Central Valley Regional Water Quality Control Board

Surface Water Ambient Monitoring Program

Work Plan

July 2002

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INTRODUCTION

The Central Valley covers 40% of the State and stretches from the Oregon border to the northern tip of Los Angeles County (60,000 square miles). This area, which includes all or part of 38 of the State's 53 counties, totals approximately 75% of the State's irrigable land. Three major watersheds have been delineated within this region, namely the Sacramento River, San Joaquin River, and Tulare Lake Basins (Figure 1). The Sacramento and San Joaquin Basins cover about one fourth of the total area of the State and furnish roughly 51 percent of the State's water supply. Surface water from these two basins meet and form the Delta, which ultimately drains to San Francisco Bay. The Tulare Lake Basin is essentially a closed basin comprised of roughly 50 percent valley floor with the remainder comprised of Kings Canyon and Sequoia National Parks and substantial portions of Sierra, Sequioia, Inyo, and Los Padres National Forests. The Kings, Kaweah, Tule, and Kern Rivers, which drain the west face of the Sierra Nevada Mountains, provide the bulk of native surface water supply, which is augmented with imported water from the San Luis Canal/California Aqueduct System, Friant-Kern Canal, and the Delta-Mendota Canal.

Comprehensive monitoring and assessment programs are critical for evaluating whether beneficial uses are being protected and for evaluating the success or failure of control programs. Over the years, the Regional Board and other agencies have focused limited resources on the mainstem rivers and water bodies that have the most obvious impairments. Because of this emphasis, limited data is now available for the Delta, the lower Sacramento River, the lower San Joaquin River and a few other water bodies that are located near significant pollutant sources (i.e., Iron Mountain Mine and Penn Mine). Many small tributaries to the mainstem rivers, streams upstream from the major reservoirs, and most of the lakes have received little attention.

A review of the monitoring requirements for surface water programs, with estimated staff and contract resources, shows an annual need of 26.5 PYs and $5,707,000 in contract funds (WMI, 2001). There are four specific areas of significant need for monitoring resources. These are: selenium monitoring on the San Joaquin River; an integrated dormant spray evaluation program; a comprehensive toxicity and TIE monitoring program on the San Joaquin River and it's major tributaries; and loading of methyl mercury to the Delta from upstream sources. Each of these four results from nonpoint sources.

A wide variety of agencies and stakeholders are involved in monitoring and assessment activities. An integral part of the Regional Board monitoring strategy is to cooperate with these other programs and stakeholders in implementing monitoring and assessment programs in order to achieve water quality improvement and promote restoration of water resources. All activities proposed in this SWAMP workplan are being coordinated with existing programs operated by local, state, and federal agencies, including but not limited to the TMDL effort, Sacramento River Watershed Program, National Water-Quality Assessment Program by USGS, pesticide evaluation by DPR, nutrient evaluation funded by the US Fish and Wildlife Service, efforts being initiated under the Ag Waiver Policy, toxicity evaluation efforts by USEPA, and projects funded through CALFED.

A regionwide effort that was identified during the triennial review and began during FY00/01 is the bioassessment and habitat evaluation of effluent and agriculturally dominated water bodies throughout the Central Valley. This effort is being coordinated with the OP TMDL effort, USGS, and DPR in order to identify appropriate water bodies to evaluate within each hydrologic regime of the basin and to maximize use of the resulting data. San Joaquin River bioassessment work is being conducted through the OP TMDL effort with specific details listed in the Central Valley Regional Water Quality Control Board SJR OP Pesticide TMDL Bioassessment Work Plan (2002). Details specific to the Sacramento bioassessment effort are described in the Sacramento River Basin section of this workplan.

SWAMP will be implemented slightly differently in each of the major watershed within the Central Valley due to the various approaches to monitoring that have been undertaken in the past. Since each watershed has both a unique set of stakeholders and unique water quality concerns that must be addressed, the management process and the accompanying monitoring program are somewhat watershed specific. Therefore this document is divided into three sections: Sacramento River Basin, San Joaquin River Basin, and Tulare Basin. A common element in all three watersheds is that monitoring programs are designed primarily to address potential nonpoint source impacts, since the most significant water quality problems in the Region result from nonpoint sources (see 1998 Clean Water Act Section 303d List and 1996 Water Quality Assessment). An overall summary of necessary monitoring projects identified by watershed and their related costs is presented in Table 1, which is an update of information presented in the WMI Chapter (2001).

SACRAMENTO RIVER WATERSHED

Introduction

The Sacramento River Basin covers 27,210 square miles and includes the area drained by the Sacramento River. The principal streams are the Sacramento River and its larger tributaries: the Pit, Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stony, Cache, and Putah Creeks to the west. Major reservoirs and lakes include Shasta, Oroville, and Folsom, Clear Lake, and Lake Berryessa. The remaining inputs (approximately 25% of the flow) come from streams entering from smaller watersheds along the river and from agricultural and storm drain systems (SWRCB, 1990). The Sacramento River basin supplies greater than 80% of the fresh water flows to the Sacramento-San Joaquin Delta (Montoya *et al*. 1988). There are over 50 sub-basins or tributaries to the Sacramento River.

Beneficial uses in the Sacramento River watershed are adversely impacted by the presence of pollutants and sediments entering the watershed from a variety of sources. In 1990, the State Water Resources Control Board released the final project report for the *Sacramento River Toxic Chemical Risk Assessment Project* (SRWCB, 1990). In this report, the four major sources of chemical pollutants entering the Sacramento River were identified and characterized. These sources are agricultural drainage, mine drainage (primarily acid mine drainage), urban runoff, and NPDES discharges. Animal production facilities, rangelands and forest activities (including fires) were not included in that assessment, but should be considered a potential sources of pollution.

Since 1987, Regional Board staff has conducted a series of toxicity surveys of various portions of the Sacramento River watershed (summarized in Cooke *et al*. 1998 and de Vlaming *et al*. 2000). Toxicity tests are used to evaluate water bodies for compliance with the narrative toxicity objective. Significant toxicity has been detected throughout the watershed. About half of the observed toxicity has been linked to specific pesticides and metals. In addition to chemical constituents impacting beneficial uses, the watershed is impacted by sedimentation, high temperatures, altered flow and temperature regimes, loss of habitat and introduction of exotic species. Because many parts of the watershed serve as sources of drinking water, concern also exists about the presence of pathogens, dissolved salts and dissolved organic carbon. A number of surface water bodies in the watershed are on the Federal Clean Water Act Section 303(d) list. In January 1998, the Regional Board approved a 303(d) list and a schedule for developing load reduction programs for all water bodies on the list.

High priority nonpoint source issues for the Sacramento River watershed are load reductions for mercury, diazinon, copper, cadmium, and zinc and development of temperature objectives protective of salmonids. In addition, development of a policy for effluent dependent waterbodies was identified a high priority item through the Triennial Review of the Basin Plan.

Previous monitoring efforts in the Sacramento River watershed have focused on the Mainstem River and its major tributaries. Future monitoring priorities should concentrate on wadeable streams tributary to the Sacramento River, establishing baseline conditions, and determining indicators that can be tracked as the nonpoint source plan is implemented.

In the Sacramento River Watershed, a watershed-wide stakeholder group has been organized to address water quality related issues. The Sacramento River Watershed Program (SRWP) is an effort to bring stakeholders together to share information and resources to address all water quality related issues within the watershed. The Regional Board has been an active stakeholder in this process. Past monitoring efforts in the Sacramento River watershed have been funded by the SRWP. However, funding for this program has been significantly reduced since its inception and current funding will end in Fiscal Year 2002-2003.

The Sacramento River Basin has been divided into the Upper and Lower Basins for the implementation of SWAMP due to the separate monitoring frameworks existing in each area. The Upper Basin directs funding to existing stakeholder groups to focus efforts in the Pit River Watershed, Chico Urban Streams Area, and City of Redding Area. The Lower Basin is continuing a broad framework in conjunction with the SRWP. Both frameworks are described below.

UPPER SACRAMENTO RIVER BASIN

PIT RIVER MONITORING

1. INTRODUCTION - FY 2001-2002 SWAMP funds were used to initiate a water quality monitoring program on the major tributaries to the Pit River, in the reach from the headwaters to McArthur. This two year monitoring program is described in the 01-02 SWAMP Workplan and in Contract # 01-166-150-0 with North Cal Neva RC&D.

Due to budget constraints, FY 01-02 funds provided support for a Pit River Monitoring Coordinator for only the first year of this two year effort. FY 02-03 SWAMP funds will be used to amend the RC&D contract to provide funding for a Monitoring Coordinator through the balance of the contract term (through April 2004).

2. BUDGET TOTAL - $30,000 (1/2 time for 12 months or approximately 1000 hrs).

3. STUDY DESIGN AND OBJECTIVES – General and specific information on the scope and objectives of the Pit River Tributary monitoring program is contained in the Scope of Work for the above referenced contract. This information includes a description of the work responsibilities of the monitoring coordinator and a description of the individual streams and sites to be monitored, parameters to be monitored, and sample frequency.

Regarding study objectives[1], the overall objective for monitoring on the Pit River (both mainstem and tributaries) is to determine:

- Does water quality support warm and cold water aquatic ecosystems, including but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates?
- Does water quality support contact and non-contact recreation?
- Does water quality support agricultural uses, including but not limited to, irrigation, stock watering, or support of vegetation for range grazing?

In general, toxicity is not expected to be a water quality issue in the Pit River watershed. Important factors impacting, or potentially impacting, beneficial uses are temperature, nutrient enrichment, sediment transport/deposition, and habitat quality.

The study design for the Pit River tributaries is a directed study design. Generally speaking, the criteria for selecting streams to be monitored is streams that have permanent year round flow and support fish or other important aquatic resources. Sampling sites are located at the lower end of each stream (i.e. at the confluence with the Pit River) and at selected locations which represent major change in land type and land use (e.g. at the boundary of public and private lands). Sample locations will be designated and recorded using GPS and photos. A specific QAPP for Pit River monitoring will be prepared consistent with SWAMP QA requirements.

The Pit River watershed monitoring program is being designed and implemented in collaboration with other local, state and federal agency monitoring programs. The following agencies participate on the Technical Advisory Committee for Pit River watershed monitoring:

- USFS
- BLM
- CA DFG
- UC Cooperative Extension
- North Cal Neva RC&D and the individual RCD's

These agencies have past and ongoing monitoring studies on various Pit River tributary streams, including data on water quality, fisheries, and habitat quality. Efforts will be make to include the data from these other agencies, together with the SWAMP data, in a overall Pit River Watershed Data Management Program.

4. DELIVERABLES – Deliverables from the SWAMP funded Pit River Tributary monitoring program include the following:

- A Pit River Monitoring Coordinator to direct and supervise all data collection and data management activities
- A final study design which includes monitoring parameters, sample locations, sample frequency and sampling methods

[1] See Attachment 1 (SWRCB, 2000)

- A QAPP
- Periodic and final data reports

5. SCHEDULE – Pit River tributary monitoring will begin June 2002 and continue through fall 2003. A final report will be submitted by January 2004.

6. OTHER – As currently design (with the exception of macroinvertebrates), all parameters (including temperature, flow, turbidity, dissolved oxygen, pH, conductivity and fish populations) will be sampled using field equipment and there will be no laboratory analysis needed. Analysis of macroinvertebrate samples will be done by the DFG Chico laboratory using funding in the DFG Master Contract.

EXHIBIT A – SCOPE OF WORK **SWRCB # _________________**
SWRCB-EXA 1/5/02 **NORTH CAL-NEVA RESOURCE CONSERVATION AND DEVELOPMENT**

1. PROJECT OFFICIALS:

The State Water Board's Contract Manager shall be **Dennis R. Heiman**, of Region 5, Central Valley Regional Water Quality Control Board. The Contract Manager shall be the day-to-day representative for administration of this agreement, and, except as otherwise specifically provided, shall have full authority to act on behalf of the State Water Resources Control Board with respect to this agreement. The State Water Board's Executive Director, or designee, may also perform any and all acts which could be performed by the Contract Manager under this agreement. Except as otherwise expressly provided, all communications relative to this agreement shall be given to the Contract Manager.

The Contractor's Project Director shall be **Todd Sloat**. The Project Director shall be the Contractor's representative for the administration of the agreement and shall have full authority to act on behalf of the Contractor. All communications given to the Project Director shall be as binding as if given to the Contractor.

The parties may change their Contract Manager or Project Director upon providing ten (10) days written notice to the other party.

2. WORK TO BE PERFORMED:

A. Background Information

The Pit River is currently 303(d) listed for impairment from high temperature, high nutrient loading and low dissolved oxygen. The Pit River Alliance, a collaborative effort by agencies, landowners and resource advocates, has been formed to achieve enhancement of water quality and aquatic habitat in the Pit River watershed. Prior to establishment of the Pit River Alliance, individual Resource Conservation Districts in the watershed have been working towards implementing on-the-ground projects deemed to have water quality/habitat benefits.

Through previous support from the State Board's SWAMP and 205j program, the Alliance started water quality monitoring on the main stem of the Pit River in April 2001. This monitoring program will continue through 2002 with the existing funds. The Alliance and the Regional Board recognized that there was need to augment the River monitoring by including water quality and channel condition monitoring on the major Pit River tributaries. Establishing a monitoring program on the Pit River tributaries is the focus of this Scope of Work.

B. Project Objectives

1. Implement a monitoring program on the principal tributaries to the Pit River which documents existing conditions for water quality, channel morphology, aquatic biota and aquatic/riparian habitat.

