Central Valley Regional Water Quality Control Board

Surface Water Ambient Monitoring Program

Work Plan

September 2001

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INTRODUCTION

The Central Valley stretches from the Oregon border to the northern tip of Los Angeles County (60,000 square miles) and includes all or part of 38 of the State's 53 counties. Three major watersheds have been delineated within this region, namely the Sacramento River, San Joaquin River, and Tulare Lake Basins. 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 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. With the limited resources, monitoring and assessment activities have been prioritized, while at the same time allowing provisions for eventually addressing all the needs in the watersheds.

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, which was cut from the budget in 1993 during the budget shortfall; an integrated dormant spray program in cooperation with DPR; a comprehensive toxicity and TIE monitoring program on the San Joaquin River and its 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 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, and projects funded through CALFED.

A regionwide effort that was identified during the triennial review and is beginning 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 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. Details specific to the 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. A common element in all three watersheds is that monitoring programs are designed primarily to address nonpoint source problems, 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 the identified monitoring projects by watershed and their related costs is presented in Table 1, which is an update of information presented in the WMI Chapter (2001). This document is divided into three sections: Sacramento River Basin, San Joaquin River Basin, and Tulare Basin.

SACRAMENTO RIVER WATERSHED

1. 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.

2. Identify Problems and Monitoring Locations

Upper Sacramento River Watershed

The upper Sacramento River watershed includes all waters tributary to the Sacramento River within the counties of Modoc, Lassen, Plumas, Siskiyou, Shasta, Tehama, Butte and Glenn. Major river drainages include the Pit River (headwaters to Lake Shasta), McCloud River (headwaters to Lake Shasta), Upper Sacramento River (headwaters to Lake Shasta) and Feather River (headwaters to Lake Oroville). Watersheds directly tributary to the Sacramento River below Lake Shasta include Butte Cr, Lt. And Big Chico Cr, Deer Cr, Mill Cr, Antelope Cr, Battle Cr, Cow Cr, Clear Cr, Cottonwood Cr, Reeds Cr, Redbank Cr, Elder Cr, Thomes Cr and Stony Cr.

In addition to serving local needs, this drainage area provides a large percentage of the water supply needs for agricultural, municipal and industrial uses throughout central and southern Ca. (via the State Water Project and federal Central Valley Project). Major land uses in the upland areas are timber production, livestock grazing and recreation. Much of the land base is publicly owned (USFS and BLM). Agricultural uses dominate the valley floor. Urban and rural residential growth is rapidly increasing.

Although there are a number of point source municipal and industrial discharges, water quality issues principally relate to nonpoint source pollution resulting from past and currently land management practices (as described above). These practices include livestock grazing, irrigated and non-irrigated agriculture, road and building construction, timber harvest, abandoned and inactive mines, and hydromodification (i.e. dams, diversions, and stream channel disturbances). While site specific water quality problems do exist and some waters are 303(d) listed, many (perhaps most) waters in the upper Sacramento River basin could be described as ‘moderately degraded’ where water quality and beneficial uses are impacted by one or more of the following symptoms:

- accelerated erosion throughout the watershed resulting in high levels of sediment transport and/or sediment deposition
- degraded aquatic and riparian habitat which impacts the diversity and abundance of fish and other aquatic species, riparian dependent species and recreational uses
- progressive changes in channel morphology typically exhibited as increased channel entrenchment (and loss of floodplain connection) and increased channel widening and shallowing (poor width/depth ratio)
- increased water temperature regime

- modified hydrology (i.e. lowered summer base flows and increased winter peak flows)

While the problems discussed above exist in varying degrees in virtually all waters of the upper Sacramento River basin, they are particularly evident within the Pit River, upper Feather River and Westside Sacramento valley drainages. In addition to these basin wide issues, other problems exist related to heavy metals from abandoned mines and water quality problems within the Chico and Redding urban areas resulting from typical urban runoff pollutants (this is a suspected but undocumented problem).

Monitoring programs and monitoring locations will be designed address relevant issues within individual watershed areas. However, in general, monitoring sites will be established to characterize water quality and watershed conditions over the spectrum of land use and elevational change (e.g. sites in upland forest reaches, mid-elevation reaches, and low elevation reaches dominated by agricultural, municipal and/or industrial uses). Long-term monitoring sites are typically established at the confluence of major drainages and parameters are selected which provide information on cumulative watershed influences upstream of that monitoring site (i.e. parameters such as temperature, flow, sediment transport and macroinvertebrates which integrate upstream influences).

The Sacramento River above Shasta Dam is being periodically monitored to test for elevated nickel and arsenic concentrations. Nickel is a known toxicant to Ceriodaphnia dubia (invertebrate) in areas above Lake Shasta. Nickel concentrations in the Upper Sacramento River have been detected as high as 26 parts per billion (ppb). These concentrations caused mortality in C. dubia in the dosage response tests. Arsenic levels have been detected as high as 25 ppb. USEPA has published a reference dose for human health protection from arsenic at 2.1 µg/L in drinking water, with cancer risk estimates even lower. Assessment of the local geology is being explored to define areas where the rock type could be contributing to the nickel toxic levels. Additional monitoring is needed to determine a trend of nickel and arsenic concentrations versus surface water flow data, and more research is necessary to determine the percent level of nickel and arsenic in the bedrock.

