

# Appendix A

## Drainage, Salt and Selenium in the San Joaquin Valley

Millions of years ago, the lands of the western San Joaquin Valley and Coast Range were an ancient seabed. As the shallow seas and wetlands of that epoch dried up and folded into mountains, elements such as selenium, boron, molybdenum, mercury, arsenic, and various other salts and minerals concentrated in the marine mud, from which soils and rocks later formed.

Today, many San Joaquin Valley growers irrigating orchards, vineyards and field crops along Interstate 5 face a vicious cycle of salty irrigation water and drainage pollution that threatens the productivity of their lands and the ecological and economic health of the San Joaquin River and the Delta estuary downstream.

As their crops take up irrigation water, they filter out salts. The salts build up in the soil. To continue cultivating these areas, growers must apply extra water just to leach salts from the root zone in order to keep the land producing. The leaching also mobilizes the selenium, boron, mercury, molybdenum, arsenic, and other elemental toxins that occur naturally in the soils. This toxic brew of irrigation drainage percolates down to a shallow impermeable layer called "Corcoran Clay." The water pools and collects on top of the Corcoran Clay. The more irrigation water is applied, the higher the toxic brew in the groundwater rises. In reaching the root zone, the brew threatens to harm plant growth and turn once productive fields into lifeless salt-encrusted wastelands.

The Valley growers' water supply problems and their drainage problems are inextricably linked and of their own making: the more they seek to expand irrigated production, the more surface water they use and then the more their drainage problems compound. The more that drainage collects underground the more its pollution drains into the west side creeks and sloughs of the San Joaquin Valley that ultimately reach the Delta, completing a vicious cycle of pollution.

Since the 1870s irrigation has been practiced widely in the San Joaquin Valley, and drainage problems have occurred ever since. Historians Kelley and Nye characterize the history of drainage problems in the Valley as having three distinct periods (Kelley and Nye 1984). Between the late 1870s and about 1915, there occurred rapid growth in irrigated acreage and salinity and drainage problems emerged. Individual irrigators experienced ponding and soil salinization. Experts from University of California agricultural experiment stations and federal soils agencies sought solutions, but by 1915, at least 80,000 acres of land in Fresno County were found to have subsurface water lying 6 feet or less from the surface. Kelley and Nye also report that "similar conditions existed in Stanislaus, Kings, and Kern counties" as well. (Kelley and Nye 1984: 5)

Between 1915 and the 1950s, agricultural production and irrigated acreage continued to expand in the San Joaquin Valley and irrigation and water districts proliferated. As statewide coordinated water development brought a shared understanding of the need for water supplies as a community

### Summary of Major Salts, Minerals, and Trace Elements in Western San Joaquin Valley (Central Area)

#### Drains:

- Arsenic
- Boron
- Calcium
- Chloride
- Magnesium
- Molybdenum
- Nitrate
- Potassium
- Selenium
- Sodium
- Sulfate

Source: California Department of  
Water Resources 2010.

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undertaking, the recognition of shared drainage problems came to the fore as well, according to Kelley and Nye. “Hundreds of miles of ditches and tile lines installed by districts lying east of the Valley trough, however, proved insufficient to lower the water tables enough to prevent salt accumulation,” they wrote.

Pressure to continue expanding irrigated agriculture in the San Joaquin Valley helped drive the approval and construction of the federal Central Valley Project between the 1930s and 1950s. The

Table A-1 San Joaquin River Exchange Contract Water Quality Provisions		
Contract Version	Total Dissolved Solids (parts per million)	Season/ Time Step
1939 Exchange Contract	200	Fall, winter, spring
	300	Summer
1956 Amendatory Exchange Contract	800	Daily maximum
	600	Monthly maximum
	450	Annual maximum
	400	5-year maximum
1968 Second Amendatory Exchange Contract	800	Daily maximum
	600	Monthly maximum
	450	Annual maximum
	400	5-year maximum

Sources: Central California Irrigation District 2011; US Bureau of Reclamation 2011; California Water Impact Network

Delta Mendota Canal was completed in 1951 to import water from the south Delta at Tracy to lands along the west side of the San Joaquin River from approximately Patterson all the way to Mendota in northern Fresno County. The Canal’s planners recognized that Delta imports would add salts to Valley soils. For instance, the original 1939 Exchange Contract by which the Bureau of Reclamation and four key water rights holders in the Firebaugh and Mendota vicinity committed the Bureau to delivering imported water with salinity concentrations that were equivalent to the quality of the Sacramento River at the head of Snodgrass Slough in the Delta (a point on the river where in most years salt concentrations were below 200 parts per million in total dissolved solids, except in drought years; California Department of Public Works 1930: Table 233, Isleton Bridge salinity gage for 1924 through 1928). The 1939 Exchange Contract also required that total dissolved solids in fall, winter, and spring seasons was not to exceed 200 parts per million, and that total dissolved solids in imported water for the summer irrigation season was not to exceed 300 parts per million. (US Department of the Interior 1939: ¶7(e) “Substitute Waters”, 4) The Exchange Contract was amended in 1956 and relaxed the salinity requirements for waters the Exchange Contractors would receive from the Bureau substantially as shown in Table A-1. These

salinity requirements were continued in the 1968 second amendatory Exchange Contract, and remain in effect today. (US Department of Interior 1956: ¶17; US Department of Interior 1968: ¶9)

Beyond the 1950s, there emerged serious drainage problems in the western San Joaquin Valley, as well as support for a regional or valley-wide salt disposal solution.

As additional political and economic pressure grew to expand irrigated agriculture further south along the Valley’s west side toward the Tulare Lake Basin, a new set of water facilities called the San Luis Unit was planned. Its projects would consist of San Luis Reservoir, and San Luis Canal/ California Aqueduct, and associated pumping plants which would be jointly owned by the state and federal governments. South of Mendota, however, there is no consistent or direct path for drainage water to reach the ocean by gravity; these lands drain mainly to Tulare Lake. Only from Fresno Slough draining the Lake and the Kings River in high runoff years do excess surface water flows reach the Pacific Ocean.



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drain water to the San Luis Drain and Kesterson Reservoir, about 42,000 acres of Westlands service area were served by the Drain. After the contamination of wildlife was discovered in 1983, however, the State Water Resources Control Board issued a clean-up and abatement order for Kesterson reservoir against the Bureau of Reclamation (State Water Resources Control Board 1985) and the Department of the Interior closed Kesterson Reservoir in 1986. Upon closure, Westlands Water District lands that had received service from the Drain began storing irrigation drainage underground. Between 1986 and 1996, the San Luis Drain went unused until the growers in the Grassland area between Firebaugh and Gustine (in what is the northern portion of the San Luis Unit service area) contracted with the Bureau to use the San Luis Drain as part of a system through which their drainage would be routed around the wildlife refuges and wetlands of the Grassland region, a project called the Grassland Bypass Project (discussed in the chapter on Government Actions). For now, this section of the San Luis Drain empties effluent from the Grassland Bypass Project into Mud Slough (North) which drains into the San Joaquin River.

The cost of providing drainage facilities from these lands is high and the difficulty of finding funding contributes to delays in providing some kind of drainage service there. A 2008 feasibility study of San Luis Drainage alternatives found that neither of the “in-valley” alternatives were economically justified nor financially feasible within existing authorizations by Congress. The cost of these alternatives was \$2.24 to \$2.69 billion at the time. The feasibility study had to rely on large contingency allowances to account for the cost of unproven reverse osmosis treatment plants for removing salts and selenium from drainage water. The lower cost alternative involves retiring more land (a total of about 200,000 acres) and more imported water from the San Luis Unit, while the higher cost alternative calls for greater use of reverse osmosis treatment of drainage water, as well as other treatment methods (but also including about 100,000 acres of land retired from applying imported water to crops).