2. Determine to what extent, if any, beneficial water uses are impaired by water quality or other stream condition factors.

3. Establish a tributary monitoring program which is repeatable and can be used in future monitoring to determine long term trends in watershed condition.

4. Provide a means to document future watershed condition improvements which are expected to result from the cumulative implementation of improved management practices, restoration projects, and watershed education.

C. Scope of Work

Activities for this project include the following:

1. Monitoring (chemical, physical and biological) at fixed stations located on 25 principal tributaries to the Pit River in the reach from the headwaters to McArthur. These tributaries were selected on the basis that they generally have year round flow and have (or have potential for) important aquatic resources. Fixed stations on any individual tributary vary from one to three, depending on the size of the tributary and diversity of landscape features.

2. Seasonal field surveys to characterize and record channel and habitat conditions using Proper Functioning Condition (TR 1737-15, US Dept of Interior) or similar methodology.

3. Support for a Pit River Watershed Monitoring Coordinator who will be responsible for conduct of the monitoring, procurement and maintenance of monitoring equipment, data analysis and reporting, and preparation of interim and final report(s).

Guidance and review of the tributaries monitoring program (together with the ongoing mainstem Pit River monitoring work) will be provided by a Monitoring Technical Advisory Committee. This committee will be established by the Pit River Alliance to assist in design of the monitoring program, program implementation, and data analysis.

North Cal-Neva Resource Conservation and Development, hereafter referred to as the Contractor, shall be responsible for the performance of the work as set forth below. The Contractor shall prepare products and a final report as specified in this Exhibit. The Project Director shall promptly notify the Contract Manager of events or proposed changes which could affect the scope, budget or schedule of the work performed under this agreement.

The specific tasks to be performed for this project shall be as follows:

Task 1 Project Management and Administration

The Contractor shall provide all technical and administrative services associated with performing and completing the work on this program. Technical and administrative tasks include: project management, coordination, crew supervision, report preparation, contract management, equipment maintenance and data collection, storage and analysis, and all other tasks that may be necessary to complete the scope of work specified in this agreement.

Specific technical and administrative responsibilities of the Project Manager will include the following:

- Submittal of quarterly progress reports
- Submittal of quarterly invoices
- Formation and coordination of the Pit River Monitoring Technical Advisory Committee
- Procurement and maintenance of needed monitoring equipment
- Securing landowner agreements for access to monitoring sites
- Oversight and conduct of the monitoring program
- Program status reports to the Pit River Alliance and other watershed stakeholders

- Compilation, storage and transmittal of monitoring data
- Preparation of interim and final reports

Task Deliverables: Quarterly progress reports, invoice, and subcontract documentation.

Task 2 Monitoring Technical Advisory Committee

Contractor will establish a Pit River Watershed Monitoring Advisory Committee to assist in development of the final monitoring program design, sampling protocol, implementation procedures and data analysis. Contractor will coordinate meetings of the Technical Advisory Committee on an as needed basis.

Task Deliverables: Membership list of the TAC, minutes and agendas for scheduled TAC meetings.

Task 3 Permanent Monitoring Stations

Contractor will establish fixed monitoring stations and implement a monitoring program at selected locations on the 25 tributary streams as listed in Attachment A (station number and location will be adjusted as needed for reasons of access, landowner concerns or other site specific issues). Monitoring parameters and frequency of sampling at each of the fixed locations are as follows:

Parameter	Frequency
Flow	Monthly (June through September)
Temperature	Continuous Recording (June through September)
Dissolved Oxygen, pH, EC	Monthly (June through September)
Macroinvertebrates	Twice During Contract Term (one fall, one spring)
Fish Survey	Once During Contract Term
Photo Monitoring	Quarterly

Task Deliverables: Interim and final data reports from permanent station monitoring.

Task 4 Channel Reach Surveys

Contractor will conduct channel and habitat condition surveys within each of the selected tributaries once during the term of this contract.

Protocol for Channel Reach Surveys will be as follows:

a. Utilize technique for assessing Proper Functioning Condition (TR 1737-15, US Dept. of Int. and US Dept. of Agr., 1998) or as modified per the Technical Advisory Committee. As described in PFC, channel survey parameters will include the following:
   - hydrology evaluation
   - vegetation evaluation
   - erosion/deposition evaluation
b. Surveys to focus on depositional stream reaches; Contractor will attempt to survey each major depositional reach within each of the 25 tributaries.
c. Surveys will be conducted during the time period of June through September.

<u>Task Deliverables:</u> Interim and final data report from the channel reach surveys.

<u>Task 5</u> Data Management and Reporting

The Contractor will collect, perform quality control checks, store and analyze data from both monitoring procedures outlined in Tasks 3 and 4. Prepare data spreadsheets and periodically update as new information comes available. Develop a data archive system to permanently store monitoring data. Provide for access to monitoring program data via the Pit River website maintained by the River Center in Alturas. Provide for data transfer to a statewide data management system as required by SWRCB.

<u>Task Deliverables:</u> Pit River watershed monitoring database, electronically based information access system.

<u>Task 6</u> Quality Assurance Plan

The Contractor shall prepare and maintain a Quality Assurance Plan (QAP) in accordance with the EPA QAP Plans for Environmental Data Operations, QA/R5 Interim Final 5/94, where applicable. Submit QAP to Regional Board Quality Assurance/Quality Control Officer, the Contract Manager, and the TAC prior to using and/or implementing quality assurance methods in any sampling or monitoring activities.

Task Deliverables: QA Plan to Regional Board Quality Assurance Officer, Contract Manager, and the TAC.

Task 7 Final Report

Prepare a technical summary report documenting the results of the two years of monitoring on Pit River tributaries. The report shall include the following components:

- Results of all data collected;
- Analysis, storage, and distribution methods used for all data collected;
- Recommendations for continued monitoring of Pit River tributaries

Task Deliverables: Final Report to be submitted no later than March 30, 2004.

D. Schedule of Completion Dates

Task	Product	Completion Dates
1	Quarterly Reports	June 2002, and quarterly thereafter
2	Establish TAC	April 2002
3	Permanent Station Location and Operation	June 2002
4	Reference Reach Surveys	June 2002
5	Initial Data Management	Continuous through December 2003
6	QA Plan	June 2002
7	Draft Report	January 2004
	Final Report	March 2004

E. Reports

1. The first quarterly report shall be submitted to the Contract Manager no later than June 15, 2002, and quarterly thereafter, for the life of this agreement. The Project Director shall provide a written report to the Contract Manager providing the following information on each quarterly report:
    - A list of activities and tasks performed and/or completed;
    - A list and record of milestones accomplished and/or completed;
    - A list of any and all problems encountered while performing the task(s); and,

- A list of proposed activities and tasks for the following quarter.

The Contractor shall submit quarterly reports within no more than 15 days after the end of each quarter. Each quarterly report shall include the information noted above.

2. The Project Director shall submit to the Contract Manager for approval reports containing the results of the work performed in accordance with Section C – Scope of Work.

3. The Project Director shall submit to the Contract Manager five (5) copies of a draft report describing the work performed pursuant to Section C – Scope of Work for review and comment, no later than January 1, 2004.

4. The Contract Manager shall submit his final comments to the Project Director within four (4) weeks of receipt of the draft report.

5. The Project Director shall submit to the Contract Manager a final report incorporating changes, revisions, comments previously provided by the Contract Manager. The Project Director shall submit the Final Report no later than March 30, 2004. The final report shall be submitted to the Contract Manager for final approval. The Final Report shall be submitted in the following manner: one (1) reproducible master and five (5) copies.

6. The Report shall not be considered final until the Contract Manager approves and accepts the Report as Final.

PIT RIVER TRIBUTARY MONITORING – PERMANENT STATION LOCATION

1. New Pine Creek
    - @ USFS boundary
    - @ Goose Lake confluence

2. Willow Creek
    - @ USFS boundary (near Bucks Cr.)
    - @ Goose Lake confluence

3. Lassen Creek
    - @ USFS boundary (near Cold Cr. campground)
    - @ Goose Lake confluence

4. Davis Creek
    - @ USFS boundary

5. Joseph Creek
    - @ USFS boundary
    - @ Pit River confluence

6. Thomas Creek
    - @ USFS boundary (near Cedar Pass campground)
    - @ Highway 299
    - @ Pit River confluence

7. Parker Creek
    - @ USFS boundary
    - @ USF&WS diversion
    - @ Pit River confluence

8. Pine Creek
    - @ Pine Creek Reservoir
    - @ USFS Rd. 42N05

9. Fitzhugh Creek
    - @ BLM boundary (near Lt. Juniper Res.)
    - @ NF/SF confluence
    - @ SF/NF confluence

10. Mill Creek
    - @ USFS boundary (near Mill Cr Falls campground)
    - @ confluence with SF Pit River (below Jess Valley)

11. East Creek
    - @ Patterson Guard Station
    - @ confluence with Mill Cr (in Jess Valley)

12. Cedar Creek
    - @ Smith Flat

13. Canyon Creek
    - @ Co. Rd. 71
    - @ Pit River confluence

14. Rattlesnake Creek
    - @ Highway 299

15. Turner Creek
    - @ Pit River confluence

16. Washington Creek

- @ Turner Cr. confluence

17. Stone Coal Creek
    - @ Pit River confluence

18. Dutch Flat Creek
    - @ USFS boundary

19. Butte Creek
    - @ Highway 299

20. Rush Creek
    - @ Highway 299

21. Ash Creek
    - @ USFS Rd. 39N50
    - @ Adin
    - @ Pit River confluence

22. Willow Creek
    - @ Highway 139 (near Hayden Hill)
    - @ Co. Rd. A-2

23. Juniper Creek
    - @ Co. Rd. 417

24. Horse Creek
    - @ Little Valley

25. Beaver Creek
    - @ Co. Rd. 404
    - @ Pittville

CHICO URBAN STREAMS MONITORING

1. <u>Description of Watersheds and Waterbodies</u>

The streams to be monitored by this project are Little Chico Creek and Big Chico Creek (and its tributaries Sycamore Creek and Lindo Channel). The program includes publicly-accessible stations upstream and downstream of the Chico Urban area, with event based sampling and dry-weather sampling. Big Chico creek originates on Colby Mountain and flows roughly 44 miles to its confluence with the Sacramento River with a drainage area of roughly 72 square miles. High water flows from Big Chico creek are diverted to Lindo Channel and Sycamore Creek prior to entering the easterly portion of the urban area of the city. Little Chico Creek drains an area of roughly 38 square miles and is tributary to Butte Creek. The high flows of Little Chico Creek are diverted to Butte Creek prior to entering the easterly portion of the City. Both Big Chico Creek and Little Chico Creek run through Chico and accept urban runoff from City, State, and County storm drain systems.

The beneficial uses of Big Chico and Little Chico Creeks include municipal and domestic supply, irrigation, stock watering, contact recreation, warm and cold freshwater habitat, fish migration and spawning, and wild life habitat. Big Chico Creek supports the spring, fall, and late fall chinook salmon and steelhead trout runs.

2. Monitoring Objectives Associated With Beneficial Uses

The goals and objectives of the monitoring are to develop a monitoring plan with the objectives of identifying urban runoff impacts to Big Chico Creek (and its tributaries Sycamore Creek and Lindo Channel) and to Little Chico Creek.

Indicator constituents will be used to determine if Chico urban runoff contains constituents at levels that may impair beneficial uses. For water-contact recreation (Attachment 1, objective 1); total and fecal colliform indicators will be measured and compared with screening values, health standards, or adopted water quality objectives. For drinking water (Attachment 1, objective 2); metal, general constituent, nutrient, pesticide and pathogen indicators will be measured and compared with screening values, health standards, or adopted water quality objectives. For agricultural supply (Attachment 1, objective 16); metal and general constituent indicators will be measured and compared with screening values, health standards, or adopted water quality objectives. For aquatic life (Attachment 1, objective 9 and 12); metal, general constituent, nutrients, and pesticide indicators will be measured and compared with screening values, health goals, and adopted water quality objectives.

3. Indicators

The indicators for identifying impacts consist of those certain metals, general constituents, nutrients, pesticides/herbicides, and pathogens as listed below:

	Metals	General Constituents	Nutrients	Pesticides/ Herbicides	Pathogens
BCC and tribs (n=8) LCC (n=8) Mud (n=2)	As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn, Fe	Chloride, sulfate, turbidity, TOC, DOC total settleable solids, TSS, TDS	Nitrite, nitrate, total ammonia, TKN, orthophosphate , total phosphorus	Organophosphate Organochlorine	Total Coliform Fecal Coliform

4. Available Data Overview

Stewart Oakley from California State University Chico conducted a Fecal Coliform Analysis in March 1999. There is currently a water quality program on Little Chico Creek that includes monitoring for coliform, bacteria, nutrients, metals, organophosphates and other petroleum, hydrocarbons, oxygenates, macroinvertibrates, fish tissue analysis and toxicity testing. This testing is not yet complete.

5. General Study Design

The monitoring program is a site-specific design that calls for runoff-event and normal-flow sampling at publicly-accessible stations located upstream and downstream of the urban area. City of Chico will contract with a qualified consultant to conduct the sampling.

6. Working Relationships

The following matrix shows working relationships and task responsibilities.