Agricultural Dominated Water Bodies

Agricultural Dominated Water Bodies (ADWs) are Central Valley water bodies that receive agricultural return water or stormwater runoff from agricultural practices. The water bodies selected were both natural creeks and sloughs, and constructed drains and channels. There are literally thousands of miles of these water bodies in the Central Valley. They are highly modified altered systems with multiple stressors. Agricultural runoff may result in high turbidity, changes in temperature, and increases nutrient loading to adjacent water bodies. In addition, agricultural return water can contain traces of fertilizers and pesticides. All of these waterways, be natural or not, flow downstream into the major tributaries of the Sacramento – San Joaquin Delta and the San Francisco Estuary.

Effluent Dominated Water Bodies

Effluent dominated water bodies (EDWs) are low flow or ephemeral streams which receive discharge from facilities operating under a NPDES[1] permit, such as a wastewater treatment

[1] National Pollutant Discharge Elimination System

plants. Wastewater discharge to low flow or ephemeral streams may either degrade or enhance beneficial uses. Currently, there are approximately 54 municipal wastewater treatment facilities in the Central Valley Region that discharge treated wastewater to low flow or ephemeral steams. Many of these facilities have been discharging for a number of years. As communities expand into rural areas, more facility managers are proposing to discharge treated municipal effluent into ephemeral water bodies or streams with limited dilution capacity, and many facilities that currently discharge to ephemeral or low flow streams are planning to increase their discharge.

3. Objectives: Fiscal Year 2001-2002

Fiscal year 2001-2002 SWAMP funds will be allocated to baseline water quality assessments in areas of the upper Sacramento River watershed which have received limited funding in the past. SWAMP funding will also be used to study agricultural dominated water bodies (ADWs) and effluent dominated water bodies (EDWs) using rapid bioassessment techniques. Although these are regional issues, the ADWs and EDWs to be studied are primarily located in the Sacramento River watershed. Some work will be done on ADWs in the San Joaquin watershed.

Upper Sacramento Watershed

The overall objective is to establish and implement a surface water monitoring program which will evaluate the extent of water quality and beneficial use impairment within each major watershed area of the upper Sacramento River basin. Specifically, a monitoring program within each watershed area will be designed to accomplish the following:

- Establish and document current water quality/watershed conditions.
- Evaluate extent of water quality and beneficial use impairment and, to the extent possible, determine sources of that impairment.
- Provide direction to the RWQCB and to individual watershed management programs on appropriate actions to address water quality/beneficial use impairments.

Document, at the watershed scale, long-term trends in water quality and watershed condition cumulatively resulting from restoration, land management practices and natural processes.

Agricultural and Effluent Dominated Water Bodies

The primary goals are to gain insight into the general condition of the habitat and to develop an understanding of the biological communities that inhabit these water bodies. In addition, we are evaluating the usefulness of the test method (CSBP[2]) for use in ADWs and EDWs of the Central Valley. A key objective of this biomonitoring project is to develop indicators, being both useful biological species assemblages and metrics. There is likely a full suite of anthropogenic and natural variables affecting these systems. We will be continually evaluating a range of metrics on a range of sites throughout different seasons and under different environmental conditions. In addition, we have selected both water quality and chemical parameters, as well as habitat assessment features, for monthly trend monitoring

[2] California Stream Bioassessment Protocol

3.1 General Study Design

3.1.1 Overview of General Approach

Upper Sacramento River Watershed
SWAMP program funding will be used to establish and implement a long-term watershed scale monitoring program in each of the major sub watersheds of the upper Sacramento River basin.

Given the nature of the water quality/beneficial use impairments which are prevalent within this basin (as described in the Introduction), the Regional Board has chosen to place much emphasis on the success of locally directed watershed management programs to assist in the achievement of our agency's nonpoint source program objectives. For this reason, surface water monitoring programs in this basin will be closely coordinated with the efforts of these local watershed programs. The data generated will provide valuable input to the conduct of the individual watershed programs and program accomplishments will be of value to the RWQCB and other resource agencies. Within each watershed area, monitoring program design will be developed in consultation with the local watershed program and some type of interdisciplinary, multi-agency Technical Advisory Group. This is important since many of the factors impacting water quality/beneficial uses are not the traditional chemical, physical and biological parameters typically monitored in the water column.

Within each watershed area, the monitoring program will typically include some or all of the following:

- continuous recording of water flow
- continuous recording of water temperature
- event based sampling of sediment and sediment transport (i.e. suspended and bedload sediment during significant runoff events)
- periodic (i.e. weekly, monthly or annually) sampling of water quality constituents such as dissolved oxygen, pH, conductivity, nutrients, standard minerals, pathogens and, in some cases, other constituents such as metals, pesticides, and petroleum hydrocarbons.
- macroinvertebrate surveys
- fish population surveys
- 'greenline transects' (distribution/density of riparian species)
- seasonal stream surveys which generally follow the USFS Stream Condition Inventory protocol and include the following:
    - bank stability
    - shade canopy
    - particle size distribution (% fines)
    - channel morphology (w/d ratio, entrenchment, pool/riffle measurement, etc)

The selected monitoring parameters, monitoring site location, number and frequency of sampling will be determined on an individual watershed basis and will be greatly influenced by availability of funding. A prototype of this kind of watershed scale monitoring was initiated on the upper Feather River watershed in 1998 and continued with FY 2000-2001 SWAMP funds. It is our intent to expand this type of monitoring effort into other portions of the upper Sacramento River basin.

