2000 California 305(b) Report On Water Quality



Prepared As Required By
Federal Clean Water Act Section 305(b)

State Water Resources Control Board

October 2000



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CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
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2000 CALIFORNIA 305(b) REPORT ON WATER QUALITY

Prepared As Required By

FEDERAL CLEAN WATER ACT SECTION 305(b)

STATE WATER RESOURCES CONTROL BOARD

NOVEMBER 2000

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LIST OF ABBREVIATIONS

305(b) Report	California's Year 2000 Report on Water Quality Pursuant to Federal Clean Water Act Section 305(b)
AB	Assembly Bill
AFB	Air Force Base
AFO	Animal Feeding Operation
AFY	Acre-Feet Per Year
AMD	Acid Mine Drainage
AOC	Area of Concern
APHIS	Animal Plant Health Inspection Service
ASBS	Area of Special Biological Significance
BBARWA	Big Bear Area Regional Wastewater Agency
BCN	Baja California Norte
BECC	Border Environment Cooperation Commission
BLM	(U.S.) Bureau of Land Management
BMP	Best Management Practices
BNSF	Burlington-Northern Santa Fe (Railway Company)
BOD	Biochemical Oxygen Demand
BMP	Best Management Practice
BPP	Basin Planning Project
BPTCP	Bay Protection and Toxic Cleanup Program
CA	California
CAFO	Confined Animal Feeding Operation
Cal/EPA	California Environmental Protection Agency
Cal/RA	California Resources Agency
Cal/BECC	California Border Environmental Cooperation Committee
CCC	California Coastal Commission
CCMP	Comprehensive Conservation and Management Plan
CCWD	Contra Costa Water District
CDF	California Department of Forestry and Fire Protection
CDQAP	California Dairy Quality Assurance Program
Cfs	Cubic Feet Per Second
CIGSM	Chino Basin Integrated Ground and Surface Water Model
CNPCP	Coastal Nonpoint Pollution Control Program
CRMP	Coordinated Resource Management Plan
CCRWQCB	Central Coast Regional Water Quality Control Board
CRBRWQCB	Colorado River Basin Regional Water Quality Control Board
CRMP	Coordinated Resource Management and Planning
CSD	Community Services District
CUWA	California Urban Water Agencies
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
CVSC	Coachella Valley Stormwater Channel
CWA	Clean Water Act

CZARA	Coastal Zone Act Reauthorization Amendments of 1990
CZMA	Coastal Zone Management Act
DBCP	Dibromochloropropane
DFA	(California) Department of Food and Agriculture
DFG	(California) Department of Fish and Game
DHS	(California) Department of Health Services
DEIR	Draft Environmental Impact Report
DFA	(California) Department of Agriculture
DFG	(California) Department of Fish and Game
DO	Dissolved Oxygen
DPR	(California) Department of Pesticide Regulation
DTSC	(California) Department of Toxic Substances Control
DWR	(California) Department of Water Resources
EBMUD	East Bay Municipal Utility District
EDB	Ethylene Dibromide
EHS	Environmental Health Services (Department)
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FDA	(U.S.) Food and Drug Administration
FESA	Federal Endangered Species Act
FFA	Federal Facilities Agreement
FSA	Farm Services Agency
FY	Fiscal Year
GAC	Granular Activated Carbon
gpm	Gallons Per Minute
Geo WBS	Geospatial Waterbody System
GIS	Geographical Information Systems
HA	Hydrologic Area
HSA	Hydrologic Subarea
HU	Hydrologic Unit
IBI	Index of Biological Integrity
LADWP	Los Angeles Department of Water and Power
LA/LB	Los Angeles/Long Beach
LARWQCB	Los Angeles Regional Water Quality Control Board
LRWQCB	Lahontan Regional Water Quality Control Board
LVHAC	Long Valley Hydrologic Advisory Committee
MBAS	Methylene Blue Additive Substances
MCL	Maximum Contaminant Level
MCLB	Marine Corps Logistics Base
MCWD	Mammoth Community Water District
mg/l	milligrams per liter
MM	Management Measures
MP	Management Practices
MTBE	Methyl Tertiary-Butyl Ether
MWQI	Municipal Water Quality Investigations
NADBANK	North American Development Bank
NAFTA	North American Free Trade Agreement

NAS	National Academy of Sciences
NAWQA	National Water-Quality Assessment
NBA	North Bay Aqueduct
NCRWQCB	North Coast Regional Water Quality Control Board
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCD	Natural Resource Conservation District
NRCS	(U.S.) Natural Resource Conservation Service
NRWTF	Napa River Watershed Task Force
NTU	Nephelometric Turbidity Unit
OAL	(California) Office of Administrative Law
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
OEHHA	California Office of Environmental Health Hazard Asssessment
OP	Organophosphorous
OU	Operational Unit
PAH	Polycyclic Aromatic Hydrocarbon
PCE	Perchloroethylene (Tetrachloroethene)
PG&E	Pacific Gas and Electric Company
PCB	Polychlorinated Biphenyls
PCP	Pentachlorophenol
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
QA	Quality Assurance
RCD	Resource Conservation District
RF3	River Reach File Version 3
ROD	Record of Decision
ROWD	Report of Waste Discharge
RWQCB	(California) Regional Water Quality Control Board
SARWQCB	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Project Authority
SCCWRP	Southern California Coastal Water Research Project
SCOPE	Santa Clara Organization for Planning the Environment
SEZ	Stream Environment Zone
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SLIC	Spills, Leaks, Investigation and Cleanup
SMBRP	Santa Monica Bay Restoration Project
SMWP	State Mussel Watch Program
SNA	Significant Natural Area
SNEP	Sierra Nevada Ecosystem Project
STOPPP	Stormwater Pollution Prevention Program
STPUD	South Tahoe Public Utility District
SWP	State Water Project
SWRCB	State Water Resources Control Board

TAC	Technical Advisory Committee
TBT	Tributyltin
TCE	Trichloroethene
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
TRPA	Tahoe Regional Planning Agency
TSMP	Toxic Substances Monitoring Program
TTP	Toxicity Testing Program
TTSA	Tahoe-Truckee Sanitation Agency
UCCE	University of California Cooperative Extension
UCD	University of California, Davis
ug/l	micrograms per liter
USBR	U.S. Bureau of Reclamation
USCOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Carbon
VVWRA	Victor Valley Wastewater Reclamation Authority
WAG	Watershed Advisory Group
WBS	Waterbody System
WDR	Waste Discharge Requirement
WET	Whole Effluent Toxicity
WMA	Watershed Management Area
WMI	Watershed Management Initiative
WQA	Water Quality Assessment
WQAS	Water Quality Attainment Strategy
WQO	Water Quality Objective
WTP	Wastewater Treatment Plant

I. INTRODUCTION

Every two years, the State Water Resources Control Board (SWRCB) submits a report on the State's water quality to the U.S. Environmental Protection Agency (USEPA) pursuant to Section 305(b) of the federal Clean Water Act (CWA). The Report provides water quality information to the general public and serves as the basis for the USEPA's National Water Quality Inventory Report to Congress. Water quality assessment information from California's nine Regional Water Quality Control Boards (RWQCBs) has been compiled and presented in the format (terminology and tables) requested in the USEPA's 1998 305(b) Guidelines.

California's Year 2000 305(b) Report on Water Quality pursuant to CWA Section 305(b) [305(b) Report] is presented in four sections titled, "I. Introduction," "II. Background," "III. Surface Water Assessment," and "IV. Ground Water Assessment." Information on total waters assessed and a description of watershed management areas and water quality problems and issues are presented in the Background section. The Surface Water Assessment section presents tables for the summary of designated use support, individual beneficial use support, the major causes and sources impacting designated beneficial uses, and the public health concerns related to elevated levels of toxicants, fish consumption advisories, and numbers of beach closures. This section also contains a discussion on surface water monitoring programs and a plan for achieving comprehensive assessments. For the Ground Water Assessment section, tables are presented for causes and sources impacting the beneficial uses of individual groundwater bodies as well as statewide totals.

Assessment information used for compiling and reporting the 305(b) Report is contained in two separate databases. Use of a database enhances the State's assessment capabilities by tracking assessment decisions made for individual water bodies. For many years California maintained data in USEPA's Water body System (WBS) database, structured for the purpose of producing the 305(b) Report. An effort to georeference California's WBS database revealed that the data often lacked spatial information as to which portions of a particular water body had beneficial use impairments. To remedy this, the State of California has developed an ArcView interface to the WBS called the Geospatial Waterbody System (GeoWBS). This program allows users to spatially define water bodies using ArcView 3.0 based on the following data coverage: River Reach File Version 3 (RF3) for rivers and shoreline, a lake's coverage from the California Department of Fish and Game (DFG) which nests with RF3, and a ground water basin coverage from SWRCB. In addition the program provides RWQCBs the ability to geographically define water bodies for those types of water bodies where no existing statewide coverage exists (e.g., wetlands, bays, and harbors). RWQCB staff began using this system to meet the Section 305(b) electronic reporting requirements in 1999. Following a rotating basins approach, the State's goal is to replace the water quality assessment data in the WBS data with spatially defined data in the GeoWBS data by year 2004.

In the process of spatially defining water quality data, the size estimations of water bodies in the WBS database are being replaced by GIS measured water body sizes. These new GIS measured water body sizes can be different than previously estimated water body sizes. There have been

some changes in the classification of water body types, and some water bodies are re-defined as the watershed (including tributaries and mainstem). For this reason, it would be misleading to conduct a trend analysis using these data and previous years' information.

Gaining a spatial and temporal understanding of California's water quality is a continual process. It should be noted that not all water bodies in the State have been catalogued into the WBS database. Table 1 presents the extent of information in the WBS database.

TABLE 1. WATER BODY COVERAGE IN THE WBS DATABASE

WATER BODY TYPE	TOTAL AREAL EXTENT IN CALIFORNIA	AREAL EXTENT OF ASSESSED WATER BODIES IN WBS	NO. OF WATER BODIES ASSESSED	PERCENT OF TOTAL AREAL EXTENT ASSESSED
Bays and Harbors (acres)	N/A[1]	471,429	50	N/A
Coastal Shoreline (miles)	1,609[2]	997	96	62
Estuaries (acres)	N/A	827,784	48	N/A
Ground Water (sq miles)	N/A	62,652	351	N/A
Lakes/Reservoirs (acres)	1,672,684[2, 3]	754,737	299	45
Ocean and Open Bay (acres)	N/A	316,794	25	N/A
Rivers/Streams (miles)	211,513[2]	25,274	715	12
Saline Lakes (acres)	N/A	410,919	10	N/A
Wetlands, Freshwater (acres)	N/A	104,782	77	N/A
Wetlands, Tidal (acres)	N/A	114,679	9	N/A

1. Not Available.
2. Estimates obtained from the 1994 USEPA Reach File 3/Digital Line Graph data. Estimates were not updated for 2000.
3. Lake estimates are for perennial and intermittent lakes.

II. BACKGROUND

A. Total Surface Waters

California is a vast state with 158,700 square miles of surface area, a population of over 33,250,000 (1998), and a wide range of water bodies (Table 2). Most of the data presented in Table 2 are from the RF3 computerized database and the U.S. Geological Survey (USGS) Digital Line Graph traces. These databases do not estimate acreage for California estuaries, harbors, bays, or wetlands. Instead, the estimates shown in Table 2 for these water bodies are obtained from the SWRCB's WBS database and therefore the data do not reflect the total size of the water bodies but only the portion that has been assessed.

TABLE 2. ATLAS INFORMATION

TOPIC	VALUE
1998 State Population Estimate[1]	33,252,000
State Surface Area in Square Miles[2]	158,693
Number of Water Basins[3]	12
Total Miles of Rivers and Streams[2]	211,513
-- Perennial River Miles (Subset)[2]	64,438
-- Intermittent Stream Miles (Subset)[2]	124,615
-- Ditch and Canal Miles (Subset)[2]	22,059
-- Border Miles of Shared River/Streams (Subset)[2]	401
Number of Lakes/Reservoirs/Ponds[2]	10,141
Acres of Lakes/Reservoirs/Ponds[2]	1,672,684
Acres of Saline Lakes[3]	413,546
Acres of Estuaries/Harbors/Bays[3]	1,369,069
Miles of Ocean Shoreline[2]	1,609
Acres of Wetlands[3]	357,064

[1] The State population estimate is calculated annually by the California Department of Finance Demographic Unit.

[2] Estimates obtained from the 1994 USEPA Reach File Version 3/Digital Line Graph data. Estimates were not updated for 2000. Lake estimates are for perennial and intermittent lakes.

[3] Estimates for estuaries, harbors and bays, saline lakes, and wetlands are totals from the SWRCB's 2000 WBS database and therefore only include those water bodies entered in the database, not total waters.

B. Water Pollution Control Programs

1. Programs to Assess Water Quality

Nonpoint Source (NPS) Pollution Management Program

The NPS Pollution Control Program (NPS Program) was established in 1988 when the SWRCB adopted and the USEPA approved the State's *NPS Management Plan* (1988 Plan). The 1988 Plan was developed in response to the requirements of CWA Section 319. In 1990 Congress identified NPS pollution as a significant factor contributing to coastal water degradation, noting the link between coastal water quality and land use activities. In response, Congress amended the Coastal Zone Management Act (CZMA) by passing the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). CZARA requires the lead water quality agency and coastal zone management agencies to jointly develop and submit a coastal nonpoint pollution control program (CNPCP). The lead State agencies for upgrading the NPS Program in California are the SWRCB (designated lead water quality agency), the nine RWQCBs, and the California Coastal Commission (CCC) (designated lead coastal zone management agency). As such, to satisfy federal requirements it was necessary to submit the NPS Program Plan for approval to USEPA and National Oceanic and Atmospheric Administration (NOAA), the lead federal agencies that administer the CWA and the CZMA, respectively.

In February 1994, the SWRCB initiated a comprehensive review of the NPS Program using technical advisory committees (TACs) for ten categories of NPS pollution. Over 150 people participated in the TACs as public and private representatives for irrigated agriculture, nutrient application, pesticide application, confined animal facilities, grazing, urban runoff, on-site sewage disposal systems, boating and marinas, hydromodification and wetlands, and abandoned mines. The TACs presented their recommendations to the SWRCB in 1995.

In lieu of a separate program for the coastal zone, the State decided to satisfy CZARA requirements on a statewide basis. As required by statute, in September 1995, the SWRCB and CCC submitted California's initial CZARA response to USEPA and NOAA. The response included two documents: *California's Coastal Nonpoint Pollution Control Submittal* detailing the State's existing programs related to NPS pollution management, and the *Initiatives in Nonpoint Source Management* based on the recommendations of the TACs.

The USEPA and NOAA released draft findings and conditions for the State's September 1995 submittal in October 1996. In August 1997, the SWRCB, CCC, USEPA, Region 9, and USEPA and NOAA headquarters staffs negotiated the *Action Plan*, which outlined a framework and activities for the State to achieve both an approvable program consistent with CZARA and an *"enhanced status"* program by addressing the nine key elements from the USEPA's *Nonpoint Source Program and*

Grants Guidance of 1997 and Future Years. In July 1998, USEPA and NOAA issued their Final Findings and Conditional Approval for California's submittal. Consistent with the *Action Plan* and final administrative changes to CNPCP guidance issued in October 1998 for final approval, the State was required to: (1) adopt management measures (MMs) consistent with the *Guidance Specifying Management Measures for Sources of Nonpoint Pollution to Coastal Waters*; (2) identify back-up and enforceable policies and mechanisms for the MMs; (3) demonstrate the ability for widespread implementation of the MMs; and (4) address the nine key elements.

The *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan) was the State's final submittal intended to satisfy the CWA section 319(h) requirements for "an upgraded program" and the CZARA requirements for a CNPCP. The NPS Program Plan achieved this intention by providing a single unified, coordinated statewide approach to dealing with NPS pollution structured around 61 MMs. The SWRCB and CCC jointly submitted the NPS Program Plan to USEPA and NOAA on February 6, 2000, and final federal approval was received July 21, 2000.

In the NPS Program Plan, MMs serve as general goals for the control and prevention of polluted runoff. Site-specific management practices (MPs) are then used to achieve the goals of each MM. Implementation of MMs will occur using a fifteen-year strategy with three nested five-year implementation plans. The fifteen-year strategy and each five-year implementation plan use an iterative program process. The program process includes: (1) assessing activities; (2) targeting efforts; (3) planning activities based on goals and objectives; (4) coordinating the efforts of federal, State, and local agencies and stakeholders; (5) implementing coordinated actions; (6) tracking and monitoring the results of implemented actions; and (7) reporting on results. The NPS Program Plan is designed to be flexible and adaptable over time.

Through the NPS Program Plan, the State has committed to implementing the required 61 NPS MMs by the year 2013 consistent with: (1) federal administrative guidance; (2) the "Three-Tiered Approach" adopted in the 1988 Plan; and (3) priorities identified in the Watershed Management Initiative (WMI) Chapters. The WMI, approved by the SWRCB in 1995, is used to help the SWRCB meet its goal to provide water resource protection, enhancement, and restoration. WMI uses an integrated planning approach to create and implement unique solutions for each watershed. Each RWQCB and the SWRCB revise their WMI Chapters annually to reflect changing priorities and conditions in the State's watersheds. Revisions currently underway will ensure that the WMI chapters and RWQCBs' actions are consistent with the NPS Program Plan's goal of implementing all MMs by the year 2013.

Total maximum daily loads (TMDLs) are another implementation-planning tool that will enhance the State's ability to foster implementation of appropriate NPS MMs. By providing watershed-specific information, TMDLs will help target specific sources and

corresponding corrective measures and will provide a framework for using more stringent approaches that may be necessary to achieve water quality goals and maintain beneficial uses.

Specifically, the NPS Program Plan:

1. Adopts 61 MMs as goals for six NPS categories (agriculture, forestry, urban areas, marinas and recreational boating, hydromodification, and wetlands/riparian areas/vegetated treatment systems);
2. Provides a fifteen-year strategy for fully implementing the MMs;
3. Continues the use of the "Three-Tiered Approach" for addressing NPS pollution problems (Tier 1: Self-Determined Implementation of Management Practices [formerly referred to as "voluntary" implementation]; Tier 2: Regulatory Based Encouragement of Management Practices; and Tier 3: Effluent Limitations and Enforcement Actions);
4. Provides the first of three five-year implementation plans targeting activities for specific MMs consistent with State and regional priorities in specific watersheds and also establishes mechanisms for: (a) coordination among agencies; (b) participation by the public; (c) assistance technically and financially; (d) adoption of additional MMs as goals, if needed; and; (e) monitoring and reporting of program effectiveness;
5. Promotes long-term interagency coordination among State agencies of California Environmental Protection Agency (Cal/EPA) and the California Resources Agency (Cal/RA) as well as other local, State, and federal agencies;
6. Identifies back-up authorities and enforceable policies and mechanisms for the 61 MMs adopted by the State; and
7. Relies on the use of existing authorities and regulatory processes to achieve implementation but allows for the adoption of the MMs as regulation after each five-year cycle if adequate progress in NPS pollution control has not been demonstrated.

Accountability of the NPS Program is critical to reassure the public of the State's commitment to deal with the NPS pollution problem. The NPS Program Plan contains actions that will result in consistent and timely evaluation and reporting of the NPS Program's progress in effectively dealing with NPS pollution. This includes annual, biennial, and five-year reporting cycles and the use of Internet-based interactive information tools. Also important is greater public participation through: (1) development of the five-year implementation plans; (2) tracking the implementation of MMs and assessing their effectiveness, (3) use of public reports; (4) expanded volunteer monitoring and education programs; (5) use of the Internet; and, (6) expansion of public outreach workshops.

Toxic Substances Monitoring Program

The Toxic Substances Monitoring Program (TSMP) was initiated in 1976 by the SWRCB. The TSMP provides a uniform statewide approach to the detection and evaluation of the occurrence of toxic substances in fresh, estuarine, and marine waters of the State through

the analysis of toxicants in the tissue of fish and other aquatic life. The TSMP primarily targets water bodies with known or suspected impaired water quality and is not intended to give an overall water quality assessment. Sampling stations are selected primarily by the nine RWQCBs. Data are used by the SWRCB, RWQCBs, and other agencies to identify waters impacted by toxic pollutants.

State Mussel Watch Program

The California State Mussel Watch Program (SMWP), initiated in 1977 by the SWRCB, provides a uniform statewide approach to detection and evaluation of the occurrence of toxic substances in the waters of California's bays, harbors, and estuaries. This is accomplished through the analysis of toxicants in the tissue of transplanted and resident mussels and clams. The SMWP primarily targets areas with known or suspected impaired water quality and is not intended to give an overall water quality assessment. Information collected in the SMWP is used by the SWRCB, RWQCBs, and other agencies to identify waters impacted by toxic pollutants.

Toxicity Testing Program

The Toxicity Testing Program (TTP) is intended to assess water quality in ambient surface waters of the State using reliable USEPA standardized toxicity testing procedures, modified USEPA toxicity identification evaluation (TIE) methods, bioassessments, and supporting chemical analyses.

Toxicity tests are integrative and cumulative measures of chemical effects on aquatic organisms and, also, provide a measure of the bioavailability of chemicals (i.e., the proportion of the chemical which is toxic) in water samples.

For the past 13 years, the TTP has been successful in providing information that identifies waterways where toxicity water quality standards (objectives) are not being met and whether these surface waters can support biological communities in aquatic ecosystems. In association with effective sampling design, the TTP has been effective in the identification of chemical causes, as well as geographic sources and land use practices, of surface water toxicity. The TTP has also identified the spatial and temporal extent of water quality problems as well as high risk areas.

The Clean Water Team: The Citizen Monitoring Program of the SWRCB

"Citizen monitoring" is the monitoring of aquatic resources, aquatic habitat, and water quality by members of the community. Across California, citizens are evaluating the health of streams, lakes, and ocean waters. Monitoring takes numerous forms based on the desires and capabilities of different community groups. Citizens may measure flow, dissolved oxygen, nutrients, or bacteria. They sample aquatic insects, identify birds and

amphibians, and watch for potential illegal spills and discharges or chronic problems, such as severe soil and stream bank erosion. Community members respond to the unique nature of the aquatic resources near their homes and design monitoring programs accordingly.

Information collected by community members can be used at the local, regional, and State level. It has been summarized and presented at city council meetings, assessed as part of watershed management plans, posted electronically, and published in local newspapers. Information gleaned from monitoring can help communities evaluate their management goals and the effectiveness of their efforts at restoring habitat, reducing pollutants, and protecting their waterways. Local planning offices, storm water agencies, and the RWQCBs have used citizen-collected data to identify riparian restoration sites, catch illegal dischargers, and identify pollution problems. Monitoring organizations that collect data in compliance with appropriate quality control measures can provide their data to the RWQCBs for use in 305(b) Reports.

2. Programs to Restore Water Quality

a. Statewide General Permits

Storm Water

The SWRCB has adopted two statewide National Pollutant Discharge Elimination System (NPDES) general permits addressing storm water discharges associated with industrial activities and from construction activities resulting in a land disturbance of five acres or more. Dischargers are required to eliminate most non-storm water discharges, develop a storm water pollution prevention plan to identify and implement control measures to minimize pollutants in storm water runoff, and monitor their discharges. There are currently more than 15,000 dischargers enrolled under these two permits.

b. Cleanup Funding Programs

Underground Tanks Cleanup Fund

To address the problems and expense of cleaning up leaking underground fuel tanks, the SWRCB administers the Underground Storage Tank (UST) Cleanup Fund (implemented in 1991) which pays for corrective action and third party liability costs up to $1.5 million per occurrence. As of September 2000, the fund had received 15,812 applications, of which 12,733 have been approved. There were 8,159 letters of commitment issued for over $1 billion. Over $893 million was paid out on 22,862 reimbursement requests. Since Fiscal Year (FY) 1992-93, the Fund has committed 100 percent of its annual appropriation each year to reimburse responsible parties for their cleanup.

c. Plans and Policies

Containment Zone Policy

In October 1996, the SWRCB adopted the "Containment Zone Policy." A containment zone is defined as a specific portion of a water bearing unit where the RWQCB finds that attainment of water quality objectives is technologically or economically unreasonable and where the RWQCB believes pollutants can be contained. The discharger(s) is required to take all actions necessary to prevent the migration of pollutants beyond the boundaries of the containment zone in concentrations which exceed water quality objectives. An approved monitoring program is required to verify containment, and mitigation measures are required to compensate for any significant adverse environmental impacts attributable to the discharge.

In an effort to ensure statewide consistency in applying and implementing the Policy, the SWRCB incorporated into the amendment a provision for the designation of a "Containment Zone Review Committee" consisting of staff from the SWRCB and each of the RWQCBs. The committee reviews problems and issues associated with the Policy and makes recommendations for consistency and improved procedures.

Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Policy) was adopted by the SWRCB on March 2, 2000 and was approved, with modifications, by the Office of Administrative Law (OAL) on May 22, 2000. The policy has been submitted to USEPA, Region 9, for review. Meanwhile, it is in effect under State law and is being implemented by the RWQCBs. The Policy contains implementation provisions for priority pollutant criteria contained in the National Toxics Rule and the California Toxics Rule and for priority pollutant objectives established by the RWQCBs in their water quality control plans.

Statewide Water Quality Enforcement Policy

The year 2000 goal of the SWRCB and RWQCBs is to achieve measurable increases in the rate of compliance with state and federal laws by January 2001 and to continue these increases into the future. The progress toward achieving this goal will be reported to the public in a Compliance Report Card prepared by each RWQCB and the SWRCB. The SWRCB and RWQCBs are undertaking a series of activities to assure that compliance rates increase.

- INCREASED RESOURCES FOR ENFORCEMENT

  Following the issuance of the Water Quality Enforcement Policy and Guidance in April 1996, the Legislature added 21 new positions statewide for increased and improved enforcement of water quality law. The additional resources and increased emphasis on enforcement have resulted in an increase in enforcement actions. Beginning in FY 1997-98 there has been a 50 percent increase in the annual number of formal enforcement actions over the previous five-year annual average. The Governor's budget for FY 2000-01 provided an additional eight positions for enforcement of water quality requirements.

- IMPROVED REPORTING TO RWQCBS AND INCREASED ACCOUNTABILITY

  The SWRCB and RWQCBs have deployed a computer data base system to track all known instances of non-compliance and the resulting enforcement actions. The commitment to track this information has resulted in increased and more consistent attention to all regulated discharges. This increase is expected to result in better compliance rates. The data system will also provide the SWRCB and RWQCBs with information needed to target repeat violators and analyze the effects of compliance and enforcement activities.

- IMPLEMENTATION OF THE NEW MANDATORY MINIMUM PENALTY LAW

  Senate Bill (SB) 709, which went into effect January 1, 2000, provided for mandatory minimum penalties of $3,000 for specific violations of effluent limits and the development of pollution prevention plans. The first penalties under this law have just been issued.

- THE 1999 COMPLIANCE ASSURANCE AND ENFORCEMENT INITIATIVE

  The SWRCB and the RWQCBs created the Compliance Assurance and Enforcement Initiative in response to Winston Hickox, Secretary for Environmental Protection, Cal/EPA. The Initiative contains a result of an enforcement program review, and it provides a blueprint for program improvements including compliance rates.