Task	Responsible Organization		
	SWRCB	RWQCBs	City of Chico
Develop contract(s) for monitoring services.	●	●	●
Identify water bodies and specific sites to be monitored for background conditions and potential impacts from urban runoff.		●	●
		●	

Task	Responsible Organization		
	SWRCB	RWQCBs	City of Chico
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions. Identify potential location impacts and water quality trend concerns.			
Identify existing research and literature pertaining to area and identified concerns.		●	●
Make decision on adequacy of available information.		●	●
Prepare site-specific study design based on monitoring objectives, the assessment of available information, sampling design, and indicators.	● (Work Plan Review Role)	●	●
Implement study design. (Collect and analyze samples.)			●
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	● (Review Role)	●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	City of Chico
Report data through SWRCB web site.	●	● (Coordination Role)	●
Prepare written report of data.	● (Review Role)	●	●

7. Specific Study Design

Chico urban streams monitoring is a directed study. Generally the criteria for selecting monitoring locations is to be able to measure water quality of Big and Little Chico Creeks above the urban area of Chico and near urban runoff discharge locations. Seven monitoring stations will be established. The program also includes one event and one base flow sample from Mud Creek. A total of eight sampling events will be conducted during one year: four during runoff events and four during fair weather conditions. Each sampling event will include all the indicator constituents shown above.

Sampling will be in accordance with the monitoring plan and the requirements of the SWAMP QAPP. The sampling will be in accordance with ultra-clean methods for metals, utilize state-approved protocols and analytical methods, and be consistent with the SRWP. Enter data into a database and analyze the results. Prepare a summary report to document sampling results, analyze trends and propose future sampling. Evaluate conformance with the monitoring plan and QAPP.

8. Main Tasks, Deliverables to RWQCB and SWRCB, and Relative Schedule

1. Program management, progress reports (quarterly).
2. Develop monitoring plan and QAPP (1st quarter).
3. Conduct sampling/Field parameter data (include reports).
4. Laboratory analytical reports (include in quarterly progress reports).
5. Summary report of findings (close of program).

9. Summary

The goal of the monitoring program is to coordinate with stakeholders (e.g. RWQCB, SRWP, Department of Water Resources, Department of Pesticide Regulation) to prepare Monitoring Plan with the objective of identifying urban runoff impacts to Big Chico Creek (and its tributaries Sycamore Creek and Lindo Channel) and Little Chico Creek. Prepare a summary report to document sampling results, analyze trends and propose future sampling.

10. Budget

The following is the budget for one year of sampling.

1. Program Management	$2,100
2. QAPP	$8,200
3. Sampling	$23,600
4. Lab costs (hydrocarbons)	$5,000
5. Lab costs (pesticides)	$27,000
6. Lab costs (metals)	$49,000
7. Lab costs (pathogens)	$5,500
8. Lab costs (nutrients)	$12,000
9. Lab costs (general const.)	$18,000
10.Lab costs (inflation factor)	$3,500
5. Draft and Final Report	$30,000
TOTAL	$183,900

11. Schedule

Chico urban streams monitoring will begin October 2002 and continue through October 2003. A final report will be submitted January 2004.

MONITORING OF SELECTED STREAMS IN THE REDDING AREA, SHASTA COUNTY

1. BACKGROUND

The City of Redding is one of three major population centers (including Chico and Yuba City/Marysville) in the Sacramento River Watershed north of Sacramento. To date there has been little or no water-quality monitoring of runoff from these urban areas. Water quality of streams in the Redding area is unknown at this time. Redding has ongoing commercial and residential development in watersheds with anadromous fish habitat that are also used for water contact recreation. Some potential non-point sources of pollutants in these watersheds are: excessive or inappropriate pesticide and fertilizer use; spilled or dumped fuel, oil, and detergents; wash down from commercial/industrial facilities; disturbed soil; and solid waste. Because the Sacramento River flows through central Redding, some urban runoff may be reaching the river with little or no attenuation in tributary streams. Monitoring of key tributary streams in Redding can provide an important assessment of water quality and non-point source pollution in a major population center of the Sacramento River Watershed.

2. MONITORING PROGRAM SCOPE AND OBJECTIVES

In cooperation with the City of Redding, the RWQCB will implement a water-quality monitoring program on the eight main streams in the Redding urban area. The streams are: Canyon Creek, Olney Creek, Sulphur Creek, Jenny Creek, Linden Creek, Calaboose Creek, Churn Creek, and little Churn Creek. Program Objectives are as follows:

1. Determine existing water quality conditions,
2. Evaluate compliance with existing Basin Plan water quality objectives and evaluate potential impairments to identified beneficial uses,
3. Evaluate potential sources of water quality/ beneficial use impairments (if any).

Water quality monitoring (directed study design) will be conducted twice monthly and during high rainfall events for 2 years and will focus on potential impacts from commercial/industrial areas, residential areas, and construction activities. One monitoring station is proposed for each of the eight tributaries. Monitoring locations are selected to collect data from the lower stream reaches, within urban areas. The monitoring locations will provide water quality data for the tributary streams and for runoff discharge to the Sacramento River. Samples will also be collected during high runoff events at upstream and downstream stations on the Sacramento River.

The most water-quality sensitive beneficial uses of these streams are: water contact recreation and cold freshwater habitat. The following SWAMP monitoring objectives and indicator constituents are applicable to the following beneficial uses: water contact recreation (Attachment 1, objective 1) Fecal coliform (E. coli), and aquatic life or cold freshwater habitat and spawning (Attachment 1, objectives 9 and 12) flow, turbidity, total suspended solids, total dissolved solids, temperature, pH, conductivity, dissolved oxygen, nutrients, (nitrate, phosphate, ammonia), standard minerals, total petroleum hydrocarbons, OP pesticide, and metals. Biological assessment will include analysis of benthic macroinvertebrate populations as a general measure of water quality and habitat.

Because of the urban setting of these streams and the sensitive nature of cold freshwater spawning habitat a relatively comprehensive list of indicators is needed to evaluate potential beneficial use impairments. A specific QAPP for the monitoring program will be prepared consistent with SWAMP QA requirements. Table 1 shows the proposed monitoring indicators and associated costs.

Table 1
Monitoring of Selected Redding Streams

Monitoring Parameter	Location	Frequency	Cost (2 years)
Fixed Frequency Sampling			
Flow	8 Stations	12 times/yr	--
Temperature	8	Continuous	3,000.00
Turbidity	8	24/yr	--
pH	8	24/yr	--
Conductivity	8	24/yr	--
Dissolved Oxygen	8	24/yr	--
E. Coli	8	24/yr	11,520.00
Standard Minerals*	8	Quarterly	8,320.00
Metals**	8	Annually	2,480.00
TPH gasoline	8	Quarterly	3,840.00
TPH diesel/oil	8	Quarterly	3,840.00
OP Pesticide	8	Quarterly	8,320.00
Macroinvertebrates	8	Annually	6,400.00
Runoff Event Sampling			
Turbidity	10	4 times/yr	--
TSS	10	4/yr	--
E. Coli	10	3/yr	2,400.00
Standard Minerals*	10	3/yr	10,400.00
Metals**	10	1/yr	12,400.00
TPH gasoline	10	3/yr	4,800.00
TPH oil	10	3/yr	4,800.00
OP Pesticide	10	3/yr	10,400.00
Field Technician		28 days/yr	--
			$92,920 Total

-- Equipment and analysis supplied RWQCB Redding office.

* Standard Minerals: TDS, EC, Chloride, Sulfate, Nitrate, Bicarbonate Alkalinity, Carbonate Alkalinity, Calcium, Magnesium, Potassium, Sodium, pH, Hardness, Silica, Boron, Iron, Ammonia, and Phosphate.

** Metals: Arsenic, Antimony, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium and Zinc.

3. <u>WORKING RELATIONSHIPS</u>

The following matrix shows working relationships and task responsibilities.

Task	Responsible Organization		
	SWRCB	RWQCBs	City of Redding
Develop contract(s) for monitoring services.	●	●	●
Identify water bodies and specific sites to be monitored for background conditions and potential impacts from urban runoff.		●	●
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions. Identify potential location impacts and water quality trend concerns.		●	
Identify existing research and literature pertaining to area and identified concerns.		●	●
Make decision on adequacy of available information.		●	●
Prepare site-specific study design based on monitoring objectives, the assessment of available information, sampling design, and indicators.	● (Work Plan Review Role)	●	●
Implement study design. (Collect and analyze samples.)		●	●
	●	●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	City of Redding
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	(Review Role)		
Report data through SWRCB web site.	●	●	
Prepare written report of data.	● (Review Role)	●	●

4. DELIVERABLES

Deliverables from the SWAMP funded monitoring of selected Redding urban streams include the following:

- A final study design that includes monitoring parameters, sample locations, sampling frequency, and sampling methods
- A QAPP
- Periodic and final laboratory and field data reports.

5. SCHEDULE

Redding urban streams monitoring will begin September 2002 and continue through September 2004. A final report will be submitted December 2004.

LOWER SACRAMENTO RIVER BASIN

Introduction

An Agricultural Dominated Water body (ADW) is a water body receiving greater than fifty percent of the flow coming from agricultural discharges during a significant portion of the irrigation season (ISWP, 1991). These discharges could be comprised of supply, return, or both flows. The aquatic environment of ADW's can be subject to a multitude of stressors, including a highly variable flow regime, increased turbidity, increased sedimentation, altered temperature patterns, and increased nutrient loading. In addition, ADW's can contain high concentrations of dissolved pesticides (Domagalski, 1996;

Holmes et al., 2000; Hunt et al., 1999) that can be acutely toxic in standard laboratory bioassays (Foe et al., 1998; Reyes et al., 2000; de Vlaming et al., 2000).

The Sacramento River Basin contains over 5,700 miles of ADW's, most of which are contained in the valley floor region of the basin. Approximately 10 percent (574 miles) of the total mileage of ADW's in the basin is comprised of historically natural, as opposed to constructed, channels or segments of historical natural channels. Natural ADW's can be dominated by irrigation supply and/or return flows. Approximately 35 percent (203 miles) and 65 percent (371 miles) of natural ADW's in the Sacramento River Basin are dominated by irrigation supply and irrigation return flows, respectively. Segments of many water bodies, be natural or constructed, may be contain both supply and return water at different times of the year due to water recycling.

The natural ADW's in the Sacramento River Basin are predominately contained within three of the total eight sub-basins of the Sacramento River Basin (ISWP, 1991). The three sub-basins include the Putah Creek and Willow Slough basin on the west side of the Sacramento River Valley, the Jack Slough and Honcut Slough basin on the east side of the Feather River near Marysville/Yuba City, and the Butte Creek/Butte Slough complex draining from the Chico area into Sacramento Slough and eventually the Sacramento River near Verona. Aside from the above named water bodies which receive flow augmentations, many natural ADW's are ephemeral and receive flow only during rainfall events and the wet season.

Effluent dominated water bodies (EDW's) are water bodies that, due to low or intermittent flows, have characteristics dominated by wastewater discharge. Many of the EDW's in the lower Sacramento River Watershed are located in the foothill region just above the valley floor. The foothill region is a region of high development and rapid population growth. There are existing and proposed wastewater treatment plants on many of the small creeks and streams that drain to the Valley floor and there are many different types of treatment plants.

Endocrine disrupting chemicals (EDC's), or chemicals anthropogenic in origin that have the capacity to mimic steroid hormones, can be released to the environment from wastewater treatment plants and nonpoint source runoff (Johnson et al., 1998; Kolpin et al., 2002). EDC's can mimic the female estrogen hormone, which has principle control of reproduction in vertebrates. Examples of EDC's include pesticides, detergent metabolites, pharmaceuticals, and biogenic hormones. Environmental exposure to EDC's has been linked to the feminization of alligators in Florida (Guillette at al., 1994), and is believed responsible for widespread sexual disruption in wild fish throughout the United Kingdom (Jobling et al., 1998). There is limited information as to the occurrence and distribution of EDC's in the lower Sacramento River Watershed.

The Basin Plan and 303d lists for the Central Valley Region identifies surface water discharges from irrigated agriculture and EDW's as priority water quality issues for the region. Baseline aquatic community composition is largely unknown in Regional ADW's and EDW's. However, in the Fall of 2000 the Central Valley Regional Board undertook a biological Surface Water Ambient Monitoring Program (SWAMP) monitoring project in ADW's and Effluent Dominated Water bodies (EDW's) of the lower Sacramento River Watershed. The goals of the two-year biological monitoring project were to identify baseline aquatic community composition, assess the condition of the habitat, and to work towards identification of biological indicators of aquatic life stressors in wadeable ADW's and EDW's of the lower Sacramento River Watershed. The sampling protocol (Harrington and Born, 1999) is a modified version of the U.S. EPA methods for use in California.

The ADW sites selected for the SWAMP 2000 biological sampling study were located in the smaller feeder streams and laterals upstream of historical pesticide monitoring project sites. The historical downstream monitoring sites were used to identify sources of organophosphate pesticide loading to the Sacramento River Watershed during the winter months. Many of the upstream sites in the laterals are directly adjacent to or in the middle of agricultural activities. The EDW sampling sites were located in foothill creeks and streams near the Sacramento area. The results of the 2000 biological study are currently being compiled. Preliminary results from biological assessments, habitat evaluations, chemical measurements, toxicity tests, and an insecticide over-spray event will be available summer 2003. In addition, draft data from this study are being used to focus a portion of the monitoring efforts for 2002/2003.