Moreover, the feasibility study found that the three northern water districts can afford to pay neither the capital nor annual operating, maintenance, research, and engineering costs of both drainage service alternatives. Westlands Water District was found to be unable to pay a portion of the capital repayment obligation if either alternative is implemented. (US Bureau of Reclamation 2008: 95-96) The Bureau’s preferred alternative is also the more expensive one that relies on greater use of reverse osmosis treatment and less land retirement. This means greater taxpayer subsidies would be needed to sustain San Luis Unit lands in privately controlled production. To address the contractors’ inability to pay the Bureau’s feasibility report recommends expansion by Congress of subsidies to the San Luis Unit through:

- Authorizing federal appropriations to pay the operating and maintenance charges needed to implement the preferred alternative *for which the northern water districts (Panoche, Pacheco, and San Luis Water Districts) are unable to pay.*
- Authorizing the Interior Secretary to *defer without interest each San Luis Unit contractor’s obligation to repay all capital and operating and maintenance costs for the preferred alternative* “until the Secretary determines that such contractor has the independent ability to repay its share of such costs without unduly burdening its water users, provided such determinations are made at not more than 5-year intervals.” (US Bureau of Reclamation 2008: 99; emphasis added)

The Bureau and Westlands Water District (the largest water district in need of drainage service in this region) have long had difficulty coming to terms on the District’s long-term water service contract due in part to the cost of repaying the federal government for all federally-constructed drainage facilities (Kelley and Nye 1984: 6). According to Westlands, the District pays about \$7.50 per acre-foot of water it receives for irrigation service and another \$0.50 per acre-foot for drainage service. (United States Court of Federal Claims 2012: 12, 14)

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Neither the Bureau nor Westlands Water District have adequately taken responsibility for the lack of drainage service to date for the San Luis Unit service area. Matters seem to be at a standstill on both sides. It has been five years since the Bureau adopted an alternative from its San Luis Drainage Feature Re-Evaluation process of the decade of the 2000s. The drainage problems of the Valley continue to mount.

#### **State Board Inaction**

The State Water Resources Control Board is also involved in this drainage fiasco for its inaction. While the Bureau of Reclamation's Central Valley Project operations are the primary cause of the salinity problems, the State Water Resources Control Board has so far been timid about trying to design and enforce regulatory solutions for this portion of the San Joaquin River Basin.

Historians Jackson and Paterson reported in 1977 that the California Department of Water Resources initiated the San Joaquin Valley Drainage Investigation in 1957 after legislative hearings on drainage and water quality issues associated with the 1957 California Water Plan. (Jackson and Paterson 1977: 136-139) The Burns Porter Act, authorized by the California voters in November 1960, contained language calling for the California Department of Water Resources to build "facilities for removal of drainage water from the San Joaquin Valley." (California Department of Water Resources 1974: Appendix B, 123)

C-WIN offers a chronology of the State Water Resources Control Board's treatment (and those of its predecessor agencies) of southern Delta salinity standards in Appendix C of this report. The Board's own 2006 Cease and Desist Order states regarding this period of State Water Rights Board regulation:

During a twelve-year period the State Water Board adopted six difference decisions (Decisions 893, 990, 1020, 1250, 1308, and 1356) approving permits for various components of the federal CVP operated by USBR. The permits issued as a result of the decisions included a term by which the Water Board reserved jurisdiction to revisit salinity control requirements. (Decision 893, p. 71, Condition 12; Decision 990, p. 86, Condition 25; Decision 1020, p. 21, Condition 9; Order Extending Time in Which to Formulate Terms and Conditions Relative to Salinity Control Pursuant to Decision 990 and Decision 1020, p. 2; Decision 1250, p. 5, Condition 9; Decision 1308, p. 11-12, Condition 8; Decision 1356, p. 17, Condition 21.)<sup>1</sup>

Beginning with its Decision 893 in 1958, and extending through its Decision 1379 in 1971, the State Water Resources Control Board (and its predecessor the State Water Rights Board) declined to establish southern Delta salinity standards even though salinity data available to the 1980 South Delta Water Agency study of the San Joaquin River existed at that time. The State Water Boards of the past, however, preferred instead to reserve jurisdiction in the matter of salinity control (and fish protection in several decisions) to some unspecified future date.

In Water Rights Decision 1020 (which addressed water rights on Old River in the South Delta; State Water Rights Board 1961), adopted by the State Water Rights Board in 1961, the Board acknowledges a warning from the Delta Water Users' Association and the San Joaquin County Flood Control and Water Conservation District that water quality in the San Joaquin River was deteriorating, and had since 1950 (and presaging the water quality results identified in the joint SDWA/USWPRS 1980 study). These parties pointed out in 1961 that (in the words of D-1020):

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<sup>1</sup> These water rights decisions are all referenced in the bibliography to this report and are accessible online at [http://www.waterboards.ca.gov/waterrights/board\\_decisions/adopted\\_orders/decisions/](http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/) where they may be searched by order or decision number.

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...the development of the San Luis Unit will further degrade water quality in the San Joaquin River and in the Delta. It is contended that return flow from the San Luis service area will contain high concentrations of salts and if added to those already found in the San Joaquin River northward from Mendota Pool, will adversely affect the water quality for diverters along the stream and in the Delta. At the same time, the parties [the Delta Water Users Association and the flood control district] point out that the construction of a master drainage system envisioned as one possible solution to the problem...will intercept all return flows for conveyance northward to San Francisco Bay, thereby reducing the flow of water in the lower San Joaquin River. (State Water Rights Board 1961: 15)

The Board took note in D-1020 of the 1960 Burns-Porter Act's proposed San Joaquin Valley drainage water facilities and dismissed the Delta and San Joaquin County water users' concerns by observing that reduced San Joaquin River flows from drainage return water being diverted to the "drainage facilities":

will result in the interception of drainage water north of Mendota Pool rather than the interception of the drainage water from the San Luis Unit [north of the expected route of the San Luis Drain]. [citation] Therefore the contention that the construction of a master drainage system will reduce the quantity of water available in the lower San Joaquin River is clearly outside of the issues under consideration in connection with [D-1020]. (State Water Rights Board 1961: 15-16)

Six years later, California withdrew from the San Joaquin Valley master drain. The State Water Rights Board did reserve its continuing jurisdiction concerning salinity control in Term 9 of D-1020, but it would be another 17 years before south Delta salinity concerns would be addressed in the water quality objectives of the 1978 Water Quality Control Plan. The Board continued to reserve its jurisdiction on salinity control matters in water right decisions through 1970. (State Water Resources Control Board 2006: Figure 2, 8-9) It would be another 27 years before the State Water Board attempted to enforce them in D-1641.

This record of delay in establishing salinity control policy is compounded by a lack of accountability of regional boards to the State Water Board, again in the area of salinity control. The State Water Resources Control Board in WQ 85-1 (relating to selenium pollution of Kesterson National Wildlife Refuge in the early 1980s) directed the Central Valley Regional Water Quality Control Board to "initiate a process to develop specific water quality objectives for the San Joaquin River basin that will result in the adoption of appropriate basin plan amendments by the Regional Board and the development of a program to regulate agricultural drainage discharges." (State Water Resources Control Board 2000: 85; State Water Resources Control Board 1985: Conclusion 11, 63) The Board's order characterizes the drain water that accumulated at Kesterson Reservoir as meeting the definition of "hazardous waste" and that the Bureau had created a "public nuisance" there. (State Water Resources Control Board 1985: Conclusion 1, 61)

Unfortunately, in 1985 the State Board allowed the Central Valley Regional Board to consider using not just waste discharge requirements to regulate drainage discharges from irrigated lands, but also "waivers of discharge requirements in appropriate circumstances" which C-WIN and others believe has been used by the Central Valley Regional Board to excess in allowing heavily saline (and other problem constituents like selenium, discussed below) drainage discharges in the San Joaquin River basin to continue. The State Board in 1985 required no preparation of a plan for ending the degradation of San Joaquin River and west side tributaries' water quality by agricultural drainage flows, only monthly "progress reports."

