220	3,540	0	0	6,090
Mar	0	0	360	2,430	3,930	0	0	6,720
Apr	0	0	510	2,360	6,090	0	0	8,960
May	920	0	750	2,430	8,110	0	0	12,210
Jun	1,800	0	690	2,360	9,070	0	0	13,920
Jul	3,700	0	560	2,430	8,760	0	0	15,450
Aug	3,770	0	420	2,430	8,670	0	0	15,290
Sep	1,830	0	330	2,360	7,480	0	0	12,000
Oct	550	0	340	2,430	5,520	0	0	8,840
Nov	0	0	320	2,360	3,860	0	0	6,540
Dec	0	0	300	2,430	3,760	0	0	6,490
Total	12,570	0	5,260	28,670	72,500	0	0	119,000

During a year when the Truckee River is unable to provide Floriston Rates the entire year, TMWA's customers' demands will be reduced by as much as 5,280 acre-feet of dry-year conservation measures. The normal year sources of supply will be supplemented by pumping additional groundwater, release of Privately Owned Stored Water (POSW) from Donner and Independence Lakes and release of TMWA's M&I Credit. Dry-year TMWA supply and conservation will be approximately as shown in the following tabulation.

TROA Alternative – TMWA Dry-Year Water Supplies to Serve Customer Demand
(units in acre-feet)

	Groundwtr Pumping	Groundwtr Recharge Pumping	Hunter Creek	40 cfs M&I Right	Supply From Acquired Irrigation Rights	POSW	Credit Storage	TOTAL SUPPLY
	----a----	----b----	----c----	----d----	----e----	----f----	----g----	----h----
Jan	0	0	250	2,430	3,740	0	0	6,420
Feb	0	0	230	2,220	3,580	0	0	6,030
Mar	0	0	250	2,430	3,970	0	0	6,650
Apr	0	0	230	2,360	6,190	0	0	8,780
May	920	0	320	2,430	8,160	0	0	11,830
Jun	2,060	0	290	2,360	2,090	330	5,960	13,090
Jul	4,570	0	200	2,430	440	250	6,480	14,370
Aug	4,660	0	150	2,430	450	200	6,330	14,220
Sep	2,770	0	150	2,360	330	3,060	2,620	11,290
Oct	970	0	190	2,430	980	120	3,710	8,400
Nov	0	0	180	2,360	2,050	230	1,400	6,220
Dec	0	0	140	2,430	3,850	0	0	6,420
Total	15,950	0	2,580	28,670	35,830	4,190	26,500	113,720*

* The total demand of 119,000 acre-feet is reduced by 5,280 acre-feet as a result of dry-year conservation (113,720 + 5,280 = 119,000).

Local Water Supply Alternative (LWSA)

LWSA assumes that additional water supplies are acquired or developed which will substitute for most or all of the water supply provided by TROA credit storage. The development of these new resources would be the most probable approach to providing a non-TROA water supply. It is assumed under LWSA that TMWA's current surface water supplies will also be augmented by:

- Continuation and renewal of the Interim Contract for storage in Stampede and Boca at the full 5000 acre-foot amount.
- Groundwater pumping up to 22,000 acre-feet in a year under the Truckee Meadows Groundwater Banking Order.
- Implementation of an artificial recharge project (described below) to increase firm drought year supply.

TMWA's demand during normal water supply years will be supplied utilizing 12,570 acre-feet per year of groundwater pumping from the Truckee Meadows under the current program for pumping of Truckee Meadows groundwater.

The artificial recharge project is estimated to recharge 1,000 acre-feet each year using well injection in the Truckee Meadows. During recent years, TMWA has developed and improved its recharge program to obtain annual recharged amounts of 780 acre-feet (1999), 1720 acre-feet (2000) and 3,080 acre-feet (2001). During January through March of 2002, 1920 acre-feet were recharged and TMWA expects to recharge another 1,000 to 1,500 acre-feet during November and December, resulting in annual recharge between 3,000 and 3,500 acre-feet during 2002. Thus, a program that recharges an average of 1,000 acre-feet each year between the months of November through March is well within TMWA's present capability. TMWA currently has State Engineer approval for underground injection, but the application and subsequent State Engineer approval to increase withdrawal of approximately 4,500 acre-feet groundwater above 22,000 acre-feet has yet to occur.

During a normal year, TMWA water demands will be served approximately as shown in the following tabulation.

LWSA Alternative – TMWA Normal-Year Water Supplies to Serve Customer Demand (units in acre-feet)

	Groundwtr Pumping	Groundwtr Recharge Pumping	Hunter Creek	40 cfs M&I Right	Supply From Acquired Irrigation Rights	POSW	Credit Storage	TOTAL SUPPLY
	----a----	----b----	----c----	----d----	----e----	----f----	----g----	----h----
Jan	0	0	350	2,430	3,710	0	0	6,490
Feb	0	0	330	2,220	3,540	0	0	6,090
Mar	0	0	360	2,430	3,930	0	0	6,720
Apr	0	0	510	2,360	6,090	0	0	8,960
May	920	0	750	2,430	8,110	0	0	12,210
Jun	1,800	0	690	2,360	9,070	0	0	13,920
Jul	3,700	0	560	2,430	8,760	0	0	15,450
Aug	3,770	0	420	2,430	8,670	0	0	15,290
Sep	1,830	0	330	2,360	7,480	0	0	12,000
Oct	550	0	340	2,430	5,520	0	0	8,840
Nov	0	0	320	2,360	3,860	0	0	6,540
Dec	0	0	300	2,430	3,760	0	0	6,490
Total	12,570	0	5,260	28,670	72,500	0	0	119,000

During a year when the Truckee River is unable to provide Floriston Rates the entire year, TMWA's supply to its water customers will be reduced by as much as 5,630 acre-feet by dry-year conservation measures. The normal year sources of supply will be supplemented by pumping additional groundwater from the Truckee Meadows. Pumping will increase to approximately 26,500 acre-feet, of which up to 22,000 will be associated with Truckee Meadows groundwater pumping in the State Engineer's existing order and approximately 4,500 acre-feet will be associated with the groundwater recharge program.