The 2002/2003 SWAMP monitoring program for the lower Sacramento River Basin will be threefold. First, biological and habitat investigations will continue with an emphasis on natural, as opposed to constructed, ADWs. Second, water column and/or sediment toxicity tests will be conducted throughout the watershed. Toxicity testing may be used to supplement monitoring of the bioassessment and/or other chemical monitoring in the watershed. Finally, a survey of endocrine disrupting chemicals (EDC's) will be conducted in the lower Sacramento River watershed using a luciferase assay and/or a vitellogenin assay. Sampling sites chosen for toxicity testing and EDC screening assays will be selected based upon relative influence of urban and agricultural areas, and other factors.

In summary, the overall plan for the 2002/2003 SWAMP has not changed substantially in the lower Sacramento River Basin. However, a more intensive assessment, which includes toxicity testing, Toxicity Identification Evaluation (TIE's), chemical analyses, and/or biomarker investigations will be made at fewer sites than in 2000-2002. A comprehensive monitoring plan, which makes use of multiple ambient water quality measurement tools, is most useful for assessment of multi-stressed aquatic ecosystems (Anderson, 2001), such as those ecosystems in the Valley Floor of the Sacramento River Basin.

Biological assessments will use a multihabitat sampling approach habitat (Barbour et al., 1999; Meador et al., 1993) to allow for standardization among the variable habitat types in natural ADW's and EDW's of the lower Sacramento River Basin. In addition to employing the standard bioassessment approach at select sites, the 2002/2003 sampling will also include limited natural variation focused sampling, and event based sampling to gain better understanding of the potential influences of natural variability and event based stressors (first flush, irrigation pesticide application season, etc.) on the seasonal distributions of aquatic communities in the highly modified natural ADW's of the Sacramento River Basin.

Goals

#1) Identify seasonal baseline distribution of aquatic ecosystem communities in EDW's and/or natural ADW's of the Sacramento River Basin.
#2) Work towards development of biological indicators of water quality and associate aquatic life stressors in EDW's and ADW's of the Sacramento River Basin.
#3) Identify relative occurrence and distribution of endocrine disruption in the lower Sacramento River Basin.

Objectives

#1) Collect benthic macro invertebrate samples in natural ADW's and/or EDW's.
#2) Conduct quantitative habitat evaluations in natural ADW's and/or EDW's.
#3) Conduct toxicity tests with TIE's, and collect associated chemistry.
#4) Conduct preliminary screen of EDC's using luciferase and/or vitellogenin assays.
#5) Collect monthly water quality data and obtain flow data.
#6) Coordinate this project with other projects in ADW's of the Sacramento River Basin, including monitoring by the Sacramento River Watershed Program (SRWP), best management practice implementation projects, Total Maximum Daily Load (TMDL) studies, and others.

<u>Monitoring Sites for 2002/2003</u>

Specific sampling sites for 2002/2003 will be determined after field reconnaissance. Sampling sites could be established on the following waters: Butte Creek, Butte Slough, Sacramento Slough, Colusa Basin Drainage Basin, Coon Creek, Honcut Creek, Dry Creek, Auburn Ravine, Pleasant Grove Creek, Pine Creek, Jack Slough, Yuba River, the Main Drainage Canal, Natomas East Main Drain (Steelhead Creek) and Arcade Creek. All ADW and EDW sampling sites for 2002/2003 are mostly low-gradient aquatic habitat. The Butte Creek/Butte Slough water bodies discharge through Sacramento Slough to the Sacramento River. The Colusa Basin Drain is a constructed ADW that receives flows from natural and constructed channels, and drains most of the ADW's on the West Side of the Sacramento River Basin which includes the natural ADW's Putah Creek, Cache Creek, and Willow Slough, and discharges into the Sacramento River at Knight's Landing. In addition, portions of these ADW's are on the 303d list of impaired water bodies for rice pesticides, almond and stonefruit pesticides, and/or unknown toxicity (Karkoski et al., 2002).

Description of Monitoring Area

Butte Creek originates above Chico and flows through the Butte Sink, Butte Slough, and eventually through the Sutter Bypass and Sacramento Slough before reaching the Sacramento River. The Butte Creek/Butte Slough complex is a natural ADW with a modified flow regime. For the majority of the irrigation season, April through September, Butte Creek is dominated by supply flows from its intersection with the Southern Pacific Railroad near Esquon to its discharge into Butte Slough, approximately 29 miles. For 14 miles, from 2.5 miles north of the Colusa County line to its discharge, the creek does receive agricultural return flows. During mid-September, freshwater releases are diverted into the channel for flooding wetland habitat. At the Highline Lateral and again at the Western Canal, the upper 28-mile section of the agriculturally dominated reach, the creek is dammed during the irrigation season to allow recycling. Enough flow is released at each dam to accommodate riparian and appropriative uses downstream.

The Colusa Basin Drain (CBD) network is the Valley Floor portion of the Sacramento River Basin that is west of the Sacramento River, south of Stoney Creek and North of Cache Creek. The majority of the drainage from the CBD enters the Sacramento River at two points at or near Knight’s Landing. The entire basin historically received flood flows from the Sacramento River and periodic flows from ephemeral streams that drain the Westside foothills. Due to flood control and levee work, the area has not received extensive annual flood flows for over 75 years. The streams entering the Valley Floor from the Westside foothills are ephemeral and only reach the Valley Floor during or shortly after intensive periods of rainfall. Many of these ephemeral streams flowed only in defined channels for the first few miles into the Valley Floor followed by wide flood washes in its lower reaches. Most of the lower reaches have been regraded for agricultural development with flood flows channelized into constructed agricultural drains.

Many of the natural creeks and sloughs in the CDB with defined channels in the Valley Floor have been highly modified to act as supply channels for agricultural drains, which eventually become the CBD. In addition, the majority of flow in these channels today is the result of irrigation supply and drainage. There are approximately 70 miles of natural ADW’s within the CBD drainage. The majority of this water is picked up later for irrigation by downslope users. These reaches that are dominated by agricultural drainage are normally upslope in the individual creek’s watershed and are ephemeral stream courses. Most of these creeks have been extensively reconstructed and realigned in their lower reaches and they now act as seasonal drains for the irrigated area. Channels that have been reconstructed within the basin cover over 208 miles. During the irrigation season, roughly April through October, these channels would remain dry in the absence of the irrigation return flows. In addition, the CBD serves as catchment for waters from over 1700 miles of constructed drains.

Coon Creek is a water body, which originates in the Sierra foothills and is an extension of the South Fork of Dry Creek. Coon Creek is an ephemeral creek, which can no longer drain to the Feather River due to extensive reconstruction along its lower reaches. In the 9.4 mile reach from the Sutter/Placer County line to the East Side Canal, the natural channel is dominated by agricultural activity between March and October. Upstream reaches are dominated by urban runoff at times.

Auburn Ravine originates near the City of Auburn in the Sierra foothills. The stream continues west until it discharges into the East Side Canal. The final six miles of the stream is dominated by agricultural activities during the irrigation season. Pleasant Grove Creek originates near Loomis and flows west until discharging into an extension of the Cross Canal known as the Pleasant Grove Creek Canal. A natural, ephemeral stream, the lower 4.5 miles, from Pettigrew Road west to its discharge, is dominated by agricultural supply and drainage between March and October. The upstream is dominated by urban runoff.

Beneficial Uses

The beneficial uses in the Butte Creek/Butte Slough complex include municipal, agriculture, industry, recreation, warm and cold freshwater habitat, migration, spawning, and wildlife habitat. In addition, endangered Sacramento Winter Run Chinook Salmon, threatened Central Valley Spring Run Chinook Salmon, and Central Valley Steelhead have critical habitat designations, which include the Butte Creek/Butte Slough complex. The beneficial uses in the Colusa Basin Drain include municipal, agriculture, recreation, warm and cold freshwater habitat, migration, spawning, and wildlife habitat.

Monitoring Objectives Association With Beneficial Uses

The goals and objectives of the 2002/2003 monitoring are most closely related to warm and cold freshwater habitat, migration, spawning, and wildlife habitat (Table LS-1). These goals and objectives are essential to further our understanding of beneficial uses and determine if aquatic populations, communities, and habitats are protected. Protection of these beneficial uses includes spawning, reproduction, and early development.

Table LS-1. Potential sampling sites in lower Sacramento River Watershed Basin, monitoring objective, associated beneficial use, and indicators.

Potential Sites	Monitoring Objective *	Beneficial Use	Indicator
Lower Sacramento River, Butte Creek, Butte Slough, Sacramento Slough, American River, Auburn Ravine, Dry Creek, Pleasant Grove Creek, Coon Creek, Feather River, Jack Slough, Yuba River, Honcut Creek, Natomas East Main Drain, Arcade Creek.	Are aquatic populations, communities, and habitats protected?	Cold Freshwater Habitat; Preservation of Biological Habitats; Rare, Threatened or Endangered Species; Warm Freshwater Habitat; Wildlife Habitat, Spawning, Reproduction and/or Early Development	Bioassessment, Toxicity Testing, TIE’s, Chemical Analyses, Vitellogenin Assays

* See Attachment 1 (SWRCB, 2000) monitoring objectives 9-11

Indicators

The indicators of water quality in the 2002/2003 monitoring project include benthic macro invertebrates, toxicity, water chemistry, and biomarker responses. Furthermore, a primary goal of this project is to work towards development of biological indicators of water quality and associate aquatic life stressors in ADW's and EDW's of the lower Sacramento River Basin.

Available Data Overview

The most comprehensive biological data set that currently exists for ADW's in the Sacramento River Basin was that conducted by Regional Board Staff in cooperation with the UC Davis Aquatic Toxicology Laboratory (UCDATL) and the California Department of Fish and Game (CDFG). The data are currently not published and are not expected to be final until early 2003. These data are from wadeable sites and the target biological assemblages were benthic macro invertebrates.

Brown and May (2000) collected benthic macro invertebrates, using U.S. Geological Survey protocols (Cuffney et al., 1993; Porter et al., 1993), in 1996 and 1997 from aquatic snag habitat in the lower Sacramento River Basin and related biological data to environmental variables. Brown and May (2000) reported that their results suggest mean dominant substrate type, gradient, specific conductance, water temperature, percentage of agricultural land use, p percentage of the basin combined in agricultural and urban land uses, and elevation were important factors for explaining benthic macro invertebrate assemblage structure in the Central Valley. The results further suggest that benthic macro invertebrate assemblages in low gradient nonwadeable reaches of the Central Valley are relatively homogenous and sufficient for detection of effects of anthropogenic land use.

The Biological and Habitat Subcommittee of the Sacramento River Watershed Program (SRWP) in cooperation with the CDFG have coordinated and collected limited biological assessment data with the Sacramento River Watershed and the Department of Water Resources. However, these data are limited to only a handful sites and are difficult to interpret due to the lack of reference sites in the Central Valley. It should be noted that the CDFG along with Staff from the Central Valley Regional are in the process of selecting reference sites in the foothill (500-2000 feet elevation) and valley floor (< 500 feet elevation) regions of the Sacramento River Watershed. The field procedures for sample collection will follow protocols for high gradient (riffles) in the foothill region (Harrington and Born, 1999) and for low-gradient reaches in the valley floor region using a multi-habitat approach (Barbour et al., 1999). The SWAMP 2002/2003 monitoring in ADW's of the valley floor region of the Sacramento River Watershed will adhere to the Barbour et al., (1999) multi-habitat approach.

Summary and Conclusions

In summary, the goals of the 2002/2003 monitoring season is to work towards development of water quality indicators and associate aquatic life stressors in ADW’s and EDW’s, to identify baseline distribution of aquatic ecosystem communities in natural ADW’s, and to identify occurrence and distribution of endocrine disrupting chemicals in the lower Sacramento River and tributaries. This monitoring project is necessary to further our understanding of aquatic communities, populations, and habitat in EDW’s and ADW’s of the lower Sacramento River Basin and to determine the adequacy and level of protection needed.

General Study Design

Monitoring will take place at selected sites throughout the lower Sacramento River Basin and will be dependent upon the parameter(s) monitored. Many sites will require field reconnaissance for confirmation of a sampling site. Initial criteria for selection of sampling sites include presence of urban land use, wastewater treatment plants, dairies, agricultural land use, homogeneity of aquatic habitat, chemical usage per a sub-basin, and other criteria. Field reconnaissance will be used to confirm site selection based upon access to a given water body and other criteria. Data collected will be analyzed by parametric, nonparametric, and clustering analyses when possible. All methods will follow SWAMP QAPP requirements.

Specific Study Design

Approximately 25 samples will be collected using bioassessment. Approximately ½ of the 25 samples will be collected on an event based sampling regime from 3 sites from the following: Butte Slough, Sacramento Slough, Colusa Basin Drain, Jack Slough, the Main Drainage Canal, Pine Creek, and/or others. The remaining samples will be collected from EDW’s and/or natural ADW’s on a Spring/Fall sampling basis at sites to be determined. Up to 48 samples can be collected for toxicity testing. At least 3 samples can have TIE and chemical analyses. Finally, at least 10 sites will be assessed for the presence of endocrine disrupting chemicals in the lower Sacramento River Basin.

Benthic macro invertebrates will be sampled and habitat will be assessed using a multi-habitat approach (Barbour et al., 1999). Chronic and/or acute toxicity tests (U.S. EPA, 1991a) may be conducted using either *cerio daphnia* and/or *hyalella* species, and would be coupled with TIE’s and chemical analyses (U.S. EPA, 1991b; U.S. EPA, 1993a; U.S. EPA, 1993b). In addition, genetic biomarker investigations using a vitellogenin assay will be conducted. The vitellogenin assay can be used as a biomarker of exposure to endocrine disrupting chemicals (Harries et al., 1996; Harries et al., 1997; Van Der Kraak, 1998). The toxicity testing and/or biomarker investigations will be conducted at selected sites and will be used to develop an understanding of baseline aquatic communities and relative magnitude of aquatic life stressors.