In D-1641, adopted by the State Water Board in 2000, the Board recalled that it had directed the Central Valley Regional Board to "initiate a process to develop specific water quality objectives for

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the San Joaquin River basin that will result in the adoption of appropriate basin plan amendments by the Regional Board and the development of a program to regulate agricultural drainage.” The Board also acknowledges in D-1641 that a long-term solution for drainage management in the San Joaquin River Basin remains to be developed.

Also in D-1641, the Board described salinity problems of the San Joaquin River system as having two principal causes: lack of sufficient diluting flows, and drainage discharges largely from western San Joaquin Valley agricultural irrigators. The Board continued:

Although releases of dilution water could help meet the southern Delta objectives, regional management of drainage water is the preferred method of meeting the objectives. The Central Valley RWQCB is currently in the process of setting salinity objectives for the San Joaquin River. [cite] The Central Valley RWQCB is hereby directed promptly to develop and adopt salinity objectives and a program of implementation for the main stem of the San Joaquin River upstream of Vernalis. (State Water Resources Control Board 2000: 84)

The Board offers no explanation as to what “regional management of drainage water” means exactly, or why it is the preferred method. *Twenty-seven years after WQ 85-1, California still awaits this important basin plan amendment.* It is over twelve years since the State Water Board issued its directive in D-1641 to the Central Valley Regional Water Quality Control Board. The Central Valley Regional Board appears still to hold committee meetings to gather stakeholder input for the basin plan amendment. Meanwhile, the San Joaquin River continues delivering an average of 922,000 tons of salt to the southern Delta each year. (Central Valley Regional Water Quality Control Board 2006: 30) There are additional instances of inaction by the State Water Resources Control Board and its Central Valley Regional Water Quality Control Board on selenium issues detailed in the next section, and in Appendix C. We could find no schedule or work plan on the Regional Board’s CV-SALTS website indicating when an effective basin plan amendment is to be accomplished by the Central Valley Regional Board and delivered to the State Water Resources Control Board for imminent consideration.

Rather, the State Water Resources Control Board in D-1641 gives support for a San Luis Drain without endorsing it overtly as its preferred method of regional drainage management. D-1641 reports that Central Valley Regional Board staff testified in support of extending the San Luis Drain to the Delta, and that Board’s water quality control plan for the Central Valley Region “states that a valley-wide drain will be the only feasible long-term solution to drainage problem [*sic*],” concluding that “the drain has numerous benefits including the maintenance of productivity and the export of salts.” (State Water Resources Control Board 2000: 85) The Board expressed dismay towards the Bureau that Public Law 86-488 “required assurance that the San Luis Drain would be constructed. In 1963 and 1967, the SJREC [the Exchange Contractors] filed suit against the US Bureau of Reclamation. The Bureau assured the judge that a drain would be constructed. Nevertheless, the USBR continues to delay making progress on an out-of-valley plan.” (State Water Resources Control Board 2000: 86) However, a Bureau witness in the D-1641 evidentiary hearings testified that the Bureau has no specific plans to “improve quality of the river upstream of Vernalis.” The Board in D-1641 then prods the Bureau:

The USBR has been directed by the court to initiate activities to resolve the drainage problems in the San Joaquin Valley. It should proceed promptly to initiate such activities and file any necessary applications.

In its 2006 Water Quality Control Plan, the State Water Resources Control Board reported that among the “emerging issues” of the Bay-Delta Estuary was “Delta and Central Valley Salinity.” The Board announced there was “broad stakeholder support” for a new Salinity Management Plan for the Central Valley and Delta to protect beneficial uses of both surface and ground waters. How this

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process is supposed to relate to the Department of Water Resources ongoing San Joaquin Valley Drainage Monitoring Program was not stated. The process, the Board reported,

*is expected to take 40 to 50 years* and to reduce economic hardship related to managing salinity. The Board will develop regulations and provide regulatory encouragement to ensure that infrastructure is developed that improves and maintains Central Valley and Delta salinity while providing certainty to local and regional planners, municipalities, agriculture, water suppliers, food processors and others.” (State Water Resources Control Board 2006: 6; emphasis added)

The 2006 Water Quality Control Plan makes clear that elevated salinity in the South Delta has many large and small sources, including low flows, salts imported to the San Joaquin River Basin in irrigation water; municipal discharges, subsurface accretions from groundwater, tidal action; local, state, and federal water diversions, channel capacity, and “discharges from land-derived salts, primarily from agricultural drainage.” The Plan makes no attempt to assign portions to these various sources, but the shares associated with these sources were analyzed by the Department of Water Resources in 2006 and reported here in Tables 2 and 3 in the body of our testimony above. The vast majority of salt sources in the San Joaquin River originate from agricultural irrigation practices that flush salts from the soils, increase surface and subsurface return flow to the River, and raise the elevation and hydraulic head of groundwater tainted with salts. The Plan itemizes a number of methods for addressing salinity problems of the River and the South Delta, but enforcement actions are not contemplated. Its recommended projects, studies and actions omit enforcement, but include a committee to “address salinity issues” through a committee-designated “task force” that will “conduct meetings” to “gather public input” and produce an economic study that will “highlight the major salinity-related issues and their statewide impacts. (State Water Resources Control Board 2006: 32; Howitt et al 2009)

To implement South Delta salinity objectives, the Board’s actions focus on

the need for an updated independent scientific investigation of irrigation salinity needs in the southern Delta....The scientific investigation should address whether the agricultural beneficial uses in the southern Delta would be reasonably protected at different salinity levels, whether management practices are available that would allow for protection of the beneficial uses at a higher salinity level in the channels of the southern Delta, and whether such management practices are technically and financial feasible. The investigation could address the feasibility of providing an alternative method of delivering fresh water to agricultural water users in the southern Delta. The scientific investigation must be specific to the southern Delta. (State Water Resources Control Board 2006: 32; Hoffman 2010)

In the same plan, the Board continues its implicit support for completing the San Luis Drain, stating almost in passing that “The salinity objectives at Vernalis can be attained by releasing dilution water from New Melones [Reservoir on the Stanislaus River] and other sources, *completing a drain to remove the salts generated by agricultural drainage and municipal discharges from the San Joaquin Valley*, and conducting measures in the San Joaquin Valley such as...state regulatory actions, state funding of projects and studies, regulation of water diversions, pollutant discharge controls, improvements in water circulation, and long-term implementation of best management practices to control saline discharges.” (State Water Resources Control Board 2006: 28)

### **Planning for More Delay**

The State Water Resources Control Board wrote a Strategic Work Plan for the Delta Estuary in 2008 that laid out five year work plans Delta and San Joaquin Valley related programs, “characterizing discharges from Delta islands,” and south Delta salinity. These Work Plan elements are a road map



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for further delay addressing salinity issues that entwine the fates of the San Joaquin River Basin and the Bay-Delta Estuary. (California Water Impact Network et al 2008; California Sportfishing Protection Alliance et al 2010)

The Irrigated Lands Regulatory Program is perhaps the single most graphic example of the failure of the State and Central Valley Boards to protect water quality in the San Joaquin River and Delta. Monitoring data collected by the Central Valley Regional Water Quality Control Board, UC Davis and agricultural coalitions, among others, established that discharges from irrigated lands represent the largest source of toxic and other pollutants to Central Valley waters. In 2006, the Central Valley Board released a landmark draft report presenting the first region-wide assessment of data collected pursuant to the Irrigated Lands Program since its inception in 2003. Data collected from some 313 sites throughout the Central Valley reveals that: 1) toxicity to aquatic life was present at 63 percent of the monitored sites (50 percent were toxic to more than one species); 2) pesticide water quality standards were exceeded at 54 percent of sites (many for multiple pesticides); 3) one or more metals violated criteria at 66 percent of the sites; 4) human health standards for bacteria were violated at 87 percent of monitored sites and 5) more than 80 percent of the locations reported exceedances for general parameters (dissolved oxygen, pH, salt and TSS). While the adequacy of monitoring varied dramatically from site to site, the report presents a dramatic panorama of the epidemic of pollution caused by the uncontrolled discharge of agricultural wastes.