LWSA Alternative – TMWA Dry-Year Water Supplies to Serve Customer Demand (units in acre-feet)

	Groundwtr Pumping	Groundwtr Recharge Pumping	Hunter Creek	40 cfs M&I Right	Supply From Acquired Irrigation Rights	POSW	Credit Storage	TOTAL SUPPLY
	----a----	----b----	----c----	----d----	----e----	----f----	----g----	----h----
Jan	0	0	250	2,430	3,620	0	110	6,410
Feb	0	0	230	2,220	3,640	0	0	6,090
Mar	0	0	250	2,430	4,040	0	0	6,720
Apr	0	0	230	2,360	6,370	0	0	8,960
May	920	0	320	2,430	8,530	0	0	12,200
Jun	1,900	290	290	2,360	1,530	6,400	0	12,770
Jul	5,360	1,110	200	2,430	10	2,610	2,320	14,040
Aug	5,410	1,100	150	2,430	380	450	3,950	13,870
Sep	5,240	1,050	150	2,360	430	680	1,000	10,910
Oct	3,100	900	190	2,430	1,740	10	0	8,370
Nov	0	0	180	2,360	4,000	0	0	6,540
Dec	0	0	140	2,430	3,920	0	0	6,490
Total	21,930	4,450	2,580	28,670	38,210	10,150	7,380	113,370*

* The total demand of 119,000 acre-feet is reduced by 5,630 acre-feet as a result of drought-year conservation (113,370 + 5,630 = 119,000).

No Action Alternative

NAA assumes that TMWA is unsuccessful in its attempts to obtain additional water supplies through TROA or LWSA. Under NAA it is assumed TMWA's current surface water supplies will also be augmented by:

- Continuation and renewal of the Interim Contract for storage in Stampede and Boca at the full 5000 acre-foot amount.
- Groundwater pumping up to 22,000 acre-feet in a year under the Truckee Meadows Groundwater Banking Order.

TMWA's demand will be supplied during normal water supply years utilizing 12,570 acre-feet of groundwater pumping, Hunter Creek Orr Ditch decree based diversion rights and Truckee River Orr Ditch decree based diversion rights. During a typical normal year, the TMWA water demand will be served approximately as shown in the following tabulation.

NAA Alternative – TMWA Normal-Year Water Supplies to Serve Customer Demand (units in acre-feet)

	Groundwtr Pumping ----a----	Groundwtr Recharge Pumping ----b----	Hunter Creek ----c----	40 cfs M&I Right ----d----	Supply From Acquired Irrigation Rights ----e----	POSW ----f----	Credit Storage ----g----	TOTAL SUPPLY ----h----
Jan	0	0	350	2,430	3,710	0	0	6,490
Feb	0	0	330	2,220	3,540	0	0	6,090
Mar	0	0	360	2,430	3,930	0	0	6,720
Apr	0	0	510	2,360	6,090	0	0	8,960
May	920	0	750	2,430	8,110	0	0	12,210
Jun	1,800	0	690	2,360	9,070	0	0	13,920
Jul	3,700	0	560	2,430	8,760	0	0	15,450
Aug	3,770	0	420	2,430	8,670	0	0	15,290
Sep	1,830	0	330	2,360	7,480	0	0	12,000
Oct	550	0	340	2,430	5,520	0	0	8,840
Nov	0	0	320	2,360	3,860	0	0	6,540
Dec	0	0	300	2,430	3,760	0	0	6,490
Total	12,570	0	5,260	28,670	72,500	0	0	119,000

During a year when the Truckee River is unable to provide Floriston Rates the entire year, TMWA's customers' demands will be reduced by as much as 11,020 acre-feet by dry-year conservation measures. The normal year sources of supply will be supplemented by pumping additional groundwater from the Truckee Meadows, release of Privately Owned Stored Water from Donner and Independence Lakes and release of TMWA's M&I Credit (available under the Interim Storage Agreement). Dry-year TMWA supply will be served approximately as shown in the following tabulation.

NAA Alternative – TMWA Dry-Year Water Supplies to Serve Customer Demand
(units in acre-feet)

	Groundwtr Pumping	Groundwtr Recharge Pumping	Hunter Creek	40 cfs M&I Right	Supply From Acquired Irrigation Rights	POSW	Credit Storage	TOTAL SUPPLY
	----a----	----b----	----c----	----d----	----e----	----f----	----g----	----h----
Jan	0	0	250	2,430	3,790	0	0	6,470
Feb	0	0	230	2,220	3,640	0	0	6,090
Mar	0	0	250	2,430	4,040	0	0	6,720
Apr	0	0	230	2,360	6,370	0	0	8,960
May	920	0	320	2,430	8,540	0	0	12,210
Jun	1,900	0	290	2,360	1,540	5,710	0	11,800
Jul	5,360	0	200	2,430	0	3,270	1,700	12,960
Aug	5,410	0	150	2,430	380	360	4,070	12,800
Sep	5,240	0	150	2,360	430	1,000	890	10,070
Oct	3,100	0	190	2,430	1,730	10	60	7,520
Nov	0	0	180	2,360	3,350	0	0	5,890
Dec	0	0	140	2,430	3,920	0	0	6,490
Total	21,930	0	2,580	28,670	37,730	10,350	6,720	107,980*

* The total demand of 119,000 acre-feet is reduced by 11,020 acre-feet as a result of dry-year conservation and/or shortage (107,980 + 11,020 = 119,000).