California Ocean Plan

The Ocean Plan establishes physical chemical and biological water quality objectives for California's ocean waters and provides the basis for regulating of point and nonpoint wastes discharged into the State's coastal waters. The SWRCB adopted the current Ocean Plan in 1997 and is required to review it on a triennial basis. The SWRCB and the six coastal RWQCBs implement the Ocean Plan.

California Pesticide Management Plan

The SWRCB and Department of Pesticide Regulation (DPR) have developed the California Pesticide Management Plan for Water Quality to coordinate staff activities to protect surface and ground water from pesticides. It identifies each agency's role in water quality protection and pesticide regulation and promotes a sharing of information relating to the study of pesticides and regulatory efforts.

Watershed Management Initiative

The SWRCB and RWQCBs, as part of the Strategic Plan, are implementing a WMI to better coordinate and focus limited public and private resources to address both point and nonpoint source water quality problems especially in high priority targeted watersheds.

Watersheds are geographical areas in which water flows to a common outlet, e.g., a stream, lake, or other body of water. Each point in a drainage basin has its own tributary "watershed" ranging in size from the area upstream of the Golden Gate to the smallest ravine; therefore, California can be divided into thousands of watersheds. Watersheds form the basis for the boundaries of the nine RWQCBs.

Each RWQCB has a watershed strategy described in its WMI Chapter. These chapters are long term workplans covering activities for the next five to seven years. These strategies rely on close coordination with other State, federal and local agencies in using limited fiscal and technical resources. This ensures that local community groups will receive the assistance they need to effectively manage their local sources of pollution. Implementation of the WMI began in July 1997.

C. Cost/Benefit Assessment

1. Funding Review

The SWRCB is generally responsible for overall policy-setting and consideration of petitions contesting actions by the nine semi-autonomous RWQCBs. Each RWQCB makes water quality decisions for its watershed-based region. These decisions include setting standards, issuing waste discharge requirements and taking enforcement actions.

The statewide perspective on a wide range of water quality planning and regulatory functions is provided by the SWRCB's Division of Water Quality. These functions include monitoring for compliance with permit requirements, inspections of treatment facilities, and developing criteria and water quality standards for inland surface waters, bays and estuaries, and the ocean. In addition, the annual comprehensive State water quality assessments that culminate in the 305(b) Reports are provided by this Division.

The wide range of activities related to monitoring and improving the inland surface and ocean water quality in the nation's third-largest state are performed by approximately 100 staff of the Division of Water Quality and approximately 850 staff of the nine RWQCBs. In addition to the tasks associated with monitoring the natural runoff waters that flow over an area of 100 million acres, the quantity of water required to sustain California's current population of over 34 million inhabitants and to irrigate more than 7 million acres of agricultural lands create additional challenges related to treatment of water discharges by these users.

The total financial resources available to support the SWRCB and RWQCBs activities during the past five State Fiscal Years (FY 1995-96 through FY 1999-00) have fluctuated from a high of $401 million in FY 1995-96 to a low of $281 million in FY 1998-99, and up again to $332 million in FY 1999-00. However, during these five years, the share of revenues allocated to UST cleanup has increased steadily, from 50 percent up to 70 percent in the past year.

The recently-signed budget for FY 2000-01 provides an additional 17 percent increase over the recently-completed fiscal year budget, and with this augmentation the share allocated to UST will decrease to 65 percent. Thus, the SWRCB and RWQCBs' efforts to improve the quality of surface water bodies received a substantial increase in funding in this fiscal year.

The water distribution and wastewater treatment and necessary funding for the related services for the household and industrial sectors are the primary responsibility of cities and the industries located within these cities. The total cost for water treatment, therefore, can be estimated only by examining two separate sets of financial data that encompass two different time frames. The financial data for the statewide total of all city expenditures related to water supply, waste water drainage, and wastewater treatment are available for FY 1997-98. However, the most recent industry expenditure data are available for the calendar year 1994.

Although the time frames are very distinct, a comparison of these financial data can be made by converting the costs to a per-capita basis. The following table provides summaries of these data. The statewide city-total expenditures for sewer services that include wastewater treatment functions amounts to an annual cost of just under $80 per person. The most recent statewide data regarding industry expenditures for water pollution control are available through the U.S. Department of Commerce and are obtained

from a survey conducted by the U.S. Bureau of the Census. When these expenditures are adjusted by the relevant population numbers, the 1994 statewide water-related pollution expenditures by industry were equivalent to just under $30 per person.

Although it is not possible to directly convert this per-capita industry expenditure for 1994 into an equivalent expenditure for 1997, it could be assumed that the 1997 statewide value would still be under $40. Thus, the 1997 combined total statewide expenditure for sewer systems, wastewater discharge and treatment would be approximately $120 per resident or approximately 30 cents per person per day.

The annual revenues and costs related to municipal and city services in California are compiled by the State Controller. The most recent data are for FY 1997-98. Because many cities do not clearly distinguish between water supply and water treatment, especially in the revenue aspect of these utilities, the reported revenues are often quite different from the reported expenses. Thus, on a statewide basis, the revenues are only approximately equal to the expenditures. On an annual per-capita basis, the expenditures for water treatment in 1997 were approximately $76, while the expenditures for water supply were $72. Table 3a below summarizes these financial reports.

Table 3a. City Water and Sewer Funding: Statewide Total for FY 1997-98

			% Of All Cities
Revenues		Million $	Total Revenue
Sewer Service Charges and Connection Fees		1,888.7	5.3
Water Service Charges and Connection Fees		2,206.3	6.2
	Total	4,095.0	
Expenditures			Annual
Sewer Systems		Million $	Per-Capita $
Operating Expenditure		1,702.3	51.23
Capitol Outlay		836.7	25.18
Subtotal		2,539.0	76.42
Water Utilities			
Operating Expenditure		1,983.1	59.69
Capitol Outlay		411.8	12.39
Subtotal		2,394.9	72.08
	Total	4,933.9	148.50

Data source: *State of California, Cities Annual Report Fiscal Year 1997-98.*
California population estimate, end-1997 (Department of Finance): 33,225,657

The costs to California industry for water pollution monitoring and control are reported through a U.S. Bureau of Census report, part of the Current Industrial Reports. The most recent publication of the *Pollution Abatement Costs and Expenditures: 1994* reports contains expenditures for the years 1990 through 1994. For purposes of comparison, the data compiled for water pollution control are included with the data for air and solid(s) waste pollution control. The data are arranged into separate tables for Pollution Abatement Operating Costs (PAOC), Pollution Abatement Capital Expenditures (PACE),

and the Combined Expenditures. One additional table is provided to indicate a measure of economic impact upon the State in the form of a per-capita basis. This table was prepared by dividing each of the annual Combined Expenditure values by that year's estimated California population.

Table 3b. Pollution Abatement Costs Incurred by California's Industrial Sector

Operating Costs (PAOC)
(Million $)

Year	Total	Air	Water	S. Waste
1994	1,632.0	698.0	502.3	431.7
1993	1,426.2	546.0	484.9	395.4
1992	1,492.6	490.3	584.1	418.2
1991	1,717.0	616.4	549.7	550.9
1990	1,818.5	673.7	558.2	586.6

Capital Expenditures (PACE)
(Million $)

Year	Total	Air	Water	S. Waste
1994	1,699.0	1,271.3	408.4	19.2
1993	955.2	802.4	114.6	38.2
1992	547.9	418.7	88.5	40.7
1991	696.6	443.7	226.4	26.5
1990	503.0	286.6	176.1	40.3

Combined Expenditures: PAOC & PACE Value

(Million $)

Year	Total	Air	Water	S. Waste
1994	3,331.0	1,969.3	910.7	450.9
1993	2,381.4	1,348.4	599.5	433.6
1992	2,040.5	909.0	672.6	458.9
1991	2,413.6	1,060.1	776.1	577.4
1990	2,321.5	960.3	734.3	626.9

Combined Expenditures on a Per-Capita Basis ($)

Year	Total	Air	Water	S. Waste
1994	104.78	61.95	28.65	14.18
1993	75.56	42.78	19.02	13.76
1992	65.43	29.15	21.57	14.71
1991	78.97	34.68	25.39	18.89
1990	77.53	32.07	24.52	20.94

2. Improvements in Water Quality (Case Studies)

IRON MOUNTAIN MINE (Central Valley Regional Water Quality Control Board)

The 4,400-acre Iron Mountain Mine site is located nine miles northwest of Redding, about 70 miles south of the California-Oregon border and 60 miles inland from the Pacific Ocean. For approximately 100 years, the site was periodically mined for iron, silver, gold, copper, zinc, and pyrite. All mining operations were discontinued in 1963. Though the mine is inactive, acid mine drainage (AMD) continues to flow from the underground workings and from waste dumps. The AMD drains into Spring Creek, into Keswick Reservoir, and eventually into the Sacramento River.

Historically, this drainage of metal constituents into Spring Creek has caused a number of fish kills in the Sacramento River. These have usually occurred following periods of reduced rainfall that resulted in lowered dilution capacity in the River. Prior to any

remediation at the Iron Mountain Mine site, the daily average discharge of metals from Spring Creek into the Sacramento River was approximately 800 pounds of copper and 2,500 pounds of zinc.

The severity of the Iron Mountain AMD problem can be put in perspective by comparing the quantity of discharge to those of some other sites:

- The Iron Mountain Mine discharge of metals is more than twice the combined discharge of the other 28 largest abandoned mines in California.
- This discharge is equal to one-fourth of the combined national discharge of copper and zinc from all industrial and municipal sources.
- The Iron Mountain Mine discharge is the nation's largest surface water discharge identified for cleanup under the Federal Superfund Program.

During the period from 1976 to 1985, the Central Valley Regional Water Quality Control Board issued a number of enforcement orders against the current mine owners (IMM, Inc.). This resulted in extensive litigation and collection of some fines, but little in the way of AMD remediation. In 1983, the site was listed on the National Priorities List of Superfund sites. Over the next several years, a number of remediation alternatives were evaluated, and in 1986, implementation of control measures began.

The most significant remedial action was the construction and operation (starting in 1994) of a lime neutralization plant with a 3,200 gallon-per-minute (gpm) capacity. This plant treats most of the drainage from the mine's underground workings. Though it is effective, the process is also expensive with operational costs averaging about $3 million/year. There is presently no resource recovery to offset the cost of treatment. Sludge from the process is currently being disposed in the open pit above the mine.

From 1994 to the present, approximately 85 percent of the total metal load from the mine runoff has been removed. From October 1994 to July 1998, treatment plant records show that 1,052,000 pounds of copper and 2,900,000 pounds of zinc were removed. Without treatment of the Iron Mountain Mine drainage, this metal load would have entered the Sacramento River, endangering resident and migratory fish. Since January 1995, the RWQCB's Basin Plan standards for copper, zinc, and cadmium in this portion of the Sacramento River have been met.

However, some additional remediation is still needed. A project is being constructed to collect diffuse AMD seeps and transport those seeps to the treatment plant. Negotiations continue between the agencies and the responsible party (Stauffer Management Co.) over the need to address additional sources of AMD and the removal of contaminated sediments that have collected for many years in Keswick Reservoir.

THE CALIFORNIA DAIRY QUALITY ASSURANCE PROGRAM PARTNERSHIP AGREEMENT

California is the country's leading dairy producing state, supplying 18 percent of total dairy products. The State's dairy industry includes approximately 1.4 million cows and 2,300 dairies, located primarily in the San Joaquin Valley and the Riverside-San Bernardino area. The average dairy farm milks 600 cows, with each cow producing an average of 20,850 pounds of milk each year. The annual statewide production of milk is nearly 14 million tons. However, for each ton of milk produced, an average of 2.1 tons of animal waste is also produced. As a result, with 1.4 million dairy cows generating nearly 30 million tons of manure each year, proper management of dairy waste is critically important. With the average dairy herd size growing rapidly due to economic conditions, the magnitude of the waste problem is also growing.

Discharges from dairy waste lagoons to drainage ditches can lead to fish kills in public waterways. If dairy waste enters a river or stream, it can cause a drop in the dissolved oxygen in the water, killing fish and other aquatic life, or it can cause the biological death of chronically oxygen-starved waterways.

If pollution from dairy waste enters the drinking water supply, it becomes a serious public health threat. Liquid animal waste percolating into ground water can add nitrates and salts. Nitrate contamination of public water supply wells can often be traced to dairies. Such contamination forces public water system operators to seek alternative supplies or more expensive treatment methods. Animal waste can also be a source of bacterial and viral contamination of shallow domestic wells, which are not frequently tested. Microorganisms such as *E. coli*, *Salmonella*, and *Giardia* found in dairy waste can contaminate drinking water, causing acute gastroenteritis and fever, kidney failure, and sometimes even death. Private well owners who discover the contamination must purchase bottled water until their wells can be disinfected.

For these reasons, the SWRCB began working with dairy industry representatives, University of California dairy experts, and other State and federal staff to solve the growing problem. Their first action was the formation of the Dairy Quality Assurance Partnership. This is a formal cooperative agreement between the California Dairy Quality Assurance Program (CDQAP), University of California Cooperative Extension (UCCE), California Department of Food and Agriculture (DFA), Cal/EPA, SWRCB, CA/RA, DFG, three organizations within the U.S. Department of Agriculture (USDA): Animal Plant Health Inspection Service (APHIS), the Natural Resources Conservation Service (NRCS), the Farm Services Agency (FSA), and USEPA, Region 9.

On September 9, 1999, the State of California, the University of California, various federal agencies and the California dairy industry signed a partnership agreement titled *Dairy Waste Management: An Integrated Approach to Education and Compliance*. Industry organizations supporting this agreement include: California Dairy Research Foundation, California Farm Bureau Federation, California Manufacturing Milk Advisory Board,

California Milk Advisory Board, Milk Producers Council, and Western United Dairymen. The partnership's objective is to help California dairy producers meet all federal, State, regional, and local requirements relating to manure management through improved farming practices. This collaborative effort to prevent water pollution will play an important role in bringing California dairy producers into compliance with environmental regulations and protecting public health.

The program core components consist of environmental education workshops for dairy producers, development and implementation of Environmental Stewardship Farm Management Plans tailored to each dairy, and on-site evaluation of dairy facilities. The University of California, Davis, is providing education and training. The DFA will provide dairy facility evaluations.

- Environmental Stewardship Short Course: Dairy producers who volunteer to participate must complete an educational workshop in environmental stewardship developed or approved by UCCE. Workshops are already being held at various locations throughout the state and are conducted by UCCE staff. The curriculum has been developed with input from State, federal, academic, and industry stakeholders.

- Environmental Stewardship Farm Management Plan: Each participating dairy producer must complete and implement an Environmental Stewardship Farm Management Plan, which will document how the producer will manage the facility to prevent surface and ground water discharges of animal waste.

- On-Site Evaluation: The DFA, with assistance from each partner, has developed draft policies and procedures for an on-site evaluation and has been refining the review checklist by conducting test reviews of eleven dairy farms.

USEPA has awarded a grant of $443,740 to fund the short course and the on-site evaluations. The grant will fund ten courses annually and 1,000 on-site evaluations over the next three years.

As more dairy producers voluntarily participate in the partnership program and learn what they can do to protect our environment, the SWRCB is confident that we will see an improvement in water quality near dairies. The partnership's ultimate goal is to ensure a healthy environment for the people and wildlife of California.

GUADALUPE RIVER FLOOD CONTROL PROJECT COLLABORATIVE

The Guadalupe River flows northward through a 30-mile basin, and discharges into the southern tip of San Francisco Bay. The River, which has flooded twice in the past decade, is habitat for the endangered chinook salmon and steelhead trout. Regulatory and flood management agencies, along with environmental advocates, have developed a collaborative agreement to resolve long-standing flood control and associated mitigation issues for the Guadalupe River.

Since World War II, 14 floods have occurred along the river. The 1995 flood caused in excess of $9 million in damage. The U.S. Army Corps of Engineers (USCOE) has estimated that a large flood, which is likely to occur once in every 100 years, would cause damages in excess of $2 billion in Santa Clara County. The 1995 and 1998 flooding of the Guadalupe River, along with increased State and federal protection for steelhead trout and chinook salmon, have given new impetus for the need for a river management plan.

As a result of the significant flooding danger, the USCOE and the Santa Clara Valley Water District initiated a project to: (1) avert potential flooding; (2) provide and protect critical habitat for threatened and endangered species affected by the project; and (3) integrate with the City of San Jose's *Guadalupe River Park and Gardens Master Plan* for recreational uses along the River corridor. In late 1996, construction of the flood protection element of the project was halted as a result of the threat of litigation filed by a coalition of concerned citizens.

The Natural Heritage Institute, representing the Guadalupe-Coyote Resource Conservation District, Trout Unlimited, the Western Waters Canoe Club, and the Pacific Coast Federation of Fishermen's Association filed a *Notice of Clean Water Act Citizen's Suit.* Their argument was that the final phase of the flood control project, comprised mainly of concrete-lined channels, would harm steelhead trout and chinook salmon in the River. To avoid costly and lengthy litigation, the Santa Clara Valley Water District, the USCOE Sacramento District, and the City of San Jose agreed to form the *Guadalupe River Flood Control Project Collaborative* to pursue resolution of the issues.

The Collaborative included senior officials from the Santa Clara Valley Water District, USCOE, City of San Jose, San Jose City Redevelopment Agency, the Natural Heritage Institute, DFG, National Marine Fisheries Service, SWRCB, San Francisco Bay Regional Water Quality Control Board, and U.S. Fish and Wildlife Service (USFWS). A neutral consultant, CONCUR, Inc., was retained to facilitate the negotiations.

After 14 months of deliberation and thousands of hours of scientific research, the Collaborative reached agreement on a revised project addressing both long-term flood control and endangered species habitat needs along the portion of the Guadalupe River in downtown San Jose. The Collaborative also produced a detailed Mitigation and Monitoring Plan to comply with conditions set by the SWRCB. An adaptive management framework and mitigation accounting system rounded out the agreement.

The new project design uses an underground bypass culvert that will run parallel to the River. By allowing high flows to enter the bypass culvert, the river's capacity will more than double, while leaving intact over 3,500 feet of sensitive river habitat for the endangered fishes.

In approving the final plan, Walt Pettit, Executive Director of the State Water Resources Control Board, noted: "Preserving populations of anadromous fish within a leading

metropolitan area, while constructing a major flood control facility, will represent a remarkable milestone in environmental engineering in California. The SWRCB believes the Collaborative's agreement is a significant step towards this milestone."

CROWLEY LAKE TROUT FISHERY

Working for the Los Angeles Department of Water and Power (LADWP), headquartered in Bishop on the east slope of the Sierra Nevada Mountains, Brian Tillemans has been at the center of restoration and protection efforts for the famous Crowley Lake trout fishery and the tributary streams that feed the Lake. Tillemans works with LADWP's watershed lands in the Mono basin and Owens River watershed, most of which are leased to independent grazing operations. Concerns for water quality, fishery and other stream restoration issues precipitated an official complaint to the Lahontan Regional Water Quality Control Board by CalTrout, a private, statewide fishing organization.

It became Tillemans' job to find solutions to fishery loss problems. Tillemans characterizes himself as a "firm believer that good flow management and good land management will take care of creeks faster than any other thing. I've seen the opposite where they've come in and worked the streams with heavy equipment or tried Band-Aid fixes and it hasn't worked," he says. "You need to shore up your land management and couple it with good flow management."

Fencing to control distribution and timing of grazing within riparian areas and creating setback pastures were the earliest and most critical land use management changes made. In some areas, where stream degradation had been particularly heavy, cattle were excluded totally. In other areas, access was managed so the cattle could not concentrate grazing pressure on riparian areas. With riparian areas protected, vegetation started to change: sedges and rushes began recolonizing, trapping more fine sediment upon the banks. Fine sediment has a higher water holding capacity, providing a better bed for vegetation. Tillemans says, "I could see bank building going on before my eyes."

At the same time, Tillemans used LADWP's control over irrigation flows, which normally were diverted from tributary streams, to aid the restoration process. For five days, when snows were melting and peak flows were charging downstream, diversions were shut off to allow the flows to do their natural channel-forming work. High flow events, interacting with a good cover of riparian vegetation, build stable stream channels according to Tillemans, "scouring and depositing sediments as streams have done for millennia." He also was able to use flow control to help cottonwoods and willows reseed naturally. Just before the trees dropped their springtime shower of masses of new seeds, peak flows were allowed to cover the floodplain, priming it with moisture for the coming seeds. "Timing and flow management are as important as land management," Tillemans says.

Fishermen are delighted with the changes. In 1997, CalTrout presented an award to LADWP for the restoration work. And as many of the cattlemen have seen their grazing lands change from less nourishing dry land plant species to the more nourishing and tasty

species associated with a moister regime, they too are pleased with the results. This change has occurred because stable streams, protected by riparian vegetation, recharge the ground water basin; high flows are stored and later given back to the stream as base flow during the dry season when flows are otherwise low. Under this more natural regime, moisture is available for meadow vegetation where there was none available before.

UNITED STATES–MEXICO REGIONAL WATER QUALITY INITIATIVES

With the passage of the North American Free Trade Agreement (NAFTA), pre-existing environmental problems along the United States-Mexico Border have been greatly magnified. The very rapid economic development, related to maquiladora agreements, that has occurred along the narrow band of the Mexico side of the border has spurred a phenomenal increase in population, need for water supplies, wastewater treatment, and related infrastructure.

In order to address these environmental concerns along the United States-Mexico Border two bi-national institutions were created: the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADBANK). The BECC and NADBANK serve to identify and resolve a broad range of environmental infrastructure deficiencies in communities north and south of the United States-Mexico Border. Formation of the BECC and NADBANK prompted the formation in 1994 of the California Border Environmental Cooperation Committee (Cal/BECC) by the Governors of California, Baja California Norte (BCN), and Baja California Sur. Cal/BECC, under direction of an eight-member board, serves to identify, promote and resolve environmental infrastructure challenges along their shared border.

Cal/BECC has assisted communities in California and Baja California in securing grant monies to complete environmental review, engineering, design, and construction. Approximately $37.2 million dollars in grant monies have been allocated to projects in the Californias. To date, seven projects have been certified and are receiving funding.

In addition to their participation in Cal/BECC, Cal/EPA boards and departments continue their long term commitment to providing technical assistance and support to counterparts in Baja California. Significant technical assistance efforts are underway by five of the six departments and boards under Cal/EPA. The following examples describe projects whose completion has been made possible by the direct support of Cal/BECC.

WATER POLLUTION CONTROL EFFORTS

- Pollution Prevention Round Table -A proposal has been made to form a Pollution Prevention Round Table under the auspices of Cal/BECC. The purpose of the Round Table is to have federal, State and local regulatory personnel share current information on pollution prevention projects and develop bi-national projects that promote pollution prevention and compliance assistance.

- Industrial Waste Monitoring and Pretreatment - The SWRCB and RWQCBs and the City of San Diego are in the second year of a three year program to train and assist State of Baja California agencies with implementation of an industrial waste monitoring and pretreatment program in Tijuana. This program will help ensure that the International Treatment Projects comply with State and Federal discharge requirements.

- Department of Toxic Substances Control (DTSC) Workshops - The DTSC recently held several workshops focusing on pollution prevention. These workshops were geared towards the maquiladora industry along the California-Baja California Border and were organized with support from Cal/BECC, the State of Baja California Department of Ecology, San Diego State University, and the Autonomous University of Baja California.

INFORMATION EXCHANGE AND TECHNICAL ASSISTANCE

- SWRCB and City of San Diego - These two agencies have conducted four technology transfer workshops for the State of Baja California. Topics have included: (1) pump station design; (2) treatment plant improvements; (3) sludge disposal; (4) ocean outfall planning and design; (5) wastewater reclamation/reuse; (6) collection systems.

- Wastewater Operator Certification - The State of Baja California has expressed interest in establishing a wastewater operator licensing program similar to the one in California. The State of California and the Colorado River Regional Water Quality Control Board are providing technical assistance.

- Wastewater Operator Training - The State of California, the Colorado River Regional Water Quality Control Board, and Dr. Ken Kerri, Sacramento State University, are working with wastewater authorities in Mexicali to customize existing United States' wastewater operator training materials for use in Mexico. Dr. Kerri's materials are used throughout the United States as practical worker training guides. Baja California has asked for their program to be greatly expanded to include materials in wastewater, potable water, and industrial waste.

- California Border Coordinators Group - California and Baja California were the first Border State pair to establish multi-agency border coordinator positions at the state agency level. All state border coordinators meet quarterly. The border coordinators from California and Baja California meet semi-annually. These meetings allow state agencies on both sides of the border and within each state to discuss priorities and coordinate border activities.

- Industrial Waste Monitoring and Pretreatment Technical Assistance - An 18-month intensive sampling program is underway in Tijuana through the coordinated efforts of Cal/BECC, SWRCB, San Diego Regional Water Quality Control Board, and City of San Diego. Cal/BECC facilitated the development of the bi-national workplan which includes monitoring of metals and toxics which impair the operations of United States and Mexican wastewater treatment plants treating Tijuana wastewater.

INFRASTRUCTURE PROJECTS ALONG THE CALIFORNIA-BAJA CALIFORNIA BORDER *(San Diego Region)*

California-Baja California Environmental Infrastructure Needs Assessment--Cal/EPA and the State of Baja California published a report identifying 65 environmental infrastructure projects needed on both sides of the border for a total estimated cost of $1.4 billion. Over 700 copies of the report were distributed to border communities and interest groups. Projects which have been certified by the BECC and are receiving construction monies from the NADBANK include:

- **Brawley, CA**—The Project consists of replacing an outdated water plant that does not meet federal and State standards for water quality. The project will benefit 24,000 residents and is currently under construction with an anticipated completion date of March 1999.
- **Tijuana, BCN**—The Project consists of a parallel conveyance system and rehabilitation of a wastewater treatment plant. The project will allow needed repairs to the existing conveyance system and will help avoid sewage runoff into the Tijuana river. The project will benefit in excess of one million residents.
- **South Bay Reclamation Plant, San Diego**--Funding is currently being negotiated. The Project will allow treated wastewater in the southern part of the Metropolitan Wastewater System to be reused in several cities in southern San Diego County. The Project will decrease the burden on the overloaded treatment facility at Point Loma.
- **Ecoparque, Tijuana**--Funding is currently being sought. The Project consists of expanding a pilot project set up to treat wastewater to secondary standards that can be reused to irrigate green areas.
- **Mexicali II, BCN**--Funding is currently being negotiated. The Project cost is approximately $50 million. The Project consists of a series of smaller projects that will collect and treat wastewater from eastern Mexicali which currently flows into the New River.
- **International Wastewater Treatment Plant, San Diego County**--With financial and technical support from the State of California, the International Boundary and Water Commission and USEPA have completed construction of a 25-million gallon per day advanced primary treatment plant to treat Tijuana's wastewater, which is currently discharged untreated to Tijuana beaches. A 187 million gallon per day ocean outfall will be completed for existing and future San Diego and Tijuana needs. The total project costs are approximately $350 million.
- **Calexico, CA**—The Project consists of upgrading the current water treatment plant which does not meet federal and State water quality standards. The Project will benefit approximately 15,000 residents and will allow Calexico to comply with State and federal requirements. The community was recently awarded a $25,000 grant to fulfill environmental requirements.