Since conditional waivers were originally adopted in 1982, and subsequently in 2003 and 2006, the Central Valley Regional Board has been unable to identify a single improvement in water quality or, indeed, a single pound reduction in the mass loading of agricultural pollutants that has been achieved by the Program (other than a reduction in application of organophosphate pesticides as farmers switched to more potent and less expensive pyrethroids). Under the agricultural waivers, the Central Valley Board does not know who the major polluters in the Central Valley are because it has required no farm-level water quality management plans, preferring instead to organize and rely on a regional monitoring approach. The Board has misinterpreted the state's "Statement of Policy with Respect to Maintaining High Waters in California" which provides that

Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in *the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.* (State Water Resources Control Board, 1968; emphasis added)

To comply with this policy, the Central Valley Regional Board must require the discharger to demonstrate that their manner of compliance is the best practicable treatment and control for the discharge. Not one irrigated lands discharger has complied with the State Board's resolution. Because it requires no farm water quality management plans, the Regional Board is entirely in the dark regarding what, if any, measures have been implemented let alone whether they amount to the best practicable treatment and control methods. (California Sportfishing Protection Alliance 2010)

The same problem with the Board's Irrigated Lands Regulatory Program clouds the prospects for its planned effort to "characterize discharges from Delta islands" called for in the Strategic Work Plan. The discharge of some 430,000 acre-feet of return flow from approximately 680,000 acres of Delta farmland clearly presents a serious problem. "Characterization" of the pollutants in these discharges is fundamental to any serious effort to protect Delta water quality. However, the State Board's proposal is a searing indictment of both the Central Valley Regional Board and the Irrigated Lands Regulatory Program. *Had requirements to submit Reports of Waste Discharge not been waived for agricultural dischargers, outflow from Delta islands would have been "characterized" years ago.* Similarly, had the State Board insisted that agricultural dischargers, coalitions, and water districts comply with the same monitoring requirements it routinely demands from virtually every other

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segment of society (that is, cities, industries, and businesses), then discharges would have already been “characterized” by now. Indeed, had the Board complied with its regulatory responsibility to protect the water quality of Delta and San Joaquin River water ways, the receiving waters would have also been fully “characterized” by now. While the State Board seems focused on agricultural discharges in the Delta, it inexplicably ignores the agricultural discharges from millions of acres of farmland along water ways upstream of the Delta. Targeting Delta farmers while ignoring those who discharge upstream is simply hypocritical. The State Board should direct the Central Valley Board to immediately issue California Water Code Section 13267 letters requiring all agricultural dischargers to “characterize” their discharges. The time is long past due.

This critique of the State and Central Valley Regional Boards records a consistent pattern of delay and inaction that favors process and voluntary compliance over results. Both methods have been ineffective if not actively harmful to the San Joaquin River Basin and the Bay-Delta Estuary. As the State Water Resources Control Board is well aware, the Bureau and the Department have great difficulty achieving compliance with salinity standards at interior South Delta compliance stations. We see in the State Board’s proposal to relax interior South Delta salinity objectives an implicit admission that all other State and Regional Board activity to control and reduce salinity has been an abject failure and that the only option left is for the State Board to “move the goalposts” or “lower the bar” in order to help the Bureau and the Department to get over a lower regulatory hurdle. Before adopting this change, however, the Board must justify this proposed relaxation in light of the Board’s longstanding antidegradation policy. This policy is required under the federal Clean Water Act. Our organizations do not believe that the proposed relaxation of South Delta salinity objectives is consistent with Board antidegradation policy and with the requirements of the federal Clean Water Act.

These proposed revisions to South Delta salinity objectives will not solve South Delta water quality problems. Null zones (areas where net stream flow in channels stagnates and residence times are lengthy) occur near each of the interior compliance points. Positive (net downstream) flows over time and during key seasonal periods are needed to improve water quality conditions in these zones. Temporary barriers (and proposed permanent operable gates) impede such flows, as do exports from the Banks and Jones pumping plants. In the absence of sufficient net downstream flows, reverse flows occur and interior South Delta water levels fall to where Delta irrigators cannot divert their flows.

A key mitigation for the Board to consider in the Bay-Delta Water Quality Control Plan is reduction or cessation of Delta pumped exports to allow instream flows to facilitate fish migration and turbid open water conditions needed by Delta smelt. The State Water Resources Control Board must determine through the Plan whether and how operational and flow options would create internal Delta hydrodynamics that more closely mimic natural flow conditions that benefit fish and reduce residence times, exposure to toxic stressors, and predation while in transit.

The Bureau’s chronic salinity objective violations result from its continued adherence to the terms of the Exchange Contract and its failure to use any method of source control in order to comply with the D-1641 condition to reduce salinity discharges at Vernalis and in the South Delta. In 2006, the Board imposed a cease and desist order, but the Board then relaxed the order in 2010. It now offers in the April 2011 Notice of Preparation proposed language that would permanently relax the interior South Delta salinity objectives themselves. The proposed new, relaxed interior South Delta objectives are a sorry perpetuation of the Board’s backpedaling and delay.

The proposal to relax salinity standards appears to be based upon a January 2010 report (Hoffman 2010) about *Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta*. The report was not peer reviewed. Repeated State Water Resources Control Board orders directing the Central Valley Regional Water Quality Control Board to develop and implement upstream salinity objectives have been ignored for many years. Had the State Board not condoned the Regional Board’s

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continued inaction on regional salinity and drainage management, meaningful source controls for the massive salt loading from West Side sources would likely now be in place. Proposing to relax long-existing standards by using seriously inadequate and flawed data while continuing to ignore and excuse the primary source of salt loading is inexcusable.

### Selenium Regulation, Unproven Technology

#### Grassland Bypass Project

The Grasslands Bypass Project was started in 1996 as a means of preventing discharge of selenium-contaminated subsurface agricultural drainage water into wildlife refuges and wetlands in the Grasslands Basin, tributary to the San Joaquin River. The Grassland Bypass Project is operated by the Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. The drainage water is “bypassed” around the refuges, wetlands and Salt Slough, and is conveyed into a segment of the San Luis Drain where it discharges to Mud Slough (north), a tributary of the San Joaquin River a few miles from the former Kesterson evaporation ponds. (See Figures A-2 and A-3.)