Truckee Meadows Groundwater Usage for LWSA and NAA

The groundwater supply assumed under LWSA and under NAA consists of utilizing the Truckee Meadows groundwater banking order of the Nevada State Engineer which allows for a banking of all groundwater resources owned by TMWA in the Truckee Meadows through the conjunctive use of surface water rights with the 15,950 acre-feet of rights referenced in the TROA alternative and the use of the "capped" groundwater permits owned by TMWA. The State Engineer's order allows for total pumping of no more than 22,000 acre-feet per year of groundwater against the "capped" groundwater rights through the accumulation of credits from reducing normal year groundwater pumping to less than the 15,950 acre-feet per year.

LWSA utilizes groundwater from groundwater recharge in the Truckee Meadows as well as the Truckee Meadows groundwater pumping associated with the groundwater banking order. The artificial recharge project is estimated to recharge 1,000 acre-feet each year using well injection in the Truckee Meadows. The following tabulation lists the LWSA amounts of modeled Truckee Meadows groundwater pumping associated with TMWA's permits and the recharge program during the historic 1987-1994 drought for the years 1985 through 1997.

LWSA-Groundwater Pumping (units in thousands of acre-feet)

Calendar Year	Permitted Pumping	Recharge Pumping	Annual Pumping
1985	12.57	0.00	12.57
1986	12.57	0.00	12.57
1987	12.57	0.00	12.57
1988	21.55	3.05	24.60
1989	12.57	0.00	12.57
1990	20.17	3.05	23.22
1991	18.78	2.15	20.93
1992	21.93	4.45	26.38
1993	12.93	0.00	12.93
1994	21.93	3.89	25.82
1995	12.57	0.00	12.57
1996	12.57	0.00	12.57
1997	12.57	0.00	12.57

The following tabulation lists the NAA amounts of modeled Truckee Meadows groundwater pumping associated with TMWA's permits during the historic 1987-1994 drought for the years 1985 through 1997.

NAA-Groundwater Pumping (units in thousands of acre-feet)

Calendar Year	Permitted Pumping (1000 a-f)	Recharge Pumping (1000 a-f)	Annual Pumping (1000 a-f)
1985	12.57	0.00	12.57
1986	12.57	0.00	12.57
1987	12.57	0.00	12.57
1988	21.00	0.00	21.00
1989	12.57	0.00	12.57
1990	20.17	0.00	20.17
1991	19.47	0.00	19.47
1992	21.93	0.00	21.93
1993	12.93	0.00	12.93
1994	21.65	0.00	21.65
1995	12.57	0.00	12.57
1996	12.57	0.00	12.57
1997	12.57	0.00	12.57

Conservation Measures and Drought Conservation

The undersigned entities are parties to an agreement with the PLPT addressing water conservation measures that are currently in force. That agreement, among other things, provides for normal year water conservation measures to be implemented and replaces the program for drought conservation required by the PSA. In addition to the normal year conservation measures, the local governments have adopted ordinances (cite codes) providing a mechanism to implement incremental levels of drought conservation measures, including placing various predefined limits on outdoor irrigation. Under severe shortages, resulting from extreme drought or other emergencies, outdoor irrigation can be prohibited. The drought and emergency provisions of the existing local ordinances are likely to be continued under LWSA and NAA because each of these alternatives relies upon conservation to address a portion of the demand in the summer months of a drought.

The conservation programs for LWSA are assumed to produce up to 10 percent maximum monthly conservation rate in summer months during droughts. For NAA insufficient water supply results in additional conservation or shortage (up to 17 percent of demand during summer months) will be required. As shown by the previous dry-year water supply tables, dry-year conservation measures play a role in reducing the demand in drought years under each of the three EIS/EIR alternatives. Conservation associated with each alternative water supply indicated with the previous examples of dry-year operation is summarized as shown in the following tabulation.

Dry-year Conservation by Month For Each Alternative

Month	Normal Year Demand (acre-feet) ----a----	TROA Conservation (acre-feet) ----b----	TROA Conservation Monthly (%) ----c----	LWSA Conservation (acre-feet) ----d----	LWSA Conservation Monthly (%) ----e----	NAA Conservation/Shortage (acre-feet) ----f----	NAA Conservation/Shortage Monthly (%) ----g----
January	6,490	70	1.1	80	1.2	20	0.3
February	6,090	60	1.0	0	0.0	0	0.0
March	6,720	70	1.0	0	0.0	0	0.0
April	8,960	180	2.0	0	0.0	0	0.0
May	12,210	380	3.1	0	0.0	0	0.0
June	13,920	830	6.0	1,150	8.3	2,120	15.2
July	15,450	1,080	7.0	1,410	9.1	2,490	16.1
August	15,290	1,070	7.0	1,420	9.3	2,490	16.3
September	12,000	710	5.9	1,090	9.1	1,930	16.1
October	8,840	440	5.0	480	5.3	1,320	14.9
November	6,540	320	4.9	0	0.0	650	9.9
December	6,490	70	1.1	0	0.0	0	0.0
Annual	119,000	5,280	4.4 *	5,630	4.7 *	11,020	9.3*

* These values are the annual percent conservation.

Please feel free to contact Don Mahin or John Erwin as principal members of the TMWA team that generated the assumptions contained herein, or with any other ideas or concerns you may have.