For purposes of organizing the long-term monitoring effort, the upper Sacramento River basin will be divided into six geographic areas which are selected on the basis of commonality of land use, watershed issues and water quality/beneficial use problems. These areas and the individual watersheds within them are as follows:

1. **Northeast** – Pit River, Fall River, McCloud River and upper Sacramento River
2. **Upper Feather River** – North, Middle and South Fork Feather River (to Lake Oroville)
3. **North Valley** – Clear Cr., Cow Cr., Battle Cr. and Redding area urban streams
4. **West Valley** – Cottonwood Cr., Reeds, Redbank, Elder, Thomes and Stony Crs.
5. **East Valley** – Mill Cr., Deer Cr, Butte Cr., Big and Lt. Chico Cr and other Chico urban area streams

Monitoring efforts will focus on one of the five areas annually so that each area will conduct data collection on a five year rotating basis. Some portions of the monitoring program (such as flow and temperature monitoring) may be continued through this five year interval.

Given the scarce staff resources provided by the SWAMP program, it would be impossible for Regional Board staff to have primary responsibility for conduct of the monitoring program. Alternatives for conduct of the monitoring work within any individual watershed area are as follows:

- contract to private consultants
- contract to resource agencies (including RWQCB)
- contributions from resource agencies (including RWQCB)
- contract to local watershed program and utilize program staff and/or subcontractors
- voluntary citizen monitoring

The method for conduct of monitoring within any watershed area will be determined in consultation with the local watershed program and in consideration of resources available. In some cases, SWAMP funds will be leveraged with other sources of funding in order to establish and implement a monitoring program.

Agricultural and Effluent Dominated Water Bodies

This project is designed to examine baseline biological and physical conditions in ADWs and EDWs of the Central Valley using the California Stream Bioassessment Procedure (CSBP) (CDFG, 1999). This standardized procedure was developed by the California Department of Fish and Game (CDFG) to measure biological aquatic community organism structure and composition, and physical habitat condition. It is a regional adaptation of the USEPA's Rapid Bioassessment Protocols (USEPA, 1990). Procedural modifications, also modeled after the CSBP, will be used depending upon sampling site conditions. The project will use the procedures and protocol as listed until SWAMP has established it's own protocol, expected 2002.

There are a several advantages associated with this method. The use of biological communities can provide a more direct assessment of ecological health. Benthic macroinvertebrates provide a good measure of biological integrity and in addition are ubiquitous, relatively stationary and due to their high species diversity, can provide an array of responses to environmental stresses. Additionally, biological assessments, when integrated with chemical and physical assessments, can better define the effects of point source discharges as well as provide a more appropriate means for evaluating discharges of non-chemical substances such as sedimentation, for example (Harrington and Born, 1999-2000).

Biological samples will be collected and physical habitat inventories will be conducted on 45 reaches in the Sacramento River watershed: 60% of the reaches will be along wadeable EDWs and 40% will be along wadeable ADWs. One reach is equal to three riffles or transects and three benthic macroinvertebrate samples (BMIs).

3.1.2 Water Quality Indicators

Water quality indicators for the Upper Sacramento River watershed are identified in Tables SAC-1 and SAC-2. Benthic macroinvertebrates will be used as water quality indicators in Effluent Dominated and Agricultural Dominated water bodies.

4. Specific Activities Planned for FY 2001-02

Upper Sacramento River Watershed

FY 00-01 SWAMP funds were used principally to continue the ongoing watershed monitoring program in the upper Feather River watershed. It is anticipated that approximately $300,000 will be available from SWAMP for monitoring in the upper Sacramento River basin in FY 01-02 (based on a similar allocation in 00-01). The focus of FY 01-02 SWAMP funded monitoring will be to continue water quality monitoring on the mainstem Pit River (started with 00-01 SWAMP funds and 205j funds) and to initiated monitoring on the principal tributaries within the Pit River drainage (including Fall River). Monitoring needs for the upper Sacramento River and McCloud River will be evaluated, however, the Upper Sacramento River has recently completed a five-year monitoring effort (funded by the Cantara Trust Council) and the McCloud River is considered to be relatively pristine. Some funding needs are anticipated for the Lake Siskiyou watershed (headwaters of the upper Sacramento River) in support of a watershed planning and assessment effort underway in this area.

<u>Sample Design and Budget</u>

The following is a budget summary for Upper Sacramento River Watershed:

- Mainstem Pit River – $34,240
- Pit River Tributaries – $141,120
- Lake Siskiyou Monitoring – $15,640
- Fall River Monitoring – To Be Determined
- McCloud River Monitoring – To Be Determined

The total budget for Upper Sacramento River Watershed is $191,000. Each Upper Sacramento watershed monitoring program is described in more detail below:

Mainstem Pit River
The Pit River, located in Modoc, Lassen and eastern Shasta counties, flows from the Warner Mountains to Shasta Lake. Predominant land uses are livestock grazing, irrigated agriculture, timber production, wildlife refuges and recreation. The River is currently 303(d) listed as impaired from it's headwaters downstream to McArthur (approximately 100 miles). Parameters listed as not meeting Basin Plan objectives are temperature, nutrients and dissolved oxygen. Sediment and bacteria are also parameters of concern. Previous water quality data comes from a 1964 study by the RWQCB, a 1980 survey by the Dept of Water Resources, continuing monitoring by DWR at three river sites, and studies by PG&E in connection with relicensing of their Pit River hydropower operations. RWQCB is currently monitoring water quality on the Pit River with funds provided by a 205j grant together with funds from FY 2000-01 SWAMP program. The intent is to continue the mainstem monitoring program for at least one additional year with funds from the FY 2001-02 SWAMP program. The Pit River Alliance, a collaborative watershed organization of agencies, landowners and advocate groups, is beginning a watershed assessment for the Pit River watershed. This water quality monitoring program will provide input to the assessment process and will also provide current information with regard to the 303(d) listing.