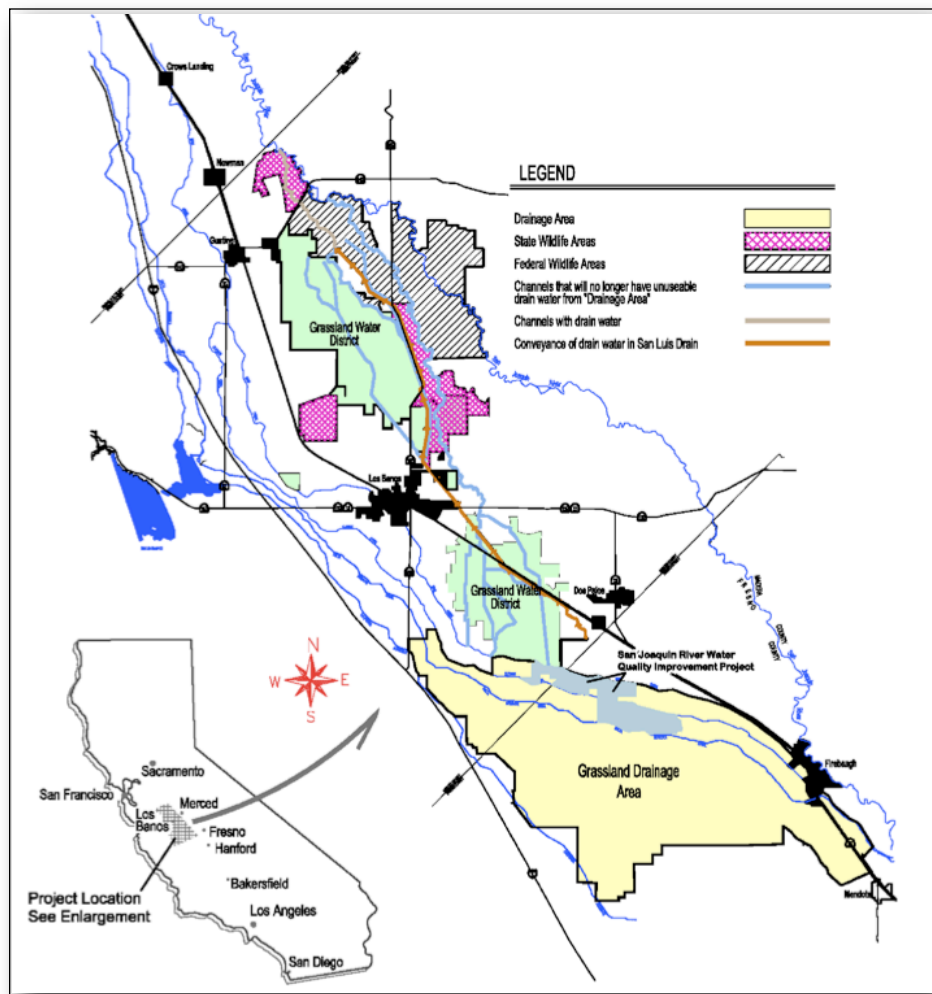


Figure A-2: Location of the Grassland Bypass Project. Source: San Luis Delta-Mendota Water Authority and US Bureau of Reclamation 2009.

The Grasslands Drainage Area is primarily in the northerly area of the San Luis Unit, but also includes lands within the Delta Mendota Canals Unit of the CVP as well as a portion of the San Joaquin River Exchange Contractors. Figure A-2 shows the geographic location of the Grassland Drainage Area in relation to the service areas of the local water providers.

The GDA is located on the western side of the San Joaquin River roughly between Los Banos to the north and Mendota to the south. The GDA consists of Charleston Drainage District,

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Pacheco Water District, Panoche Drainage District, a portion of the Central California Irrigation District (CCID) known as Camp 13 drainage area, Firebaugh Canal Water District, Broadview Water District (acquired by Westlands Water District following retirement from irrigation), and Widren Water District.

The In- Valley drainage reuse area, called the San Joaquin River Water Quality Improvement Project (SJRIP), is owned and operated by Panoche Drainage District. (US Bureau of Reclamation and San Luis Delta-Mendota Water Authority 2009)

The principal features of the Grassland Bypass Project are drainage collection and drainage reduction. A portion of the federally owned San Luis Drain is the conveyance structure to discharge the drainage to areas outside of the Grassland Bypass Project service area at Mud Slough (north; see Figure A-3). Grassland Bypass Project proponents claim that the reductions in drainage volume, selenium, salt and boron are a direct result of source control (lining ditches, reducing seepage, irrigation system improvements, etc.), groundwater management, dust control using drainage water, and reuse at the San Joaquin River Improvement Project. Land retirement must also play a role (see below)

The Grassland Bypass Project is facilitated by a Use Agreement signed by Reclamation and the San Luis Delta Mendota Water Authority on behalf of the Grassland Drainers to establish conditions for use of a portion of the San Luis Drain to discharge selenium and other pollutants from the Grassland Drainage Area. The first Use Agreement was signed in 1996 and was renewed and amended in 2009. The Use Agreement includes monitoring provisions, penalties for selenium discharges in excess of Waste Discharge Requirements and limitations on the volume of drainage water that can be conveyed in the San Luis Drain.

While the Grassland Bypass Project has improved water quality in Salt Slough, the wildlife refuges and wetlands, the Project discharges pollutants directly into Mud Slough and the San Joaquin River, thereby increasing pollution there. It has sustained the productivity of 97,000 acres of irrigated acres, mostly in the northerly area of the San Luis Unit at the expense of water quality in Mud Slough and the San Joaquin River. The Grassland drainers do not have the same problems with high salty groundwater that the Westlands irrigators have because they are able to export their salty drainage water via Mud Slough and the San Joaquin River. The Grassland Bypass Project is the de facto San Luis Drain, emptying pollution into Mud Slough and the San Joaquin River. Salt, selenium and boron are the major sources of pollution from the Grassland Bypass Project, but nutrients and other pollutants are also discharged. Excessive nutrients from Mud and Salt Sloughs have been linked to dissolved oxygen water quality problems in the San Joaquin River deepwater ship channel. (Lee and Jones-Lee 2003)

The selenium control program described in the Central Valley Regional Water Quality Control Plan

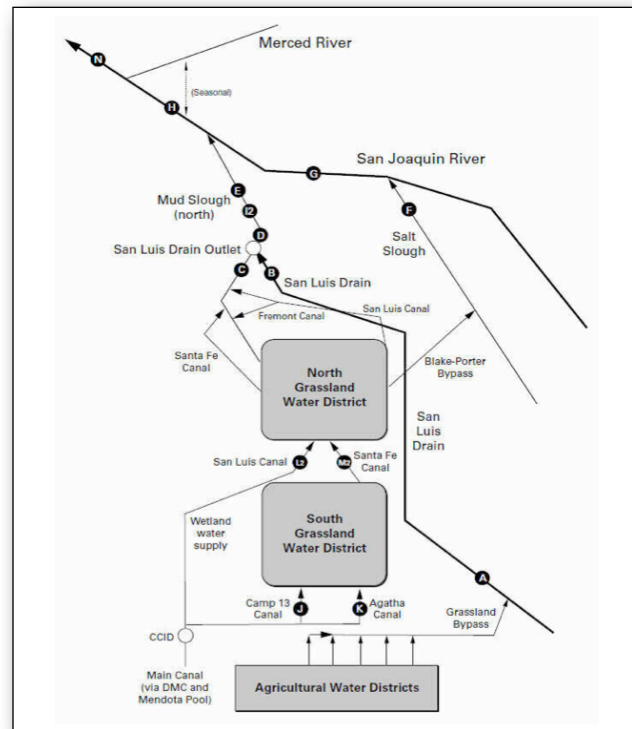


Figure A-3: Schematic Map of the Grassland Bypass Project. Source: US Bureau of Reclamation.

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for the Sacramento River and San Joaquin River Basins (Basin Plan) includes a prohibition of discharge of agricultural subsurface agricultural drainage unless the discharge is regulated by Waste Discharge Requirements or water quality objectives for selenium are met. Selenium water quality objectives are 5 µg/L (4 day mean) for the San Joaquin River and 2 µg/L (4 day mean) for Salt Slough and wetland water supply channels identified in the Basin Plan. The Basin Plan amendment in 1996 included a compliance time schedule establishing October 1, 2010, as the effective date of the prohibition of discharges for Mud Slough (north) and the San Joaquin River above the mouth of the Merced River. Waste Discharge Requirements (California Regional Water Quality Control Board, 2001a) were issued by the Central Valley Regional Board allowing selenium discharges in excess of the Basin Plan selenium objective and larger than the allowable monthly and annual selenium loads at Vernalis contained in the San Joaquin River TMDL (California Regional Water Quality Control Board 2001b) until October 1, 2010. The Waste Discharge Requirements includes monthly monitoring for molybdenum and nutrients (nitrate, ammonia, total Kjeldahl nitrogen, total phosphate, and ortho-phosphate) as well as weekly analyses of salinity, selenium, boron, and other parameters, and chronic toxicity testing. The Waste Discharge Requirements also outline a program to monitor storm water releases from the Grassland Drainage Area into the Grassland wetland supply channels should they occur.