For Truckee Meadows Water Authority

John A. Erwin

For Washoe County

Steve Bradhurst

For City of Reno

Greg Dennis

For City of Sparks

Wayne Seidel

CC:
Gordon Depaoli
Rod Hall
Sue Oldham

Attachment D

June 2, 2003, letter from the California Department of Water Resources: Water Use Estimates for the Lake Tahoe and Truckee River Basins

STATE OF CALIFORNIA - THE RESOURCES AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
3251 S STREET
SACRAMENTO, CA 95816-7017

JUN 0 2 2003

Mr. Tom Strekal
Western Nevada Agency
1677 Hot Springs Road
Carson City, Nevada 89706

Subject: Water Use Estimates for the Lake Tahoe and Truckee River Basins

Dear Mr. Strekal:

This letter is to transmit information for the Truckee-Carson Water Accounting Model in accordance with the request by the TROA EIS/EIR Management Team. The TROA EIS/EIR Management Team requested further specificity in the updated estimates of water use in the California portions of the Lake Tahoe and Truckee River Basins that we provided in our April 16th letter. These updated estimates were determined from the California Department of Finance's 2000 census numbers. These estimates are used as input parameters in the Truckee-Carson Water Accounting Model for year 2002 and year 2033 alternatives.

The following tables list estimates and projections of water use in the Lake Tahoe and Truckee River Basins in the years 2002 and 2033, the years identified for the current and future TROA EIS/EIR conditions. Estimates are provided for current use and each of the alternatives that will be considered in the TROA EIS/EIR: the No Action Alternative, the Local Water Supply Alternative, and TROA Alternative. The estimates also include both surface and ground water use along with the exercise of U.S. Forest Service and State Parks water rights in the Lake Tahoe Basin.

Table 1 - Lake Tahoe Basin Water Use (AF/year)

		Surface & Ground Water	Forest Service	State Parks	Total Water Use
Current Use	(2002)	17,286	1,103	308	18,697
EIS/EIR Alternatives					
No Action	(2033)	20,090	2,560	350	23,000
Local Water Supply	(2033)	20,090	2,560	350	23,000
TROA	(2033)	20,090	2,560	350	23,000

The following table shows the Truckee River Basin water uses needed for the input to the model. The surface water uses are divided into Municipal and Industrial (M & I), Agricultural (Ag), and Recreational (Rec) water use.

Table 2 - Truckee River Basin Water Use (AF/year)

		Ground Water	Surface Water Uses				Total Water Use
			M & I	Ag.	Rec.	Total	
Current Use	(2002)	7,573	1,000	1,500	300	2,800	10,370
EIS/EIR Alternatives							
No Action	(2033)	19,600	1,000	1,500	600	3,100	22,700
Local Water Supply	(2033)	18,400	2,200	1,500	600	4,300	22,700
TROA	(2033)	18,400	2,200	1,500	600	4,300	22,700

We understand that additional information is needed for the Accounting Model on two diversions of water out of the Lake Tahoe and Truckee River Basins. About 7000 AF/year is diverted out of the Little Truckee River for irrigation in Sierra Valley, which is in the Feather River Basin of the Sacramento River Region. About 2000 AF/year is diverted out of the Lake Tahoe Basin from Echo Lake into the South Fork of the American River. We project that both of these will remain relatively unchanged through to the year 2033.

Similarly, the model will also utilize wastewater discharge information. The South Tahoe Public Utility District (STPUD) discharges treated wastewater into holding ponds in the Carson River Basin. The source of this wastewater is water diverted within the Lake Tahoe Basin, which is then used in the STPUD service area and treated at the STPUD wastewater treatment plant. The current year 2002 estimated average annual flow of treated wastewater from the Tahoe Basin to the Carson Basin is 5,000 AF/year. This is projected to increase to 6,500 AF/year by the year 2033.

Another special model requirement is Tahoe-Truckee Sanitation Agency (T-TSA) discharge information. The T-TSA collects wastewater in North Lake Tahoe and Truckee River Basins. After treatment, T-TSA discharges the wastewater onto lands southwest of the confluence of the Truckee River with Martis Creek. The actual discharges can vary significantly due to flood events that produce high infiltration and inflows. The following table shows actual discharges in the year 2002 and projections of average annual discharges from T-TSA for 2033.

Table 3 – T-TSA's Actual and Projected Effluent Flows (AF/year)

SOURCE OF T-TSA WASTEWATER	ACTUAL DISHARGE 2002	PROJECTED DISCHARGE 2033
Lake Tahoe Basin	2,523	2,600
Truckee River Basin	2,569	6,000

If you have any questions or need additional information concerning the methods or reported values, please call me at (916) 227-7564.

Sincerely,

Tim Nelson

Tim Nelson, Engineer W.R.
California-Nevada Assessment Section

cc: Mr. Kenneth Parr
U.S. Bureau of Reclamation
705 North Plaza Street, Suite 320
Carson City, NV 89702

Ms. Mary Jo Elpers
U.S. Fish and Wildlife Service
1340 Financial Blvd., Suite 234
Reno, NV 89502

Mr. Tom Scott
U.S. Bureau of Reclamation
705 North Plaza Street, Suite 320
Carson City, NV 89702

Mr. Rod Hall
Sierra Hydrotech
1024 Simon Dr.
P.O. Box 169
Placerville, CA 95667

Attachment E

Nevada State Engineer's Groundwater Management
Order 1161, Dated May 16, 2000

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

1161

<u>GROUNDWATER BANKING ORDER</u>

<u>TRUCKEE MEADOWS GROUNDWATER BASIN</u>

WHEREAS, under the provisions of Chapter 534 of the Nevada Revised Statutes (NRS) the State Engineer issued Order No. 708 in 1978, which designated the Truckee Meadows Groundwater Basin as a basin in need of additional administration (Hydrographic Basin 87)

WHEREAS, the State Engineer issued sixteen certificates for municipal use of groundwater within the Truckee Meadows Groundwater Basin to Sierra Pacific Power Company ("Sierra") in years prior to 1981 and recognized one claim of vested right (Attachment A). The total diversion rate of these rights is 66.8 cubic feet per second, and in 1986 the State Engineer imposed a pumping limit of 12,000 acre-feet per year on these pre-1981 groundwater certificates and one claim of vested right as being the limit and extent of the beneficial use Sierra also holds other permits and certificates for groundwater and surface water issued by the State Engineer for municipal purposes

WHEREAS, under the provisions of Chapter 534 of the Nevada Revised Statues (NRS) the State Engineer may issue Orders to manage certain groundwater as a "Bank", in which more water is extracted in some years than the stated duty of a groundwater permit, based on reduced extractions in other years.