- **Mexicali, BCN Quick Fixes**--A number of projects to eliminate raw sewage flows from Mexicali to the New River and improve pump stations have been completed.

Liaison Activities:

USEPA--California Border Infrastructure Group. This group is comprised of representatives of USEPA Region 9, USDA, NADBANK, BECC, USCOE, and Cal/BECC. The group meets every six weeks to discuss priorities and strategies in preparing projects for BECC certification and developing a sound financial package. The group also discusses project viability, environmental soundness, and qualifications under the BECC criteria.

Dialogue with Mexican agencies on California Waste Tire Regulations. Proposed waste tire regulations in California will provide a substantial economic impact to waste tire buyers and haulers from the State of Baja California and an environmental improvement to California.

Salton Sea Restoration - The Salton Sea Authority recently requested the assistance of Cal/BECC to obtain input on the numerous Salton Sea restoration alternatives from federal, State and local Mexican agencies. Previous efforts on behalf of federal agencies in the United States have fallen short of including participation from Mexico.

Ten States Alliance (Retreat)- Under the direction of the Governors of the ten United States/Mexico border states, the Environmental Secretaries of each state meet annually to discuss environmental problems and opportunities in the border region. As a result of the 1998 Ten State Alliance (Retreat), the *Coordination Principles Between The Border XXI National Coordinators and the U.S. and Mexican Border States and Tribes for the Border XXI Program*, were developed and signed by the ten states and USEPA in May 1999. These Principles provide an opportunity for full participation from the states as partners in the Border XXI Program.

Border XXI Activities - Cal/BECC coordinates Border XXI activities with the California Border Coordinators Group. This includes providing updates and comments on framework documents and projects, assisting in securing funding, and developing Standard Operational Procedures for work groups and sub-work groups. As Border XXI continues to expand, so will activities that may impact the California-Baja California Border region.

D. Regional Watershed Overview

1. Introduction

California is divided into hydrological regions that form the boundaries for the nine RWQCBs. The mission of the RWQCBs is to develop and enforce water quality objectives and implementation plans which best protect area waters at the regional level. This is a challenging task which must recognize local differences in climate, topography, geology, and hydrology. Additionally, the RWQCBs must consider all the competing uses of their Region's water including the needs of the environment, industry, agriculture, and municipal districts.

The foundation for pollution control in each region is its "Basin Plan" which identifies the region's water bodies, its beneficial uses (Appendix I), objectives to protect those uses, and a plan to achieve those objectives.

The RWQCBs issue waste discharge requirements and permits to control discharges to surface water, ground water, or wetlands from both point and nonpoint sources; enforce pollution control requirements; take action against violators; and monitor water quality.

The water resource protection efforts of the SWRCB and the RWQCBs are guided by a five year Strategic Plan (updated in 1997). A key component of the Strategic Plan is a watershed management approach for water resources protection.

This section introduces the concept of watershed management through the WMI. It includes descriptions, taken verbatim from the RWQCBs' WMI Chapters of the watershed management areas of each of the nine Regions and water quality problems and issues in these areas.

The WMI Chapters contain sections devoted to descriptions of activities to correct water quality problems. These descriptions are very thorough (task by task). Because of the length of these sections, they have been left out of this 305b Report. For more information on RWQCB activities to correct water quality problems, the reader can refer to the WMI Chapters.

2. Watershed Management Initiative

To protect water resources within a watershed context, a mix of point and nonpoint source discharges, ground and surface water interactions, and water quality/water quantity relationships must be considered. These complex relationships present considerable challenges to water resource protection programs. The SWRCB and RWQCBs are responding to these challenges with the WMI. The WMI is designed to integrate various surface and ground water regulatory programs while promoting cooperative and collaborative efforts within watersheds. It is also designed to focus limited resources on key issues.

Past SWRCB and RWQCB programs tended to be directed at site-specific problems. This approach was reasonably effective for controlling pollution from point sources. However, with diffuse nonpoint sources of pollutants, a new regulatory strategy was needed. The WMI uses a strategy to draw solutions from all interested parties within a watershed and to more effectively coordinate and implement measures to control both point and nonpoint sources.

During initial implementation of the WMI, each RWQCB identified the watersheds in its Region, prioritized water quality issues, and developed watershed management strategies. These strategies and the SWRCB's overall coordinating approach to the WMI are contained in the Integrated Plan for Implementation of the WMI.

Addressing water resource issues on a watershed basis is founded in determining the problems and needs independently of funding sources. In this way the analysis of problems and needs and their prioritization is unencumbered by program constraints. The melding of the pure analysis of needs and relationships in a watershed with programs presents an administrative challenge.

Addressing problems on a more holistic basis with a collaborative approach involving landowners and other agencies in a watershed represents a new and challenging role for government. The WMI seeks to facilitate solutions from all interested parties in a watershed, and coordinates measures to improve watershed health and ultimately the beneficial uses of water.

The process is responsive to the WMI called for in the SWRCB *Strategic Plan* (June 22, 1995). It essentially involves designating Watershed Management Areas (WMA) and performing the following steps:

- Assessing water quality related issues on a watershed basis,
- Developing prioritized water quality goals for watersheds from the issues,
- Addressing the issues with various programs through a multi-year implementation strategy, and
- Evaluating progress at the end of a specified time period.

The vision on a statewide basis of the watershed-based process is a yearly evaluation of the SWRCB units' and RWQCBs' multi-year plans by a management team representing SWRCB, RWQCBs, and USEPA. The intent is to provide a multi-year perspective to all participants at the same time, thus avoiding multiple negotiations among the various participants at separate times. It is anticipated that this will streamline the process in addition to providing the integration of programs on a watershed basis and in a multi-year perspective.

North Coast Region (Region 1)



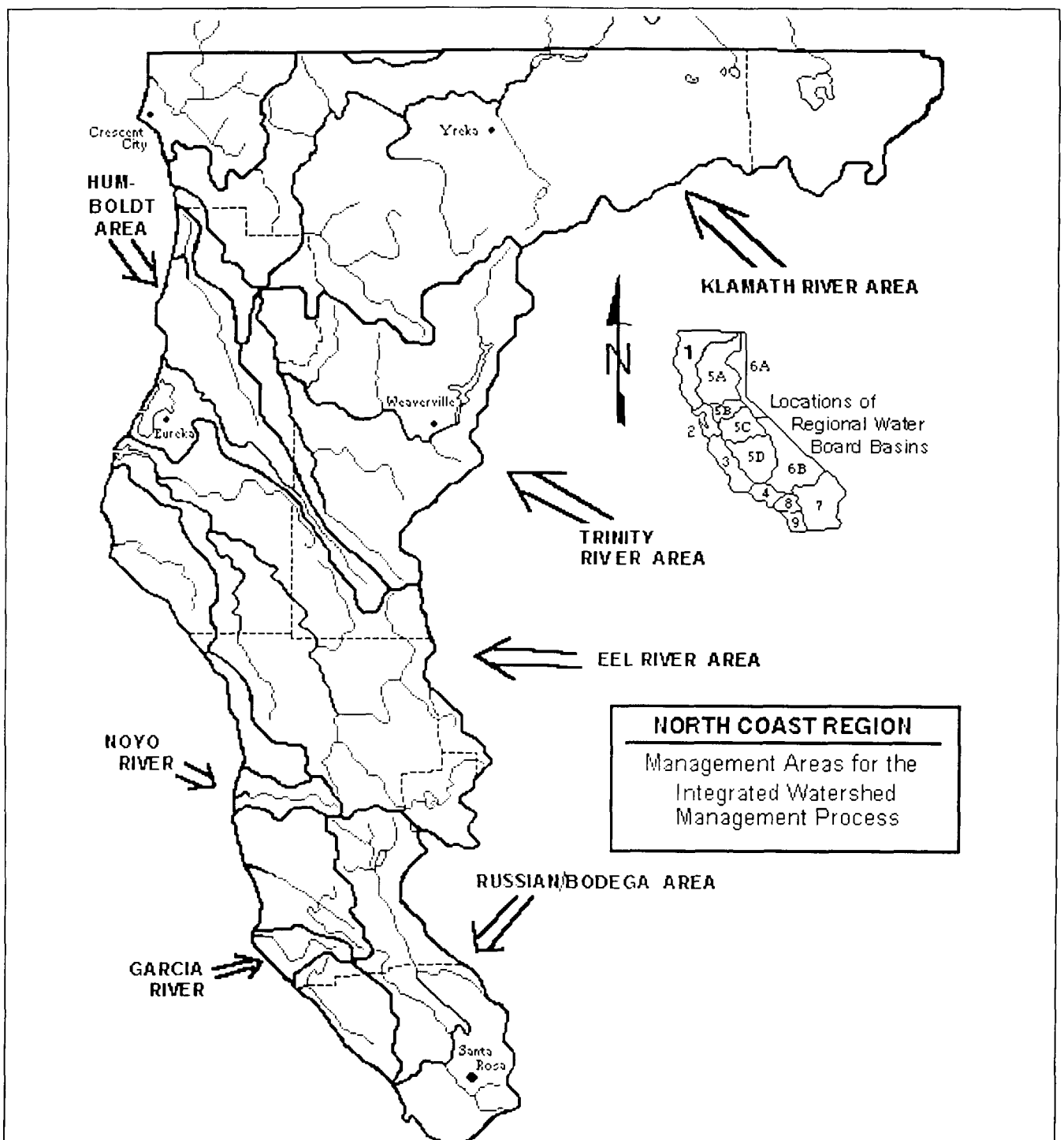
The focus of the watershed-based effort is to assure all North Coast Region activities are coordinated throughout a watershed in an efficient, integrated manner. Related land use issues will be addressed through self-determined "voluntary" compliance with appropriate enforcement if pollution events occur in accordance with current practices. Water resources issues will be coordinated with appropriate State and federal agencies, such as the SWRCB's Division of Water Rights and Department of Water Resources.

For the purposes of this process, "management area" is the basic planning unit and may contain one or more drainage "basins" or "watersheds." The North Coast Region WMAs and their watersheds are depicted in Figure 1-1. They are:

- 2.1 Russian/Bodega WMA
- 2.2 Klamath WMA
- 2.3 North Coast Rivers WMA
  - 2.3.3 Mattole River
  - 2.3.5 Noyo River
  - 2.3.6 Big River
  - 2.3.8 Navarro River
  - 2.3.9 Greenwood Creek
  - 2.3.11 Garcia River
  - 2.3.12 Gualala River
- 2.4 Humboldt Bay WMA
- 2.5 Eel River WMA
- 2.6 Trinity River WMA

Note that the "management areas" are on a different scale than the basins and hydrologic units specified in the *Water Quality Control Plan for the North Coast Region* (Basin Plan). This is a conscious effort to reduce the number of units within this process for reasonable assessment and budgeting. The individual watersheds and hydrologic units are not ignored and may be assessed at that finer level of resolution in the process.

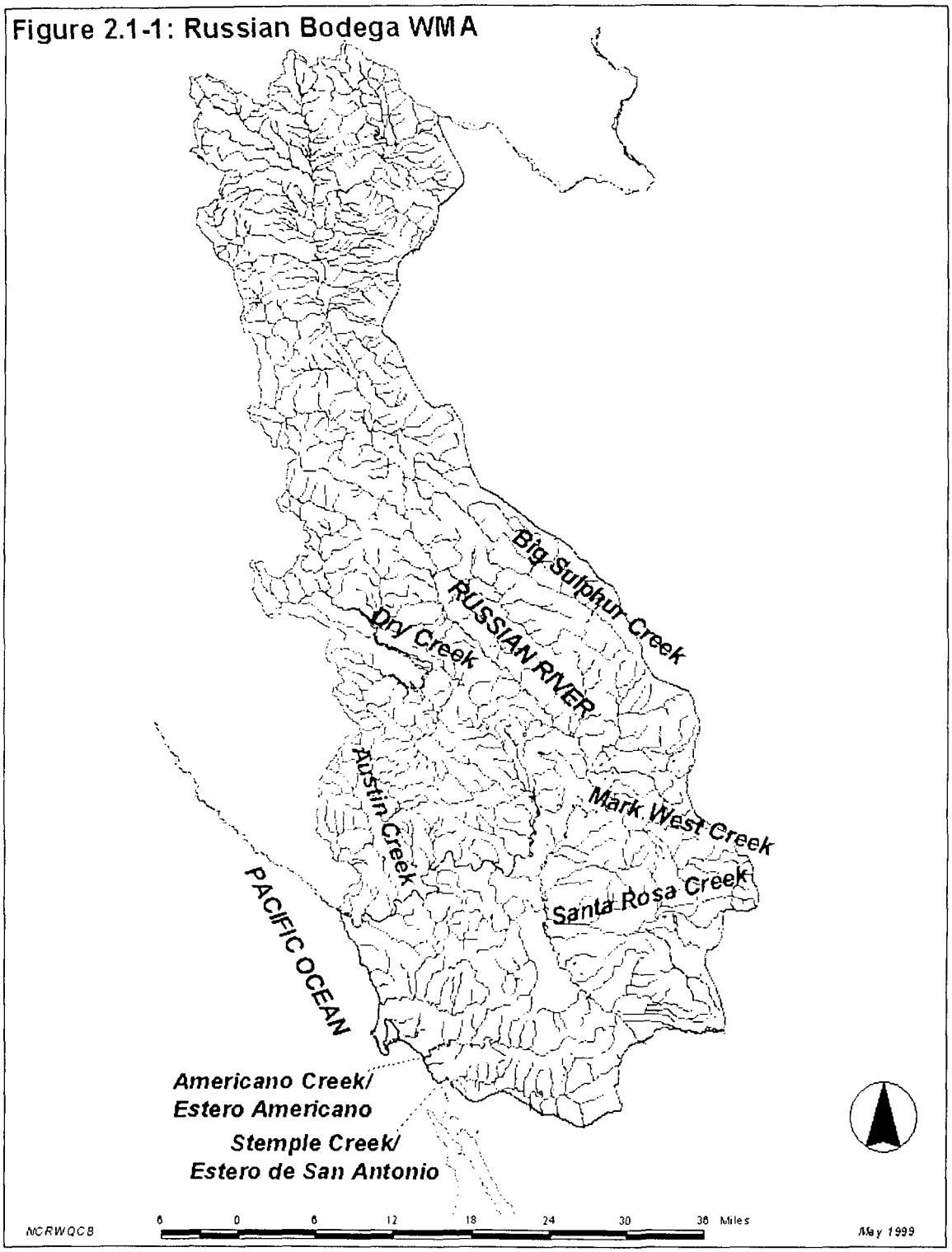
Watershed Management Areas for the North Coast Regional Water Quality Control Board's watershed planning process.



The North Coast Region faces several water quality issues. The highest priority water quality problems include contamination of surface water due to nonpoint source pollution from storm water runoff, erosion and sedimentation (roads, vineyards, timber harvest), channel modification, gravel mining and dairies, and methyl tertiary butyl ether (MTBE) and dioxin contamination. Ground water contamination from leaking underground tanks and health and safety issues from contaminated areas that are open to the public are also priority issues. High priority water quality problems due to point sources include chronic violations by publicly owned treatment works (POTWs) and lack of permit compliance. Lack of funding for water quality monitoring and watershed assessment compounds the difficulty of addressing these issues.

RUSSIAN/BODEGA WATERSHED MANAGEMENT AREA

Figure 2.1-1: Russian Bodega WMA



The following draws upon knowledge obtained through public involvement, agency contacts, and the personal experience of North Coast Regional Water Quality Control Board (NCRWQCB) staff. Significant strategy development and implementation are occurring in the management area at the present time. We recognize that the problem identification and watershed assessment and the strategy development are not complete and that further involvement will improve the effort.

MANAGEMENT AREA DESCRIPTION

This management area includes the Russian River and Bodega hydrologic units numbers 114.00 and 115.00, respectively. Within those units are the entire Russian River watershed (114.00) and Salmon Creek, Bodega Bay (including Bodega Harbor), Americano Creek, and Stemple Creek watersheds (115.00) (Figure 2.1-1).

Russian River Hydrologic Unit

The Russian River hydrologic unit encompasses 1,485 square miles in Mendocino and Sonoma Counties, bounded by the Coast Ranges on both the east and west. The mainstem is about 110 miles long, flowing southward from Redwood and Potter Valleys (north of Ukiah) to its confluence with Mark West Creek where it turns west to cut through the coast range and empties into the Pacific Ocean at Jenner (Figure 2.1-1.) The principal tributaries from the headwaters down are the East Fork Russian River, Feliz, Pieta, Big Sulfur Creek, Dry Creek, Mark West Creek (including the Laguna de Santa Rosa), Green Valley Creek, and Austin Creek. Elevations range from sea level at the estuary near Jenner to 4,343 feet at the summit of Mt. St. Helena in the Mayacamas Mountains.

Two reservoirs provide flood protection and water supply storage: (1) Coyote Dam and Lake Mendocino on the East Fork Russian River near Ukiah, and (2) Warm Springs Dam and Lake Sonoma on Dry Creek west of Healdsburg. A diversion from the Eel River through the Potter Valley powerhouse flows into the East Fork and Lake Mendocino. The Russian River hydrologic unit supplies drinking water, including ground water supply to over 500,000 people and an unknown amount of water for agricultural purposes. The SWRCB Division of Water Rights has declared the Russian River tributaries fully appropriated from April 1 through December 14. The Water Rights Division is in the process of developing a strategy to deal with additional diversions in the mainstem and tributaries outside of the fully appropriated period. The majority of flow in the Russian River is during the winter season when rainfall ranges from 30-80 inches, depending on locale. The summer climate is moist and cool near the coast with temperatures increasing in the upper valley areas that are more isolated from the coastal influence.

Bodega Hydrologic Unit

The Bodega Hydrologic Unit is typified by cooler temperatures and relatively high rainfall due to coastal influences. The terrain in this unit is relatively steep, with the streams carving through

the coast range and entering the Pacific Ocean south of the Russian River. Salmon Creek, Americano Creek, and Stemple Creek and their associated estuaries are the main water bodies. These streams are located in erosive topography and are sensitive to land disturbance. Summertime flows are often non-existent in Americano Creek and Stemple Creek, while Salmon Creek flow is low but sustained.

The three major watersheds in the Bodega Hydrologic Unit each have estuary areas. However, the most notable are the Estero Americano (Americano Creek) and the Estero de San Antonio (Stemple Creek). Those two estuaries are prized for their resemblance to fjords and the resource values associated with isolated estuarine areas.

Assessment:

Though limited by funding, we intend to focus assessment efforts on identified concerns regarding objectives, attainment (e.g., dissolved oxygen, bacterial quality, sedimentation), biological health (e.g., presence of xenobiotic estrogen responses in fish, benthic macroinvertebrate populations), evaluation of Basin Plan water quality objectives regarding federal Endangered Species Act (FESA) compliance (e.g., dissolved oxygen, temperature), ground water quality, and water quality and watershed modeling to assess the relative importance of various factors to changes in water quality. While some of the assessment efforts will be finished in the first three years of the five-year cycle, the FESA evaluations and water quality monitoring activities will continue into the next cycle. The biennial Water Quality Assessment under CWA Section 305(b) will be supported by the assessment and monitoring activities, including listings for Section 303(d).

ASSESSMENT AND PROBLEM IDENTIFICATION

The following analysis is based on existing knowledge of issues and problems in the Russian River basin from long-term water quality monitoring, discharger regulation, water quality planning, nonpoint source program efforts, and public involvement. However, the following analysis may not constitute a full assessment and will be updated annually.

Russian River Hydrologic Unit

The watershed is agriculturally based with urban and industrial uses concentrated around the incorporated municipalities. The most notable municipalities are Ukiah, Cloverdale, Healdsburg, Windsor, Rohnert Park, Cotati, Sebastopol, and Santa Rosa. The largest concentration of urban and industrial use is in the Santa Rosa Plain, with Ukiah and Windsor second and third. Industrial uses include electronics manufacturing industries, petroleum distribution plants, light manufacturing, wrecking and salvage yards, wineries, wood products, and industries related to the construction industry, with Santa Rosa as the commercial distribution center for the North Coast.

In the Potter Valley area north of Ukiah, irrigated agriculture and pasturing are common. Rangeland and mixed coniferous forests (with minimal timber harvesting) are prevalent in the

hills away from the farmed alluvial plains. Around Ukiah, irrigated orchards and vineyards are common land uses with light industry, several large wood products facilities associated with the timber industry, and gravel mining. Water quality issues in this part of the watershed are primarily associated with industrial areas, wastewater treatment plants, water use, erosion and sedimentation in the tributaries, destruction of riparian areas, and agricultural chemical uses in the alluvial areas.

Moving down the watershed, the Hopland area is predominantly vineyards with rangeland grazing in the areas away from the mainstem. The River then cuts through a small canyon with rangeland grazing as the primary land use before reaching Cloverdale and more vineyards. Vineyards predominate the valley areas down to the Santa Rosa Plains. Vineyard development in the hillside areas adjacent to the alluvial terrace is an increasing concern from the standpoint of erosion and sedimentation. Gravel terrace pits are another feature interspersed in the alluvial plain. In addition to the water quality issues upstream, bank erosion, health of riparian areas, construction activities, and more industrial, commercial, household, and agricultural chemical uses rank high as concerns for this area.

The Santa Rosa Plain and Healdsburg hydrogeologic areas contain large ground water basins, supplying water for municipal, domestic, industrial, and agricultural uses. The Santa Rosa Plain and tributary uplands include a number of animal facility operations,. There are currently 24 active dairies in the Mark West Creek (Laguna de Santa Rosa) watershed. Conversion of rangeland, pasture, and orchards to vineyards has increased in the last decade. The availability of reclaimed wastewater produced by the City of Santa Rosa operated sub-regional municipal wastewater treatment facility has resulted in conversion of about 6,500 acres of rangeland to irrigated pasture, cultivated fodder crops, and other uses. The Santa Rosa Plain is the most populated area in the North Coast Region with six incorporated communities and over 200,000 residents (1990 U.S. Census). A number of large river terrace pit-type gravel mines are located downstream of Healdsburg.

The trend appears to be toward continued conversion of range, pasture, and forest lands to vineyards and continued growth of the urban areas of Ukiah, Cloverdale, Healdsburg, Windsor, Santa Rosa, and Rohnert Park. Associated with that growth are active construction sites and an increase in light industrial operations. A concerted effort is being made in the Santa Rosa Plains to retain the (reclaimed wastewater irrigated crop) and pastureland type of agriculture and maintain the viability of the dairy industry; however, significant conversion of rangeland and pasture to vineyards continues to occur. The market for premium North Coast wine grapes far the outstrips the supply. Therefore, the pressure for land conversion to vineyards probably will not diminish.

The Laguna de Santa Rosa watershed drains the southern two-thirds of the Santa Rosa Plains. The Laguna de Santa Rosa, which is a major tributary of Mark West Creek, is listed for nutrient and dissolved oxygen impairment on the CWA Section 303(d) list. Nutrient and dissolved oxygen impairments results from both point and nonpoint source discharges and the hydrology of the watershed. An active waste reduction strategy is underway in accordance with Section 303(d) requirements, including the development of wasteloading limitations.

The Russian River turns to the west and cuts through the Coastal Range downstream from the confluence of the Laguna de Santa Rosa and Mark West Creek tributary area. This downstream physical structure of the River has a lower gradient and the summer base flow occupies most of the low flow channel. The lower Russian River hillsides are steep and forested with mixed conifers, redwoods being the major component. Residential areas are periodically along the River with a number of them located on the narrow flood plain. Land uses are consistent with the semi-rural setting with vineyards and pastures located on the flood plain benches. Industrial activity is associated primarily with timber (harvesting and lumber) and the construction trade. Tourism associated with summer recreational use of the river is a major economic base. Growth has been sporadic. The 1990 Census lists five unincorporated communities with less than 10,000 total residents. Water quality concerns include effects from upstream land use activities in both urban and rural areas and include individual on-site septic system problems and erosion and sedimentation problems from tributary streams.

As the river flood plain flattens to meet the ocean, the river widens into a relatively narrow estuary in the Jenner area. Land use is predominantly rangeland grazing and timber production.

Current Water Quality Conditions

Russian River sampling programs conducted over the last 20 years indicate substantial improvements in water quality. Pollution control efforts with respect to point sources (municipal and industrial waste treatment and discharge) and nonpoint sources (agricultural runoff, urban and industrial runoff, and septic tank practices) are largely responsible for improvements in water quality (*Interim Staff Report Regarding Russian River Water Quality Monitoring*, January 27, 1993, currently being revised).

Toxic substances have rarely been detected in the water column. Sediment sampling in 1985-86 and again in 1995 detected no pesticides in sediments. Monitoring of heavy metals exhibited no trends, with the exception of higher zinc in concentrations downstream from the more urbanized areas.

Toxic substance sampling in resident fishes and in transplanted freshwater clams does occasionally detect pesticides and/or heavy metals. However, the only significant trend is the presence of mercury in fish flesh from lakes (Pillsbury, Mendocino, and Sonoma) (TSMP data reports, 1976-1995; *Sediment Sample Results for Organic Chemicals, Metals, and Nutrients in the Laguna de Santa Rosa/Mark West Creek System and the Russian River*, 1985-86 and 1995 in draft form). The issue of mercury in fish flesh was referred to the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) for its analysis and action and a health advisory issued for Lake Pillsbury.

The major water quality issues associated with the Healdsburg and Santa Rosa Plain areas are concentrated downstream from the urbanized areas (storm water runoff, chemical usage, wastewater), and where animal facility operations (primarily dairies), cultivated agriculture, and industrial sites are located. Ground water resources have been affected by toxic discharges, (primarily petroleum products and solvents from leaky USTs and other industrial sites), with

municipal supply wells for the City of Sebastopol and City of Santa Rosa being shut down due to toxic chemical contamination. Many individual wells in the area are also contaminated by toxic chemicals.

Sedimentation, riparian area destruction, low stream flows, stream modification practices, and high water temperatures have been identified as concerns in the tributaries. The Russian River watershed was added to the Section 303(d) list for sedimentation issues in December 1997. Further assessment of conditions and actions to reduce impacts to the anadromous fishery from excessive erosion and sedimentation will be a priority for the future. The streambed of the mainstem of the Russian River through this area has downcut considerably due to a variety of factors. Obvious problems associated with that downcutting include bank erosion, downcutting of tributaries and the threat of barriers to fish migration due to excessive elevation changes between the tributaries and the mainstem, and lowering ground water elevations in the alluvial terraces. Exacerbating these problems is the large-scale invasion of exotic bamboo, *Arundo donax*, along the riparian areas of streams in the Russian River watershed. Concern is high and actions to address this problem are being discussed, including eradication by a variety of methods.