Monitoring Scope and Objectives:
RWQCB will implement a water quality monitoring program with the following program objectives:

1. Evaluate existing water quality conditions which can be compared to previous information and can be used to track future water quality and watershed trends.
2. Evaluate compliance with Basin Plan objectives and determine the appropriateness of the 303(d) impaired waterbody listing.
3. Provide input to the ongoing Watershed Assessment being conducted under the direction of the Pit River Alliance.
4. Provide input to the overall efforts to enhance water quality and aquatic habitat in the Pit River watershed and document results of those enhancement efforts.

This proposal is to continue existing monitoring efforts for one additional year (i.e. June 2002 to June 2003). Eight monitoring stations will be located as follows:

(1) NF Pit River above Alturas
(2) SF Pit River near Likely
(3) NF Pit River at Alturas
(4) SF Pit River at Alturas
(5) Pit River at Co. Rd. 70
(6) Pit River at Highway 299 (Canby Bridge)
(7) Pit River at Co. Rd. 90
(8) Pit River at Pittville

Table **SAC-1** shows the proposed monitoring parameters, frequency and associated costs.

Table SAC-1

Water Quality Monitoring on the Mainstem Pit River

Parameter	Frequency	Cost (6-02 to 6-03)
Flow	Monthly	----
Temperature	Continuous	----
Nutrients	Weekly (summer) Monthly (winter)	14,400
Total/Fecal Bacteria	Weekly (summer) Monthly (winter)	6,480
Sediment • turbidity • suspended solids • settleable solids	Weekly	8320
Chemical • D.O. • PH • Conductivity	Weekly	----
Metals	Quarterly (2 sites)	1200
Pesticides	Quarterly (2 sites)	1200
Standard Minerals	Quarterly (2 sites)	1040
Macroinvertebrates	Annually	1600
Field Technician	52 trips (10 hrs/trip)	----
		$34,240 Total

Pit River Tributaries

This proposed monitoring will expand monitoring efforts which are currently underway on the mainstem Pit River. The Pit River watershed, which for purposes of this program includes that area from the headwaters downstream to McArthur, contains numerous tributary streams which provide quality habitat for a variety of cold and warm water fishes, other aquatic organisms, wildlife species and some T&E species. Water from these tributary streams is used to support irrigated agriculture, livestock grazing and recreational uses. Monitoring data on tributary streams will provide valuable input to the ongoing efforts of the Pit River Alliance, the individual Resource Conservation Districts, and the public land management agencies to protect and improve water quality and aquatic habitat in this watershed. In particular, the monitoring will provide input to the completion of a Watershed Assessment for the Pit River. The tributary monitoring program will include evaluation of certain water quality parameters, but it will also focus on evaluation of riparian, aquatic habitat and stream channel conditions.

Monitoring Scope and Objectives:

Pit River tributary monitoring will have the following program objectives:

1. Evaluate existing water quality conditions and determine to what extent these conditions may be limiting beneficial water uses.
2. Establish baseline water quality, habitat and channel conditions which can be used for future tracking of watershed condition trends.
3. Demonstrate on a watershed scale (i.e. not individual project scale) future improvements in watershed condition which may result from ongoing watershed enhancement efforts by the RCD's, the public land management agencies and the Pit River Alliance.

The following 25 tributaries have initially been selected for monitoring:

- Lassen Cr.
- Willow Cr.
- Davis Cr.
- Joseph Cr.
- Parker Cr.
- Mill Cr.
- East Cr.
- Cedar Cr.
- Canyon Cr.
- Rattlesnake Cr.
- Turner Cr.
- Washington Cr.
- Hulbert Cr.
- Stone Coal Cr.
- Juniper Cr.
- Clover Swale Cr.
- Butte Cr.

- Rush Cr.
- Ash Cr.
- Dutch Flat Cr.
- Willow Cr.
- Horse Cr.
- Beaver Cr.

These tributaries are selected on the basis that they generally have perennial flow, resident fish populations and other aquatic species and support important aquatic and riparian habitat. Also, it is anticipated that these streams will be the subject of numerous enhancement projects as the Pit River watershed program continues over future years.

For purposes of estimating costs it is assumed that there will be two sample sites on each tributary (flow, temperature and other parameters), however, some tributaries may only have one sample site and others may have more than two. Habitat and channel survey work will be as comprehensive as possible given the limitations of crew size and time of the summer field season.

Table **SAC-2** shows the proposed monitoring parameters, frequency and associated costs. Specific monitoring parameters and sample locations will be determined by the Monitoring Subcommittee of the Pit River Alliance.