WHEREAS, the Truckee River, which provides, on average, over 80% of the municipal water supply for customers in Sierra's service area, produces highly variable flows from year to year and endured the most severe drought on record between 1986 and 1994. During and immediately following this drought, Sierra implemented a preliminary conjunctive use operation, with the approval of the State Engineer, in which up to 15,728 acre-feet of groundwater was pumped during a severe drought year (1994), and as little as 7,744 acre-feet was pumped during a post-drought year (1998). The Truckee Meadows groundwater aquifer recovered fully after the drought

WHEREAS, the total population in Washoe County is projected to grow from 312,000 in 1998 to 418,000 in 2015. Future water demand projections indicate Sierra's water demand will increase from 68,000 acre-feet in 1998 to 85,000 acre-feet in 2015 Sierra's Water Resource Plan approved by the Regional Water Planning Commission and the Public Utilities Commission directs continued reliance on the Truckee River as the primary water supply for Sierra's service area, but recognizes that the River requires supplemental water from other sources during droughts

WHEREAS, Sierra has implemented management practices that reduce its use of groundwater during non-drought periods, including the construction of a year-round surface water treatment plant at Chalk Bluff to increase the use of Truckee River water during winter months; the execution of a contract for storage of water in Stampede Reservoir with the United States; and continued efforts to complete the Truckee River Operating Agreement, which will triple Sierra's drought reserves

WHEREAS, the State Engineer supports the conjunctive use of groundwater and surface water which allows for optimal use of surface water rights during years when surface water is available thereby allowing the Truckee Meadows Groundwater Basin to rest, in return for pumping additional groundwater during drought years when surface water availability is at a minimum.

NOW THEREFORE, the State Engineer orders and allows as follows:

1 Commencing on January 1, 2000, Sierra shall manage its Truckee Meadows Groundwater Basin rights as a banked resource under rules set forth in this Order The management provisions of this Order shall apply to all Truckee Meadows Groundwater Basin rights held by Sierra, whether from its Vested water rights and certificates listed in Attachment A or by subsequent acquisition or appropriation of ground water rights or domestic well credits Pumping from other water systems which Sierra may acquire and rights located in other hydrographic basins are not included in this Order

2. The baseline, or long-term average amount of groundwater Sierra may pump shall be 15,950 acre-feet per year, based on Sierra's 12,000 acre-foot administrative cap, an additional 1,105 acre-feet found by the State Engineer to have been beneficially used by Sierra under its pre-1981 certificates, 200 acre-feet allowance for domestic well credits owned by the Airport Authority, and 2,645 acre-feet of groundwater rights acquired prior to the date of this Order Any year in which Sierra pumps less than 15,950 acre-feet in the Truckee Meadows Groundwater Basin shall result in a credit to the Bank balance; pumping in excess of 15,950 acre-feet shall result in a debit against the Bank balance. Any amounts of water artificially recharged shall be credited to the Bank balance in accordance with the terms of the recharge permit. A hypothetical illustration of this accounting procedure is found in Attachment B.

3. The Bank set forth in Paragraph 2 shall be administered on a calendar year basis The beginning balance on January 1, 2000, shall be 1,799 acre-feet, representing the quantity of water Sierra had artificially recharged into the

Truckee Meadows Groundwater Basin under Permit No. 010 prior to that date.

4. Notwithstanding that the Bank balance may be larger than 22,000 acre feet in a future year, Sierra may pump a maximum of 22,000 acre-feet from the Truckee Meadows Groundwater Basin during any calendar year from the bank balance. Such volume of pumping shall not continue for more than three years in succession.

5. To the extent that year-round pumping is required for permitted environmental remediation or dewatering projects, and these projects discharge water into Sierra's system, pumping during the months of June through September shall be counted against Sierra's bank balance. During the remaining months of the year only ground water pumped in excess of that required for permitted environmental remediation or dewatering projects shall also be counted against Sierra's bank balance.

6 Based on 1,105 acre-feet of groundwater rights held by Sierra not previously allowed for pumping and a 200 acre-feet well credit for the Airport Authority, Sierra may issue will-serve commitments up to 1,305 acre-feet against its Truckee Meadows Groundwater Basin rights, pursuant to this Order.

7. The Truckee Meadows Groundwater Basin rights of Sierra Pacific Power Company shall not be subject to forfeiture under NRS 534 090 when operated in accordance with this Order In the Truckee Meadows Groundwater Basin cumulation and rotation procedures using all Sierra's groundwater rights may be utilized to allow a maximum flow rate greater than the diversion rate for any single water right provided that the total combined diversion rate authorized under all rights is not exceeded.

8. Sierra shall continue to abide by the "Groundwater Management Agreement" dated September 5, 1991 with Truckee-Carson Irrigation District unless it terminates by its terms

9. Sierra shall continue to monitor water levels and water quality and report to the State Engineer at the end of the calendar year with their results.