The Laguna de Santa Rosa is seasonally eutrophic. A TMDL has been developed and implementation is underway to reduce and/or eliminate nutrient sources necessary to improve water quality. CWA grant funding has been utilized for upgraded publicly owned treatment facilities in the watershed since 1972. A watershed task force developed recommendations for managing resources in the watershed, and the Laguna Foundation promotes restoration of wetlands and other wildlife and water quality resources in the watershed. A Waste Reduction Strategy (TMDL) is being implemented and tracked with attainment of dissolved oxygen objectives and the USEPA ammonia criterion as the goal (*Waste Reduction Strategy for the Laguna de Santa Rosa*, NCRWQCB, March 1, 1995; *Laguna de Santa Rosa Water Quality Objective Attainment Plan*, CH2M Hill Consulting, June 1994; *Investigation for Nonpoint Source Pollutants in the Laguna de Santa Rosa, Sonoma County*, NCRWQCB, September 24, 1992). Ammonia goals were met ahead of schedule, but dissolved oxygen continues to be a problem due to enriched bottom deposits in the Laguna.

Bodega Hydrologic Unit

This Bodega Hydrologic management unit is typified by rangeland grazing and animal facility operations, including dairies and some timber production in the Salmon Creek watershed. Although the community of Bodega Bay (in the Bodega Harbor watershed) has experienced some development in the last decade, the growth has been minimal in comparison to the growth that has occurred in the Santa Rosa Plain. The population of the Bodega Bay area was 1,127 residents according to the 1990 Census.

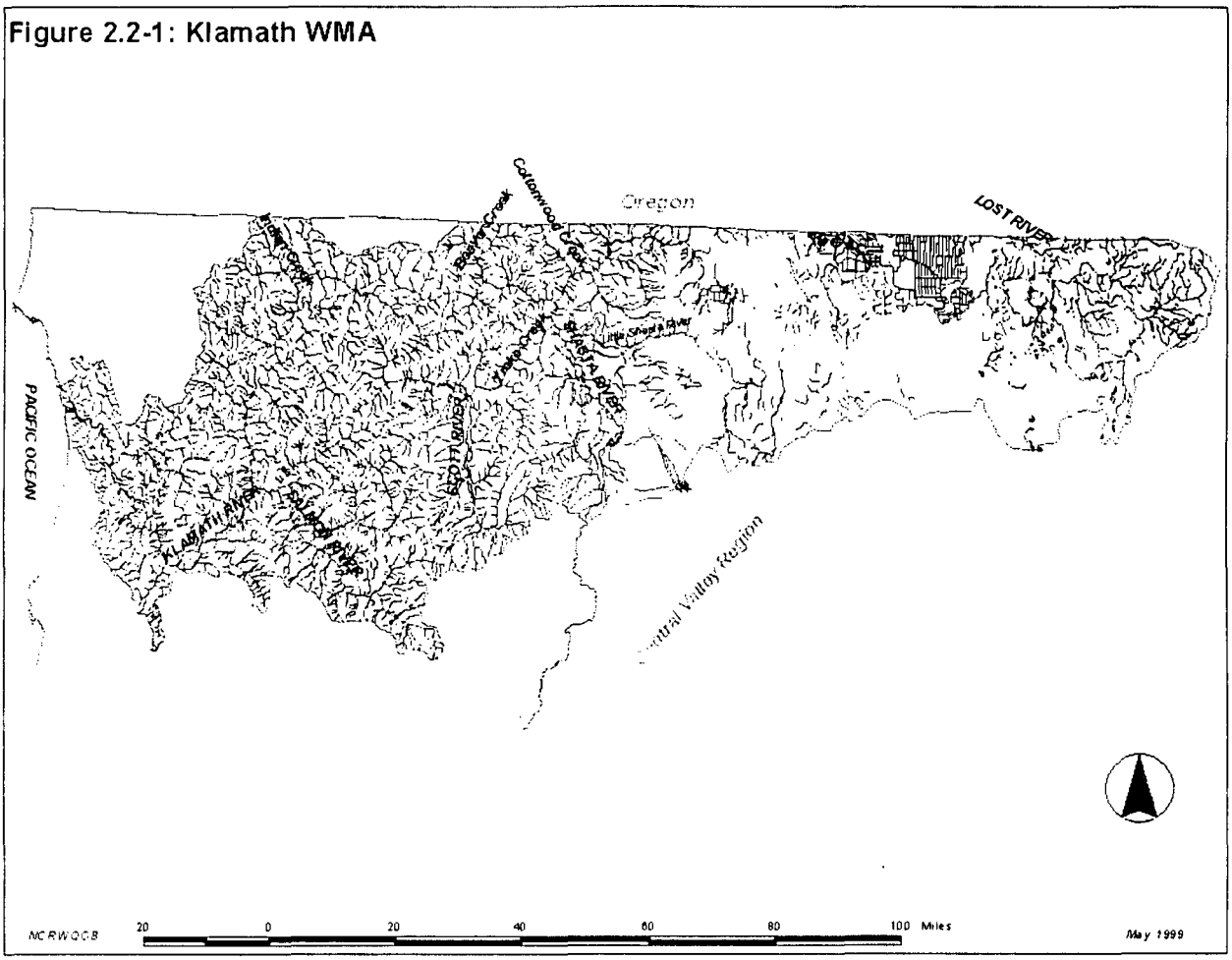
Americano Creek and Stemple Creek are CWA Section 303(d) listed for water quality impairment associated with high ammonia and low dissolved oxygen (*Stemple Creek Water Quality Characteristics and a Maximum Daily Load Process, Marin and Sonoma Counties*, NCRWQCB, August 15, 1995). A watershed group was formed in the Stemple Creek watershed to address erosion and animal facility operation waste issues. A Section 303(d) *Total Maximum*

Daily Load and Attainment Strategy for the Stemple Creek Watershed was developed and adopted by the NCRWQCB in 1997 to address sediment and nutrient issues. Water quality improvements have been documented in the last two years as a result of activities in the watershed.

The coastal watersheds (Stemple Creek Americano Creek, Salmon Creek, and other smaller tributaries to Bodega Bay) located south of the Russian River have historically received little attention from a water quality sampling perspective. However Americano Creek will be targeted for a waste reduction strategy similar to Stemple Creek in the next few years. The DFG is presently conducting water quality monitoring in Stemple Creek and Americano Creek; however, we are unsure of the future of that monitoring. The Marin/Sonoma Farm Bureau's Animal Resource Management Committee is implementing a citizen voluntary monitoring program for the Stemple and Americano Creek watersheds.

KLAMATH WATERSHED MANAGEMENT AREA

Figure 2.2-1: Klamath WMA



This WMA is targeted for a ten-year cycle to coincide with the Federal Energy Regulatory Commission's re-licensing schedule for Klamath River reservoirs.

The following discussion draws upon knowledge obtained through public input, agency contacts, and the personal experience of NCRWQCB staff. What is presented in this document is a summary of our knowledge regarding water quality issues and the existing and planned actions at this time.

MANAGEMENT AREA DESCRIPTION

The Klamath River Watershed Management Area (most of that portion of the overall Klamath River Basin which is within the State of California) has been divided into three sub-basins: Lower Klamath, Middle Klamath, and Upper Klamath (Figure 2.2-1). This division

facilitates our budgeting process, and it also helps us recognize that the size of the overall basin and its diversity in climatic and geologic facets and land uses affect water quality in different ways in different sub-areas of the basin. In addition to this, for convenience segmentation of the watershed area within California, we recognize that roughly half of the watershed is north (and mostly upstream) of the California-Oregon state border. This "segment" of the basin in Oregon has profound effects on the quality and quantity of the Klamath River in California. The Trinity River watershed, though within the overall Klamath "Basin," is not included in the Klamath River WMA. Each sub-basin is described below.

The Lower Klamath sub-basin encompasses that portion of the Klamath River and its tributary watershed downstream from the Scott River to the Pacific Ocean (excluding the Trinity River), and is 2,564 square miles in area. Included in the watershed are the Salmon River, Blue Creek, numerous smaller perennial streams, and the Klamath River delta/estuary. The area is largely rugged, steep forest land with highly erodable soils. The population of the area is small and scattered. Water quality issues have arisen as a result of unauthorized discharges or inadequately treated residential sewage. In one past instance, the NCRWQCB adopted enforcement measures and sponsored grant-funding assistance for the community of Happy Camp where flood damages caused raw sewage discharges. This issue was resolved after a community-wide sewerage system was built. Other issues have included:

- Several to-the-river garbage dumps have been abated;
- Mill sites and industrial/commercial activities which had direct discharges and spilled petroleum products have been cleaned up;
- Acid-drainage-producing mine waste sites also are under regulation by the NCRWQCB.

While such "past" issues now require diligent regulation, today's water quality issues in the sub-basin are related to the salmonid-habitat qualities of the mainstem river and the effects of silvicultural activities on both federal and private lands to the tributaries. These issues include high summertime temperatures, sedimentation, erosion, mass wasting and stream modifications, which affect salmonid habitats and forestland herbicide applications, which threaten domestic water supplies.

The Middle Klamath sub-basin is 2,850 square miles in area and encompasses that portion of the Klamath River and tributaries between the confluence of the Klamath and Scott Rivers and Iron Gate Dam.

Included in the watershed are the mainstem Klamath and the Shasta and Scott River watersheds and lesser tributaries. The two major tributaries, the Shasta and Scott Rivers, receive localized precipitation as well as snow and glacial melt from nearby mountain ranges. The quality of water from Iron Gate reservoir (which is the sum total of the effects of reservoir limnology, up-river irrigation development, and hydropower hydrology), agriculture in the Shasta and Scott Valleys and silvicultural activities in the remainder of the drainage are the major issues. Other water quality issues are related to surface water and groundwater contamination from toxic chemical discharges in the Weed and the Yreka areas. Voluntary nonpoint source control projects and monitoring activities in the Shasta and Scott Valleys have resulted in improved response by the local agricultural and timber-related interests and formation of

Coordinated Resource Management and Planning (CRMP) groups in the Shasta and Scott Rivers, and a French Creek Watershed Advisory Group (WAG). Remedial actions have reduced and/or eliminated problems with toxic chemical discharges. (Appendix D)

The Upper Klamath sub-basin includes watershed areas in California which are upstream of Iron Gate Dam. Many natural and human-altered watershed elements above Iron Gate and across the California-Oregon border affect the quality and quantity of water which exits Iron Gate Dam, supplies the mainstem flow, and affects (both supports and jeopardizes) the beneficial uses of the River within California. The complexity of this sub-basin is magnified by jurisdictional issues associated with water-delivery/utilization infrastructures (including the federal Klamath project irrigation), hydropower, endangered species, tribal rights, lake-level-management demands for Upper Klamath Lake, the waters criss-crossing the California-Oregon border, and minimum flow requirements in the Klamath below Iron Gate Dam. Considerable energy is being expended in State/federal cooperative efforts to assist in resolving trans-border issues. While we recognize that water quality assessment, planning, and management should be conducted with regard to the issues, the realities of the California-Oregon border and other jurisdictions color the perspective and intensify the issues.

Most of the Upper Klamath watershed area is in Oregon. The primary sub-watershed in California is the Lost River watershed, which is 1,689 square miles in area. That sub-watershed, which is about half-and-half in California and Oregon, encompasses Clear Lake Reservoir and most of its tributaries in California, the agricultural and contributing areas in Oregon, and back in California, the agricultural and wildlife-refuge areas which were once the bottom of Tule Lake and the Lower Klamath Lake. The Lost River basin was periodically connected to the Klamath River via the marshes which occurred south of what is now the community of Klamath Falls, Oregon, until Euroamerican settlement and development including farmland "reclamation" and construction of the railroad. Further south, the marsh-river systems dead-ended in Tule Lake that was a closed part of the basin with no natural outlet. The lower end of this basin has been modified to support agricultural crop production; and consequently, an artificial outlet has been provided for Lost River water to be pumped into Lower Klamath Lake. Lower Klamath Lake was originally a backwater of the Klamath River, but has been extensively modified for agriculture and a wildlife refuge. Water leaving that system is discharged northward back into Oregon to the Klamath River via the Klamath Straits Drain. Much of the former wetlands in the basin is now intensively managed for wildlife as part of the Klamath Basin National Wildlife Refuges, with mingled and overlapping cropping and wildlife uses.

Primary beneficial uses in the basin are domestic, agricultural and industrial water supply, cold and warm water fisheries, and recreation. The shortnosed sucker (*Chamistes brevirostris*) and Lost River sucker (*Deltistes luxatus*), native to the watershed, are listed as endangered under the FESA of 1973.

Both Oregon and California have CWA Section 303(d) water quality impairment in the Lost and Klamath Rivers. A joint effort to reconcile the inconsistencies between the Oregon and California standards and addressing the nonattainments is under way. A primary element of that effort is to first define the roles of the various states' agencies in these interstate water bodies.

Assessment:

We intend to focus assessment efforts on identified concerns regarding objectives attainment, and integration with Oregon's standards (e.g., dissolved oxygen, temperature, sediment, un-ionized ammonia) and evaluation of the need to develop an action plan for the management area to be included in the Basin Plan. Interagency coordination is a large part of the effort, since many agencies, tribes, and groups are collecting information and have jurisdiction.

A CWA grant supported an assessment effort in the Upper and Middle Klamath watersheds. It involved considerable interagency coordination and data sharing with the U.S. Bureau of Reclamation (USBR), National Biological Service, PacifiCorp, University of California at Davis, DFG, Oregon Department of Environmental Quality, and others. The overall assessment is aimed at describing the water quality relationships in the Klamath River downstream to Ike's Falls. Some minor assessment activities are occurring in the major tributary streams, notably the Lost, Shasta, and Scott Rivers. Additional investigations into pesticides in the Tulelake area may be warranted in the future.

In the Scott River watershed, sedimentation and temperature studies need enhancement, especially regarding sediment inputs from the east side of the watershed. A federal grant to investigate sediment sources in Moffit Creek was awarded in 1999. The local community is involved in a CRMP process that needs assistance in developing a TMDL waste reduction strategy for sediment and temperature.

The Shasta River watershed faces similar needs regarding local community assistance in developing a TMDL waste reduction strategy for temperature and dissolved oxygen. Further investigation of toxics issues in the upper watershed near Weed should be sought to determine the extent to which dioxins, metals, and MTBE contamination of local sites is impacting the beneficial uses of the Shasta River.

ASSESSMENT AND PROBLEM IDENTIFICATION

The Klamath River WMA is divided into three sections for ease in describing the various water quality problems and relationships. As we continue through the assessment phase, these sections will likely expand in relation to the knowledge we accumulate with respect to water quality and land use management.

Upper Klamath Sub-Basin.

Land uses and associated hydrologic and water quality factors in the Klamath basin change dramatically as we move downstream through the watershed areas. The uppermost Lost River basin around Clear Lake, characterized by high desert stream systems, continues to be dominated by cattle grazing on both U.S. Forest Service (USFS) and private lands. The area is sparsely settled, with Clear Lake being part of the Klamath Basin National Wildlife Refuges. Clear Lake was a natural water body whose outlet was dammed in the early 1900s for two main purposes:

(1) to retain upper-basin runoff in a place where it would evaporate to help accelerate the reclamation of the lower parts of the Klamath Project farmlands; and (2) to provide increased storage of water for downstream irrigation (which came into play after the lower basin was "reclaimed"). The water released from Clear Lake storage flows downstream in the Lost River through the agricultural areas of the Klamath Project in Oregon. A diversion canal has been constructed to link the Lost River to the Klamath River. Water from both river systems is then transported through the Lost River to irrigate more lands in Oregon and California upstream of Tulelake.

Land uses on the California side in the lower Lost River basin are primarily (1) crop agriculture such as grains, potatoes, and onions, (2) grazing, and (3) lands administered for the National Wildlife Refuge. Small agriculturally-based towns, such as Tulelake, provide the centers for commerce. This pattern of land use started about 1860, then accelerated at the turn of the century when the nutrient rich bottom lands and wetlands started to be reclaimed by the U.S. Government for homesteading and agriculture. Tule Lake sump and Lower Klamath Lake have been diked and managed to accommodate both agriculture and waterfowl. These are shallow, nutrient-rich water bodies. These lakes receive the agricultural drainage described above before it is then pumped back to the Klamath River north into Oregon upstream of the California-Oregon border.

The Klamath Basin in Oregon is dominated by the large, shallow, nutrient-rich Upper Klamath Lake. Major watersheds flowing into Upper Klamath Lake support silvicultural and grazing land uses for the most part. Upper Klamath Lake has been dammed (raising its surface by about 20 feet) to provide up to 735,000 acre-feet of storage beyond its natural capacity and enable release of water for Klamath Project irrigation. Much of the wetlands around Upper Klamath Lake have been reclaimed for agriculture and grazing. Klamath Falls, Oregon, is the major population center, adjacent to Upper Klamath Lake. Lumber mills, Kingsley Field Air Force Base (AFB) and agriculture associated with the Klamath Project are its economic bases. Klamath Falls is now growing and diversifying its commerce, although agriculture and timber interests still dominate the economy.

The Klamath River begins at the point where the outflow from Upper Klamath Lake is released through the modified natural channel known as Link River and also via hydro-power systems and thence enters Lake Ewana. This lake is controlled by Keno Dam. Below Keno, the River flows through rugged canyon areas into California. It passes through the John Boyle hydropower structures along its way. White water rafting is popular from John Boyle Dam down to the California border. Since 1965, when a USCOE flood-abatement project was constructed to drain Butte Valley/Meiss Lake, there is an occasional discharge to the Klamath River from the agricultural Butte Valley during abnormally wet years. This drainage discharge was a source of concern because of its muddiness and alkalinity during 1965-66 and 1996-97 when it was used to drain winter floodwaters from the valley.

Upon entering California, the Klamath River flows into Copco Reservoir through its hydro-power system and then into Iron Gate Reservoir. These reservoirs were created by dams for power generation and to regulate flow regimes down stream. Permanent residences and

cabins dot the shoreline of Copco Lake. Both cold and warm-water fishing are popular in the nutrient-rich waters. Iron Gate Dam blocks upstream salmon migration at this point in the Klamath River. Iron Gate Hatchery is located just downstream of the dam.

Middle Klamath Sub-Basin

The Middle Klamath sub-basin begins at Iron Gate Dam, downstream of which enters the Shasta River. The Shasta River valley has a substantial cattle-grazing industry on private lands irrigated extensively by streams in the watershed. Dwinnel Dam on the upper Shasta River controls stream flows for downstream irrigation, and the movement and distribution of water is complex. The City of Weed, which is supported by the forest-products and tourist industries, is situated upstream of the reservoir. The Shasta River historically was the top salmon-producing tributary in the Klamath River system. The small cities of Yreka and Weed are the primary centers of population.

The Scott River is the other major tributary in the Middle Klamath sub-basin. It also has a substantial cattle grazing industry irrigated extensively from streams in the watershed. Silvicultural activities on both USFS and private lands dominate the steep, highly erodable watersheds flowing into the valley floor. The Scott River alluvial gravels were mined extensively in the 1800s. That activity and more-recent channeling for flood control altered its morphological characteristics dramatically. The Scott River also supports substantial salmon runs. Small towns in the valley support the timber- and grazing-dominated economies.

Lower Klamath Sub-Basin

The Lower Klamath sub-basin below Scott River is characterized by mountainous terrain used extensively for silvicultural purposes on both USFS and private lands. Logging is particularly heavy on private corporate lands in the Redwood region of the lower basin. The small communities along the Klamath are almost all timber-based. The Karuk and Yurok Tribes make their ancestral communities along the lower Klamath River, with fishing being an important part of their cultures. The Lower Klamath River recreational salmon fishery is popular. There has been both historic and recent mining activity on some of the tributaries, such as Indian Creek.

FORESTED NORTH COAST RIVERS

North Coast rivers not specifically included in other WMAs are included in this grouping. The major watersheds from the Oregon border south include the following listing. Those in bold have information in this section:

Section 2.3.1	Smith River
Section 2.3.2	Bear River
Section 2.3.3	Mattole River
Section 2.3.4	Ten Mile River
Section 2.3.5	**Noyo River**
Section 2.3.6	Big River

Section 2.3.7	Albion River
Section 2.3.8	**Navarro River**
Section 2.3.9	**Greenwood**, Elk, and Alder creeks
Section 2.3.11	**Garcia River**
Section 2.3.12	**Gualala River**

A citizens' lawsuit against USEPA produced a consent decree scheduling a number of North Coast rivers for development of CWA Section 303(d) "TMDLs" or Total Maximum Daily Loads primarily for sediment and temperature. The NCRWQCB has accepted responsibility for developing and implementing waste reduction strategies in compliance with the CWA in the Mattole, Noyo, Big, Navarro, Garcia, and Gualala Rivers within this WMA. Of those, five are targeted for activities in FYs 1999-00, 2000-01 and 2000-02: Mattole, Noyo, Big, Navarro, and Gualala.

Most streams in this WMA support anadromous fisheries, including coho salmon, that were listed on July 19, 1995 as threatened under the FESA. The Mattole, Ten Mile, Noyo, Albion, Big, Navarro, Garcia, and Gualala Rivers, pursuant to Section 303(d) of the CWA, are listed as impaired by excessive sediment loading associated with historic logging, overgrazing, and road building. The Mattole and Navarro are listed for high water temperatures as well.

NOYO RIVER WATERSHED

The assessment and strategy provided for the Noyo River watershed at this time is not extensive. Based on the recognition that the anadromous fishery is in decline, activities to assess the watershed and improve conditions for anadromous salmonids are underway. A CWA Section 303(d) TMDL waste reduction strategy for sediment was completed and approved by USEPA in 1999. The following provides an overview of activities and outlines our basic framework and strategy at this time. Details will be added and the descriptions refined as the process proceeds.

MANAGEMENT AREA DESCRIPTION

The Noyo River watershed is a 66,000-acre coastal tributary that flows to the Pacific Ocean at the City of Fort Bragg. Redwood and Douglas fir forest on rugged, mountainous terrain dominate the watershed. The climate has moderate temperatures (annual average 53° F) and an annual rainfall of 39 inches. The primary land use within the watershed is timber harvesting by three large timberland owners: Mendocino Redwoods Company (previously Louisiana Pacific Corporation), Georgia Pacific Corporation, and the Jackson State Forest. The mouth of the Noyo River is dominated by a marina and associated fish processing facilities in support of the local fishing industry. Hillside vineyard development is a concern for production of sediment as land is converted to new vineyards in the future.

The Noyo River supports an anadromous fishery, including coho salmon, which were listed on July 19, 1995 as threatened under the FESA. The Noyo River, pursuant to Section 303(d) of the CWA, is listed as impaired by excessive sediment loading associated with historic logging, overgrazing, and road building.

The City of Fort Bragg uses surface water from the Noyo River as a primary source of drinking water. The City of Fort Bragg suffered from lack of sufficient quantity of water during the drought in the 1980s and is subject to high raw water turbidities during the winter period. A new water treatment plant was constructed in 1987. The water intake system was designed to frequently backflush compressed air through the intake screens to remove silt that was plugging the screens (State Department of Health Services, personal communication, July 1995).

A more complete description of the watershed and a map will be developed from the assessments for the TMDL waste reduction strategy for sediment.

ASSESSMENT AND PROBLEM IDENTIFICATION

The Noyo River watershed is primarily private land in timber production. Little development has occurred in the watershed in the last two decades. As mentioned above, the primary water quality concerns are related to drinking water supply and the anadromous fishery. Some of the major issues are listed below.

1. The City of Fort Bragg's Noyo River water supply is directly influenced by surface water and suffers from frequent siltation of the intakes.
2. The anadromous fishery has experienced shifts in species composition. California Department of Forestry and Fire Protection (CDF) employees, Valentine and Jameson repeated aspects of earlier fisheries work by DFG biologist, J. W. Burns, on the Little North Fork Noyo River in 1992 near the same location as Burns' initial study reaches. They found the total salmonid biomass was similar to that found by Burns, but the species composition has inverted from primarily coho salmon to primarily steelhead trout. They suggest that the decline in the stream channel's average pool depth in response to past logging practices seems the most likely instream parameter causing the inversion in salmonid species composition in the Little North Fork Noyo River.
3. The Noyo River, pursuant to Section 303(d) of the CWA, is listed as impaired by excessive sediment loading associated with historic logging, overgrazing, and road building. The harbor must be dredged on a frequent basis due to the large amounts of sediment deposited from upstream.
4. Contamination from diesel, penta- and tetrachlorophenol, and dioxins in stream sediments has been documented in the Parlin Fork and the Noyo River as a result of past activities at a wood treatment plant at the CDF camp.

NAVARRO WATERSHED MANAGEMENT AREA

The Navarro River in Mendocino County, California, is listed on California's 303(d) list as a water quality limited water requiring the establishment of a TMDL due to sedimentation and temperature. The key stakeholder concern for the Navarro River is the decline of the once healthy coho salmon and steelhead trout fisheries thought to be associated with excess sediment load and elevated water temperatures. Recently, the Anderson Valley Land Trust, Mendocino County Water Agency, and the California State Coastal Conservancy jointly prepared a Navarro Watershed Restoration Plan focusing on restoration opportunities related to sediment and temperature and their impact on salmonid species in the watershed. A Consent Decree entered in settlement of a lawsuit against the USEPA assigned the date of December 31, 2000 for completion of TMDL allocations for the Navarro River.

MANAGEMENT AREA DESCRIPTION

The Navarro River, together with its North Fork and major tributaries Rancheria, Indian, and Anderson Creeks, forms a 330 square mile coastal basin in southern Mendocino County. As recently as 1985, the Navarro was considered to have the most anadromous habitat of any coastal stream in the county. The Navarro was famous for its coho (silver) salmon runs. Today, the range and abundance of coho salmon have been reduced greatly and subsequently listed as threatened on the FESA list. The steelhead, although faring somewhat better than salmon due to a higher tolerance for high water temperature, also have been reduced severely.

The Navarro River basin supports a significant base of agriculture, livestock, and timber (and formerly fishery) production. Sheep and cattle graze the open grassland areas, especially in the headwaters. Anderson Valley, the most settled part of the basin, supports significant orchard and viticulture industries. Recent vineyard development of the highest ridges surrounding the Anderson Valley has led to the official designation of Sky Island appellation. The lower basin supports mixed redwood-Douglas-fir forest, which has been heavily logged. While exploitation of these resources has been in part responsible for the damage to the salmon and steelhead resource, they continue to play an important role in the local economy. The enhancement of the fishery must be planned and carried out in a way that takes account of other land uses and respects property rights in the basin.

The watershed damage and concomitant damage to the anadromous fishery of the Navarro River basin is in large measure a result of accelerated erosion and sediment production, coupled with reduced flows in late summer due to agricultural diversion.

A more detailed description and map is available in the restoration plan, *Navarro Watershed Restoration Plan* (1998).

ASSESSMENT AND PROBLEM IDENTIFICATION

This section will be developed further when the TMDL is completed. In summary, the primary water quality problems are sedimentation and increased water temperatures. Probable causes include logging, road building, vineyard conversions, landslides, and grazing. Water diversions are an issue the SWRCB's Division of Water Rights is addressing.

GREENWOOD CREEK WATERSHED

The Greenwood Creek watershed is located in Mendocino County in California. It was considered for the 303(d) list for sedimentation, but was not listed. This watershed is still a priority watershed because of FESA listing of threatened for coho salmon.