Table SAC-2

Water Quality Monitoring on Pit River Tributaries

Parameter	Frequency	Cost (June 2002 to July 2003)
Flow	Monthly (two locations/str)	$1400 (purchase flow meter)
Temperature	Continuous (two locations/str)	$5000 (purchase 50 temp recorders)
Nutrients	Monthly (one location/str)	$18,000
Chemical (DO, pH, EC)	Monthly (two locations/str)	$1500 (purchase field meter)
Sediment	Event Sampling – 5/yr (one/str)	$3720
Macroinvertebrate	Annual (two locations/str)	$15,000*
Fish & Other Aquatics	Annual (two locations/str)	$15,000
Stream Survey	Annual (multiple locations/str)	$41,500

- USFS Stream Condition Inventory
- Riparian Inventory (Greenline Protocol)

Breakdown for Stream Survey Monitoring

Monitoring Crew (3) ---------- $12,500
(assume 3 crew members at $6.25/hr. and 66 working days @ 10 hrs/day)
Crew Leader -------------------- $25,000
Vehicle Rental ----------------- $2000
Misc. Equipment -------------- $2000

$41,500

Program Management (contract services) $40,000

Total - **$141,120**

*DFG Master Contract

Siskiyou County
Wagon Creek, Big Springs Creek, Cold Creek and Mill Creek are streams tributary to Lake Siskiyou in southern Siskiyou County. These streams drain lands with multiple land use activities such as grazing, timber harvest, and urbanization. The streams comprise the eastern watershed of Lake Siskiyou, a popular fishing and contact recreation water body located on the upper Sacramento River. These tributaries can serve as indicators of water quality in the most developed part of the Lake Siskiyou watershed. Siskiyou County is currently in the process of preparing a watershed management plan for the Lake Siskiyou watershed and this monitoring program will provide timely input to plan development.

Monitoring Scope and Objectives:
RWQCB will implement a water quality monitoring program on Wagon Creek, Big Springs Creek, Cold Creek and Mill Creek. Program objectives are as follows:

1. Establish existing and baseline water quality conditions which can be used to track future water quality and watershed trends.
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).
4. Provide input to the preparation of a Lake Siskiyou Watershed Management Plan and Strategy.

Water quality monitoring will be conducted for two years and will focus on potential impacts from urbanization, livestock grazing, construction activities and timber harvest. The following parameters will be included in the monitoring program: flow, sediment (turbidity and suspended sediment), temperature, pH, total dissolved solids, dissolved oxygen, conductivity, coliform bacteria, nutrients (nitrate, phosphate, ammonia), and metals. Biological assessment will include analysis of benthic macroinvertebrate populations.

Three monitoring stations are proposed for Wagon Creek, two for Big Springs Creek, and two for Cold Creek. Monitoring locations are selected to collect data from reaches upstream of urban/residential areas, and at lower reaches just above lake Siskiyou. Table 1 shows the proposed monitoring parameters and associated costs.

Table SAC-3

Monitoring of Selected Lake Siskiyou Tributaries

Monitoring Parameter	Location	Frequency	Cost (10-01to10-03)
Flow	All 7	Monthly	--
Temperature	Lower 3	Continuous	300.00
Turbidity	All	5 events /year	--
Total Suspended Solids	All	5 events/year	100.00
pH	All	Monthly and event	--
Conductivity	All	Monthly and event	--
Dissolved Oxygen	All	Monthly and event	--
Coliform (Total & Fecal)	All	Monthly and event	4500.00
Standard Minerals*	All	Quarterly	7280.00
Metals**	Lower 2	Quarterly	660.00
Macroinvertebrates	All	Annually	2800.00
Field Technician	All	34 trips (10hrs/trip)	--
			$15,640 Total

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

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

Agricultural and Effluent Dominated Water Bodies

List of Water Bodies to be Sampled in 2001-02

Table **SAC-4** lists EDW and ADW water bodies to be sampled:

Table: SAC-4

Effluent Dominated Water Bodies
Auburn Ravine
Coon Creek
Dry Creek
Pleasant Grove Creek
Agricultural Dominated Water Bodies
Butte Creek
Jack Slough
Main Drain
Wadsworth Canal
Live Oak Slough
Gilsizer Slough

Review of Available Information

Data available for these watersheds includes NPDES self-monitoring reports, citizen monitoring data, Sacramento River Watershed Program monitoring data, CDFG bioassessment data, USGS NAWQA data and special studies, among others.

Specific Sampling Design/Sample Collection

The field procedures for sample collection will follow protocol established by CDFG as the standardized procedure in the CSBP (CDFG, 1999). The non-point source sampling design will be used. Modifications for sampling streams with sand and mud bottoms will follow protocol established by the Central Coast Regional Water Quality Control Board/Salinas Watershed Aquatic Bioassessment (CCRWQCB, 2000), modeled after the CSBP and with revisions by J. T. King of Bioassessment Services. Procedural modifications for sampling narrow streams will follow those discussed in Harrington and Born (1999-2000). These procedures are described in the Quality Assurance Project Plan (QAPP) for this project (Reyes *et al.*, 2000). This project specific QAPP will be followed until the SWAMP QAPP has been implemented.

Laboratory Analysis

The laboratory procedures for BMI sample processing, taxonomic identification and metric analysis will follow CSBP protocol. These procedures are described in the QAPP for this project (Reyes *et al.*, 2000). This project specific QAPP will be followed until the SWAMP QAPP has been implemented.

Since the procedures have been standardized by CDFG, SOPs and the procedures to be followed for the laboratory phase of this project will be based on the CSBP. Taxonomic identification and metric analyses will be conducted with CDFG trained personnel.