10. Sierra may petition the State Engineer to increase the baseline amount under Paragraph 2 and may petition to adjust the 22,000 acre-foot limit in Paragraph 4

11 The State Engineer retains the authority to limit Sierra's pumpage at any given location in the event that unreasonable drawdown or water quality degradation as a result of Sierra's pumping occurs

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada, this

16th day of May, 2000 .

ATTACHMENT A

Sierra Pacific Power Company Pre-1981 Groundwater Rights At Original Point of Diversion[1]

Permit	Certificate	Diversion Rate (cfs)	(Well)
V-05533		4.5[2]	Fourth Street
17585	5678	4.0	Stanford Way
17838	5365	4.0	Mill Street
18414	5292	6.0	Popular #1
19185	5677	3.3	Terminal
19909	5802	6.7	High Street
20207	5489	2.5	Mill Street
20371	6116	6.2	Morrill
20372	6573	4.7	Peckham
23847	7627	2.9	Poplar #2
23848	7623	2.9	Greg Street
24758	8274	2.2	S. Virginia
24869	8044	5.6	View Street
25997	8811	1.1	Delucchi Lane
26193	8939	5.5	Kietzke Lane
26310	8767	1.6	Sparks Ave
28055	10641	3.1	Pezzi
TOTAL		**66.8 cubic feet per second**	

[1] Many rights have been changed to new locations since certified
[2] Based on 2,000 gpm pump capacity

ATTACHMENT B
BANK ACCOUNTING ILLUSTRATION

Year	Description a	Baseline Pumping b	Annual Pumpage c	Recharge d	Credit/Debit (b-c+d) e	Ending Balance f
	Beginning Balance					1799
1	Non-Drought	15950	11000	1000	5950	7749
2	Non-Drought	15950	10500	1500	6950	14699
3	Non-Drought	15950	11000	1700	6650	21349
4	Non-Drought	15950	9000	1500	8450	29799
5	Drought	15950	22000	500	-5550	24249
6	Drought	15950	22000	750	-5300	18949
7	Drought	15950	22000	500	-5550	13399
8	Non-Drought	15950	12000	1700	5650	19049
9	Non-Drought	15950	8000	1000	8950	27999
10	Non-Drought	15950	10000	1200	7150	35149

Attachment F

Donner Lake Evaluation

ATTACHMENT F

Donner Lake Evaluation

The evaluation of the environmental and economic effects of TROA on Donner Lake was based upon several factors. First, a review was conducted of the 1998 draft EIS/EIR and related public comments to determine key issues. Public meetings conducted at that time identified Donner Lake home owner concerns, which combined with input from local area leadership, aided in further defining potential impacts. Local leadership was provided through the Truckee River Basin Water Group. These meetings with home owners, coordination meetings with local leaders, and analytical meetings with representatives from various public agencies, helped to determine evaluation methodologies.

One of the purposes of the activities described above was to clarify the dual objectives of increasing instream flow benefits in Donner Creek and enhancing recreational beneficial uses for both the creek and Donner Lake. Specifically, recreation was evaluated using indicators such as changes in lake levels, aesthetics (the visual effects of lowered water levels), fishing in the lake and creek, visitor days, boat ramp usage and economics. Thresholds values were developed and used in combination with best professional judgment to determine the significance of operational changes at Donner Lake associated with the TROA.

The analytical methods used to evaluate potential changes included mathematical model assessments, statistical comparison, and field surveys, as well as biological, recreation, aesthetic, and economic assessments. The mathematical methods included assessments for operations, economics and visitor days. Key indicators used to compare differences between TROA and the other alternatives specific to hydrologic conditions, included end of month storage, average change in lake and reservoir levels, river and tributary flows, and recreation usage.

In regards to TROA's potential effect on aesthetics when compared to the no action alternative, the model showed that average monthly lake level in Donner Lake was a few inches lower in July, August and October, and was about a foot higher in September. The annual average lake levels will be generally higher with TROA. Generally, significant effects to aesthetic resources would occur if the proposed activity adversely affects a scenic vista or degrades scenic resources. Given that the average differences in lake levels between TROA and the other alternatives are not expected to be discernible, there will be no significant degradation of scenic vistas or resources around the Donner Lake area.

Seasonal recreation visitation and associated expenditures were used as indicators to evaluate the effects of TROA on reservoir recreation at Donner Lake. Variations were evaluated for different hydrologic conditions including wet, dry and median. A recreation model was used to provide input to the economic model to determine differences in visitation and expenditures among alternatives. The analysis showed that for all hydrologic conditions, visitation and expenditures at Donner Lake were, on the average, 0.31% higher with TROA when compared to the no action alternative. When specifically comparing wet and dry periods, visitations and expenditures were .05% to .26% lower, respectively, while visitation and expenditures under TROA were 1.18% higher under median conditions. These variations were considered not to be significant because the overall differences in average visitation among the alternatives were less than 1.0 percent, and average visitation under TROA, when compared to the other alternatives is expected to be slightly higher.

Another indicator that was used to determine the potential effect of TROA on Donner Lake recreational usage was boat ramp usability during the recreation season. Under TROA, when compared with the no action alternative, boat ramps in Donner Lake will be useable 14% more of the time under median hydrologic conditions and they will be useable 14% less of the time under dry hydrologic conditions. Under wet hydrologic conditions there is no difference among the alternatives. Because of the improvement in boat ramp usability under TROA under median conditions, which represents the majority of the time, TROA will have an overall positive effect on boat ramp usability at Donner Lake and consequently TROA is not expected to have a significant adverse impact on boat ramp usage.