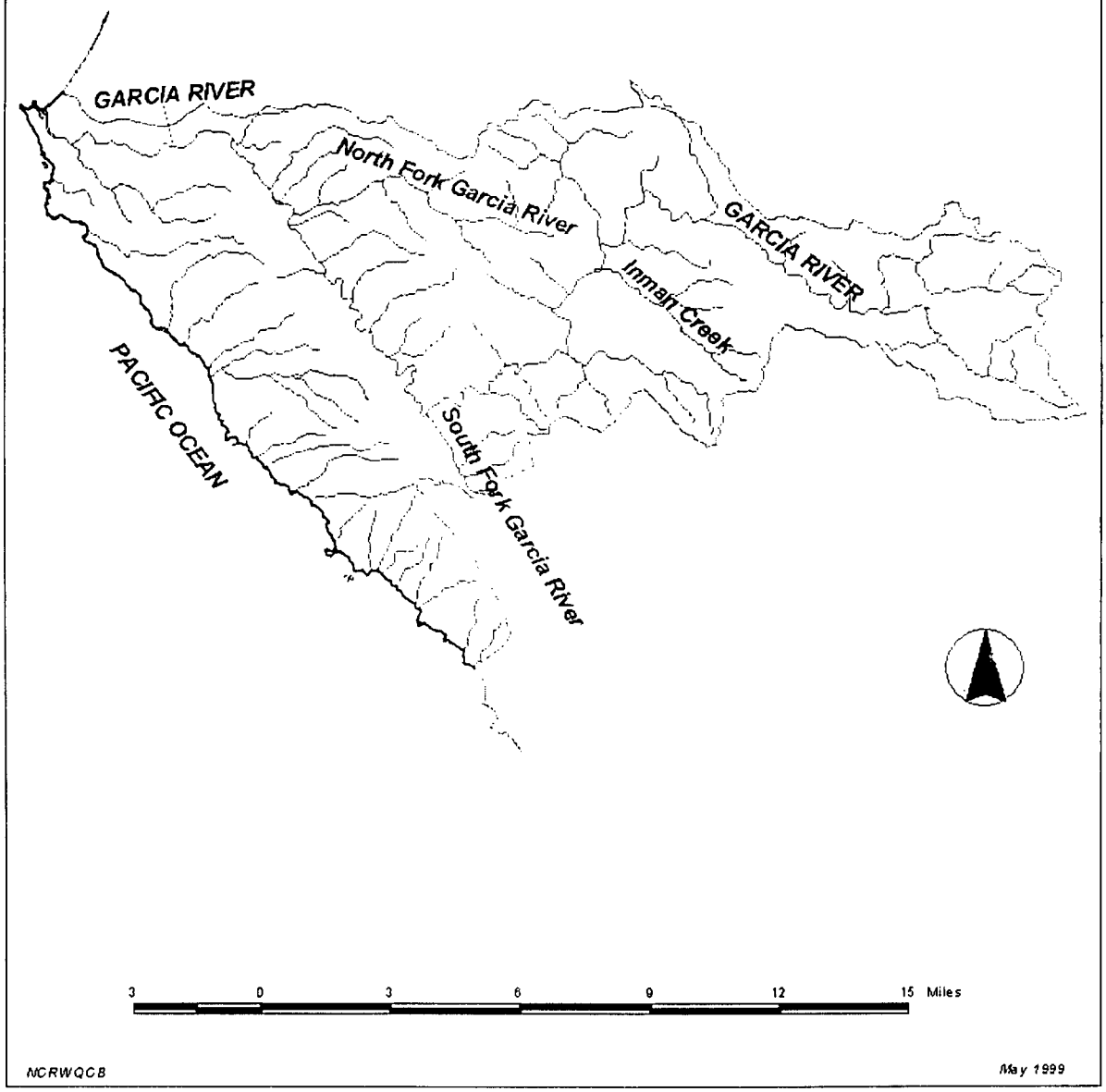
The Creek itself supports municipal supplies to the town of Elk, cold water and migratory/spawning habitat for salmonids, wildlife habitat, recreation, and agriculture.

MANAGEMENT AREA DESCRIPTION

Greenwood Creek Watershed is about 16 miles long and approximately 16,000 acres in area. It is located on the southern Mendocino Coast between the town of Elk and Philo and between Greenwood Ridge (north), Clift Ridge (south), and Signal Ridge (east). Most of the coastal watershed is privately owned, with 60 percent owned by Mendocino Redwood Company (formerly Louisiana-Pacific Corporation) as Timber Production Zone land, and the rest owned by approximately 50 smaller landowners. The only public land in or adjacent to Greenwood Creek is Greenwood State Beach, which contains the Greenwood Creek estuary and a very small parcel owned by Elk County Water District. Primary land uses include timber production, viticulture, fruit orchards, residences, and limited cattle ranching.

GARCIA RIVER WATERSHED

Figure 2.3.11-1: Garcia River Watershed



MANAGEMENT AREA DESCRIPTION

The Garcia River watershed, located in southern Mendocino County, is a forested watershed with coastal influenced climate in the lower half of the drainage (Figure 2.3.11-1). Steelhead and coho salmon utilize the stream for spawning and rearing; however, populations have plummeted in the last decade. The Garcia River is listed under CWA Section 303(d) for excessive sedimentation and subsequent anadromous salmonid habitat loss.

Natural events and multiple land uses are responsible to varying degrees for sediment contributions through accelerated erosion and mass wasting and include timber production and harvest, road construction and maintenance, grazing, and gravel mining. The watershed is all privately owned under multiple ownership. Hillside vineyard development is a concern for production of sediment as land is converted to new vineyards in the future.

A comprehensive watershed description is included in the *Proposed Garcia River Watershed Water Quality Attainment Strategy for Sediment* (Mangelsdorf and Lundborg 1997) and the *Assessment of Aquatic Conditions in the Garcia River Watershed* (NCRWQCB 1997) that was prepared for the development of a CWA Section 303(d) wasteload allocation and sediment reduction process (TMDL).

Assessment and Monitoring:

A monitoring strategy is contained in the Water Quality Attainment Strategy (WQAS) but needs to be refined. We will work with the UCCE in its rangeland management and monitoring training activities and major landowners in priority sub-watersheds, as well as promote volunteer monitoring in the watershed. Monitoring for the most part will be supportive of the WQAS and assist in fine-tuning the numeric targets and implementation measures. First-round TMDL monitoring will take place in the spring of 2000. A CWA Section 319(h) grant was approved in 1999 to support local volunteer monitoring of implementation actions. Additional detail on NCRWQCB monitoring and assessment needs are presented in Appendix 2.3.11-B.

ASSESSMENT AND PROBLEM IDENTIFICATION

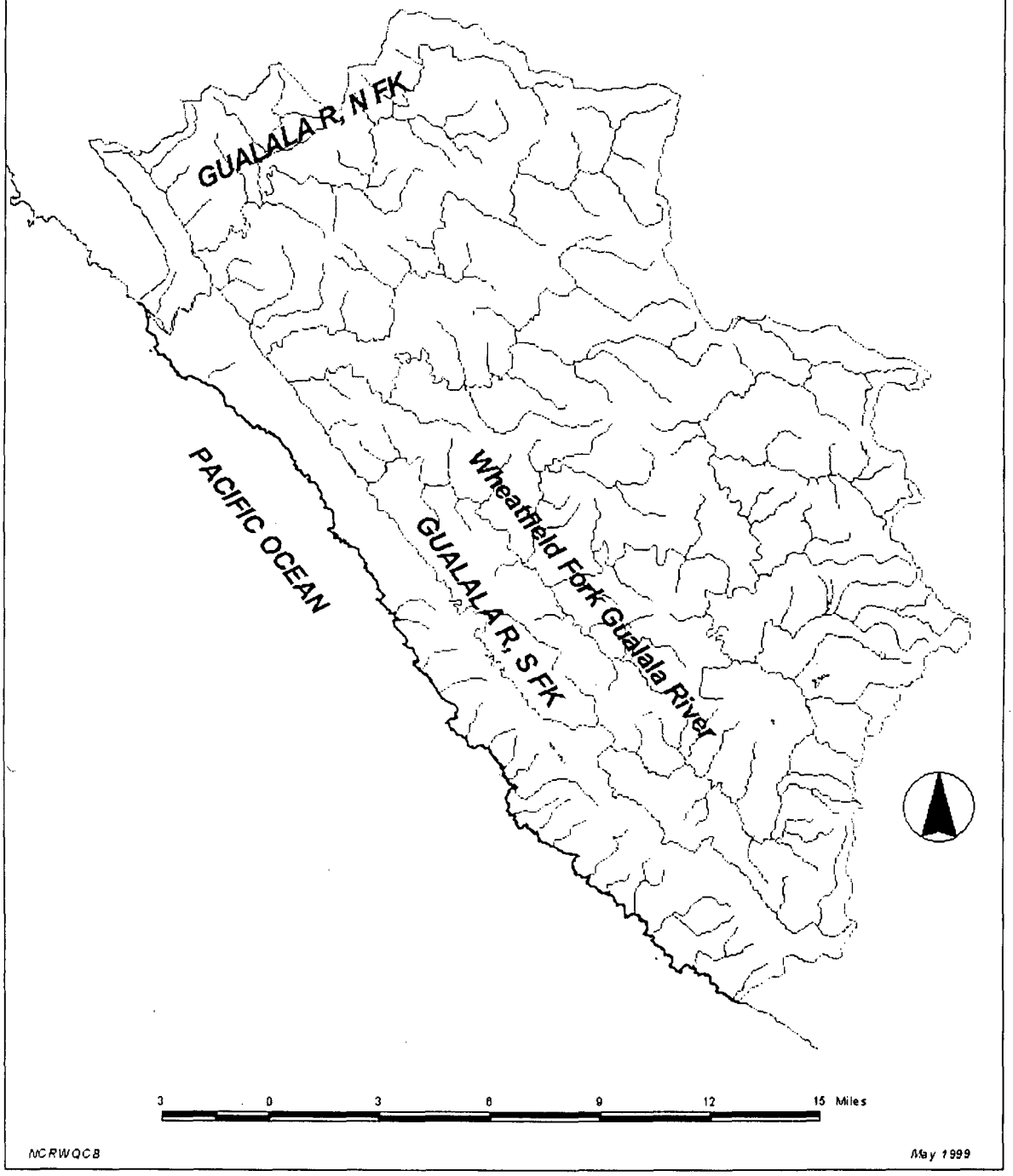
The existing watershed enhancement plan provides an overview of the problems and identifies specific areas for implementation. The WQAS details specific problem areas and sediment sources. The following is an overview and is not intended to duplicate the comprehensive analysis in the WQAS.

Overview of current and future land uses

Primary land uses are forestry, grazing, and gravel mining, with little change in the last two decades. The WQAS contains additional detail on land use and changes over time that are not repeated in this section.

GUALALA RIVER WATERSHED

Figure 2.3.12-1: Gualala River Watershed



The Gualala River in Sonoma and Mendocino Counties, California, is listed on California's 303(d) list as a water quality limited water requiring the establishment of a TMDL for sedimentation. The key stakeholder concern for the watershed is the decline of the once healthy salmon and steelhead trout fisheries thought to be associated with excess sediment load and elevated water temperatures. A Consent Decree entered in settlement of a lawsuit against the USEPA assigned the date of December 31, 2001 for completion of TMDL sediment allocations for the Gualala River.

MANAGEMENT AREA DESCRIPTION

The Gualala River watershed is about 300 square miles, running in a north-south direction and flowing into the ocean at the town of Gualala (Figure 2.3.12-1). The watershed is in mountainous terrain and relatively erodable soils. The tributaries flow through steep valleys with narrow bottom lands and elevations range from sea level to over 2,650 feet. The steep slopes are forested mainly with Douglas fir and redwood interspersed with madrone and tan oak. Rainfall averages 38 inches per year at the coast and up to 100 inches per year on the inland peaks. Primary land use is forest production and grazing. Hillside vineyard development is becoming an increasing threat to water quality as more and more steep land is converted to vineyards.

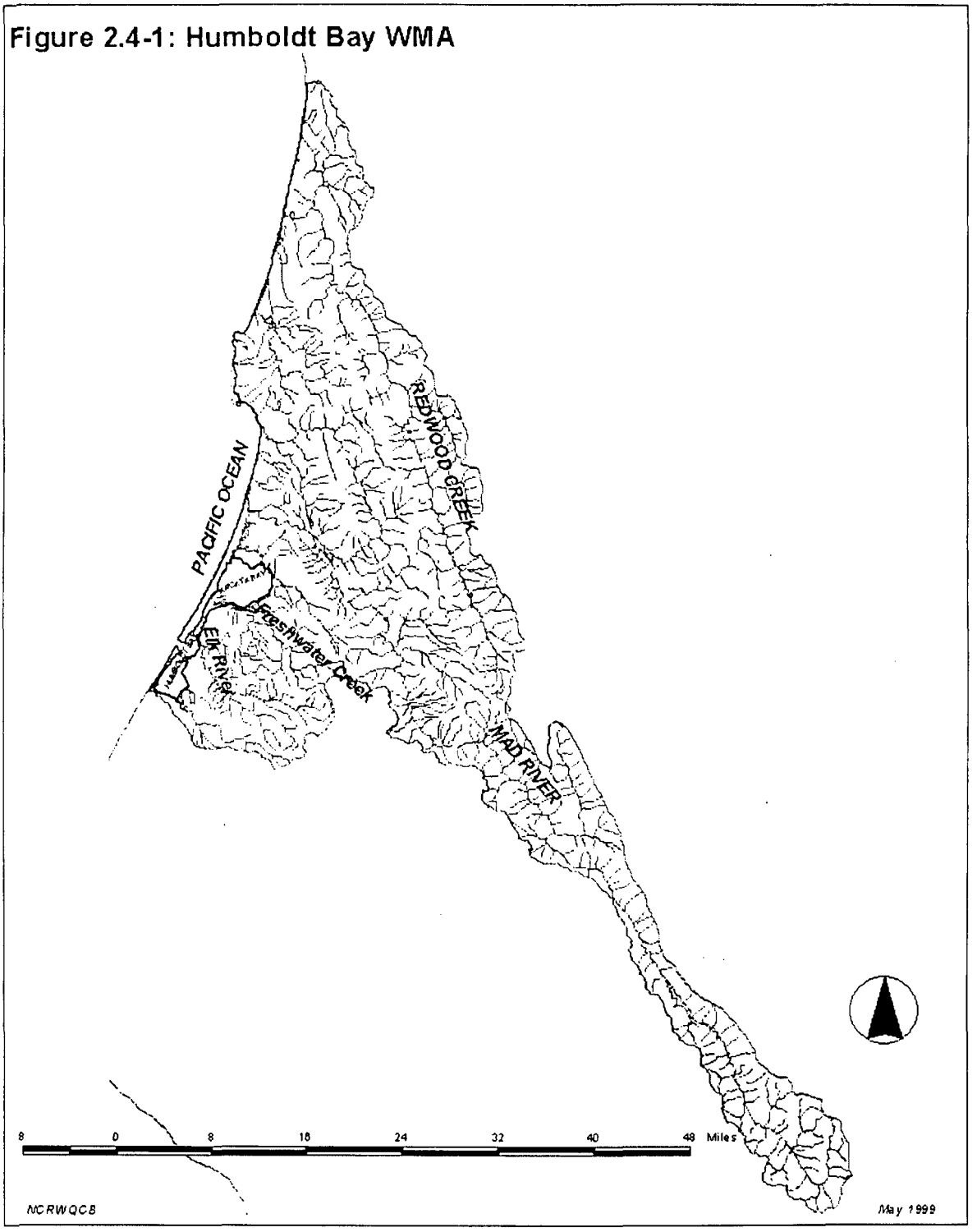
Assessment and Monitoring:

Assessment of existing information and some ground-truthing is needed in developing the TMDL strategy. We will be drawing from existing information developed for the enhancement plan. Monitoring in the short term will assist in ground-truthing existing information for the TMDL development and evaluating water temperature problems. An assessment of bacterial quality in two high use recreation areas may be undertaken in the future as well. In the long term, monitoring will be associated with determining the effectiveness of management practices to reduce erosion and sedimentation and determining trends towards the desired future condition.

In summary, the primary water quality problems are sedimentation and increased water temperatures.

HUMBOLDT WATERSHED MANAGEMENT AREA

Figure 2.4-1: Humboldt Bay WMA



The following draws upon information obtained through public input, agency contacts, and the personal experience of NCRWQCB staff. What is presented in this document is a summary of our knowledge regarding water quality issues and the existing and planned actions at this date in time based on current NCRWQCB staff knowledge.

MANAGEMENT AREA DESCRIPTION

This area encompasses the water bodies that are tributary to the Pacific Ocean from Humboldt Bay north to and including Redwood Creek and all groundwater within that area (Figure 2.4-1). Major river systems in this area are the Mad River and Redwood Creek. Other major water bodies include Humboldt Bay and Mad River Slough, numerous coastal lagoons (Big Lagoon, Stone Lagoon, Freshwater Lagoon), and coastal streams (Elk River, Freshwater, Jacoby, and Maple creeks, Little River).

Freshwater streams in this unit support production of anadromous salmonids, including steelhead and cutthroat trout, coho and chinook salmon. The Mad River is the drinking water and industrial supply for the Humboldt Bay Area, and other coastal streams provide drinking water for local communities and individual homes. The deltas of the Elk River and Mad River Slough support commercial and sport shellfish production and harvesting.

Land use in the WMA is primarily timber production, with agricultural uses in the non-forested areas consisting primarily of grazing and dairies. Lily bulb farms are found in the Arcata bottoms and the McKinleyville area. Urbanized areas include Trinidad on the ocean, McKinleyville and Blue Lake on the Mad River, and Arcata and Eureka on Humboldt Bay. Rural residential developments are scattered throughout the timber/grazing interface.

Humboldt Bay includes the typical coastal values of an estuarine embayment, as well as an extensive commercial oyster industry. It is a major shipping center for the North Coast, the largest such center between San Francisco and Coos Bay, Oregon, and presents the potential for water quality problems associated with industrial uses adjacent to the bay.

Assessment and Monitoring:

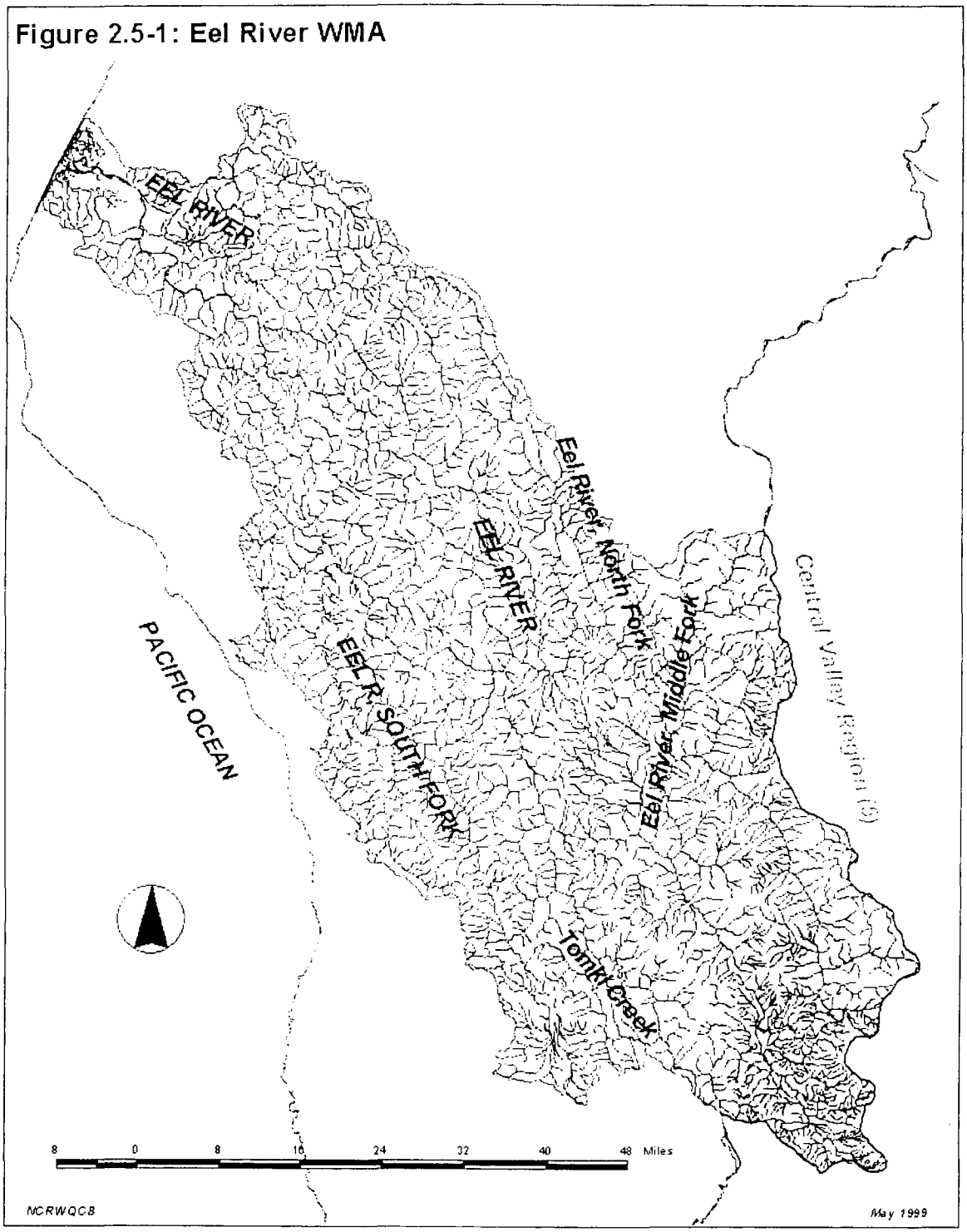
Additional assessment needs were identified for storm water issues, both urban and otherwise. The uses of Humboldt Bay are threatened by runoff contaminants, and the freshwater streams are subject to sedimentation by storm water runoff from eroding areas. There is concern that ground water data are not sufficient to describe the condition of ground water in the WMA, and a system to gather and analyze existing information has been suggested.

Local monitoring workshops have been conducted to improve coordination, standardize protocols, develop an information bank, and foster a volunteer monitoring program. The need to monitor both the implementation and effectiveness of watershed enhancement efforts should be addressed. Long-term monitoring programs are present to some degree, but would benefit from additional coordination. For instance, the bacterial data collected on Humboldt Bay for determining oyster harvest conditions may benefit from a broader data analysis. Continuing to

promote the use of State funds for the SMWP and TSMP is a high priority, so that we maintain a watch on toxic chemical accumulation in food and fauna, and the ability to detect hot spots. The SMWP, a sentinel monitoring program for toxic chemicals, has provided valuable information on occurrence of toxic chemicals that has guided cleanups around the bay. Current activities relating to water quality in the Eureka Waterfront area are guided by information from that program, the Bay Protection and Toxic Cleanup Program, and ground water monitoring and assessment activities.

EEL RIVER WATERSHED MANAGEMENT AREA

Figure 2.5-1: Eel River WMA



MANAGEMENT AREA DESCRIPTION

The Eel River Watershed encompasses roughly 3,684 square miles in highly erodable soils in the steep coastal mountains of the North Coast Region, supporting a variety of water uses including municipal and agricultural supply systems, salmonid fisheries, and recreation. Surface water in many areas is intimately connected with the ground water along the nearby alluvial valleys, thereby having a profound effect on local groundwater supplies. The Eel River Watershed is also a prime recreational area boasting numerous State and private campgrounds along its length with both contact and non-contact uses such as boating and swimming. The Eel River is the third largest producer of salmon and steelhead in the State of California and supports a large recreational fishing industry. The erodable soils, steep terrain, and timber production evoke a high level of concern for the anadromous fishery resource. Coho salmon were listed as threatened under the FESA in 1997, and chinook were listed as threatened in 1999.

It is heavily forested and as such, heavily utilized for timber production. Numerous activities occur within the watershed that may result in potential adverse effects to the beneficial uses of the Eel River Watershed. Municipal, agricultural, and recreational uses may be impaired through discharges to surface water bodies from chemical, biological, and sedimentary materials entering the surface water system. A few of the many activities, if conducted improperly, are likely to impair surface water beneficial uses. These include: illegal waste disposal, vehicle and railroad maintenance yard operations, herbicide application, gravel extraction, timber harvesting, road building, dairy operations, automotive wrecking yard activities, wood treatment facilities, POTWs, and failing septic systems.

Assessment and Monitoring:

Additional assessment needs were identified for erosion/sedimentation and ground water issues. Assessment of existing data is a key element in the upcoming TMDLs in the Eel and Van Duzen Rivers. There is a need to organize surface and groundwater data to more effectively describe conditions in the WMA and direct future monitoring activities. For instance, additional emphasis should be directed to evaluating the connection between surface and groundwaters in urbanized/industrialized areas and the potential for cross-contamination. A system to gather and analyze existing information on a spatial perspective has been suggested.

A monitoring workshop has been suggested to improve coordination, standardize protocols, develop an information bank, and foster a volunteer monitoring program. We will provide some staff assistance and request additional funding to assist the Humboldt Resource Conservation District (RCD) in continuing a temperature monitoring and screening program in the watershed. Likewise, the need to monitor both the implementation and effectiveness of watershed enhancement efforts should be addressed, as well as bacterial quality at popular recreation sites in the South Fork Eel and Van Duzen Rivers.

ASSESSMENT AND PROBLEM IDENTIFICATION

In general, the primary issues associated with water quality in the Eel River WMA are focused on the beneficial uses for drinking water supply, recreation, and the salmonid fishery. Since the watershed is located in steep forested terrain with highly erosive soils and high rainfall, erosion and sediment production and transport are high. For most of the watershed the issues of temperature and sedimentation and their impacts on the salmonid fishery are of high concern, involving the timber and rangeland industries. Other issues include ground water contamination, dairies in the delta area near the ocean, and localized contamination of surface and ground waters.