### **State Board Also Delays Selenium Protections**

The 1996 Grassland Bypass Project Basin Plan Amendment and waste discharge requirements were originally approved by the Central Valley Regional Board to establish an end to seleniferous discharges into Mud Slough North by October 1, 2010. The intent was to have zero selenium discharges by that time as a result of treatment through source control and reuse, with reverse osmosis and biotreatment for the remaining volume of drainage. However, by 2007 it became apparent that there was no “Best Practicable Treatment and Control” option to treat the selenium pollution, so the Grassland Drainers and Reclamation requested and received a time extension in 2010 from the Central Valley Regional Water Quality Control Board and the State Water Resources Control Board to delay implementation of selenium water quality objectives in the San Joaquin River and Mud Slough North until December 31, 2019. An unenforceable “performance goal” of 15 µg/L monthly mean has been established for December 31, 2015 by the CVRWQCB. (California Regional Water Quality Control Board 2010) The U.S. Environmental Protection Agency declined to approve or disapprove of the Basin Plan Amendment, claiming that it was not subject to federal jurisdiction. (Strauss 2011)

The two main reasons given for the delay are the lack of effective drainage treatment options and lack of funding. Reclamation and the San Luis Delta Mendota Water Authority had originally anticipated that effective drainage treatment technology could be identified prior to 2010, but it did not occur. Several technologies were tested but results have not been positive, with no clear Best Practicable Treatment and Control option identified. Prior to full-scale implementation, treatment technology must still be tested and validated. Over \$100 million in state, federal and private monies have been spent on the Grassland Bypass Project. (Water Education Foundation n.d.) The Grassland Drainers were spending a \$25 million grant award when the State Department of Finance issued Budget Letter 08-33 stopping payment of awarded grant funds and forcing the Grassland Drainers to stop work. The “halt work” order came when the project had completed a series of local source control projects and the SJRIP drainage reuse area had been constructed, but before treatment technology could be identified, constructed, tested and used.

The rationale for the Central Valley Regional Board’s action to extend the compliance date for the 5 µg/L (4 day mean) selenium water quality objective can be summed up in the following paragraphs from its Resolution R5-2010-0046 approving the Basin Plan amendment:

8. In a 13 December 2006 letter to the US Bureau of Reclamation, the GAF [Grassland Area

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Farmers] informed the Bureau and Central Valley Water Board staff that the GBP [Grassland Bypass Project] would be unable to eliminate all surface water discharges of agricultural subsurface drainage by 30 October 2010 without increased risks of loss of soil productivity; accelerated loss of beneficial use of groundwater due to salinization; a significant decrease in farm profitability stemming from a rising water table if irrigation continues; or low or no returns if fields are dryland farmed or fallowed. Rising groundwater would also increase groundwater seepage to surface water channels and open ditches, potentially increasing selenium in channels now protected by the monitoring and management of the regional drainage program. Continued farm productivity and profitability is necessary to fund ongoing regional drainage management in this area; and continued wildlife protection is consistent with state, federal, local and GBP priorities.

9. The GBP [Grassland Bypass Project] operators anticipate that the project area will be able to achieve full control of agricultural subsurface drainage if an additional nine years, three months beyond the existing compliance date is granted." (California Regional Water Quality Control Board 2010a, 2010b)

The Central Valley Regional Board Final Staff Report for the Basin Plan Amendment also justified the requested delay as follows:

The compliance time schedule currently in the Basin Plan includes compliance dates prior to 2010 for other channels and other reaches of the River. The Grassland Area Farmers (GAF), the subset of local agencies within the Authority participating in the GBP, have met the interim milestones of the selenium control program, complying with the prohibition of discharge or meeting the selenium objective in the channels where these requirements are now in effect (see Figures 3, 4 and 6 in Section 1 of this report). Given this history, it is reasonable to expect that if the Board approves the requested time extension by adopting the proposed amendment, the GAF will develop full drainage management capacity in the project area. In this context, "full drainage management capacity" means that, consistent with the Grassland Bypass Project's dual goals of water quality and environmental protection and maintaining the viability of farming in the area, the dischargers are able to control all agricultural subsurface drainage generated in the drainage area without discharge. The Grassland Area Farmers expect to achieve this by further development of the source control measures and drainage reuse strategies in current use and by treating drainage to remove selenium and/or salt. Expanded source control and reuse alone could potentially increase the Project's drainage management capacity sufficiently to achieve water quality and environmental goals, but at a cost. If the Board adopts the proposed amendments, dischargers will need to weigh those costs and determine whether drainage treatment is truly feasible for this area; and report their decision to the Board in 2013."

Currently, the Bureau of Reclamation is funding a selenium demonstration treatment plant in the Panoche Drainage District. The project, estimated to cost \$37 million (United States District Court, Eastern District 2011), will treat 200 gallons per minute constantly for 18 months (470 AF). At that treatment rate, the cost of treating agricultural drainage only for selenium (excluding salt and boron treatment) is \$78,723 per acre-foot, not counting transportation and disposal of the processed solid waste to a hazardous waste facility. Even at that cost, the potential for economic feasibility is at best low. A 2010 Report by CH2M Hill for the North American Metals Council determined the following:

While these physical, chemical and biological treatment technologies have the potential to remove selenium, there are very few technologies that have successfully and/or consistently removed selenium in water to less than 5 µg/L at any scale. There are still fewer technologies that have been demonstrated at full-scale to remove selenium to less than 5 µg/L, or have been in full-scale operation for sufficient time to determine the long-term feasibility of the selenium removal technology. There are no technologies that have been

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demonstrated at full-scale to cost-effectively remove selenium to less than 5 µg/L for waters associated with every one of the industry sectors.” (CH2M Hill 2010)

The Grassland Bypass Project has resulted in a reduction of the volume of drainage water and pollutants as follows for Water Years 1997 through 2010:

- Discharge volume (Acre-Feet) reduced by 64% (39,856 AF to 14,529 AF)
- Selenium load reduced by 77% (7,096 lbs. to 1,601 lbs.)
- Salt load reduced by 61% (172,608 tons to 67,661 tons)
- Boron load reduced by 58% (753,000 lbs. to 315,000 lbs.) (McGahan 2010)

These improvements are achieved at enormous cost relative to the economic activity it is intended to support: agriculture. The U.S. Geological Survey, in its 2008 “Technical Analysis of In-Valley Drainage Management Strategies for the Western San Joaquin Valley, California” stated in regard to the possibilities for treatment of drainage water that:

The treatment sequence of reuse, reverse osmosis, selenium bio-treatment, and enhanced solar evaporation is unprecedented and untested at the scale needed to meet plan requirements.” (Presser and Schwarzbach 2008)

**Land Retirement**

While drainage reduction through source control and reuse have likely led to reductions in salt, selenium and boron discharges into Mud Slough, the role of land retirement has not been adequately analyzed to determine its role in reducing the amount of pollution discharged by the Grassland Bypass Project. Land retirement policies are currently voluntary. (US Bureau of Reclamation 2005, 2006)

The 2004 Draft Environmental Assessment on Broadview Water Contract Assignment Project identified significant reductions in the volume of drainage water, salt, selenium and boron from the retirement from irrigation of 10,000 acres in the Broadview Water District, as shown in Table A-2. (Environmental Sciences Associates 2004, 4-2)

The Northerly subarea of Westlands Water District, which drains subsurface flows to the Grassland area, has also had substantial land

<b>Table A-2</b> <b>Drainage and Water Quality Effects of Land Retirement</b> <b>in the Broadview Water District Along West Side of San Joaquin River</b>			
<b>Broadview Water District</b> <b>Water Quality Indicators</b>	<b>Existing</b> <b>Conditions</b>	<b>Under</b> <b>Proposed</b> <b>Action</b> <b>Conditions</b>	<b>Estimated</b> <b>Reduction</b> <b>Attributable</b> <b>to Proposed</b> <b>Action</b>
Drainage to San Joaquin River	3,700	1,100	2,600
Estimated Salt Production (tons/year)	24,300	7,300	17,000
Estimated Selenium Production (pounds per year)	2,140	640	1,500
Estimated Boron Production (pounds per year)	74,000	22,000	52,000
Source: Environmental Sciences Associates 2004; California Water Impact Network.			