A final indicator that was used to determine the potential effect of TROA on Donner Lake recreational usage was usability of stationary docks at Donner Lake. With TRO would not be significantly affected under any alternative during June, July, or August

An indicator used to evaluate stream-based recreation for Donner Creek was the suitability of flows for fly fishing and spin/lure/bait fishing in the creek during the recreation season. Operations model results showed that flows preferred by fisherman (40-50 cfs) for fly fishing and spin/lure/bait fishing will not be obtained during wet or dry hydrologic conditions either under TROA or the No Action alternative. In median hydrologic years, preferred flows for fly fishing will be obtained 29% of the time under both the TROA and No Action alternative. Because the model results show that there will be no difference in fishing opportunities, between TROA and the No Action alternative, with TROA there would not be expected to have a significant effect on fishing in Donner Creek.

With TROA, study results shows a significant benefit to meeting preferred flows for brown trout in Donner Creek, where TROA meets preferred flows 33% of fall/winter months, while Current Conditions only meet preferred flows 14% of fall/winter months. TROA will also provide a significant benefit to meeting preferred flows for rainbow trout in Donner Creek, where TROA meets preferred flows 31% of spring/summer months, while Current Conditions meet preferred flows 18% of spring/summer months. Finally, the frequencies of the occurrence of flows low enough during winter months to increase the potential for icing conditions under TROA show a significant beneficial effect when compared to Current Conditions in Donner Creek.

TROA may provide additional benefits not reflected in the model runs used for the above analysis. After TROA is signed and becomes effective, California will annually submit Guidelines for Truckee River Reservoir Operations concerning instream flows in Donner Creek and Donner Lake reservoir levels. These Guidelines will develop specific operational goals and objectives based on the specific hydrology for that year, to help encourage and guide operators in meeting California’s objectives, including those for Donner Lake and Donner Creek. During a dry season California will not specify a preferred instream flow in Donner Creek.

Under TROA it is expected that habitat conditions in Donner Creek will improve. Fishery conditions will also be improved by the increased flows made available by TROA. Parties to TROA will provide between $50,000 and $100,000 yearly to a Habitat Restoration Fund, which will be distributed to California during the first two years TROA is in effect, and thereafter to Nevada, the Pyramid Tribe, and California who will each receive one-third of the funds each decade TROA is in effect. A portion of California's share of the fund could be made available to plan and implement fish habitat restoration or maintenance projects in Donner Creek

California's minimum storage objective in Donner Lake is 6.3 TAF for the period June through August. To preserve higher lake levels, TROA provides that no scheduling party will be required to exchange water out of Donner Lake when the Lake is below 7.5 TAF in June and July, and 6.5 TAF in August. TROA also allows California to arrange required trades of joint program fish credit water for privately owned stored water in Donner Lake, which may maintain water levels in Donner Lake if circumstances result in high summer releases of water to satisfy downstream needs. Finally, TROA allows for a temporary downward adjustment of enhanced minimum instream flows, which could improve lake levels if conditions warrant. These adjustments will require coordination between the California Department of Fish and Game and local interests. The results of this coordination will be the development of an annual plan for implementing an appropriate balance between the maintaining Lake levels and instream flows.

Attachment G

January 22, 2003, letter from the
Pyramid Lake Paiute Tribe of Indians: TROA EIS/EIR

Pyramid Lake Paiute Tribe
Department of Water Resources

P.O. Box 256
Nixon, Nevada 89424

Telephone (775) 574-1050 Fax (775) 574-1025

January 22, 2003

Mr. Tom Strekal
TROA EIS/EIR Team Leader
Bureau of Indian Affairs
Western Nevada Agency
1677 Hot Springs Road
Carson City, Nevada 89706

Subject: TROA EIS/EIR

Dear Tom:

This letter is provided in reference to your letter of January 7, 2003, requesting Pyramid Lake Paiute Tribe's assistance relative to future water use in Truckee River Basin for the purpose of computer modeling for the revised draft EIS/EIR. You identified five scenarios for the Tribe's use of its water under Orr Ditch Claim Nos. 1 and 2 in Year 2033 (when annual Truckee Meadows water demand is projected to be about 119,000 acre-feet, as identified in draft TROA Section 4.B.2).

We have reviewed the five scenarios and we believe the most likely scenario for the use of Tribe's water under the both claims in Year 2033 would be Scenario No. 2. That is, Claim Nos. 1 and 2 would be completely exercised for agriculture/M&I purposes. However, during the period between now and Year 2033, the unused portions of Claim Nos. 1 and 2 are expected to be transferred to instream flows for wildlife purposes in the lower Truckee River. As requested, the monthly demand schedule for Scenario No. 2 is attached.

We trust this will assist you in the analysis for the revised draft EIS/EIR. Please call if additional information is needed.

Sincerely,

John W. Jackson

John Jackson, Director
Pyramid Lake Water Resources Department

Scenario No. 2
Monthly Demand Schedule
for Claim Nos. 1 and 2 in Year 2033

Note: It is assumed that 50% of Tribe's water under both claims would be used for agriculture and the remaining 50% would be used for M&I purposes in Year 2033. The associated demand schedules are assumed to have the following patterns:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Agriculture													
percent	0.0	0.0	0.0	3.0	13.0	20.0	25.0	20.0	13.0	6.0	0.0	0.0	100
acre-feet	0	0	0	451	1,956	3,009	3,761	3,009	1,955	902	0	0	15,043
M&I													
percent	5.7	5.3	5.9	7.5	10.1	11.5	12.8	12.2	10.1	7.5	5.8	5.6	100
acre-feet	858	797	888	1,128	1,519	1,730	1,926	1,835	1,519	1,128	873	842	15,043
Total													
percent	2.9	2.6	3.0	5.2	11.6	15.8	18.9	16.1	11.5	6.7	2.9	2.8	100
acre-feet	858	797	888	1,579	3,475	4,739	5,687	4,844	3,474	2,030	873	842	30,086