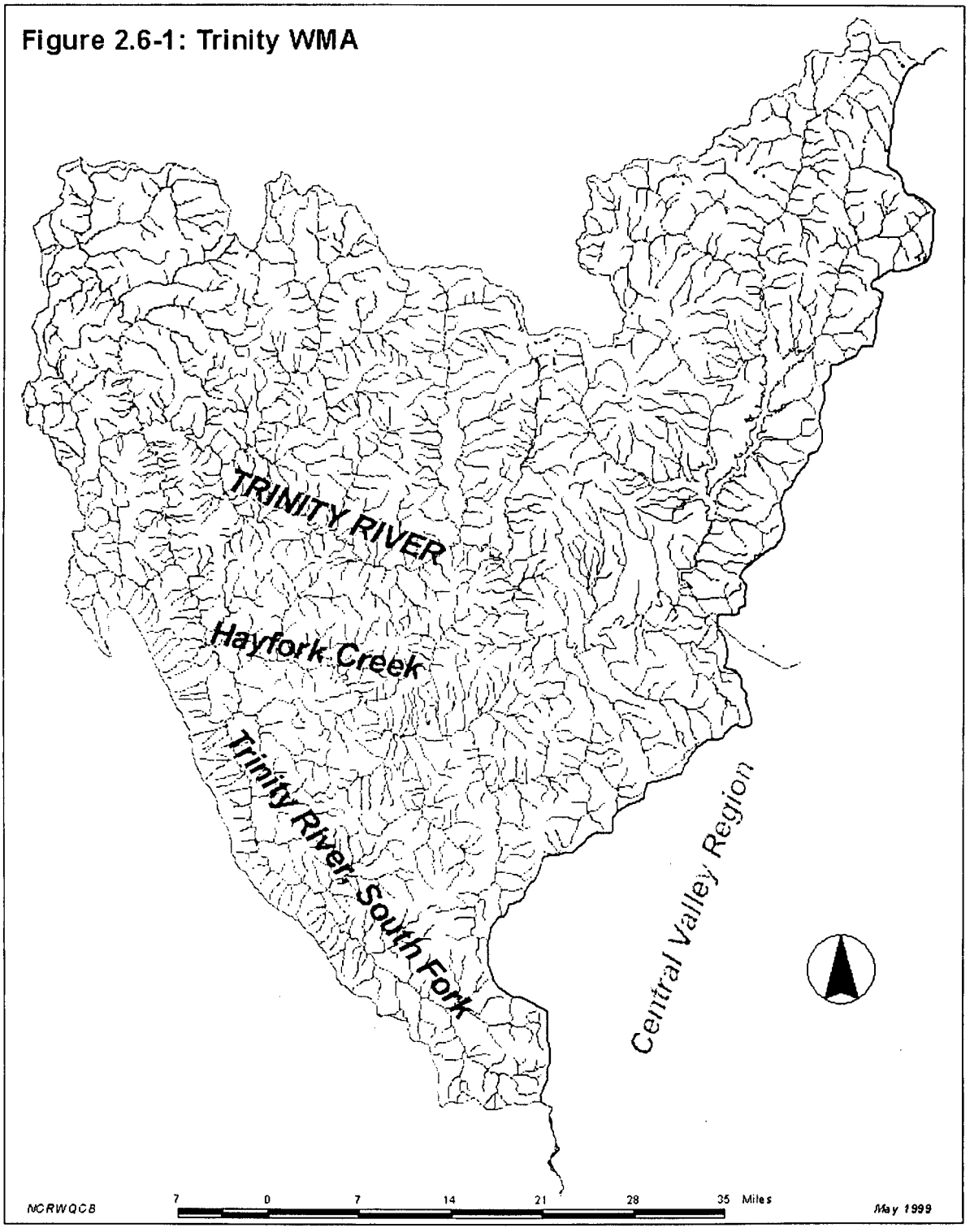
An internal Watershed Team developed listings of water quality problems, issues, and concerns, which were grouped under water quality goals. The Team used knowledge provided by other agencies to develop their listings as well as their own knowledge of the watershed. The goals and subsequent actions to address the issues were prioritized by the Team. Their effort is presented below, however due to funding constraints, the priorities will not be followed in exact order. If discretionary funding is made available or redirections of existing funding occur, the highest priority actions will be addressed first.

The four goals for the Eel River WMA are related through the beneficial uses they address:

- **Goal 1: Protect and enhance the salmonid resources (COLD)**
- **Goal 2: Protect other surface water uses (MUN, AGR, REC 1, REC-2)**
- **Goal 3: Protect ground water uses (MUN, IND. AGR, REC-1, REC-2)**
- **Goal 4. Protect warmwater fishery resources**

Protection of surface water (Goal 2) for the primary beneficial uses MUN, AGR, REC-1, and REC-2 will in most cases protect all other beneficial uses. The MUN (municipal and domestic supply) beneficial use designation is for uses of water for community, or individual water supply systems including, but not limited to, drinking water supply. It demands, therefore, the highest quality of water. The REC-1 (water contact recreation) beneficial use designation is for uses of water for recreational activities involving body contact with water, where ingestion is reasonably possible. This beneficial use also demands a high degree of water quality. If MUN and REC-1 beneficial uses are protected then it follows that agricultural and industrial supplies are also protected which relates Goal 2 to Goal 3. The protection of cold and warm water fisheries (Goals 1 and 4) requires the protection of surface and ground waters (Goals 2 and 3) along with additional concerns for siltation, habitat loss, low tributary flows and water temperature. Therefore, by protecting the beneficial uses that demand the highest quality waters most components supporting the other beneficial uses also will be protected.

TRINITY RIVER WATERSHED MANAGEMENT AREA



The USEPA developed and adopted a TMDL for sediment in the South Fork Trinity River in 1998. Implementation of that TMDL is dependent on funding at the NCRWQCB level. At this point, there is not sufficient funding for the NCRWQCB to develop an implementation plan to accompany the TMDL nor to accomplish any monitoring of activities in the watershed.

The remainder of the Trinity River watershed is scheduled for TMDL adoption by USEPA in 2001.

San Francisco Bay Region (Region 2)



Watersheds in the San Francisco Bay Region

The San Francisco Bay basin is located on the Central Coast of California. The basin functions as the only drainage outlet for waters of the Central Valley. It also marks a natural topographic separation between the northern and southern coastal mountain ranges. The Region's waterways, wetlands, and bays form the centerpiece of the United States' fourth-largest metropolitan region. Because of its highly dynamic and complex environmental conditions, the basin supports an extraordinarily diverse and productive ecosystem. The basin's deepwater channels, tidelands, and marshlands provide a wide variety of habitat that have become increasingly vital to the survival of several plant and animal species. The basin sustains rich communities of crabs, clams, fish, birds, and other aquatic life and serves as important wintering sites for migrating waterfowl.

Nearly 50 significant upland watersheds have been delineated in the San Francisco Bay Regional Water Quality Control Board's (SFBRWQCB) Basin Plan. The basin's watershed includes freshwater and estuarine streams and rivers. These surface waters serve as vital habitat and as spawning areas for anadromous fish. Also they support municipal and domestic drinking water supply, agricultural and industrial process supply, water recreation, and navigation beneficial uses.

Within our nine-county region there are over 33 groundwater basins. Santa Clara Valley, Niles Cone, Livermore Valley, and Westside Basins are the largest water supply resources, which supply groundwater to approximately 3 million people. During the dry seasons, groundwater discharges to surface water provide essential fresh water replenishment to creeks. Locally, groundwater is used for irrigation and industrial supply beneficial uses.

The uplands watershed includes water bodies of special significance. Watersheds within Marin (Lagunitas Creek and Redwood Creek) and San Mateo Counties (Pescadero Creek and San Gregorio Creek) are vital to Coho salmon survival. These watersheds provide the best habitat for threatened or endangered fish populations in Central California. This critical beneficial use is impaired in each of these watersheds due to impacts from sedimentation. Tomales Bay has special significance since it is one of the few (relatively) unpolluted estuaries along the coast. It is one of four commercial shellfish growing areas and also has a significant

herring fishery. Tomales Bay is home to other sport and commercial fisheries and is a major recreational area for the whole San Francisco Bay Region. Unfortunately, Tomales Bay is an impaired water body due to impacts from pathogens, sediment, and mercury.

Alameda Watershed Management Area

Bordering the east bay shoreline of San Francisco Bay, Alameda County encompasses 738 square miles of land and has a total population of approximately 1.4 million. Highly urbanized in the western portion, eastern Alameda County still has considerable agricultural and open space lands (although substantial land development is predicted during the next ten years). The County has 500,000 acres of rangeland and grazeable woodlands. Elevations range from sea level along the 36 miles of bay shoreline to 3,817 feet in the Diablo Mountain Range south of Livermore. The County is approximately 32 miles long in a north-south direction and 45 miles wide (Figure II-1).

The County is a diverse combination of land types and forms, with the western portion containing an urban corridor running between Berkeley and Fremont with a narrow fringe of marshlands along the Bay and considerable open space in the East Bay Hills. The eastern portion of the county varies from gently rolling terraces and alluvial plains to the steep V-shaped upland areas. The population is concentrated in the highly urbanized Bay Plain along the Bay and suburban sprawl east of the East Bay Hills.

Northern Alameda County imports its drinking water from Sierra Nevada sources serviced by the East Bay Municipal Utility District (EBMUD). Southern and eastern Alameda County also relies on groundwater basins to augment surface water supplies.

Lake Merritt (160 acre surface area) in Oakland and Lake Elizabeth (63 acre surface area) in Fremont are natural receiving bodies for many local creeks which have been somewhat modified for flood management and recreation purposes. All other creeks drain directly to San Francisco Bay. Low dissolved oxygen is a problem in Lake Merritt and there is concern over pesticides in all area creeks. There are five major reservoirs in the County, three of which are located in the Alameda Creek watershed. Some of the major creeks, which are receiving attention from local community groups include: Alameda (remnant steelhead population), Sausal, Glen Echo, Seminary, Codornices, Arroyo Viejo, San Leandro, San Lorenzo, and Temescal Creeks. In addition, the largest constructed marsh in the Region, Hayward Marsh, and Harbor Bay Island, a constructed lagoon, are located in the County.

Alameda Creek is a significant water body in the East Bay as it drains a major watershed of three counties: Alameda, Contra Costa, and Santa Clara; and it makes up more than half of the entire East Bay watershed area. To the west, its tributaries drain from the Coast Range to the east from the foothills of Mt. Hamilton. The creek flows recharges the Niles Cone groundwater basin before emptying into San Francisco Bay. Biologically, it is one of the most significant watersheds in the region due to the great diversity of species found there, and it has one of the few remaining remnant steelhead populations in the East Bay. The Alameda County Public Works Agency is applying to the USCOE for funding to construct a fish ladder past the primary barrier to anadromous fish migration on Alameda Creek. This is a large concrete railway bridge support structure in Fremont. There is a local citizens effort, the Alameda Creek Alliance,

actively supporting this proposal. Concerns about aquatic habitat in this watershed include fragmentation caused by urbanization, herbicide/pesticide use, stream habitat degradation caused by excessive cattle grazing and associated soil erosion, direct livestock impacts to stream corridors through bank scaring and collapse from animal passage, similar impacts from wild pigs, and stream obstructions. A stakeholder group of livestock and rangeland managers has formed to begin to address these issues in the entire Alameda Creek watershed. Some progress is occurring on lands controlled by the East Bay Park District and the City and County of San Francisco.

Flows in the upper reaches of the Alameda Creek watershed are controlled by water releases from the Calaveras Reservoir, which is managed by the City and County of San Francisco. The Calaveras Reservoir captures natural runoff and stores imported water from the Hetch Hetchy reservoir. Issues in this reach include soil erosion, yellow star thistle, pathogens, and nutrients from cattle grazing. The intermediate area of the watershed is controlled by the Zone 7 Water District, which harvests the local runoff. Supplies for public and wildlife use come from the State Water Project. Issues in this reach include sedimentation and erosion. The Alameda County Water District manages the lower reaches of the watershed. Water from Alameda Creek is used for groundwater recharge in the Niles Cone groundwater basin. Issues in this reach include equine facilities that are located near creeks, increasing vineyard development, and pollution threats to groundwater recharge areas from upstream activities.

Water recycling and reclamation are important issues discussed in the Alameda Creek Watershed Management Initiative. The local grape growers, agriculture, and new development are examining using recycled water for irrigation. In addition water recycling is promoted by wastewater dischargers. Local water purveyors have been discussing groundwater injection of highly treated (reverse osmosis) recycled water for drinking. Wastewater discharges include two deep water outfalls into Central San Francisco Bay (EBMUD, East Bay Dischargers Authority, and Livermore Amador Valley Water Management Agency). A portion of the Union Sanitary District discharge is reclaimed into the Hayward Marsh.

The Alameda Countywide Storm water Program began in 1987 and uses a watershed approach to storm water pollution problems in the County. It is an effort of the 13 cities in Alameda County, and the County working together under a Municipal NPDES Storm Water Permit. This is a model program, incorporating the key program elements of industrial inspection and illicit discharge control, public participation and public outreach, municipal maintenance enhancement, and new development storm water pollution controls. This program, working closely with the Alameda County Public Works Agency staff and staff of the SFBRWQCB, have taken an innovative, leadership approach to solving many difficult problems. While much remains to be accomplished on the path to clean storm water runoff, this program has demonstrated that a great deal can be accomplished with a reasonable resource commitment. It has been successful in coordinating a true watershed management approach and coordinating regulatory compliance amongst all municipalities.

Significant Issues

- Hillside and Bay-adjacent development and associated proposals for wetland and stream alteration; probable increase in nonpoint source pollutants,

- Urban runoff (new development permanent storm water treatment measures, pesticide runoff pollution control, and industrial source inspection effectiveness),
- Cattle grazing and rangeland management, particularly in upper Alameda, Arroyo Laguna and San Lorenzo Creeks,
- Degradation of groundwater quality in Livermore Valley,
- Modification of drainageways for flood-control maintenance,
- Regulatory oversight of increased reclamation of treated wastewater,
- Large number of unpermitted low threat discharges from utilities,
- Wastewater discharge to 303(d) listed water bodies (lower San Francisco Bay),
- Quarries in Livermore Valley discharging high turbidity and high pH water to creeks,
- Groundwater degradation due to salt loading in Livermore Valley, and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

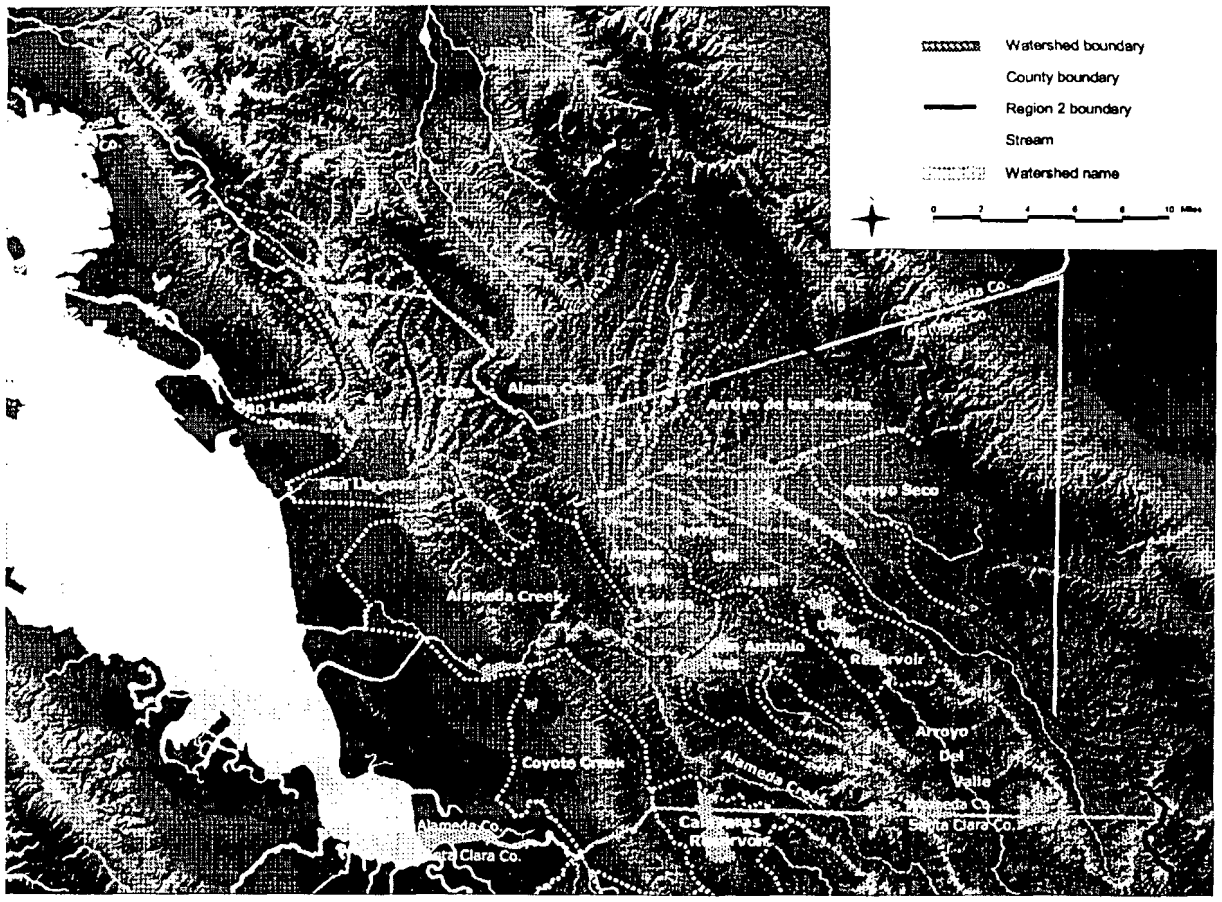


Figure II-1. Alameda County Significant Watersheds

C. Contra Costa Watershed Management Area

The Contra Costa Watershed Management Area (Figure II-2) includes areas within the jurisdiction of 17 municipalities and the County's unincorporated areas. The total area is approximately 800 square miles and contains a population of 900,700 (1998). The dominant demographic phenomenon has been the significant increase in urbanization of the County at the expense of agricultural land, which has declined by half since 1940. Contra Costa also has the largest number of municipal and industrial dischargers in the Region.

The County is bounded by San Francisco Bay and San Pablo Bay to the west, by Suisun Bay and the channels of the Sacramento and San Joaquin Rivers to the north, by Alameda County to the south, and by San Joaquin County to the east.

The County is divided into three geographic areas: West County, Central County, and East County.

West County – contains 27 percent of the urbanized area in the County and contains a mixture of residential and commercial/industrial uses. Only 10 percent of this watershed is in agriculture. Major industries in this area include petroleum refineries and chemical companies. The major creeks are Wildcat, San Pablo, and Rheem, which discharge into San Pablo Bay.

Central County – is the largest of the watersheds located in Contra Costa County and drains mostly residential areas. The largest land use designation is undeveloped at 48 percent, 44 percent is urbanized with less than 5 percent in agriculture, and only 3 percent is publicly owned. The major drainage areas are Grayson/Walnut Creek, San Ramon, and Arroyo del Hambre, which drain into Suisun Bay and the Carquinez Straits.

East County - is predominantly undeveloped with agricultural uses comprising 70 percent of the watershed. Urbanized land uses comprise only 13 percent of the land area and the major receiving water is the Delta; however, most of this area is outside of our Region's jurisdiction.

Municipal water supply is provided to the county by two main water purveyors. EBMUD provides water service to a large portion of the East Bay, including the urbanized western portion of the County as well as to central portions. Most of this water comes from the Mokelumne River. The Contra Costa Water District (CCWD) provides water service to the urban areas in the north of the County. The CCWD obtains its water from the Central Valley Project via the Contra Costa Canal.

The predominant economic resources of the county include the petroleum and chemical industries and agriculture. The dominant trend in local agriculture in Contra Costa County since 1940 has been a significant decrease in the amount of acreage in production. Much of this decline is attributable to the increasing urbanization of the Region. In Contra Costa County, land in all types of active agricultural uses (cropland and grazing lands) has declined by almost half, from over 400,000 acres in 1940 (85 percent of the County's total land area) to almost 216,000 acres in 1987 (46 percent of all County lands). The largest money-producing crops now are nursery crops (bedding plants, cut flowers, Christmas trees) and vegetables. Range and pasturelands account for a large portion of total agricultural acreage in the County.

The wide variety of terrain found in Contra Costa County supports several rare and endangered species and provides many acres of open space for recreational use. Major land forms include tidal and freshwater marshes along the Bays and Delta; sloughs, islands and tracts in the Delta itself; and inland, grasslands and mountain ridges, riparian woodlands, redwood forests, among others.

Significant Issues

- Heavily industrialized County with significant wastewater discharges;
- Increasing major industries in East County (e.g., two new proposed power plants with proposed water reclamation for cooling);
- Proposed redevelopment of several industrial sites with potential use of wetlands for wastewater treatment along with traditional discharge methods;
- New development – wetlands modification, erosion controls, and inspection and enforcement;
- NPDES permits;
- Dioxin and selenium limits in NPDES permits;
- NPDES permits now being scrutinized and appealed more than previously;
- Inclusion of pollution reduction and waste minimization requirements in industry permits;
- Urban runoff (new development, pesticides);
- Effluent toxicity from POTWs;
- Protection of "sources of drinking water" in East County;
- Development and implementation of mass reduction load at petroleum refineries;
- Creek assessment: water quality, creek inventories by County requiring staff oversight; and
- Implementation of Nonpoint Source Program Management Measures:
  Erosion and Sediment Control; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

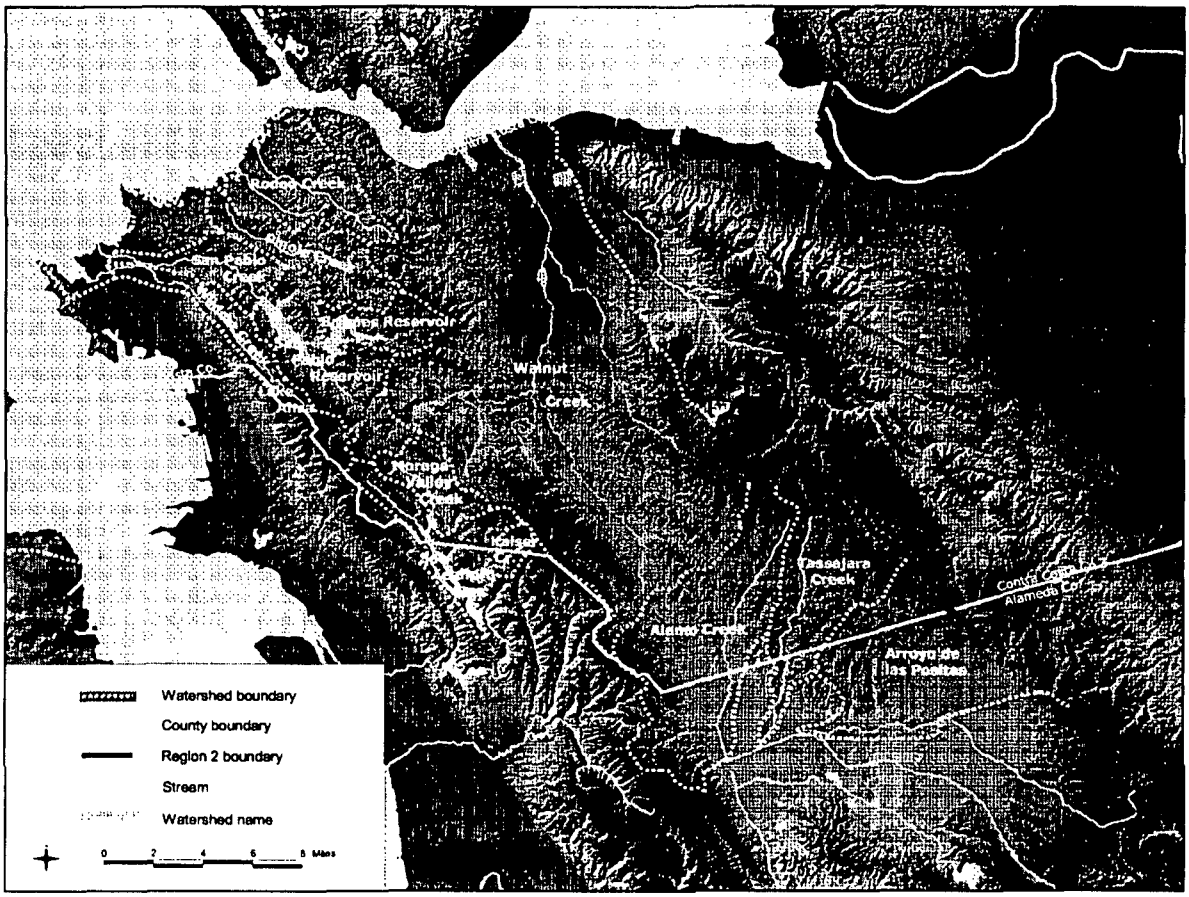


Figure II-2. Contra Costa County Significant Watersheds

D. Marin Watershed Management Area

Located on a peninsula, Marin County is bounded on the west and south by the Pacific Ocean (with significant small bays and lagoons) and on the east by San Pablo Bay and the extreme southeast by Richardson Bay (Figure II-3). The population (245,900) is concentrated in the heavily urbanized eastern part of the County, with its POTWs discharging into San Pablo Bay. The western portion remains mainly rural, with small treatment plants and on-site septic systems. The two major cities are San Rafael and Novato, both located in the eastern part of the County. Economically, ranching, dairy farming, shellfish farming, small-scale farming and vineyards, and movie and video production occur in west Marin; in eastern Marin can be found communications, computer software, and printing industries, as well as construction and manufacturing industries (concrete, plastic products, ceramics, candles), and boatyards.

The 521 square miles of Marin offer a wide variety of topography, climate, and vegetation from the tidal flats of the coastline to the slopes of Mt. Tamalpais (2,600 feet) and from the dense stands of redwood and pine to the inland grasslands and exposed rocky areas. A significant feature of Marin is the 141,400 acres of recreational open space that is a draw for the entire Bay Area.

The major streams in Marin County are Miller, Gallinas, Novato, San Rafael, Corte Madera, Arroyo Corte Madera del Presidio, Lagunitas, Olema, Walker, and Redwood Creeks. Miller, Gallinas, San Rafael, and Novato Creeks flow eastward in through semi-rural and urban areas and discharge into San Pablo Bay. Corte Madera Creek and Corte Madera del Presidio flow southeastward through highly urbanized valleys and discharge into San Pablo Bay and Richardson Bay, respectively. Lagunitas flows northeastward and discharges into Tomales Bay; major tributaries of Lagunitas Creek are San Geronimo and Nicasio Creeks. Olema Creek flows northwest along the San Andreas fault and discharges into Lagunitas Creek near its mouth. Walker Creek flows north-northwest and discharges into Tomales Bay. Redwood Creek flows from Mt. Tamalpais through Muir Woods National Monument and discharges into the Pacific Ocean at Muir Beach. Both Lagunitas and Redwood Creeks are significant coho salmon spawning creeks in Central California.

Significant water quality issues in west Marin County watersheds include hill and gully erosion and impacts to stream corridors, runoff from confined animal (dairy) waste, and coliform contamination of shellfish growing areas in Tomales Bay. Water bodies in Marin on the 303(d) list for nutrients, pathogens, and siltation are Tomales Bay, Lagunitas Creek, and Walker Creek. Noteworthy impacts are also documented in Bolinas Lagoon. As part of the WMI, management has directed additional resources to investigate and develop strategies to resolve confined animal waste problems.

Tomales Bay is well known for its commercial oyster beds and fisheries and recreational crabbing, clamming, and fishing. An abandoned mercury mine (Gambonini Mine) is located east of Tomales Bay. Baseline monitoring over the last three years indicated that the mine site is discharging a large quantity of mercury-laden sediment and is a significant source of mercury to Walker Creek. The site poses a significant threat to the beneficial uses of Walker Creek and Tomales Bay. Walker Creek is a 303(d)-listed water body for siltation and for metals from mine tailing. Baseline monitoring and investigation are ongoing with work now shifting toward developing and implementing remedial strategies. Cleanup of this mine is a top priority for Marin County and our Planning staff.