Sampling sites will be designated using a Global Positioning System (GPS) and documented using a digital camera. Digital pictures will be taken seasonally from sampling reach where sampling is conducted. Monthly trend monitoring will be conducted at selected sites to identify water quality and habitat conditions throughout each season and develop additional water quality and habitat data for stressor association.

Quality Assurance/Quality Control (QA/QC) will follow those recommended by Barbour et al., (1999) for the sampling and analyses of the biological samples and assessment of habitat. In addition, approximately 10 percent of benthic macro vertebrate samples will be subcontracted out to an external laboratory for taxonomic validation. QA/QC for toxicity testing will follow those recommended by U.S. EPA (1991).

Description of Deliverables

1) Quarterly progress reports throughout life of contract summarizing work performed to date, including data results, data interpretation, problems encountered, and any corrective actions.
2) Standard Operation Procedures for multi-habitat sampling.
3) QAPP and Monitoring Plan.
4) Taxonomic lists and analyses.
5) Toxicity test, TIE, chemical, and biomarker data and analyses.
6) Draft and Final Report.

Anticipated Milestones

The QAPP and Monitoring Plan will be due in early Fall 2002 before any work can begin. Sampling is anticipated to start in late Fall of 2002 and finish by Summer of 2003. Taxonomy will be complete six months after the final sampling – approximately December 2003. A draft and final report should be available by June 2004 and December 2004, respectively.

<u>Budget</u>

Task 1	Project Management and Administration		$3,940.00
	Quarterly Reports		$4,000.00
Task 2	QAPP		$500.00
Task 3	Monitoring Plan		$500.00
Task 4	Site Recon (@$150.00x5/sites one time)		$750.00
Task 5	Sampling & Processing BMI Samples		
	BMI Sampling	($200/site)	
	BMI Sorting	($75/site)	
	BMI Taxonomy	($500/site)	
	BMI List & Analyses	<u>($300/site)</u>	

	$1,075 per site (25 sites)	$26,875.00
Task 6 Toxicity Test's (w/ TIE'S & CHEM) TOX Tests ($225/Treatment)(48)= $11000 TIES and Chem. ($2000/Treatment)(3)=$6000		$17,000.00
Task 7 Endocrine Disrupting Chemical Assays		$33,420.00
Task 8 Draft & Final Report		$9,780.00
	Supplies	$6,417.00
	Subtotal	$103,182.00
	Overhead @ 10%	$10,318.00
	Sub-contract QA/QC	$4,000.00
	Total	$117,500.00

Working Relationships

This is collaborative effort with the University of California at Davis and Central Valley Regional Board Staff (Table LS-2). Any deviations from the project plan will be approved by the contract manager.

Table LS-2. Responsibility matrix for lower Sacramento River 02/03 SWAMP project.

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Develop contract(s) for monitoring services.	●	●	●
Identify water bodies or sites of concern and clean sites to be monitored.		●	
Identify site-specific locations with potential beneficial use impacts or unimpacted conditions that will be monitored.		●	
Decide if concern is related to objectives focused on location or trends of impacts.		●	
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions.		●	
Identify already-completed monitoring and research efforts focused on potential problem, monitoring objective, or clean conditions.		●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Make decision on adequacy of available information.		●	●
Prepare site-specific study design based on monitoring objectives, the assessment of available information, sampling design, and indicators.	● (Work Plan Review Role)	●	●
Implement study design. (Collect and analyze samples.)			●
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	● (Review Role)	●	●
Report data through SWRCB web site.	●	● (Coordination Role)	●
Prepare written report of data.	●	●	●

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SAN JOAQUIN RIVER WATERSHED

1.0 Introduction

The San Joaquin River flows northward and drains the portion of the Central Valley south of the Sacramento-San Joaquin Delta and north of the Tulare Lake Basin. The San Joaquin River Basin covers 15,880 square miles and yields an average annual surface runoff of about 1.6 million acre feet. The Basin includes the entire area drained by the San Joaquin River and all watersheds tributary to the river. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Camanche, Pardee, New Hogan, New Melones, Don Pedro, McClure, and Millerton.

The lower Basin (below Millerton Reservoir) has had a highly managed hydrology since implementation of the Central Valley Project (CVP) in 1951. Most of the San Joaquin River flow is diverted into the Friant-Kern Canal, leaving the river channel upstream of the Mendota Pool dry except during periods of wet weather flow and major snow melt. Poorer quality (higher salinity) water is imported from the Delta for irrigation along the west side of the river to replace water lost through diversion of the upper San Joaquin River flows. During the irrigation season, the flows in the river between the Mendota Pool and Salt Slough consist largely of groundwater accretions. Salt Slough and Mud Slough are the principal drainage arteries for the Grassland Sub-Watershed and add significantly to the flows and waste loads in the San Joaquin River upstream of its confluence with the Merced River. Discharges from three major river systems, the Merced, Tuolumne, and Stanislaus Rivers, which drain the Sierra Nevada, dominate flow and quality of discharges from the east side of the Lower San Joaquin River Basin. Flows from the west side of the river basin are dominated by agricultural return flows since west side streams are ephemeral and their downstream channels are used to transport agricultural return flows to the main river channel.

Major land use along the San Joaquin Valley floor is agricultural, with over 2.1 million irrigated acres, representing 22% of the irrigated acreage in California. Urban growth along the I-5 corridor between Fresno and Stockton is rapidly converting historical agricultural lands to urban areas as more and more people choose to commute from the Central Valley to the Bay Area. This rapid conversion of rural areas is leading to increased potential for stormwater and urban impacts to local waterways.

The San Joaquin River Watershed can be broken into smaller units to address specific problems. One such area is the Grassland Watershed, a 370,000-acre area west of the San Joaquin River between the Tulare Lake Basin and the Orestimba Creek alluvial fan. The watershed contains managed wetlands, irrigated agriculture and a 97,000-acre drainage project area, which is the primary source of selenium to the San Joaquin River. Mud Slough (north) and Salt Slough are tributary to the river and serve as the only drainage outlets for the Grassland Watershed. The watershed has been the focus of the Region’s subsurface agricultural drainage program since 1985, and considerable staff effort and resources have been directed to the effort of developing a comprehensive monitoring program, insuring stakeholder involvement, and adopting Basin Plan Amendments and Waste Discharge Requirements in order to develop a workable and comprehensive selenium control program. The proposed comprehensive SWAMP program builds upon this established framework.

2.0 Identify Problems and Monitoring Locations

In 1985, an extensive water quality survey to evaluate the impacts of agricultural drainage on the lower San Joaquin River was initiated. Although a number of issues of concern were identified, salt, boron and selenium impacts were the priority and the resulting multi-agency water quality monitoring program focused its limited resources on evaluating these constituents. Maintaining the existing program and expanding it to facilitate real-time monitoring activities are priorities in the basin. Other issues of concern include: aquatic toxicity from water born pesticides; aquatic life impacts from pesticides in bed sediment; habitat impacts from sedimentation; elevated nutrient and BOD levels; pathogens; elevated temperatures; impacts from abandoned mines, timber harvesting and grazing; and establishing baseline condition in rural coast range streams in areas slated for future urban development. Table **SJR-1** lists the projects within the basin by priority and provides a summary of anticipated costs and projections of funded vs. unfunded activities. Specific details for each project including site locations, parameters to be monitored and frequency, and cost are described in Table **SJR-2**. A general description of each project is listed in the overview of the general approach (SJR 3.1.1).

3.0 Objectives

There are two main objectives in the SJR SWAMP program. The first objective is to insure that the most limiting beneficial uses in a specific water body are being protected and identify sources of potential impairment. The most limiting beneficial uses identified for the water bodies in the San Joaquin River Basin (Table **SJR-6**) are drinking water, aquatic life, irrigation water supply, recreation, and in the case of selenium, wildlife (specifically waterfowl). To evaluate beneficial use protection, results obtained from this program will be evaluated against narrative and numeric water quality objectives in *The Water Quality Control Plan (*Bruns, 1998), [which includes specific numeric objectives for selenium, boron and molybdenum that were adopted as part of the selenium control program, numeric electrical conductivity objective adopted as part of the Bay/Delta program, and narrative criteria for toxicity] as well as narrative and numeric water quality goals listed in *A Compilation of Water Quality Goals* (Marshack, 2000)[See summary table SJR-7.] To identify potential sources of impairment, site selection has focused on locations representing subwatersheds within the basin and/or specific land uses.

The second objective is to determine, overtime, if implementation efforts are improving water quality. To help meet this objective, permanent monitoring locations have been selected along the main stem of the San Joaquin River and also at sites representing drainage flows into the main stem from five sub-basins. These sites will allow evaluation of water quality both over time and over water year types that can range from flood to critically dry years.

In meeting these two summary objectives, the design of the SJR monitoring program satisfies a number of the site-specific objectives identified in SWRCB (2000), as noted in Table **SJR-6**.

3.1 General Study Design

All available funding is being utilized for directed sampling activities to better characterize the extent and source of known and suspected water quality impairments. Activities are being coordinated with internal as well as external agency sampling efforts in order to meet the specific needs identified above, maximize limited resources, and insure comparability of data. These agency efforts include:

- Department of Pesticide Regulation: dormant spray evaluation program;
-
- USEPA: toxicity and TIE monitoring program;
- Central Valley RWQCB:
    - Organophosphate Total Maximum Daily Load (OP TMDL) dormant spray evaluation program;
    - Mercury TMDL (loading of Methyl Mercury);
    - Agricultural Waiver Discharge Evaluation;
    - Dissolved Oxygen TMDL effort.
- US Fish and Wildlife Service: Nutrient Survey;
- USGS: Phase II National Ambient Water Quality Monitoring (NAWQA) Program

Sampling efforts are coordinated on the Water Year timeline[1] in order to account for the temporal differences between normal, wet, dry and critical runoff years (SWRCB, 1995). Review and adjustments to all SWAMP program activities will be made upon evaluation of Water Year 2001and 2002 data, which is expected to occur in October 2002. Current focus is on the lower SJR and tributaries on the valley floor representing sub-watershed areas just prior to discharge into the lower SJR. Future augmentations will allow more randomized sampling of the upper watersheds during hydrologic unit rotations, which can in turn be coordinated with upper basin activities of pathogen source identification, abandoned mines, and grazing. Frequency of monitoring and selection of constituents have been adjusted to account for the arid nature of the watershed, it's highly modified hydrology and the dominant role that storm water flows and irrigation return flows play in overall hydrology. For instance, special sampling events are scheduled during winter storms to catch the initial and ongoing flushes of the watershed, while overall sampling frequency is increased during the irrigation season to evaluate agricultural return flow impacts.

[1] A water year lasts from 01 October through 30 September of the following year.

During FY02/03, monitoring activities related to the OP-TMDL and DO-TMDL efforts are scheduled to escalate in the San Joaquin River Basin; therefore, current design has eliminated pesticide, bioassessment and a majority of nutrient analyses from the overall program design.

3.1.1 Overview of General Approach

A general description of the projects prioritized in Table **SJR-1** follows.

Salt/Boron/Selenium Program: This project would allow continued participation in the multi-agency monitoring effort to evaluate the effectiveness and environmental impacts of the Grassland Bypass Project on selenium, salt and boron concentrations within the Grassland Watershed and the Lower San Joaquin River (SFEI, 2002).

Expansion for Real Time Monitoring: This project allows expanded monitoring of salt and boron in assorted inflows to the Lower San Joaquin River (including an increase in the number of sites as well as the frequency of analyses), in order to facilitate the use of a "Real Time Model" to balance discharges of fresh and saline inflows to meet salt and boron water quality objectives at the boundary of the Sacramento-San Joaquin Delta.

Main Stem of the San Joaquin River: The San Joaquin River serves as the drainage channel for the entire 16,000 square mile basin and discharges into the Sacramento-San Joaquin Delta. Eight sites, each one downstream of a major inflow to the lower river, will be monitored weekly, monthly, or quarterly (depending on the constituent) to determine overall water quality and potential source of the constituent. In addition to selenium, salt, and boron, evaluations will be conducted for dissolved oxygen, pH, temperature, hardness, general minerals, trace elements, nutrients, pesticides, total suspended solids, total organic carbon, and water column toxicity.

Drainage Basin Inflows to the lower San Joaquin River: Based on evaluations conducted during the Inland Surface Water Plan (ISWP, 1993) and initial TMDL evaluations (ref), six subwatersheds have been identified in the San Joaquin River Basin(Figure **SJR-1**):

1. Northeast Basin: Comprised of the Cosumnes, Mokelumne, and Calaveras Watersheds as well as eastside areas draining into the Sacramento-San Joaquin Delta downstream of Vernalis.
2. Eastside Basin: Comprised of the Stanislaus, Tuolumne, and Merced Watersheds as well as eastside valley floor areas draining directly to the main stem of the San Joaquin River.
3. Southeast Basin: Eastside areas draining into the San Joaquin River upstream of the San Joaquin River at Lander Avenue (Hwy 165).
4. Grassland Basin: Westside drainage into the San Joaquin River upstream of the Orestimba Creek watershed. Encompasses the Grassland Watershed (specifically identified within the Basin Plan (Bruns, 1998) which in turn encompasses the

Drainage Project Area (97,000-acres of intensively farmed land that discharges selenium enriched subsurface agricultural drainage).