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following/retirement due to shallow salty groundwater within the root zone. (California Water Research Associates 2011) So much land has been retired in the Northerly subarea of Westlands that Westlands does not believe it is cost effective to install drainage service for the remaining acreage. (United States Court of Federal Claims 2012) It is unknown how much total land has been retired in Westlands' Northerly subarea, but it is likely to be at least 40,000 acres. (Water Education Foundation, n.d.) Based on the estimates from the Broadview Contract Assignment Project Draft Environmental Assessment, extrapolation of potential drainage, salt, selenium and boron savings from the retirement of an estimated 40,000 acres in the northerly area of Westlands and the 10,000 acres in Broadview could result in the following reduction in discharges:

Drainage to San Joaquin River (AF)	13,000
Salt (tons)	85,000
Selenium (lbs.)	7,500
Boron (lbs.)	260,000

The above sample estimated numbers could represent a significant percentage of the total reduction in drainage volume, salt, selenium and boron from inception of the Grassland Bypass Project in 1996 through 2010 and do not count other retired lands such as Widren, Eagle Field and Mercy Springs water districts, and may not include all of the retired lands within Westlands' northerly subarea. Most of the reduction in drainage, salt, selenium and boron discharged from the Grassland Bypass Project would come from retirement of irrigation from lands with drainage problems and reductions in water deliveries due to drought. Other measures may be given unwarranted credit for the savings. However, there has not been a definitive study on the issue to determine the specific reason for reductions in pollution.

As of early 2012, significant new grants and subsidies have been awarded to the Grassland Drainers through the Panoche Drainage District. The Selenium Demonstration Treatment Facility at Panoche is estimated to cost \$37 million, averaging over \$78,000 per acre-foot of treated drainage water. In September 2011, the Pacheco Water District was awarded a \$262,000 CALFED water efficiency grant to line three miles of open channel (US Bureau of Reclamation 2011) in order to reduce seepage and creation of drainage water. The lowest annual volume of drainage water discharged into Mud Slough from the Grassland Bypass Project was 13,166 acre-feet in Water Year 2009. As recently as Water Year 2005, drainage volume was 29,957 AF. (McGahan 2010) The efficacy of the proposed treatment methodology has yet to be proven, as noted above.

The Bureau of Reclamation's National Economic Development feasibility analysis found that land retirement is the most cost effective solution to resolve problems associated with irrigation of these toxic soils. (US Bureau of Reclamation 2008) The Bureau's Land Retirement Demonstration Project has shown significant and immediate success in lowering contaminated groundwater levels and selenium exposure from land retirement. Presser and Schwarzbach of the US Geological Survey found that:

When lands are retired, there is an overall reduction in water applied to a district. In general, less water applied as irrigation means less drainage produced, which in turn means less drainage requiring treatment and storage. (Presser and Schwarzbach 2008: 9)

Ceasing imported water deliveries from the Delta to these toxic lands need not preclude agriculture. The lands could return to dry farming (where growers rely on rainfall for their crops, as occurred in this area prior to the arrival of surface water supplies in the 1960s and 1970s). The west side of the San Joaquin Valley sees rainfall of between 5 and 10 inches a year. Before completion of the California Aqueduct in 1967, groundwater was the primary source of irrigation water in the area. This dependence led to land subsidence of an average of one foot across the whole region, but as much as 29 feet in some localized areas. But presently, imported supplies have shifted the groundwater budget from one of overdraft to one of surplus. Groundwater elevations in the area of



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Panoche and Cantua creeks in the western San Joaquin Valley rose 100 to 200 feet between 1967 and 1984. Belitz and Phillips state that this rise in the water table “represents a recovery of nearly one half the total drawdown that had occurred” prior to development of imported water supplies. (Belitz and Phillips 1995: 1847)

The lands may also be used for other purposes compatible with adjacent land uses such as solar “farms.” Solar farms would provide much needed sustainable electricity to complement the hydropower generation from the east side’s dams on the San Joaquin River and its tributaries.

Land retirement already occurs here. Since the 1990s, Westlands Water District (the largest water district in California’s Central Valley) has purchased outright about 100,000 acres of drainage problem lands within its limits. However, the land retirement alternative appears to have plateaued in deference to continued delivery of imported subsidized water.

Researchers have not undertaken yet to model the potential impacts of climate change for the forecasting and handling of toxic contaminants like selenium in the state’s water quality regulation and policy frameworks. C-WIN urges the State Water Resources Control Board to seek such research as soon as possible. Presser and Schwarzbach have laid out the two principal scenarios, however, which state and federal regulators, and the communities of the San Joaquin Valley will increasingly have to confront:

The draining of accumulated reservoirs of salt and selenium stored in the soils and aquifers of the valley to surface impoundment [i.e., to some form of surface storage such as evaporation ponds and other treatment processes] may have large-scale implications for the future of the valley in terms of tradeoffs of contaminated groundwater aquifers (i.e., life of the aquifer for irrigation and drinking water use) for contaminated land-surfaces (i.e., creation of salt waste dumps and landfills for designated bio-treatment waste). (Presser and Schwarzbach 2008: 14)

There is hazardous agricultural drainage water collecting in aquifers year after year in the western San Joaquin Valley. There is already a significant unaddressed backlog of seleniferous hazards waiting to be addressed. C-WIN believes that California’s water regulators should act now to stop creation of yet more hazardous wastewater by retiring lands from irrigation with imported surface supplies in areas known to contain high selenium concentrations, under the prohibition on waste and unreasonable use of water in the California Constitution, Article X, Section 2.

### **San Luis Drainage Feature Re-Evaluation**

As a result of years of litigation regarding drainage issues and a Ninth Circuit Court of Appeals decision on the responsibility of Reclamation to provide drainage service to Westlands and other San Luis Unit contractors, Reclamation issued a final Environmental Impact Statement and Record of Decision (ROD) for the San Luis Drainage Feature Re-Evaluation. The Final Environmental Impact Statement was issued in 2006, with the Record of Decision issued in 2007. (US Bureau of Reclamation 2005, 2006)

While the environmentally preferred alternative in the San Luis Drainage Feature Re-Evaluation Environmental Impact Statement was the “In Valley/Drainage Impaired Land Retirement” alternative which would have retired all 298,000 acres of drainage impaired lands in Westlands, Reclamation selected the “In-Valley Water Needs Land Retirement” alternative to retire just 194,000 acres of impaired lands, which also includes existing land that is retired.

The San Luis Drainage Feature Re-Evaluation Record of Decision called for a combination of land retirement, reuse, reverse osmosis, biotreatment and evaporation ponds to reduce the formation of

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drainage and to treat drainage that remains. It includes continuation of the Grassland Bypass Project, with little or no additional land retirement in that area. The U.S. Fish and Wildlife Service recommended that Reclamation consider an alternative retiring all of the 379,000 acres of drainage impaired lands in the San Luis Unit (including the Grassland area), but Reclamation did not consider retirement of the portion of the San Luis Unit within Grassland Drainage Area. (US Bureau of Reclamation 2005: Appendix M)

The National Economic Development Act (NED) analysis for the San Luis Drainage Feature Re-Evaluation Environmental Impact Statement showed that the “In Valley/Drainage Impaired Land Retirement” alternative was the most cost effective, with a \$5 million/year benefit. However, Reclamation requested and received a waiver of the National Economic Development Act requirement to adopt the most cost effective alternative and instead adopted the “In-Valley Water Needs Land Retirement” alternative, which would lose approximately \$10 million/year. (US Bureau of Reclamation 2005: Appendix N, Cost-Benefit Analysis, Table N-10, p. N-17)

The Environmental Working Group report, “Throwing Good Money at Bad Land” estimated that crop subsidies provided to the drainage impaired lands in the San Luis Unit are approximately \$10 million per year. (Environmental Working Group 2011) Environmental Working Group estimated that adding the crop subsidies to the drainage subsidies for San Luis Drainage Feature Re-Evaluation would result in a \$20 million loss to the taxpayers, and concluded that land retirement would be the most cost effective solution to resolving drainage problems.