In eastern Marin, there are three major proposed development projects in diked wetland areas, a proposed flood control project on Corte Madera Creek, and a major erosion control project on Novato Creek. There are significant wetland fill or creek modification issues with each of these projects. There is an active countywide storm water program that has a creek and watershed awareness focus and has begun pilot creek assessments in several eastern Marin creeks. The County program is active in working on urban runoff control issues and is preparing for Phase II storm water permitting. The County has begun a pilot bioassessment program as part of their overall watershed assessment and monitoring approach. Some of the 303(d) listings were done in the 1970s. There is need for improved monitoring and assessment for all listings to determine if de-listing would be appropriate.

Significant Watershed Issues

- Confined animal facilities' waste runoff: rangeland management and riparian habitat protection;
- Abandoned mine runoff: mercury-laden sediment;
- Administrative issues associated with increased numbers of small-scale developments with greater than 2,000 gallon septic systems;
- Need for assessment of on-site sewage systems in Tomales Bay watershed and other rural areas to determine pollutant impacts and potential remediation strategies;
- Wetland modifications associated with new development and flood control along the Bay shoreline;
- Flooding and flood management;
- Hydromodification projects and loss of functions of stream corridors;
- Degradation of fishery habitat as a result of excess siltation, loss of spawning gravels, and water diversions;
- Pathogen contamination of shellfish growing areas in Tomales Bay;
- Urban runoff: new development, pesticides;
- Opportunity and need to protect (not just clean up) good habitat, open space, and parkland;
- Restoration of tidal and seasonal wetlands, e.g. Hamilton AFB, Petaluma River, Bel Marin Keys;
- Impacts on San Francisco and Tomales Bays from pollutants from marinas, houseboats, and boatworks;
- Pollutant discharges and dredging impacts from recreational lagoons adjacent to creeks and San Francisco Bay; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Confined Animal Facilities; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

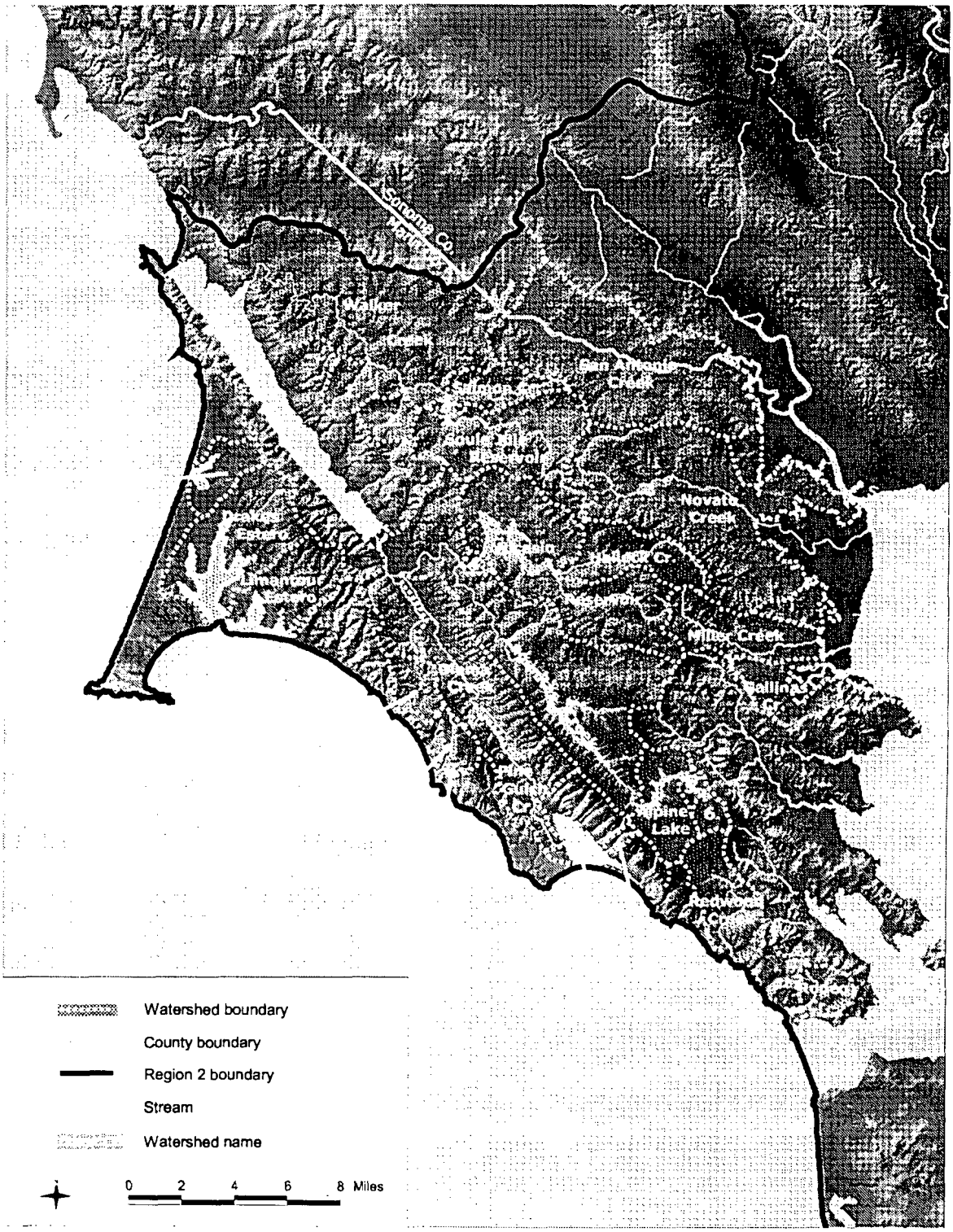


Figure II-3. Marin County Significant Watersheds

E. Napa Watershed Management Area

The Napa River Watershed is the portion of western Napa County within our jurisdiction. Eastern Napa County is within the Central Valley Regional Water Quality Control Board (CVRWQCB). The major drainage in the watershed, the Napa River, flows through the Napa Valley and encompasses an area of approximately 210 square miles (Figure III-4). The watershed is predominately rural, however, the fastest growing land use is urban housing. The largest community, Napa, has a population of over 64,000. The Napa River is intermittent in the northern reach, but becomes perennial due to groundwater discharge. The Napa River is a significant freshwater tributary to San Francisco Bay. Wastewater discharges to the Napa River occur during the wet season only; during dry months 100 percent of wastewater flows are reclaimed.

The Napa River and numerous tributaries support steelhead, federally listed as a threatened species. Additionally, the California Freshwater Shrimp (Syncaris pacifica), listed as endangered by State and federal government, resides within the watershed. The beneficial uses include: Cold Freshwater Habitat, Warm Freshwater Habitat, Fish Spawning, Fish Migration, Preservation of Rare and Endangered Species Habitat, Wildlife Habitat, and Municipal and Domestic Water Supply. The extensive marshlands bordering the lower river teem with hundreds of thousands of migratory birds during the fall and spring and host two endangered species, the California clapper rail and the salt marsh harvest mouse.

The watershed supplies 85 percent of the County's total water demand through its ground and surface water production. The cities of Calistoga, American Canyon, Napa, and Yountville also receive water from the State Water Project.

The Napa River is on the 303(d) list for nutrients, pathogens, and siltation. The sediment listing is based predominately on qualitative visual assessments of the Napa River and its tributaries by SFBRWQCB and DFG staff. It is suspected that nutrient loading is one cause of exceedences of the water quality objectives for biostimulatory substances and dissolved oxygen. Staff also believes that the standards for total and fecal coliform are not being achieved in some parts of the watershed.

Many local, State, and federal agencies are involved in watershed protection efforts in the Napa River Watershed. A Napa River Watershed Task Force (NRWTF) has been convened by the Napa County Board of Supervisors (beginning February, 1999). This task force is comprised of local citizens selected for their expertise and their ability to represent the views of interest groups within the Napa County community. Numerous agencies including the SFBRWQCB, Natural Resource Conservation District (NRCD), and the Napa County RCD are advisory to this task force. The short-term mission of this task force is to make recommendations to the County Board of Supervisors regarding interim measures specific to the development of vineyards and is intended to protect the economic, ecological, and social health of the community. It is anticipated that this forum will continue to serve as a long-term task force to address important issues in the Napa Valley, such as the sediment TMDL and surface and ground water allocations.

The RCD is a leader in many aspects of Napa County's watershed management activities. Its efforts have led to successful implementation of several community based water quality projects.

Significant Watershed Issues

- Need for comprehensive baseline watershed assessment;
- Significant alteration of flow regime;
- Dry season streamflow reduction by surface water diversions and groundwater extraction;
- Peak flows during wet season potentially increases flooding and stream bank failure;
- Flooding and associated flood management practices;
- Water quality impairment in the Napa River and tributaries due to siltation, nutrients, pathogens, and possibly dissolved oxygen, high temperature, and eutrophication;
- Urban runoff, in particular, new development;
- Development and loss of wetlands south of Napa in the airport industrial area;
- Loss of riparian habitat;
- Change in hydrology in localized areas, such that the volume of peak flows is increased;
- Wastewater discharge impacts on surface water and groundwater; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Education/Outreach; Forestry; Urban Areas; and Hydromodification.

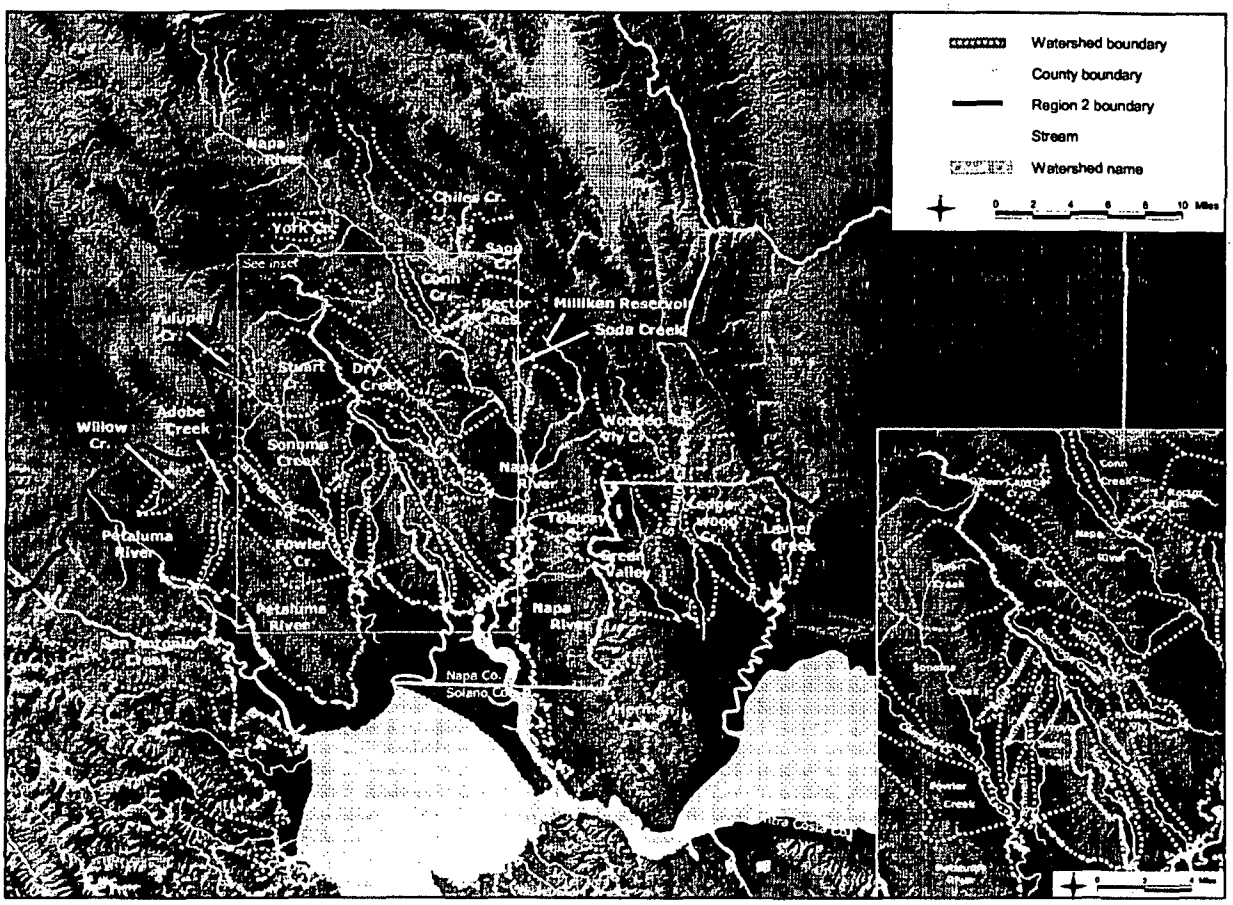


Figure II-4. Significant Watersheds in Napa, Sonoma, and Solano Counties

F. San Francisco Watershed Management Area

Located at the tip of a narrow peninsula (46.7 sq. mi.), San Francisco County's population is approximately 725,000. The peninsula is bounded by the Pacific Ocean to the west and by San Francisco Bay to the north and east. Northeast San Francisco is densely developed with high-rises and apartment buildings. The southeastern part of the City is largely industrial and residential, with limited open space. The eastern shoreline is largely developed and devoted to maritime and industrial uses, some of which are obsolete. Accordingly, there are numerous redevelopment projects along the shoreline. The west side of San Francisco is predominately residential, but also features large open spaces including Golden Gate Park, Lake Merced, and golf courses surrounding Lake Merced.

San Francisco relies on imported surface water from Hetch Hetchy reservoir. Recently, San Francisco County has completed both groundwater and reclaimed water master plans that reflect the goal of diversifying water supplies. Most of San Francisco has a combined sanitary sewerage and storm water collection system.

Significant Watershed Issues

- Development of a municipal storm water permit for non-combined sewer system areas;
- Military base conversion at Hunter's Point and associated industrial storm water issues;
- Contaminated sediments in Islais and Mission Creeks;
- Development projects at Mission Bay, Treasure Island, Ferry Terminal, Candlestick Park, Port of San Francisco, and Embarcadero; and
- Protection of Beneficial Uses at Lake Merced.

G. San Mateo Watershed Management Area

San Mateo County is located on a peninsula bordered on the north and east by San Francisco Bay and on its west by the Pacific Ocean (Figure II-5). The County, which has 20 cities, covers about 450 square miles and the population of approximately 750,000 is concentrated primarily in the eastern part of the County. The San Mateo Range runs north/south through the County on its western side. The western part of the County has considerable amounts of agricultural and open space lands, with pockets of urbanization particularly in the northern part of the County in Daly City and Pacifica and around Half Moon Bay. To the east of the range lies the flat, more densely urbanized area. About 26 percent (74,300 acres) of the County's total 285,000 acres is considered urbanized.

San Gregorio Creek, Pescadero Creek, and San Francisquito Creek are listed as impaired water bodies [303(d) list] due to degradation of salmonid habitat by siltation caused by land-use practices, which have increased the rate of sediment production to streams. All three water bodies support steelhead trout runs. Steelhead trout are federally listed as threatened in central California. Coho salmon are still thought to be present in Pescadero and San Gregorio Creeks, and these basins are listed as top priority streams in DFG's Coho recovery plan for streams south of the Golden Gate. Coho salmon are State-listed as endangered (south of the Golden Gate) and federally listed as threatened in central California. National Marine Fisheries Service staff has stated that the risk of extinction of coho salmon south of the Golden Gate is higher than for almost any other run of salmonids on the west coast (S. Kramer, personal communication). Additional attention and resources from the SFBRWQCB, in the form of a full-time watershed staff casehandler devoted to coastal San Mateo County should be made a priority considering that the consequences of inaction are substantial and possibly irreversible.

We have prepared a workplan to establish and implement TMDLs for sediment to address potential siltation problems in the listed creeks. Of vital importance in this effort is the initiation of holistic watershed assessments to determine whether sediment is actually a major factor limiting salmonid populations and/or whether watershed disturbances are of equal or greater importance as limiting factors (e.g., water abstraction, reduction in large woody debris loading, stream temperature, etc.). Stakeholder forums have been established in the San Francisquito Creek and Pescadero Creek watersheds due to locally initiated CRMP processes. These groups however are badly in need of additional resources to support full-time professional watershed coordinators so that it will be possible to further define and implement watershed stewardship priorities. Funding these positions should be given high priority in State and federal grant programs and/or Supplemental Environmental Projects.

The coastal waters of San Mateo County (excluding Pacifica) are within the Monterey Bay National Marine Sanctuary. This presents opportunities for collaboration with other water resource protection efforts, such as the Sanctuary's Agricultural Initiative. Pescadero Creek basin has been selected as a pilot basin for initial implementation of the Agricultural Initiative in San Mateo County and several programs areas will be initiated this year. These efforts hold tremendous promise if they can be effectively implemented. SFBRWQCB staff resources are insufficient at present, however, to allow for adequate participation and guidance. In addition, the San Mateo Stormwater Pollution Prevention Program (STOPPP) efforts should be expanded to provide baseline watershed inventory and assessment information in the San Francisquito Creek watershed. Our challenge is to coordinate with the various entities so that we gain better benefit from our mutual interests in resolving the sediment issues.

Staff resource constraints substantially limit our ability to initiate the TMDL process in the listed watersheds. Given existing staffing, we are able to maintain all of our baseline permitting and associated urban watershed management activities. These include, continued implementation of the county's storm water permit (including new program areas involving road erosion control and prevention, integrated pest management, and holistic lagoon management), CWA Section 401 Certification of San Francisco Airport wetland fills and the San Pedro Creek Flood Management Project, and three major NDPES permits. There may be opportunities to better leverage ongoing local watershed management efforts; consequently, with additional resources, we could better coordinate and focus them on TMDL development.

Significant Watershed Issues

- Restoration and protection of steelhead and Coho salmon habitats in coastal streams;
- Lack of watershed assessment data for develop of sediment TMDL;
- Sedimentation in streams from rural road erosion;
- Sewage overflows from wastewater collection systems with adverse impacts to beaches and coastal creeks;
- Nutrient pollution from horse stables;
- Replacement of Pacifica wastewater treatment facility;
- San Francisco Airport expansion wetland fill;
- Urban runoff (new development, pesticides, lagoon management);
- Technical assistance needed on sediment budgets for TMDL process; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Grazing Management; Education/Outreach; Forestry; Urban Areas; and Hydromodification.

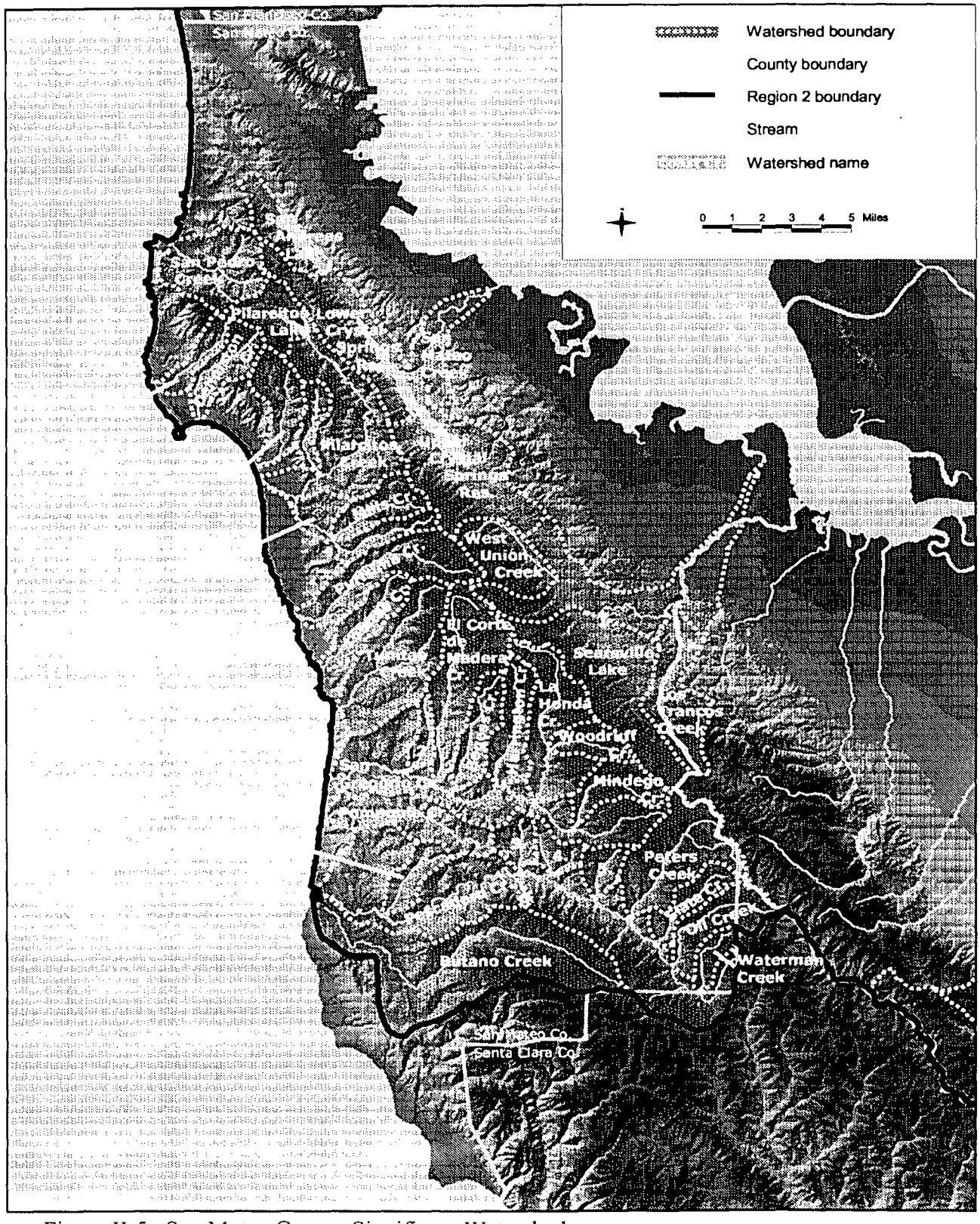


Figure II-5. San Mateo County Significant Watersheds

H. Santa Clara Watershed Management Area (Santa Clara Basin)

The Santa Clara Basin encompasses the extreme South Bay (below the Dumbarton Bridge) and those areas of Santa Clara County that drain to the South Bay, including the eastern slope of the Santa Cruz Mountains, the Santa Clara ("Silicon") Valley, and the western slope of the Diablo Range. The Basin consists of 11 sub-basins including the Coyote Creek watershed on the east side of the valley, the Guadalupe River watershed which drains the south-central portion of the valley, and a series of small, relatively urbanized watersheds that drain the west side of the valley. Santa Clara County has more than 700 miles of creeks and rivers (Figure II-6).

The planning area has a population of approximately 1.7 million and is mostly urbanized with some agricultural uses in the rural upper watershed areas. It is one of the fastest growing counties in California. Wastewater discharges into San Francisco Bay from the Silicon Valley have been an ongoing issue for SFBRWQCB staff. The discharge from the San Jose/Santa Clara wastewater treatment plant goes into historic salt marshes in the South Bay. The discharge has caused conversion of portions of the salt marsh to brackish marsh, which is significant since two endangered species rely on the salt marsh habitat. In responses to this, the SFRWQCB has required mitigation for converted habitat and adopted the "South Bay Action Plan" to limit flows from the treatment plant. The Action Plan includes reclamation, conservation, and environmental enhancement projects.

The watershed includes the Region's most significant groundwater resource, the Santa Clara Valley. Drinking water supplies come from both local groundwater and surface water and imported surface water.

The extreme South Bay has been designated as an impaired waterbody under section 303(d) of the CWA. Concentrations of certain toxic pollutants exceed water quality criteria in this poorly flushed portion of the Bay, and aquatic and riparian habitats are in various states of degradation. In addition, several reservoirs and creeks in the valley have been designated as impaired water bodies due to mercury from historic mining sources. The USEPA has ranked the Santa Clara Basin a "5" on a scale of 1(best) to 6 (worst) for watershed condition and vulnerability.

We initiated our watershed management effort in the Santa Clara Basin in the summer of 1996 with a series of stakeholder focus group meetings at which we solicited stakeholders' interests relative to watershed management in the Basin. The local agencies, environmental groups, and community organizations embraced this opportunity to accept responsibility for local stewardship of the watershed. All these stakeholders have committed to implement a watershed management planning process for the Santa Clara Basin that integrates the following issues:

- Habitat and water quality protection and enhancement;
- Water rights and water supply reliability;
- Flood management;
- Regulatory compliance;
- Land use; and
- Public awareness and involvement.

Collectively, we now refer to this effort as the Santa Clara Basin Watershed Management Initiative (Initiative). Specifically, we have promoted the following ten actions as desired outcomes of the Initiative:

1. Implementation of a comprehensive watershed assessment strategy that identifies problems or otherwise establishes steps to resolve unknowns;
2. Implementation of a comprehensive watershed assessment strategy that identifies sources of problems or otherwise establishes steps to resolve unknowns;
3. Implementation of a comprehensive watershed assessment strategy that identifies solutions of problems or otherwise establishes steps to resolve unknowns;
4. Long-term resolution of municipal wastewater permit issues;
5. Resolution of urban runoff (municipal storm water) permit issues;
6. Establishment of basis for Basin Plan Amendments (includes consideration of site specific objectives);
7. Assessment and resolution of 303(d) impaired water body listings and development of a phased TMDL (initial emphasis will be on copper and nickel in South San Francisco Bay, followed by mercury in Guadalupe River and sediment in San Francisquito Creek);
8. Long-term resolution of San Jose/Santa Clara wastewater discharge flow cap issues;
9. Establishment of a streamlined CWA Sections 404 permit/401 certification process for stream and wetlands fill and dredging projects; and
10. Implementation the SFBRWQCB staff recommendations for new development.

The committed stakeholders include local, State, and federal agencies, environmental and public interest groups, and business and industry trade groups. The stakeholders participate in various groups that form the Initiative. Key outcomes of the Initiative will be a Watershed Assessment Report. The Watershed Report and Plan will be based on sound science with broad stakeholder involvement and will integrate existing programs and identify what needs to be done to reduce and prevent pollution and provide for effective land use and waterway management. The comprehensive stakeholder process will be used to reach agreement on the Plan, its priorities and long term implementation.