5. Northwest Basin: Westside drainage into the San Joaquin River between the Grassland Basin and the Sacramento-San Joaquin Delta.
6. Delta Basin: Westside drainage into and including the Lower Sacramento and Lower San Joaquin River systems.

Each sub-area is bounded by either the Sierra Nevada or Coast Range and is comprised of like land uses and drainage patterns. All natural and constructed water bodies have been identified in each sub-area as well as potential water quality concerns and major representative discharges to the lower river (ISWP, 1992). Multi-constituent monitoring is to be conducted at these representative discharges from each basin on monthly basis and twice a month during the irrigation season (February through August). The monitoring will allow an evaluation of the potential water quality concerns within the drainage basins as well as the relative impacts from the basins on the lower river.

Baseline Conditions for Future Urban Creek: Land use patterns in the basin are changing as traditionally rural areas are developing into an urban corridor between Fresno and Stockton, and demand continues to increase for housing in the Bay Area. A completely new city of 55,000 is slated for development between 2000 and 2003 and will completely surround Mountain House Creek. Mt. House Creek currently receives drainage from agricultural and pasture lands. This project will develop a record of baseline conditions and aid in evaluation of urban impacts on existing water bodies.

Intensive Rotational Basin Monitoring: The majority of monitoring efforts in the San Joaquin River Basin are focused on the valley floor and lower river reach. The Intensive Basin Program will evaluate surface water quality in the five identified subwatersheds that are tributary to the San Joaquin River on a five-year rotational basis and determine if beneficial uses are impaired. Data generated from this program will be used to evaluate overall water quality in the subwatershed, determine 303d listing and/or delisting, identify potential water quality concerns related to land use, and be used to help support and develop drinking water policy decisions. Approximately 15 sites will be selected from each of the 5 basins during the year that basin is monitored, in addition to the long-term monitoring sites already incorporated as part of the Drainage Basin Inflow project. At a minimum, the additional sites will be evaluated for EC, pH, temperature, turbidity, dissolved oxygen, total coliform, and E. coli twice a month. Expanded analyses will be funding dependent.

Pathogens/Bacteria: All surface water bodies within the basin have potential municipal supply designated as a beneficial use. In addition, the San Joaquin River discharges to the Sacramento-San Joaquin Delta and can impact water supplies delivered to southern California. A major concern with water supplies used for drinking water and recreation is contamination by pathogens and bacteria. This project will identify baseline pathogen/bacteria conditions within the five sub-basins described in *Intensive Basin Rotational Monitoring* and potential sources. If resources are available, this project will extend into the main stem of the San Joaquin River on a quarterly basis.

Total Organic Carbon: Drinking water groups have identified total organic carbon (TOC) as a constituent of high priority due to the potential for trihalomethane formation during chlorination of water supplies. TOC will be monitored on a weekly basis at 15 sites in the sub-basins described in *Intensive Basin Rotational Monitoring* to support the drinking water aspect of the Intensive Basin Program. This project will identify baseline TOC conditions within the five sub-basins and identify potential sources. It will then link back to the Main Stem program by correlating Intensive Basin findings to those found along the main stem.

Storm Events: The lower San Joaquin River has a highly managed hydrology with flow patterns and water quality primarily impacted by water year type (wet, normal, dry), storm events, and irrigation return flows. Frequency of standardized monitoring has been developed to emphasize predictable irrigation patterns. This project will focus on intensive monitoring of 9 key sites distributed throughout the basin during two major storm events (greater than two inches of rain in a 72-hour period). Monitoring will be conducted every six to twelve hours depending on accessibility, while continuous samplers will be distributed to five sites in order to determine changing concentrations over time and flow patterns. Review of data will help to determine and change future storm sampling events.

Algal Bloom in Hidden Reservoir: Excessive algal Blooms have been observed in Hidden Reservoir (a.k.a. Hensley Lake). The Fresno River Watershed has been identified as the contributor of nutrients. SWAMP funds will be used to begin identifying sources of nitrates and phosphorus in the Fresno River Watershed.

Abandoned Mines: Mercury has been identified as a major contaminant of placer deposits in the Sierra Nevada. In addition, abandoned mercury mines exist in the coast ranges of the San Joaquin River Basin. This project will allow a preliminary review of potential mercury contamination from such sources during each round of the subwatershed evaluation discussed above.

Grazing and Timber Harvest: Impacts from grazing and timber harvest have not been evaluated within the San Joaquin River Basin. This project will allow a preliminary review of potential impacts from these activities during each round of the subwatershed evaluation discussed above.

During FY01-02, approximately $670,000 in contract dollars was allocated to the San Joaquin River Basin for monitoring activities through a combination of funding sources including the Surface Water Ambient Monitoring Program (SWAMP) ($375,000), general office funds ($70,000), OP TMDL, bioassessment ($210,000), and CALFED ($15,000). The allocation has allowed staff to move forward on the first six project priorities identified for the basin (salt/boron/selenium through baseline conditions for future urban creeks) and begin preliminary site investigations for an intensive rotational baseline monitoring of subwatersheds (hydrologic units).

During FY02-03, funding cuts have curtailed SWAMP program as well as other agency and partner programs. Negotiations will continue with these funding sources in order to maintain the overall contract dollars available to the basin. The cutoff point continues to be at the Rotational Basin Priority.

3.1.2 Water Quality Indicators

Water quality indicators are identified in Table **SJR-7**, and are based on the most limiting beneficial uses identified for the basin.

4.0 Specific Activities FY01/02

4.1 List of Water Bodies to be Sampled

See Table **SJR-2** for a list of water bodies to be sampled by project. Table **SJR-6** lists the water bodies and associated most limiting beneficial uses.

4.2 Review of Available Information

In house reports as well as information/reports from the USGS, DWR, and recent sanitary surveys were briefly reviewed to determine priority concerns within the watershed and appropriate locations to monitor (Chilcott, 1992; DWR, 1995; Steensen *et.al.*, 1998; USGS, 1998; and SFEI, 2002). Table **SJR-3** is a limited summary (subject to change) that lists some of the major activities and current monitoring by other state, federal and local agencies which will supplement and support this comprehensive program.

4.3 Specific Sampling Design/Sample Collection

Site locations and frequencies are listed in Table **SJR-2**. Sample collection procedures are listed in the *Ag Subsurface Drainage Program Procedures Manual* (Chilcott, *et. al.*, 1996) and updated draft appendices

4.4 Laboratory Analyses

Table **SJR-4** lists laboratories and analytical methods used during FY01-02. Continued use of these laboratories will depend on future funding and availability of a blanket resolution to allow augmentation of current analytical contracts.

4.5 Data Quality Evaluation and Data Reporting

To maintain the integrity of the monitoring activities, specific QA/QC procedures have been developed. These procedures include precise sample preparation, collection, and processing activities, as well as, development of check samples (blanks, splits, spikes) to determine precision and accuracy of laboratory analyses--both in-house and by contract laboratories. All activities are governed by an internal Quality Assurance Project Plan (QAPP) (Chilcott, *et. al.*, 1996), and updated appendices. Updates to these QAPP's will be consistent with the pending master SWAMP QAPP.

4.6 Deliverable Products

The State Board will receive water year reports by project every two years with interim draft water quality information (EC, pH, Temp, Boron, Selenium, TSS, TOC) for San Joaquin River and Grassland Bypass Project sites is available on the web at: http://www.swrcb.ca.gov/rwqcb5/programs/agunit/bypass/disclaim.htm. Data at these sites is updated on a monthly basis and is usually available within 10 weeks of collection.

4.7 Desired Milestone Schedule

Activities specifically slated for FY02-03 include:

- Complete funded monitoring identified in Table **SJR-2**
  - Coordinate fieldwork internally and with outside agencies to meet sampling schedule outlined in Table **SJR-2**
- Re-establish 3-year laboratory contract for boron, trace elements, full minerals, and TOC analyses.
- Augment existing laboratory contracts or develop new contracts and subcontracts through the Master Contract for:
  - CSUS Foundation — Student interns
  - Twining Laboratories — Boron, minerals, trace elements, TOC
  - DFG Master — Sediment chemistry and toxicity, equipment
  - Sierra Foothill Lab — TSS, BOD, Toxicity testing, TOC
  - UCD — Nutrients
- Update scope of work for sediment toxicity and sediment chemistry analyses under Department of Fish and Game Master Contract
- Update QAPP's for following monitoring programs based on WY 01 and 02 data:
  - Main stem of the San Joaquin River
  - Drainage Basin Inflows to the San Joaquin River
  - Baseline conditions for future urban creeks
  - Intensive Rotational Basin Monitoring
  - Storm Events
- Continue QA/QC comparisons for sample methods and laboratory analysis through coordination with other agency groups and internal laboratories.
- Complete draft reports on the following topics
  - Water Quality chapter for the GBP Annual Report (Water Year 2001)
  - Water Quality within the Grassland Watershed (Water Year 2001)
  - Water Quality in the Lower San Joaquin River (Water Year 2001)
- Complete Phase I Intensive Basin Program
  - Continue bacteriological work in house to help finalize development of QAPP and SOP for Rotational Intensive Basin Monitoring Program.
  - Complete field monitoring
  - Draft initial findings
- Start coordination efforts for Phase II: Intensive Basin Program

- Establish contacts in the Stanislaus, Tuolumne, and Merced River Watersheds
- Site Selection
- Begin Monitoring in October 2002

4.8 Desired "Sample Throughput" Schedule

Throughput schedule will depend on lab being utilized and final contract agreement.

4.9 Budget

See Table **SJR-2** for summary costs by project and an indication of which project will not be funded based on the current budget of $351, 695. The costs listed in Tables **SJR-2** assume the use of existing laboratory contracts for the majority of water column analyses and habitat assessment, use of a Master Contract for sediment toxicity testing, and augmentation of an existing student contract for field work and data tracking. The listed costs assume that monitoring programs currently under development by the University of California, US Fish and Wildlife Service, and US Geological Survey will be in place by July 2002.

Summary Notes – SJR SWAMP Program

The previous discussion has applied to contract dollars. A severe shortfall exists in staffing necessary to maintain the program. Staff is needed to establish and maintain analytical and student contracts; establish and update QAPPs for each project; oversee and participate with students in sample collection, sample processing, data quality review, data entry and verification in data bases; prepare annual report; coordinate with federal, state and local agencies conducting monitoring within the Basin; and disseminate that information to area stakeholders.

Table **SJR-5** indicates available staffing resources and additional resources necessary to adequately address monitoring issues.

5.0 Working Relationships

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Develop contract(s) for monitoring services.	●	●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Identify water bodies or sites of concern and clean sites to be monitored.		●	
Identify site-specific locations with potential beneficial use impacts or unimpacted conditions that will be monitored.		●	
Decide if concern is related to objectives focused on location or trends of impacts.		●	
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions.		●	
Identify already-completed monitoring and research efforts focused on potential problem, monitoring objective, or clean conditions.		●	
Make decision on adequacy of available information.		●	
Prepare site-specific study	● (Work Plan	●	

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
design based on monitoring objectives, the assessment of available information, sampling design, and indicators.	Review Role)		
Implement study design. (Collect and analyze samples.)		●	●
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	● (Review Role)	●	●
Report data through SWRCB web site.	●	● (Coordination Role)	●
Prepare written report of data.		●	●

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TULARE LAKE BASIN

1.0 Introduction

The Tulare Lake Hydrologic Basin (Basin) comprises roughly fifty percent of the Central Valley floor and includes the historical lakebed, with the remainder comprised of Kings Canyon and Sequoia National Parks and substantial portions of Sierra, Sequoia, Inyo, and Los Padres National Forests. The Tulare Lake Basin is essentially a closed basin since surface water drains north into the San Joaquin River only in years of extreme rainfall. The Kings River, Kaweah River, Tule River, Kern River, and all waters tributary drain the west face of the Sierra Nevada Mountains and provide the bulk of native surface water supply in the Tulare Lake Basin. These surface waters are augmented with imported water from the San Luis Canal/California Aqueduct System, Friant-Kern Canal, and the Delta Mendota Canal.

The Tulare Lake Basin is divided into six watershed management areas. Each area is defined as the designated groundwater basin. Thus, the Kern County Basin Management Area includes the Kern River and the Poso Creek drainage areas, as well as the drainage areas of westside streams in Kern County. The Tulare Lake Basin Management Area consists of the historical lakebed. The Tule Basin Management Area includes the Tule River, Deer Creek, and White River drainage areas. The Kaweah Basin Management Area includes the Kaweah River and Yokohl Creek drainage areas. The Kings Basin Management Area includes the Kings River drainage area as well as the drainage area for the tributaries and distribution systems of the Kings River. The Westside Basin includes the drainage areas of westside streams in the Kings and Fresno counties.

Point and nonpoint sources of pollution, resultant from historical and current land use, dominate water quality concerns in the Tulare Lake Basin. Principally, these uses include, but are not limited to, industrial processes, livestock grazing, dams, recreation, irrigated agriculture, confined animal facilities, and foothill and urban development.

To date, there has been no comprehensive monitoring or assessment initiated for surface waters in the Tulare Lake Basin. As such, the objective is to develop a surface water-monitoring program that will evaluate the water quality and identify, if any, beneficial use impairment within the six watershed management areas of the Tulare Lake Basin. The overall intent of this program is to meet the following goals:

- Identify reference and baseline surface water conditions;
- Assess water quality and beneficial use impairment/support;
- Provide data for impaired water body listings; and
- Determine if there is an association between land use and impacts.