Data Quality Evaluation and Data Reporting

Details of the Quality Assurance/Quality Control (QA/QC) program are described in the QAPP for this project (Reyes *et al.*, 2000). This project specific QAPP will be followed until the SWAMP QAPP has been implemented. Included in the document are field and laboratory quality assurance procedures, interlaboratory taxonomic validation, bioassessment validation, corrective action, performance and system audits and time lines for quality assurance reporting.

Deliverable Products

In addition to weekly meetings with the Contract Manager, the UCD-ATL also will submit written reports to the contracting agency's Contract Manager. These reports will summarize work performed to date and include results of sample processing, any problems encountered, any corrective measures taken and an assessment of any potential effects.

Desired Milestone Schedule

Activities specifically slated for FY01-02 include:

- Quarterly Reports
- Fall Bioassessment Sampling
- Spring Bioassessment Sampling
- Species List
- Metric analysis
- Final Report

Desired "sample throughput schedule"

Bioassessment will be conducted twice at each site, in the Fall and Spring. Insect samples will be preserved in alcohol and identified within 6 months of collection. The lab will provide quarterly reports on sampling, identification and analysis progress.

Budget

Total budget for monitoring of Agricultural and Effluent Dominated Water Bodies is $125,000. See Table **SAC-5** for more detail.

Working Relationships

This project is a collaborative effort with the Regional Board, CDFG, and the UCD-ATL. As this is the first bioassessment project to be undertaken by the UCD-ATL, the CDFG

Water Pollution Laboratory will collaborate closely with the UC Davis Laboratory in all implementation aspects of this project. The CDFG has had extensive experience in conducting bioassessment work and has agreed to work closely with the UCD-ATL on most aspects of this project including site reconnaissance, biological sample collection, physical habitat surveys, sample identification, and metric analysis.

Many of the EDW sites are located in watersheds with active citizen monitoring groups, including the Dry Creek Conservancy and the Auburn Ravine/Coon Creek CRMP. Regional Board staff will coordinate with citizen monitoring efforts in these watersheds. All monitoring projects funded through the SWAMP program will also be coordinated with Sacramento River Watershed Program monitoring efforts.

Table: SAC-5

Budget for Bioassessment in Effluent and Agriculturally Dominated Water Bodies

Task #	Task Expenses/ Description	Cost
Task 1	**Project Management and Administration** - Quartely Reports	$ 2,200.00
Task 2	**Bioassessment Quality Assurance Plan (Update)**	$ 500.00
Task 3	**Bioasessssment Sampling and Processing** - Collect biological samples - Collect physical habitat data - Sort and identify biological samples - Taxonomic List Generation and Metric Analysis 45 Sites at $2,000/site	$ 90,000.00
Task 4	**Bioassessment Draft Final Report** **Bioassessment Final Project Report**	$ 11,500.00
	Subtotal	**$ 104,200.00**
	Overhead at 10%	$ 10,420.00
	Equipment	$ 4,000.00
	Subcontracting DFG (QA)	$ 6,380.00
	TOTAL	**$ 125,000.00**

Literature Cited

CCRWQCB (Central Coast Regional Water Quality Control Board). 1999. *Salinas River Watershed Bioassessment Procedure: protocol brief for biological and physical/habitat assessment in wadeable streams.* With revisions by J. Thomas King, Bioassessment Services, June 2000.

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Cooke, J. and V. Connor 1998 *Toxicants in Surface Waters of the Sacramento River Watershed.* Central Valley Regional Water Quality Control Board

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Montoya, Barry, et.al. 1988. A Mass Loading Assessment of Major Point and Non-point Sources Discharge to Surface Water in the Central Valley, California, 1985 (Draft Section Report) Central Valley Regional Water Quality Control Board

Reyes, E.L., M. Emanuel, L. Deanovic. 2000. Quality Assurance Project Plan for Bioassessment Studies of Effluent and Agricultural Dominated Waterbodies. University of California, Davis, Aquatic Toxicology Laboratory. Davis, CA. prepared for the Central Valley Regional Water Quality Control Board. (in prep)

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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 Consumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

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 westside streams receive no snowmelt to maintain their flows and most would go dry during the summer months.

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 chose 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 monitoring 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 coast range streams in areas slated for future 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

The overall 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 are dinking water, aquatic life, irrigation water supply, and in the case of selenium, wildlife (specifically waterfowl). Results obtained from this program will be evaluated against existing narrative and numeric water quality objectives in the Central Valley Regional Water Quality Control Board Basin Plan (2000), 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.

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. Sampling efforts are coordinated on the Water timeline[1]. Review and adjustments to the program will be made upon evaluation of Water Year 2001 data, which is expected to occur in October 2001. Future augmentations will allow more randomized sampling during hydrologic unit rotations, which can in turn be coordinated with upper basin activities of abandoned mines, grazing, and pathogen source identification. Frequency of monitoring and selection of constituents have been adjusted to account for the arid nature of the watershed and the dominant role that stormwater 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

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

overall sampling frequency is increased during the irrigation season to evaluate agricultural return flow impacts.

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.