As of early 2012, resolution of drainage issues within the San Luis Unit remains problematic. The ceiling of appropriations for the San Luis Unit is lower than the projected cost of a drainage collection and treatment system for all drainage impaired lands, and Reclamation has identified and recommended increases in federal subsidies will be necessary to allow the project to proceed. (US Bureau of Reclamation 2008) Westlands Water District filed a lawsuit in the federal claims court in January 2012 asking for damages from Reclamation’s lack of progress in providing drainage service. (Unites States Federal Court of Claims 2012)

Presser and Schwarzbach (2008) recommended a “Decision Analysis” process to resolve San Luis Drainage problems, but to date no action has been taken to initiate such a process. They also recommended as much land retirement as possible, noting, “Land retirement is a key strategy to reduce drainage because it can effectively reduce drainage to zero if all drainage-impaired lands are retired.” (Presser and Schwarzbach 2008) However, despite land retirement recommendations from them and the Bureau’s San Luis Drainage Feature Re-Evaluation ROD’s inclusion of 194,000 acres of retired land, there has been no additional land retirement within the San Luis Unit since 2007 (Lee 2012).

Presser and Schwarzbach (2008) identified several problems for implementation of the San Luis Drainage Feature Re-Evaluation Record of Decision as follows:

- “Regardless of what drainage plan is implemented, the amount of salt in groundwater will increase. Based on projections of future total dissolved solids in groundwater of the Westland and Northerly Areas, the useable life of the aquifer under various irrigation and drainage management goals is estimated to be between 25 and 220 years.” (Presser and Schwarzbach 2008: 2)
- They recommend a “program that substitutes groundwater pumping for surface water delivery, thus helping to shift the groundwater budget from large surplus to small deficit and to stem any expansion of the drainage problem through time with continued irrigation.” (Presser and Schwarzbach 2008: 3)

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- A Decision Analysis process would allow objective and scientific analysis of different treatment options, but it would require stakeholder participation. (Presser and Schwarzbach 2008: 3)
- “A drainage alternative that exports wastewaters outside of the valley may slow the degradation of valley resources, but drainage alone cannot alleviate the selenium build-up in the valley, at least within a century, even if influx of selenium from the Coast Ranges could be curtailed.” (Presser and Schwarzbach 2008: 6)
- “If the goal is to create a sustainable integrated production/habitat system, then up-gradient land retirement emerges as the most logical strategy. Implementation of a successful land retirement program may require an approach that weighs independently the benefits of drainage reduction, selenium reduction, habitat creation, water acquisition and removal of lands that are no longer productive. Such an approach would also serve to identify target lands within each category that might not be considered for land retirement under a voluntary land retirement program.” (Presser and Schwarzbach 2008: 10)
- “The stream of RO [Reverse Osmosis] treated water produced would be available for other uses, but some water- quality issues (e.g., boron and mercury) remain for the product water. For example for planning for agricultural use of RO product water, it would be necessary to dilute the concentration of boron in the product water by up to 36-fold with CVP water to obtain a boron concentration that would not impair plant growth (San Luis Drainage Feature Re-Evaluation Environmental Impact Statement, 2007, Response to Comments).” (Presser and Schwarzbach 2008: 15)
- “A review of treatment technologies in 2004, evaluated the advantages and disadvantage of a number of technologies specifically tested on agricultural drainage waters from the valley. Some initial reduction of selenium concentration is possible (e.g., from 400 µg/L to 100 µg/L), but achieving levels low enough to meet regulatory requirements (2-5 µg/L) to protect the environment were found difficult and expensive.” (Presser and Schwarzbach 2008: 25)
- “The concentration of selenium in liquids associated with the sludge bio-waste in the scenarios illustrated in figures 6-12 may be as high as 1,068 µg/L if a two-fold concentrating factor is assumed. The final concentration of selenium in the bio-waste would depend on an assumed density, but the potential exists for the production of liquids and solids that would be designated or hazardous selenium wastes. The selenium criteria for a hazardous waste are 1,000 µg/L for a liquid and 100 µg/g wet weight for a solid (U.S. Department of Health and Human Services, 1996).” (Presser and Schwarzbach 2008: 27)
- “If 100,000 acres of land is retired under the *Groundwater Quality* alternative, then 412,772 tons salt/year are available for storage at the end of the evaporation process. Assuming a bulk dry density of 1 g/cm<sup>3</sup>, then 13.24 million feet<sup>3</sup> [cubic feet of] salt are produced per year. At one-foot depth, this amount would cover 311 acres. In 50 years, the salt waste pile would rise to 50 ft. on the assumed 311 acres. This amount would be produced each 50 years into perpetuity.” (Presser and Schwarzbach 2008: 27)
- “[A]irborne particulates from salt waste piles may provide an additional pathway of exposure to wildlife and humans. Air quality problems may arise from wind-driven salt particles containing selenium.” (Presser and Schwarzbach 2008)
- “A scenario that successfully scales-up drainage water reuse, selenium bio-treatment, and evaporation of water to concentrate salt to magnitudes effective in treating planned volumes of drainflow may create new selenium exposure pathways that pose potential risks at levels that are currently undefined. However, selenium risk may be greatest at reuse

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areas.” (Presser and Schwarzbach 2008: 28)

A September 1, 2010, letter from the Michael Conner, Commissioner of Reclamation to Senator Dianne Feinstein identified numerous problems with implementation of the San Luis Drainage Feature Re-Evaluation ROD. Reclamation had attempted to negotiate a legislative settlement with the San Luis Unit contractors and interested public in 2007 and 2008, but no consensus could be reached. The letter identifies the inadequate authorization ceiling of appropriations for San Luis Drainage Feature Re-Evaluation implementation and also states that while the 2008 Feasibility Report identified that the San Luis Drainage Feature Re-Evaluation Record of Decision is financially and economically infeasible *“because the costs exceed the national economic benefits and are beyond the ability of the beneficiaries to repay.”*

Despite the recommendation from Reclamation to increase the authorized ceiling of appropriations for the San Luis Unit and increase allowable subsidies, Congress has taken no action. There is only adequate funding authorization remaining to construct drainage collection and treatment facilities in one subarea of Westlands. Reclamation and Westlands continue to negotiate which area that will be (northerly sub-area or central sub-area of Westlands). Meanwhile, Reclamation continues to deliver hundreds of thousands of acre-feet, sometimes over a million acre-feet of water to the San Luis Unit. Each acre-foot of clean water delivered to that area results in creation of highly seleniferous drainage water that either goes into shallow or deep aquifers, and/or the Grassland Bypass Project for discharge into Mud Slough and the San Joaquin River. As long as irrigation deliveries continue to these poisoned lands, pollution will occur.

### **Conclusion**

The State Water Resources Control Board has the authority to bring order, economic sanity, and environmental protection to drainage, salinity, and selenium problems of the Bay-Delta Estuary and the western San Joaquin Valley by acting through the Bay-Delta Water Quality Control Plan to prioritize land retirement as the most economically feasible option for reducing saline and seleniferous drainage to the lower San Joaquin River and the Bay-Delta Estuary. The time for Board action is long past due.