2.0 Identify Problems and Monitoring Locations

Kings Basin Management Area
Reportedly, there are elevated bacteria levels in Pine Flat Reservoir and phytoplankton biostimulants have been measured in Sequoia Lake. The potential exists for high bacteria levels in Sequoia Lake. Unusual algal blooms have been reported in the Upper Kings River by Cedar Grove along with in Ten Mile Creek, a tributary to the Kings River.[2]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to, publicly and privately owned treatment works, individual septic tanks, livestock grazing, foothill development, and recreation. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 1 below:

TABLE 1

KINGS BASIN MANAGEMENT AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS
FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[3]	Category	Indicator
	Site-Specific		
Water Contact	1	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria
Fish and Shellfish Contamintion	4, 5, 6, 7, and 8	Contaminant exposure	Fecal coliform bacteria in water
Aquatic Life	9, 10, 11, 12, and 13	Pollutant exposure	Nutrients
		Habitat	Dissolved oxygen Water temperature Electrical conductivity Ammonia
Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
Sufficient Flow	14 and 15	Habitat	Water temperature

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[2] Central Valley Regional Water Quality Control Board. Watershed Management Initiative Chapter, 19 January 2001, p 90.

[3] Attachment 1 (SWRCB, 2000) State of California. State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature, 30 November 2000.

Beneficial Use	Monitoring Objectives[3]	Category	Indicator
	Site-Specific		
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

Tulare Lake Basin Management Area

The Lower Kings River occasionally contains electrical conductivity and total dissolved solids higher than the water quality objectives outlined in the Water Quality Control Plan for the Tulare Lake Basin (Basin Plan), second edition, 1995. Problems were common during the critically dry years from 1987 to 1994. Molybdenum levels in the River are also high enough to impact agricultural beneficial uses. Fish from the river have contained elevated levels of copper, arsenic, toxaphene, and Group A pesticides.[4]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to, publicly and privately owned treatment works, individual septic tanks, industrial discharges, cattle grazing, irrigated agriculture, confined animal facilities, urban development, and recreation. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 2 below:

TABLE 2

TULARE LAKE BASIN AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS
FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[5]	Category	Indicator
	Site-Specific		
Water Contact	1	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria
Drinking Water	2 and 3	Contaminant exposure	Nutrients Total coliform bacteria
Fish and Shellfish Contamin-ation	4, 5, 6, 7, and 8	Contaminant exposure	Fecal coliform bacteria in water

[4] Watershed Management Initiative.

[5] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
		Pollutant exposure	Nutrients
		Habitat	Dissolved oxygen Water temperature Electrical conductivity Ammonia

Beneficial Use	Monitoring Objectives[6]	Category	Indicator
	Site-Specific		
Sufficient Flow	14 and 15	Habitat	Water temperature
		Biological response	N/A
Agricultural Supply	16 and 17	Pollutant Exposure	N/A
Industrial Supply	18 and 19	Pollutant Exposure	Temperature Electrical conductivity
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

Kaweah Basin Management Area
Fish in Kaweah Lake are reported to contain elevated levels of copper, arsenic, and silver. Sedimentation has been noted in the lake. The potential exists for high bacteria levels in the Kaweah River and Lake.[7]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to, publicly and privately owned treatment works, individual septic tanks, industrial discharges, cattle grazing, irrigated agriculture, confined animal facilities, foothill and urban development, and recreation. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 3 below:

TABLE 3

KAWEAH BASIN AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS

[6] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

[7] Watershed Management Initiative Chapter.

FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[8] Site-Specific	Category	Indicator
Water Contact	1	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria
Beneficial Use	Monitoring Objectives[9] Site-Specific	Category	Indicator
Drinking Water	2 and 3	Contaminant exposure	Nutrients Total coliform bacteria
Fish and Shellfish Contamin-ation	4, 5, 6, 7, and 8	Contaminant exposure	Fecal coliform bacteria in water
Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
		Pollutant exposure	Nutrients
		Habitat	Dissolved oxygen Water temperature Electrical conductivity Ammonia
Sufficient Flow	14 and 15	Habitat	Water temperature
		Biological response	N/A
Agricultural Supply	16 and 17	Pollutant Exposure	N/A
Industrial Supply	18 and 19	Pollutant Exposure	Temperature Electrical conductivity
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

[8] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

[9] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

Tule Basin Management Area
Sedimentation has been noted in Lake Success. The potential exists for high bacteria levels in the Tule River and Lake Success.[10]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to, publicly and privately owned treatment works, individual septic tanks, industrial discharges, cattle grazing, irrigated agriculture, confined animal facilities, foothill and urban development, and recreation. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 4 below:

TABLE 4

TULE BASIN AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS
FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[11]	Category	Indicator
	Site-Specific		
Water Contact	1	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria
Drinking Water	2 and 3	Contaminant exposure	Nutrients Total coliform bacteria
Fish and Shellfish Contamin-ation	4, 5, 6, 7, and 8	Contaminant exposure	Fecal coliform bacteria in water
Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
Aquatic Life		Pollutant exposure	Nutrients
		Habitat	Dissolved oxygen Water temperature Electrical conductivity Ammonia
Sufficient Flow	14 and 15	Habitat	Water temperature

[10] Watershed Management Initiative Chapter.

[11] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

Sufficient Flow		Biological response	N/A
Agricultural Supply	16 and 17	Pollutant Exposure	N/A
Industrial Supply	18 and 19	Pollutant Exposure	Temperature Electrical conductivity
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

Westside and Pleasant Valley Basin Management Area

High sedimentation and selenium loads originate from the Panoche Creek Watershed. San Carlos Creek has high levels of mercury that also cause high levels of mercury in Panoche Creek. The source of the mercury is believed to be mines in the New Idria area.[12]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to individual septic tanks, mining, cattle grazing, and irrigated agriculture. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 5 below:

TABLE 5

WESTSIDE AND PLEASANT VALLEY BASIN AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS
FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[13]	Category	Indicator
	Site-Specific		
Water Contact	1	Contaminant exposure	N/A
Fish and Shellfish Contamin-ation	4, 5, 6, 7, and 8	Contaminant exposure	N/A
Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
		Pollutant exposure	Inorganic water chemistry Turbidity

12 Watershed Management Initiative Chapter.

13 Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature.

		Habitat	Dissolved oxygen Water temperature Electrical conductivity
Sufficient Flow	14 and 15	Habitat	Water temperature
		Biological response	N/A
Agricultural Supply	16 and 17	Pollutant Exposure	Inorganic chemistry
Industrial Supply	18 and 19	Pollutant Exposure	Temperature Electrical conductivity
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

Kern County Basin Management Area

Sedimentation problems are noted in Lake Isabella. Also, the potential exists for high bacteria levels in the Kern River and Lake Isabella.[14]

The sources of contaminants and associated pollutants for the management area have not yet been identified. Potential sources include, but are not limited to, publicly owned treatment works, individual septic tanks, industrial discharges, cattle grazing, irrigated agriculture, confined animal facilities, foothill and urban development, and recreation. The beneficial uses for the management area and the associated proposed monitoring indicators are listed in Table 6 below:

TABLE 6

KERN COUNTY BASIN AREA
MONITORING OBJECTIVES WITH ASSOCIATED INDICATORS
FISCAL YEAR 2002-2003

Beneficial Use	Monitoring Objectives[15]	Category	Indicator
	Site-Specific		

[14] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program.
[15] Attachment 1 (SWRCB, 2000) State Water Resources Control Board Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program.

Beneficial Use	Monitoring Objectives[15]	Category	Indicator
	Site-Specific		
Water Contact	1	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria
Drinking Water	2 and 3	Contaminant exposure	Nutrients Total coliform bacteria
Fish and Shellfish Contamin-ation	4, 5, 6, 7, and 8	Contaminant exposure	Fecal coliform bacteria in water
Aquatic Life	9, 10, 11, 12, and 13	Biological response	N/A
		Pollutant exposure	Nutrients
		Habitat	Dissolved oxygen Water temperature Electrical conductivity Ammonia
Sufficient Flow	14 and 15	Habitat	Water temperature
Sufficient Flow		Biological response	N/A
Agricultural Supply	16 and 17	Pollutant Exposure	N/A
Industrial Supply	18 and 19	Pollutant Exposure	Temperature Electrical conductivity
Aesthetic Condition	20 and 21	Pollutant Exposure	N/A

** N/A – Funding is not currently available to investigate the monitoring indicators for this beneficial use.

3.0 Objectives

The overall objective is to establish and implement a surface water monitoring program that will evaluate the extent of water quality and beneficial use impairment within the six Basin management areas. There have been no comprehensive monitoring and assessment programs for surface waters implemented in the Basin. Baseline monitoring is needed to define long-term trends in water quality downstream from the major reservoirs. Additional work is needed to characterize water quality conditions in waters upstream of reservoirs. Results will be evaluated against narrative and numeric water quality objectives summarized in *The Water Quality Control Plan for the Tulare Lake Basin*, 2nd Edition-1995, and in *A Compilation of Water Quality Goals* (Marshack, 2000).

3.1 General Study Design

Because there is limited data regarding how the variation in spatial and temporal changes in the watershed, as well as allied land uses, may or may not be impacting the six management areas, the sampling strategy will be to utilize available funding for a directed sampling approach. Sampling sites will be determined within the management areas based on these differences in an effort to identify reference and baseline surface water conditions. Any future funding will allow expanded studies in the six management areas. Frequency of monitoring and selection of constituents will be adjusted based on sample results, field conditions, and available funding. Sampling activities and data collection are intended to better characterize the extent and sources of known and suspected water quality impairments and insure comparability of data.

3.1.1 Overview of General Approach

The SWAMP program funding will be used to establish and implement a long-term watershed monitoring program in each of the six management areas of the Tulare Lake Basin. Monitoring will begin in areas where beneficial uses of water may have been impacted from development, recreational uses, industrial processes, agriculture, and livestock grazing. As there is little quantitative data for any of these water bodies the following physical and biological parameters will be monitored to provide baseline information.

- Quarterly monitoring of water temperature
- Periodic (i.e. weekly, monthly, quarterly, or annually) sampling of water quality constituents such as dissolved oxygen, pH, conductivity, nutrients, standard minerals, and pathogens

Selection of additional monitoring sites and monitoring parameters (i.e., pesticides, petroleum hydrocarbons, macroinvertebrate surveys, etc.) will be evaluated using baseline monitoring data, and will be dependent on future available funding. Dependent on future funding for FY 02-03, baseline monitoring may be expanded to the Mendota Pool, Panoche Creek, and San Carlos Creek. Citizen Monitoring groups will be utilized when possible to assist in collection of data. As funding becomes available, baseline monitoring will begin on the waterbodies listed in Table **TLB-1**.

4.0 Specific Activities Planned for FY 2002-03

Activities planned for FY 2002-03, will be to continue baseline water quality monitoring for the water bodies listed in section 4.1. Two of these waters bodies have been identified through complaints from citizens groups identifying them as potentially impaired.

4.1 List of Water Bodies to be Sampled in 2002-03

With SWAMP funding for FY 2002-03, baseline monitoring for the following water bodies will continue. Table **TLB-2** provides a listing of monitoring parameters.

1. Ten Mile Creek, including Hume Lake
2. South Fork of the Kings River and tributaries
3. Kings River and tributaries
4. Kaweah River and tributaries, including Lake Kaweah
5. Tule River and tributaries, including Lake Success and Elk Bayou
6. Kern River and tributaries, including Lake Isabella
7. Mendota Pool
8. Panoche Creek
9. San Carlos Creek

4.2 Review of Available Information

Data available from self monitoring reports, citizen monitoring data, United States Army Corp of Engineers, Federal Energy Regulatory Commission renewal projects, and any other current monitoring done by state, federal, or local agencies will be reviewed.

4.3 Specific Sampling Design/Sample Collection

Site locations and frequencies will be developed for each watershed to be monitored. Sample sites will be designated using a Global Positioning System (GPS) and photographic documentation. Each watershed and related number of sampling sites are listed in Table 7 below:

TABLE 7

SAMPLING SITES AND ANALYSIS
FISCAL YEAR 2002-2003

Watershed	Number of Sample Sites	Sample Analysis	Frequency of Sampling
Ten Mile Creek	5	Physical Properties Nutrient and Bacteria	Quarterly
Kings River, South Fork	5	Physical Properties Nutrient and Bacteria	Quarterly
Kings River	7	Physical Properties Nutrient and Bacteria	Quarterly
Tule River	14	Physical Properties Nutrient and Bacteria	Quarterly
Kaweah River	14	Physical Properties Nutrient and Bacteria	Quarterly

Kern River	18	Physical Properties Nutrient and Bacteria	Quarterly
Mendota Pool	6	Physical Properties Nutrient and Bacteria Inorganic Chemistry	March, April, May
Panoche Creek	4	Physical Properties Inorganic Chemistry	Quarterly
San Carlos Creek	4	Physical Properties Inorganic Chemistry Turbidity	Quarterly

Sample and collection procedures will be developed similar to the attached Fresno River Nutrient and Bacteria Monitoring Quality Assurance Project Plan (QAPP).

4.4 Laboratory Analyses

Laboratory analyses will depend on future funding and assessment needs for the watersheds to be monitored. Twining Laboratories, Inc. will perform the bacteria count, standard metals and minerals analysis; and University of California, Davis, Division of Environmental Studies will perform the nutrient analysis.