Expansion for Real Time Monitoring: This project allows expanded monitoring of 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 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: In 1993, five distinct drainage basins were identified that discharged into the lower San Joaquin River. The number of drainage basins was expanded to seven in 2001: (1) upper San Joaquin River; (2) Grassland Watershed; (3) Westside; (4) Merced River Watershed; (5) Tuolumne River Watershed; (6) Stanislaus River Watershed; and (7) eastside direct to San Joaquin River. Each drainage basin 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 basin as well as potential water quality concerns and major representative discharges to the lower river. This project allows multi-constituent monitoring to be conducted in 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 patters 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 over the next three years 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.

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 emphasis predictable irrigation patterns. This project will focus on intensive monitoring of 15 key sites distributed throughout the basin during two major storm events (greater that two inches of rain in a 72-hour period). Monitoring at 10-sites 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.

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.

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. This project will allow a randomized approach to assess overall water quality in each of the seven identified sub-watersheds that drain into the lower river, including water bodies within the coast range and Sierra Nevada. Approximately 15-sites will be added to existing sites within a subwatershed for a one year period. Additional sites will be evaluated for EC, ph, temperature, turbidity and dissolved oxygen seasonally (at least quarterly). The subwatershed evaluated will be rotated each year.

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 drinking water supplies is contamination by pathogens and bacterial. This project will identify baseline pathogen/bacteria conditions throughout the basin and potential sources. It is anticipated that this projected will be linked to the main stem and drainage basin projects and expanded into the rotational subwatershed project.

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 FY00-01, approximately $570,000 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) ($400,000), general office funds ($100,000) and CALFED ($70,000). 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).

3.1.2 Water Quality Indicators

Water quality indicators are identified in Table **SJR-2**.

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.

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. Current monitoring by other state, federal and local agencies which will supplement and support this comprehensive program is listed in Table SJR-3 by site.

4.3 Specific Sampling Design/Sample Collection

Site locations and frequencies are listed in Table **SJR-2**. Sample design and collection procedures are listed in the attached *San Joaquin River Basin QAPP* and updated draft appendices.

4.4 Laboratory Analyses

Table SJR-4 lists laboratories and analytical methods used during FY00-01. 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) that is updated annually. See *San Joaquin River Basin QAPP* and updated appendices. Updates to these QAPP's will be consistent with the pending QAPP SWAMP.

4.6 Deliverable Products

Annual water year reports by project.

4.7 Desired Milestone Schedule

Activities specifically slated for FY01-02 include:

- Complete monitoring identified in Table **SJR-2**
- Re-establish 3-year laboratory contract for selenium and molybdenum analyses in saline water
- Augment existing laboratory contracts or develop subcontracts through the Master Contract for:
  - Student interns
  - Nutrients, minerals, trace elements
  - Pesticides in water and sediment
  - Sediment chemistry
  - Toxicity testing
  - Bioassessment and habitat evaluation
- Develop scope of work for sediment toxicity analyses under Department of Fish and Game Master Contract
- Update QAPPs for following monitoring programs based on WY 00/01 data:
  - Main stem of the San Joaquin River
  - Drainage Basin Inflows to the San Joaquin River
  - Storm Events
  - Baseline conditions for future urban creeks
  - Intensive Rotational Basin Monitoring
- Participate in updating multi-agency monitoring program for the Grassland Bypass Project (GBP)
- Coordinate field work internally and with outside agencies to meet sampling schedule outlined in Table **SJR-2**
- Complete reports on the following topics
  - Water Quality chapter for the GBP Annual Report (Water Years 1999, 2000)
  - Water Quality within the Grassland Watershed (Water Years 1999, 2000)
  - Water Quality in the Lower San Joaquin River (Water Years 1999, 2000)
  - Selenium Concentrations in Internal Wetland Water Supply Channels within the Grassland Watershed (Water Years 1999, 2000)
  - Total Suspended Sediment Concentrations in the Lower San Joaquin River (Water Year 1999)
- Coordinate with stakeholders and disseminate information
  - Encourage Citizen Monitoring Groups
- Identify potential agency to conduct pathogen/bacteria work (possible development of a Request for Qualifications)

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. 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 2000. In addition, the first year of cost included the purchase of approximately $60,000 of equipment, which will be utilized during future monitoring efforts.

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.

SWAMP will be established and updated by state contractor.

TULARE BASIN

1.0 Introduction

The Tulare Lake Hydrologic Basin (Basin) comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. The Basin is essentially a closed basin since surface water drains north into the San Joaquin River only in years of extreme rainfall.

The Basin is divided into six watershed management areas. Each area is defined as the designated groundwater basin including the surface waters that are tributary to each 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.

2.0 Identify Problems and Monitoring Locations

Kings Basin Management Area
There are elevated bacteria levels in Pine Flat Reservoir. Phytoplankton biostimulants were measured in Sequoia Lake. The potential exists for high bacteria levels in Sequoia Lake. Unusual algal blooms have been identified in the Upper Kings River by Cedar Grove and unusual foaming has been observed at Ten Mile Creek, a tributary to the Kings River.

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 California Regional Water Quality Control Board, Central Valley Region 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 contain elevated levels of copper, arsenic, toxaphene, and Group A pesticides.

The Lower Kings River is on the Clean Water Act Section 303(d) list because of electrical conductivity, molybdenum, and toxaphene. Total maximum daily load development is scheduled to start in 2003.

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 both the Kaweah River and the lake.

Tule Basin Management Area
Sedimentation has been noted in Lake Success. Also, the potential exists for high bacteria levels in the Tule River and the lake.

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.