Attachment H

April 23, 2007, letter from the
U.S. Fish and Wildlife Service: Informal Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

April 23, 2007
File No. 1-5-07-I-108

Memorandum

To: Area Manager, Bureau of Reclamation, Carson City, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Informal Consultation for the Administrative Draft Truckee River Operating Agreement Environmental Impact Statement, El Dorado, Placer, Nevada, and Sierra counties, California and Douglas, Carson City, Washoe, Storey, Lyon, Churchill, and Pershing counties, Nevada

We have reviewed your Administrative Draft Truckee River Operating Agreement Environmental Impact Statement (EIS) dated March 2007, and received on March 20, 2007. This project proposes the signature, adoption and implementation of the Truckee River Operating Agreement (TROA) by the Secretary of the Interior and the State of California and to promulgate TROA as a Federal Rule, change California water rights permits and licenses to allow water storage, transfers, and exchanges provided for in TROA, and negotiate storage contracts with owners of credit water created under TROA to store this water in Federal Truckee River reservoirs. You have requested our concurrence with your not likely to adversely affect determination for three species listed under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act): cui-ui (*Chasmistes cujus*) (endangered), Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (threatened) (LCT), and bald eagle (*Haliaeetus leucocephalus*) (threatened).

The TROA is intended to: 1) enhance water management flexibility, water quality, conditions for cui-ui and LCT, reservoir recreational opportunities, and reservoir efficiency; 2) increase municipal and industrial water drought supply, minimum reservoir releases, and the capacity for carryover storage; 3) allocate Truckee River water between the States of California and Nevada; and 4) reduce water use conflicts.

Implementation of TROA would modify operations of the Truckee River reservoirs while ensuring that existing water rights are served and flood control and dam safety requirements are met. The TROA would supersede all requirements of any agreements concerning the operation of the Truckee River reservoirs, including those of the Truckee River Agreement and the Tahoe-Prosser Exchange Agreement, and would become the sole operating agreement for all Federal reservoirs in the Truckee River system. The TROA is not intended to alter other applicable Federal or State laws. The TROA also contains provisions to implement the interstate allocation of Lake Tahoe and Truckee River waters between Nevada and California (section 204 of P.L. 101-618).

Based on a TROA model and assumptions over a 100-year period, impacts to listed species are not anticipated to adversely affect them as it is anticipated that: 1) the average annual inflow to Pyramid Lake would be greater under TROA by 5,240 acre-feet (af) as compared to current conditions. Higher inflows would result in a 1.5 foot increase in Pyramid Lake elevation under TROA compared with current conditions. This would benefit cui-ui and LCT by enhancing lake habitat as well as Truckee River access for spawning and migration;

2) the frequency (number of years) of river flow regimes 1 or 2 occurring in the Truckee River between Numana and Marble Bluff Dams during May and June would be increased under TROA compared with current conditions, enhancing river conditions for cui-ui during spawning;

3) under TROA, the relative amounts of riparian habitat being maintained along the lower river would have no effect during wet years, but would be beneficial during median, dry, and extremely dry hydrologic conditions for cui-ui and LCT providing shade and resultant cooler water temperatures along the lower Truckee River downstream of Derby Dam;

4) the number of times that Independence Lake would fall below 7,500 af would be reduced by one less time (in August) under TROA as compared with current conditions. The number of years was not different compared with current conditions for May, June or July under TROA. This reduced frequency would benefit LCT as access to spawning habitat in the lake during May to August is prevented by a delta when storage is at or below 7,500 af;

5) TROA allows California Department of Fish and Game to direct the Truckee Meadows Water Authority to provide and maintain a fish channel through the delta should storage fall below 7,500 af at Independence Lake;

6) under TROA, minimum storage thresholds at Prosser Creek, Stampede, Boca, and Lahontan Reservoirs would be reached in fewer years, approximately 27 percent, 13 percent, 61 percent, and the same percent for these four reservoirs, respectively, as compared with current conditions. TROA would allow a substantial reduction in the possibility of fish mortality events in these water bodies, thus benefiting bald eagle foraging; and

7) under TROA, the average area of shallow water fish spawning habitat in Lake Tahoe, Independence Lake, Pyramid Lake and Lahontan Reservoir, while analyzed differently for each water body, would be the same as under current conditions for both Lake Tahoe and Independence Lake during representative wet and medium hydrologic conditions and about the

same during dry hydrologic conditions (a reduction of 7 acres for Lake Tahoe and a reduction of 1 acre for Independence Lake). For Pyramid Lake, TROA would provide a less than 1 percent reduction in average area of shallow water fish spawning habitat in June. The TROA would allow Lahontan Reservoir to recede below 160,000 af four percent more often than under current conditions. These minor reductions in the average area of shallow water fish spawning habitat would not result in a significant impact to bald eagle foraging.

Based on the information provided in the Administrative Draft EIS, the Service concurs that the proposed project is not likely to adversely affect cui-ui, Lahontan cutthroat trout, or bald eagle. Therefore, formal consultation pursuant to section 7 of the Act is not required.

This response constitutes informal consultation under regulations promulgated in 50 CFR § 402, which established procedures governing interagency consultation under section 7 of the Act. If the proposed action as described is changed, if monitoring efforts as developed under the Biological Resources Monitoring Program Memorandum of Understanding indicate that impacts are affecting listed species other than as predicted by the model, or if new biological information becomes available concerning listed or candidate species which may be affected by the project, your agency should reinitiate consultation with the Service.

If you have any questions, please contact me or Marcy Haworth at (775) 861-6300.

Robert D. Williams

CODE	PERSON RESP	INITIAL & DATE
100 X		
101 X		KP 4/24
105		
110		
400		
700		
800		
900		KP 4/24
130X		