4.5 Data Quality Evaluation and Data Reporting

To maintain data reliability and quality, monitoring activities will follow the SWAMP QAPP. Sampling activities will follow specific quality assurance/quality control procedures as outlined in the SWAMP QAPP. Data collected from other sources will be reviewed and assessed for reliability and quality based on the inclusion of quality assurance and laboratory reports.

4.6 Deliverable Products

For each watershed monitoring project an annual water year report will be prepared. In addition, copies of all reports and laboratory analysis will be submitted to the State of California, State Water Resources Control Board.

4.7 Desired Milestone Schedule

Anticipated milestones are described in Table 8:

TABLE 8

ANTICIPATED MILESTONES

FISCAL YEAR 2002-2003

Milestone	Projected Start Date	Projected Date of Completion
Quarterly Sampling	1 September 2002	30 June 2003
Identifying Sampling Sites	1 August 2002	1 September 2002
Evaluation of Data	1 September 2002	30 June 2003
Preparation of Annual Report	30 June 2003	1 October 2003

Activities specifically slated for FY 02-03 include:

- Complete funded monitoring from FY 01-02. (Due to slow contracting process one of the contracts for FY 01-02 still has not been signed.)
  - Coordinate field work internally and with citizen monitoring groups to complete quarterly sampling of sites.
- Augment existing laboratory contracts or develop subcontracts through the Master Contract for:
  - CSUF Foundation — Student interns
  - Twining Laboratories — Water chemistry
  - UCD — Nutrients
  - DFG Master — Equipment, Sample Collection & Analysis
- Update QAPPs as necessary based on WY 01 and 02 data and finalization of the SWAMP QAPP.
- Complete draft report on Fresno River monitoring FY 00-01
- Start coordination efforts for expanding monitoring to Lower Kings River, Mendota Pool, Panoche Creek, and San Carlos Creek
  - Establish agreement with Kings River Conservation District to collect lower Kings River samples.
  - Site Selection.
  - Begin Monitoring (after contracts are in place).

4.8 Desired "Sample Throughput" Schedule

Throughput schedule will depend on laboratory being used and the final contract agreements.

4.9 Budget

See attached Monitoring and Assessment Budget Table **TLB-2**. The costs listed in TLB-2 assume the use of existing laboratory contracts, use of the Master Contract for equipment, sample collection and analysis as needed, and the augmentation of an existing student contract for field work and data tracking. The listed costs assume the use of existing contracts without significant cost increases.

Summary Notes – Tulare Lake Basin SWAMP Program

The previous discussion has applied to contract dollars. A severe shortfall exists in staffing necessary to maintain the program. Staff is needed to establish and maintain analytical and student contracts; establish and update QAPPs for each project; oversee and participate with students in sample collection, sample processing, data quality review, data entry and verification in data bases; prepare annual report; coordinate with federal, state, and local agencies conducting monitoring within the Basin; compile and evaluate existing data from other sources; and disseminate that information to area stakeholders. To perform these tasks we estimate a minimum of 2.0 PYs is needed, currently the Tulare Lake Basin is allocated 0.3 PY.

4.10 Working Relationships

A decision matrix should be included in the workplan to show the relationship of the various organizations and contractors. The following decision matrix describes the general relationships for implementing the regional monitoring portion of SWAMP. If more than one contractor is used , modify the matrix to show relationships of multiple contractors.

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Develop contract(s) for monitoring services.	●	●	●
Identify water bodies or sites of concern and clean sites to be monitored.		●	
Identify site-specific locations with potential beneficial use impacts or unimpacted conditions that will be monitored.		●	
Decide if concern is related to objectives focused on location or trends of impacts.		●	

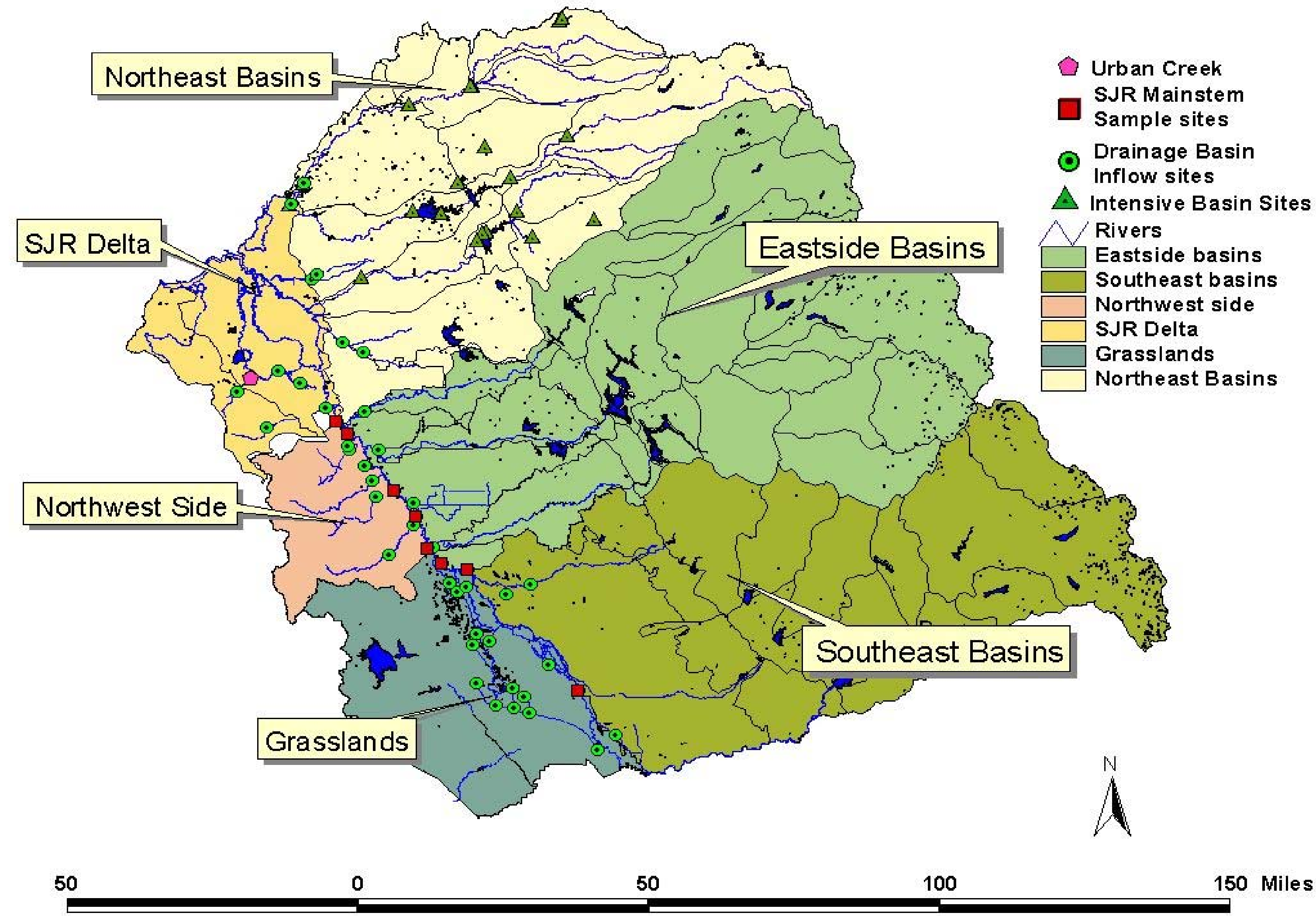
Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions.		●	
Identify already-completed monitoring and research efforts focused on potential problem, monitoring objective, or clean conditions.		●	●
Make decision on adequacy of available information.		●	●
Prepare site-specific study design based on monitoring objectives, the assessment of available information, sampling design, and indicators.	● (Work Plan Review Role)	●	●
Implement study design. (Collect and analyze samples.)			●
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	● (Review Role)	●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Report data through SWRCB web site.	●	● (Coordination Role)	●
Prepare written report of data.	●	●	●

FIGURE 1


Region 5 Basins
Sacramento River
San Joaquin River
Tulare Basin
Tulare Basin
San Joaquin River Basin
Sacramento River Basin
N
60
0
60
120
180
Miles

Figure SJR-1. San Joaquin River Basin Sub-areas* (Updated from Salinity & Boron TMDL-Oppenheimer, *et. al.*, 2002)



ATTACHMENT 1 (SWRCB, 2000)

SECTION VI. SITE-SPECIFIC MONITORING

The overall goal of this activity of SWAMP is to develop site-specific information on sites that are (1) known or suspected to have water quality problems and (2) known or suspected to be clean. It is intended that this portion of SWAMP will be targeted at specific locations in each region. This portion of SWAMP is focused on collecting information from sites in water bodies of the State that could be potentially listed or delisted under CWA Section 303(d). The RWQCBs are given significant flexibility to select the specific locations to be monitored. The RWQCBs at their discretion may perform monitoring at clean sites to determine baseline conditions (for assessments related to antidegradation requirements) or if this information is needed to place problem sites into perspective with cleaner sites in the Region.

Monitoring Objectives

In developing the SWAMP monitoring objectives, the SWRCB used a modified version of the model for developing clear monitoring objectives proposed by Bernstein et al. (1993). The model makes explicit the assumptions and/or expectations that are often embedded in less detailed statements of objectives (as presented in SWRCB, 2000). This section is organized by each major question posed in the SWRCB report to the Legislature on comprehensive monitoring (SWRCB, 2000).

Is it safe to swim?

Beneficial Use: Water Contact Recreation

1. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pathogenic contaminants, estimate the concentration of bacteria or pathogens above screening values, health standards, or adopted water quality objectives.

Is it safe to drink the water?

Beneficial Use: Municipal and Domestic Water Supply

2. At specific locations in lakes, rivers and streams that are sources of drinking water and suspected to be contaminated, estimate the concentration of microbial and

chemical contaminants above screening values, drinking water standards, or adopted water quality objectives used to protect drinking water quality.

3. At specific locations in lakes, rivers and streams that are sources of drinking water and suspected to be contaminated, verify previous estimates of the concentration of microbial and chemical contaminants above screening values, drinking water standards, or adopted water quality objectives used to protect drinking water quality.

Is it safe to eat fish and other aquatic resources?

Beneficial Uses: Commercial and Sport Fishing, Shellfish Harvesting

4. At specific sites influenced by sources of bacterial contaminants, estimate the concentration of bacterial contaminants above health standards or adopted water quality objectives to protect shellfish harvesting areas.

5. At specific sites influenced by sources of chemical contaminants, estimate the concentration of chemical contaminants in edible aquatic life tissues above advisory levels and critical thresholds of potential human health risk.

6. At frequently fished sites, estimate the concentration of chemical contaminants in commonly consumed fish and shellfish target species above advisory levels and critical thresholds of potential human health risk (Adapted from USEPA, 1995).

7. At frequently fished sites, verify previous estimates of the concentration of chemical contaminants in commonly consumed fish and shellfish target species above advisory levels and critical thresholds of potential human health risk (Adapted from USEPA, 1995).

8. Throughout water bodies (streams, rivers, lakes, nearshore waters, enclosed bays and estuaries), estimate the concentration of chemical contaminants in fish and aquatic resources from year to year using several critical threshold values of potential human impact (advisory or action levels).

Are aquatic populations, communities, and habitats protected?

Beneficial Uses: Cold Freshwater Habitat; Estuarine Habitat; Inland Saline Water Habitats; Marine Habitat; Preservation of Biological Habitats; Rare, Threatened or Endangered Species; Warm Freshwater Habitat; Wildlife Habitat

9. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded water or sediments in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, water column or epibenthic community analysis, habitat condition, and chemical concentration.

10. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded sediment in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, benthic community analysis, habitat condition, and chemical concentration.

11. Identify the areal extent of degraded sediment locations in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of toxicity, benthic community analysis, habitat condition, and chemical concentration.

Beneficial Use: Spawning, Reproduction and/or Early Development

12. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded water or sediment in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of early life-stage toxicity, chemical concentration, and physical characteristics.

13. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, verify previous measurements identifying specific locations of degraded water or sediment in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of early life-stage toxicity, chemical concentration, and physical characteristics.

Is water flow sufficient to protect fisheries?

Beneficial Use: Migration of Aquatic Organisms; Rare, Threatened or Endangered Species; Wildlife Habitat

14. At specific sites influenced by pollution, estimate the presence of conditions necessary for the migration and survival of aquatic organisms, such as anadromous fish, using measures of habitat condition including water flow, watercourse geomorphology, sedimentation, temperature, and biological communities.

15. At specific sites influenced by pollution, verify previous estimates of the presence of conditions necessary for the migration and survival of aquatic organisms, such

as anadromous fish, using measures of habitat condition including water flow, watercourse geomorphology, sedimentation, temperature, and biological communities.

Is water safe for agricultural use?

Beneficial Use: Agricultural supply

16. At specific locations in lakes, rivers and streams that are used for agricultural purposes, estimate the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect agricultural use.

17. At specific locations in lakes, rivers and streams that are used for agricultural purposes, verify previous estimates of the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect agricultural uses.

Is water safe for industrial use?

Beneficial Use: Industrial Source Supply; Industrial Process Supply

18. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams that are used for industrial purposes, estimate the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect industrial use.

19. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams that are used for industrial purposes, verify previous estimates of the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect industrial uses.

Are aesthetic conditions of the water protected?

Beneficial Use: Non-Contact Water Recreation

20. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams, estimate the aesthetic condition above screening values or adopted water quality objectives used to protect non-contact water recreation.

21. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams, verify previous estimates of the aesthetic condition above screening values or adopted water quality objectives used to protect non-contact water recreation.