San Carlos Creek is on the Clean Water Act Section 303(d) list because of mercury. Panoche Creek is on the Clean Water Act Section 303(d) list because of sediment, selenium, and mercury. Total maximum daily load development is scheduled to start in 2003.

Kern County Basin Management Area
Sedimentation problems are noted in Lake Isabella.

3.0 Objectives

The overall objective is to establish and implement a surface water monitoring program to 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.

3.1 General Study Design

All available funding will be utilized for directed sampling activities to better characterize the extent and source of known and suspected water quality impairments. 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.

3.1.1 Overview of General Approach

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 Basin. Monitoring will begin in areas where beneficial uses of water may have been impacted from development, recreational uses and livestock grazing. As there is little quantitative data for any of these water bodies, the following physical and biological indicators will be monitored to provide baseline information.

- Quarterly monitoring of water temperature

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

Selection of additional monitoring sites and monitoring parameters (e.g., pesticides, petroleum hydrocarbons, macroinvertebrate surveys, etc.) will be evaluated using baseline monitoring data and will depend on future available funding. Citizen Monitoring groups will be utilized when possible to assist in data collection. As funding becomes available, baseline monitoring will begin on the waterbodies listed on table TLB-1.

4.0 Specific Activities Planned for FY 2001-02

Activities planned for FY 2001-02 will be to initiate baseline water quality monitoring for the water bodies listed in section 4.1. Two of these waters bodies have been identified as potentially impaired through complaints from citizens groups.

4.1 List of Water Bodies to be Sampled in 2001-02

With SWAMP funding for FY 2001-02 baseline monitoring for the following water bodies will begin. Table TLB-2 provides a listing of monitoring parameters.

1. Ten Mile Creek
2. Kaweah River, Upper
3. Tule River, Upper
4. Kern River, Upper

4.2 Review of Available Information

Data will be reviewed and compiled from all available sources, such as 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.

4.3 Specific Sampling Design/Sample Collection

Site locations and frequencies will be developed for each watershed to be monitored. Sample design and collection procedures will be developed following the Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOP).

4.4 Laboratory Analyses

Laboratory analyses will depend on future funding and assessment needs for the watersheds to be monitored.

4.5 Data Quality Evaluation and Data Reporting

To maintain data reliability and quality, the monitoring activities will follow the State Water Resources Control Board, Clean Water Team guidelines. A QAPP will be developed for each project, and will include specific quality assurance/quality control procedures.

4.6 Deliverable Products

For each watershed monitoring project an annual water year report will be prepared.

4.7 Desired Milestone Schedule

- Establish laboratory contracts
- Develop QAPP for each watershed to be monitored
- Develop Sampling Plan for each watershed
- Coordinate field work internally and with Citizen Monitoring Groups to meet sampling schedules outlined in the Sampling Plan
- Complete annual water year reports for each watershed monitored

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.

Table: TLB-1

Monitoring and assessment contract needs in thousands of dollars for Tulare Lake Hydrologic Basin						
	FY 01/02		**FY02/03**		**FY 03/04**	
PROJECT	**Funded**	**Unfunded**	**Funded**	**Unfunded**	**Funded**	**Unfunded**
Ten Mile Creek, including Hume Lake, and South Fork Kings River (upper)						
Monitor foaming problems and unusual algal bloom	13	37		25		25
Total	**13**	**37**		**25**		**25**
Kaweah River, Upper - including Lake Kaweah						
Assess bacteria problems	15	35		50		50
TOTAL	**15**	**35**		**50**		**50**
Tule River, Upper - including Lake Success						
Assess water quality	15	35		50		50
Total	**15**	**35**		**50**		**50**
Kern River including Lake Isabella						
Assess water quality	15	35		50		50
Total	**15**	**35**		**50**		**50**
Kings River, Lower						
Assess high salinity drainage dischargers		10		10		10
Feasibility studies to reduce salinity		50		50		50
TOTAL		**60**		**60**		**60**

Monitoring and assessment contract needs in thousands of dollars for Fresno River (part of San Joaquin River Basin)						
PROJECT	**FY 01/02**		**FY02/03**		**FY 03/04**	
Fresno River	**Funded**	**Unfunded**	**Funded**	**Unfunded**	**Funded**	**Unfunded**
Nutrient Monitoring		25		25		25
TOTAL		**25**		**25**		**25**

Table: TLB-2

I. MONITORING LOCATIONS

1. Ten Mile Creek (Hume Lake to Highway 180)
2. Kaweah River, Upper (Highway 198 bridge south of Sequoia to Lake Kaweah)
3. Tule River, Upper (Coffee Camp to Lake Success)
4. Kern River, Upper (Kernville to Bakersfield)

II. MONITORING PARAMETERS

1. Field parameters
   - EC, DO, pH, and Temperature
   - Cost - $0
2. Nutrients
   - Constituents – Nitrate, phosphate, ammonia
   - Method – water sample
   - Frequency – Quarterly
   - Cost - $28,800 (320 samples @ $90/per)
3. Pathogens
   - Constituents – Total Coliform, Fecal Coliform, Streptococcus
   - Method – water sample
   - Frequency – Quarterly
   - Cost - $19,200 (320 samples @ $60/per)
4. Student Contract
   - Cost - $8,000
5. Misc. Equipment
   - Replace field meters and sampling equipment
   - Cost - $2,000

TOTAL ESTIMATED COST $58,000