Significant Issues

- Pollution prevention action plans and site specific objectives for copper and nickel;
- Hg impairment in San Francisco Bay and upland watersheds from natural sources and abandoned mines;
- Identification of significant sediment sources and their causes;
- Clarification of "resolution of potential sediment impairment";
- Protection of endangered species;
- Restoration of bayland wetlands;
- POTW NPDES permit litigation;
- Improved permit process (e.g., stream alternation and wetland fill permits);
- Improved stream maintenance practices (Stream Protection Policy);
- Urban runoff (new development/pesticides);
- New development – wetland loss, erosion controls, and inspection/enforcement actions;
- Habitat loss and segmentation from ongoing flood management projects;
- Protection and enhancement of riparian buffers;

- Protection of high quality groundwater resources and cleanup of polluted ground water;
- Lack of watershed assessment data for Hg TMDL and for other potential new listings;
- Toxicity from pesticides;
- Santa Clara Basin WMI;
- Resolution of potential sediment impairment;
- Reclaimed wastewater for environmental enhancement; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

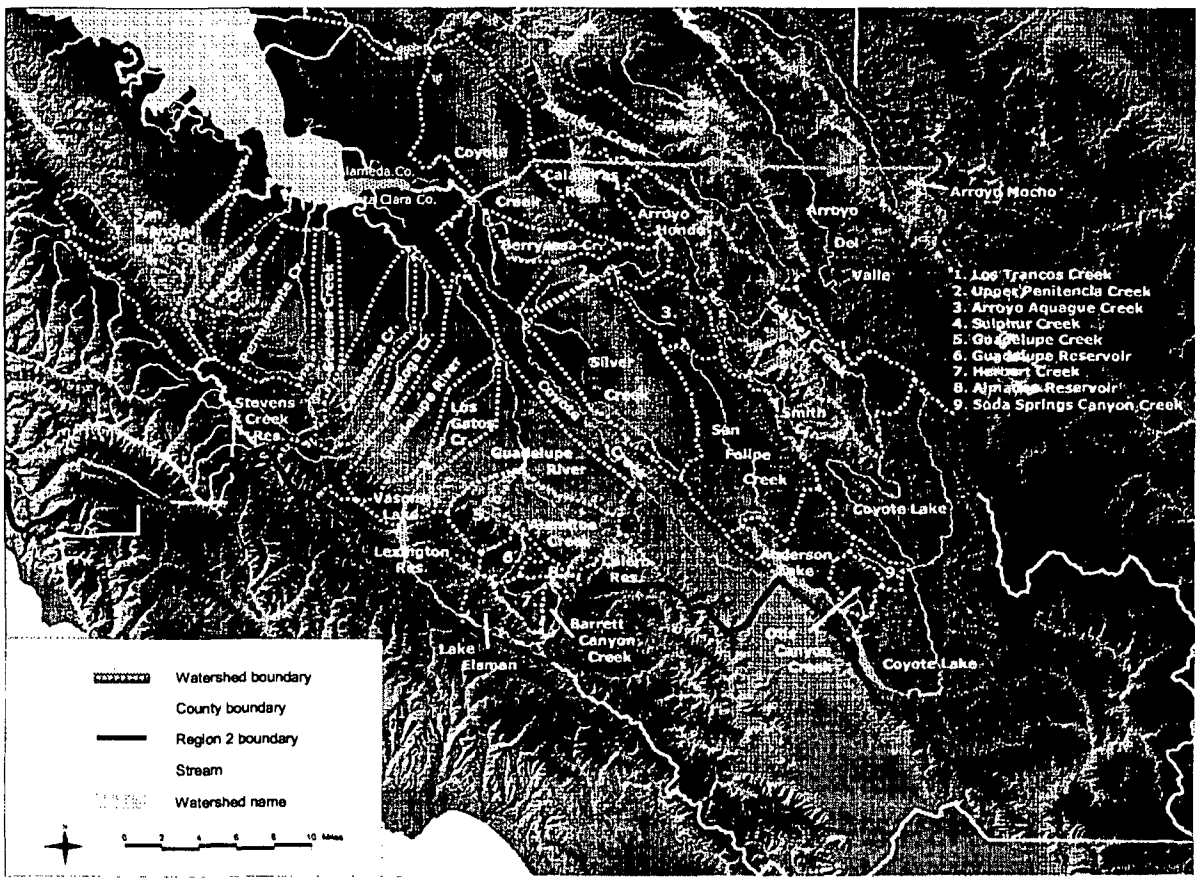


Figure II-6. Santa Clara County Significant Watersheds

I. Solano Watershed Management Area

Solano County is the northernmost of the nine counties within the San Francisco Bay Area. The County's population of 373,000 is concentrated along the Interstate 80 corridor that runs generally in an east-west direction through the center of the County. Of the County's 828 square mile area, 64 percent is in agriculture, although, as with most outlying Bay Area counties, suburban development is causing a decrease in farmland acreage. The landscape of

Solano County ranges from flat agricultural land in the north to rolling hills in the south. Along its southern and western borders are San Pablo and Suisun Bays, the Napa River, and the Mare Island and Carquinez Straits. The Sacramento River is the eastern boundary of the County. SFBRWQCB's jurisdiction in the County comprises the area that drains into San Francisco Bay and the Carquinez Straits, generally the southwestern half of the County. Figure II-4 shows significant watersheds in the North Bay including Solano County. The major cities in our portion of the County are Vallejo and Benicia at its southern most end and Fairfield and Suisun City in central Solano County. Vallejo is the largest city in the County with a population of 115,000 (1994). Fairfield is characterized by a maturing center and new development at the fringes, surrounded by crop and grazing land.

Fairfield is the County seat and second largest city. Solano County has become a leader in Bay Area growth since the 1980s because it possesses some of the last remaining large tracts of easily developable land in the Bay Area.

The western portion of Solano County is characterized by the large expanses of wetlands composed of marshes, farmed wetlands, islands, sloughs, and mudflats forming a crescent along the north shoreline of San Pablo Bay. This crescent is anchored by Mare Island at its eastern most point. The eastern portion of Solano County is characterized by the Suisun Marsh, a vast expanse of dikes and vegetated wetlands, marshes, sloughs, islands and mudflats. The extensive 10,000 acre open space tract of the Tri-City and County Cooperative Plan forms the upland area to the Suisun Marsh.

Significant Watershed Issues

- Upland erosion and downstream sedimentation in Suisun Marsh and tributaries;
- Urban runoff (new development, pesticides);
- Protection of endangered species habitat;
- Mare Island Base conversion and environmental cleanup;
- Discharges from refineries;
- Highway 80 sliding south of Fairfield;
- Lake Herman designated as impaired on 303(d) list due to mercury; low TMDL priority;
- Suisun Marsh Wetlands designated as impaired on 303(d) list, due to metals, nutrients, organic enrichment, low Dissolved Oxygen (DO), and salinity; medium priority TMDL; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

J. Sonoma Watershed Management Area

Our region encompasses Sonoma County south of the City of Santa Rosa and includes the drainage basins of the Petaluma River, Sonoma Creek, and Tolay Creek. Figure II-4 illustrates significant watersheds in the North Bay, including Sonoma County. These water bodies drain into tidal flats adjoining the north end of San Pablo Bay. The Cities of Petaluma and Sonoma are

within this management area. Sonoma County is one of the fastest growing counties in California. This growth is resulting in land use changes and associated environmental and water quality issues.

The Petaluma River and its tributaries drain a total area of about 146 square miles and are situated in both Sonoma and Marin Counties. The Petaluma watershed has a diverse range of habitat from redwood/fir forests in the headwaters to chaparral, oak woodland, and bayland areas. In Sonoma County, the Petaluma River receives water flowing out from the hills surrounding the city of Petaluma, which is located in one of two long narrow valleys in the southern part of the County. The city of Petaluma has a population of 50,000 and has a 4.8 mgd wet weather discharge to the Petaluma River. The Petaluma wastewater treatment plan is approaching its discharge capacity.

Sonoma Creek drains a 170 square mile area from the ranges on both sides of the Sonoma Valley in which is located the area's other major city, Sonoma. These watersheds are home to an array of land uses, such as vineyards, livestock facilities, croplands, State parks, and urban areas. The western part of southern Sonoma County is generally low, rolling hills. Reclaimed San Pablo tidal flats form the lower ends of the two valleys. The valley floors and adjacent hills are farmed intensively. The hills in southwestern Sonoma County are used largely for grazing dairy cattle and sheep. The Sonoma County Water Agency wastewater treatment plant in Santa Rosa has exceeded its capacity.

Tolay Creek drains about 10.9 square miles. There are no major tributaries, but there are springs and seasonal drainage ways in the watershed. The Sears Point Raceway is located within the Tolay Creek watershed.

The Sonoma Creek and Petaluma River watersheds support beneficial uses for cold and warm freshwater habitat, fish migration, preservation of rare and endangered species, fish spawning, wildlife habit, and contact and non-contract recreation. In addition, groundwater is a source of drinking and irrigation water in rural areas of the County. Impacts from agricultural runoff, construction, development, and urban runoff have resulted in the 303(d) listing of Sonoma Creek and Petaluma River for nutrients, pathogens, and siltation.

The lack of up-to-date water quality and watershed information poses the most significant obstacle to developing a meaningful and effective TMDL for nutrients, pathogens, and sediment in both the Sonoma Creek and Petaluma River watersheds. In both watersheds, it is suspected that nutrient loading is causing exceedences of the water quality objectives for toxicity, biostimulatory substances, un-ionized ammonia, dissolved oxygen, and total dissolved solids. Staff also believes that the standards for total and fecal coliform are not being achieved in some part of the watersheds. Preliminary sediment evaluation work has been completed in both watersheds; however, linkages on a watershed scale have not been made.

Watershed management efforts are underway in Sonoma Creek and Petaluma River watersheds. The Southern Sonoma County RCD recently completed the "Sonoma Creek Watershed Enhancement Plan" and the "Sonoma Creek Habitat Inventory." The RCD was recently awarded CALFED funding to hire a watershed coordinator, implement priority habitat restoration

projects, and conduct watershed assessment activities. In the Petaluma River watershed, CALFED funds were awarded to the San Francisco Estuary Institute for monitoring and restoration work. The RCD has also completed a "Petaluma River Watershed Enhancement Plan." A preliminary sedimentation study has also been completed for the Petaluma River.

Significant Watershed Issues

Petaluma River

- High levels of metals at the Regional Monitoring Program Station at the mouth of the Petaluma River; need to resolve whether the Petaluma River is a source of the metals;
- Nutrient problems documented by DFG need urgent actions including source identification, more frequent inspections of confined animal facilities (dairy, horse boarding, livestock producers) to evaluate compliance with State minimum standards, issue requests for corrective action and Report of Waste Discharge (ROWD) (conservation ranch plans with nutrient budgets), and associated follow-up actions, including inspections, permit issuance, report review and enforcement as appropriate;
- Sedimentation problems in tributaries associated with new development, gullying, and agricultural land use practices necessitate staff involvement with Best Management Practices (BMP) outreach programs, management of watershed enhancement grant contracts, watershed monitoring and assessment, and TMDL development;
- Baseline watershed assessment targeting 303(d) impairment listing is needed, including coordination with stakeholder groups collecting water quality monitoring and watershed assessment data to update the 303(d) list and support TMDL development;
- Countywide baseline storm water management program needs Tier 2/Tier 3 level encouragement;
- Water quality and habitat impacts due to waterway maintenance and improvements;
- Wastewater treatment plant reconstruction forthcoming; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Confined Animal Facilities; Grazing Management; Education/Outreach; Urban Areas; and Hydromodification.

Sonoma Creek

- Sedimentation, nutrient and pathogen impacts require baseline watershed assessment targeting 303(d) listing and TMDL development;
- Expansion of wineries and resultant wastewater management issues;
- Development of hillside vineyards and associated erosion and runoff;
- Increasing water diversions to support increasing vineyard acreage may be affecting stream habitat and anadromous fish survival rate;
- Need to review Sonoma County on-site septic program, participate in quarterly meetings with the County, review proposals for large projects ($\geq$ 1500 gal/day) and projects requesting variances to siting requirements, respond to public concerns, issue permits, and enforce as necessary;
- Countywide baseline storm water management program needs Tier 2/Tier 3 encouragement;
- Wastewater treatment plant capacity deficiencies;

- Waterway maintenance and capacity "improvements"; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Grazing Management; Education/Outreach; Forestry; Urban Areas; and Hydromodification.

Tolay Creek

- Sears Point Raceway expansion requiring project review, permitting and follow-up;
- Animal waste management;
- Recurrent flooding of homes and domestic septic systems in lower Tolay Creek requires urgent corrective action; and
- Implementation of Nonpoint Source Program Management Measures: Erosion and Sediment Control; Confined Animal Facilities; Grazing Management; Education/Outreach; and Hydromodification.

Central Coast Region (Region 3)



Watershed Management Areas

The Central Coast Region is organized into three WMAs, the North, Central and South WMAs (See Figure 2). The North WMA includes two targeted, high priority watersheds: San Lorenzo River Watershed and Pajaro River Watershed. The Central WMA includes the largest targeted, high priority watershed, the Salinas River Watershed. The South WMA includes three targeted watersheds: Morro Bay Watershed, Santa Maria River Watershed and Santa Ynez River Watershed, with Morro Bay Watershed one of the high priority watersheds. Subsequently, staff identified the Salinas River, San Lorenzo River, and Morro Bay Watersheds as the highest priority watersheds (See Figure 3). The targeted watersheds were selected because they were recognized as having the worst water quality problems along with existing local efforts and commitments established to address these problems.

Figure 2
Central Coast Region
Region 3
Watershed Management Areas

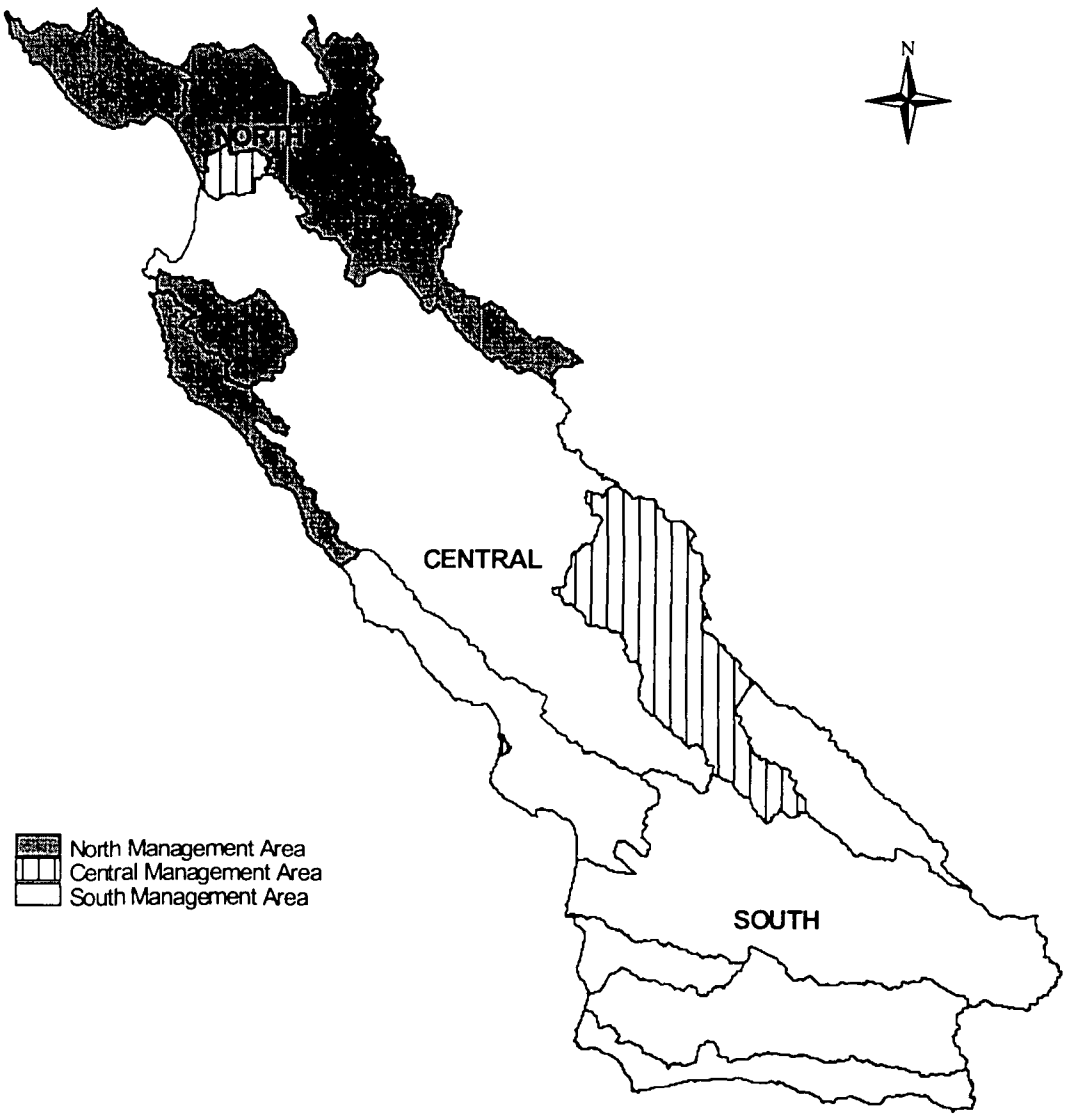
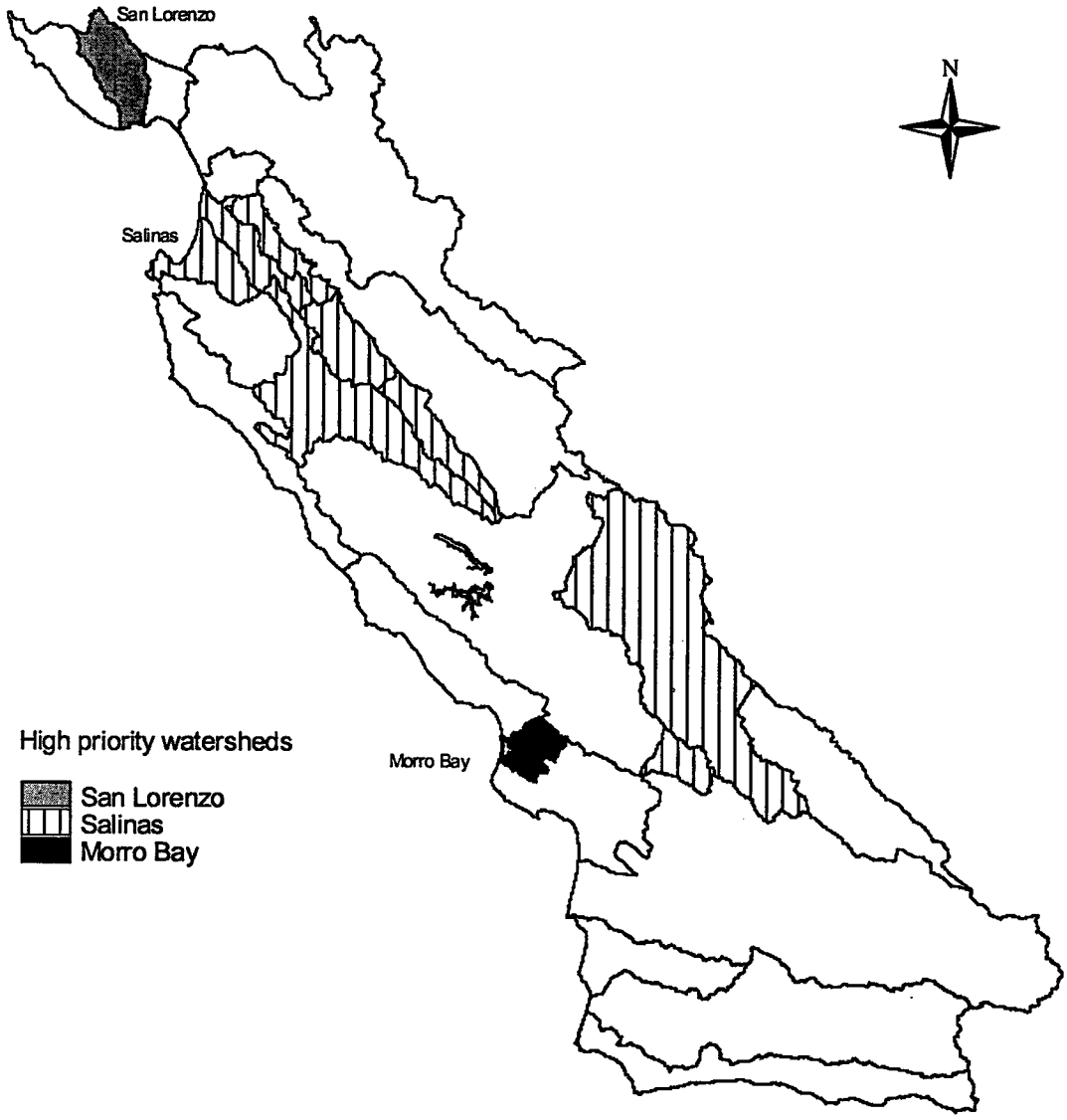


Figure 3
Central Coast Region
Region 3
High Priority Watersheds



The following table, Table 1, briefly indicates the major water quality problems in each targeted watershed.

Table 1: Water Quality Pollutants and Problems in Targeted Watersheds

TARGETED WATERSHED	PAGE	POLLUTANTS OF CONCERN	WATER QUALITY PROBLEMS
Salinas River	27	Nitrates and minerals in ground water, nitrates in surface water, pesticides, heavy metals, erosion and sedimentation	Agricultural activities, urban development and runoff, seawater intrusion, past mineral mining, and gravel mining
Morro Bay	35	Sedimentation, pathogens, nutrients, heavy metals	Urban development and runoff, agricultural activities, septic systems
San Lorenzo River	20	Nutrients, sedimentation, bacteria	Erosion from roads and timber harvested areas, urban runoff.
Pajaro River	21	Sedimentation, heavy metals, nitrates	Erosion from inactive and abandon mines and urban development, agricultural runoff, urban runoff, hydromodification, gravel mining
Santa Maria River	38	Sedimentation, nitrates	Erosion from reservoir operation, agricultural activities, urban runoff and development
Santa Ynez River	40	Sedimentation	Habitat loss and erosion from ranching and land development

These watersheds are impacted predominantly by nonpoint source pollution. The Central Coast Regional Water Quality Control Board (CCRWQCB) wished to develop a more systematic approach to developing control strategies for these nonpoint source pollution problems, given limited staff resources. The framework for determining the need to develop and implement a control strategy for a given nonpoint source pollution problem considers four factors. These factors include the magnitude of the problem (through assessment); the presence of existing institutional and community action, acceptability, and/or willingness to partner in addressing problems (stakeholder involvement); the presence of existing government agencies as potential partners or responsible parties for controlling the problem; and opportunities to coordinate with existing internal staff efforts (e.g., outreach, point source control strategies, monitoring). Watersheds (or sub-watersheds) with all of these factors present for a given water body are "highest priority" for staff efforts, as they have the greatest need and greatest chance of success

for control strategies. Watersheds (or sub-watersheds) with one, two, or three of these factors present are "targeted" for staff efforts but not necessarily as the highest priority. Reconsideration of high priority and targeted watersheds is necessary on an ongoing basis as new information about water bodies is developed and as development and implementation of various control strategies are tested. This can only be done effectively with increased levels of monitoring and assessment.

In reality, many regulatory and non-regulatory activities were underway to address both point and nonpoint source pollution at the time the targeted watersheds were selected and prioritized. Therefore, efforts to prioritize watersheds and problems in watersheds rarely occur with a clean slate. The process of assessment and prioritization *begins* while other efforts are already underway.

Region 3 staff is facilitating additional efforts to protect and improve fish habitat by participating in the California Coastal Salmon and Watersheds Program of the Cal/RA and improving coordination with the SWRCB's Water Rights Division. Implementation of nonpoint source management measures, particularly those that control erosion and sediment discharges, will contribute to protection and improvement of fish habitat. In addition to the larger rivers targeted for attention through the WMI, several smaller, coastal-draining streams in Region 3 also support fish habitat. Region 3 will continue existing efforts and initiate new efforts in the smaller, coastal-draining streams as information increases on the status of fish habitat and on recommended protection methods.

NORTH WATERSHED MANAGEMENT AREA

The North WMA includes portions of San Mateo, Santa Cruz, Santa Clara, San Benito, and western Monterey Counties. The Big Basin, Pajaro River, Carmel River, part of the Salinas River (Monterey Peninsula), and the Santa Lucia Hydrologic Units (304, 305, 307, 309.5, and 308, respectively) are located within the North WMA. This WMA is separated into two distinct areas. The area north of Elkhorn Slough includes the Big Basin and Pajaro River Hydrologic Units. The area south of the Salinas River includes the Monterey Peninsula, Carmel River Hydrologic Unit, and the Santa Lucia Hydrologic Unit. The Pajaro River Hydrologic Unit drains to the Pacific Ocean through Monterey Bay. The Big Sur, Carmel River, and Santa Lucia Hydrologic Units drain to the Pacific Ocean through coastal rivers and streams. San Lorenzo River and Pajaro River watersheds are targeted in the North WMA, with San Lorenzo River watershed one of the Region's high priority watersheds.

Descriptions of the Watersheds

San Lorenzo River Watershed

The primary water quality concerns confronting the San Lorenzo River watershed are elevated nutrient levels, accelerated erosion, and elevated bacteria levels. These concerns are summarized below:

- Nutrients—Nutrients are periodically elevated among various segments of the San Lorenzo River. The predominant sources include septic tanks, horse corrals, and urban runoff. In 1995, Santa Cruz County began implementing a Wastewater Management Plan. The plan implements actions that will improve/correct and/or protect water quality. Region 3 staff is currently developing a Memorandum of Understanding with Santa Cruz County regarding construction and maintenance of alternative wastewater treatment systems. In addition, staff is developing minimum nitrogen removal limits for on-site treatment and disposal systems. The minimum nitrogen removal limits will support the implementation of a TMDL program currently being developed by County and Region 3 staff. The County, with input from Region 3 staff, has developed BMPs for animal horse corrals.

- Erosion—Erosion has significantly reduced the fish resources of this watershed. The predominant sources include urban development and poor road maintenance. In 1979, Santa Cruz County implemented a Watershed Management Plan. The Plan is currently under revision. The revised Plan, when fully implemented, will reduce impacts to water quality. A CWA Section 319(h) grant, managed by Region 3 staff and directed by the Santa Cruz RCD will also implement corrective measures. Additionally, the County and the City of Santa Cruz are developing an urban runoff management program that includes measures to reduce erosion. A TMDL will be developed by Region 3 by 2005 to address this problem.

- Pathogens—Bacteria are periodically elevated along various segments of the San Lorenzo River. The predominant sources include septic tanks, horse corrals, and urban runoff. In 1995, Santa Cruz County began implementing a Wastewater Management Plan. That Plan calls for implementation of BMPs to protect and enhance water quality. Staff has aided the County's efforts by assisting on inspections and public outreach. The urban runoff management program will also lead to improvements in discharges of pathogens. A TMDL will be developed by Region 3 by 2004 to address this problem.

- The Scott's Valley groundwater aquifer underlies the surface water bodies in this watershed. This aquifer is a sole source aquifer, which means it provides drinking water. This aquifer has been rated high for contamination susceptibility through statewide groundwater assessment.

Pajaro River Watershed

The Pajaro River watershed is located within San Benito, Santa Clara, Santa Cruz, and Monterey Counties and comprises approximately 1,300 square miles. The Pajaro River flows through diverse and important habitats. Types of problems currently facing the watershed include erosion and sedimentation, pesticides, nutrients, heavy metals, pathogens, stream bed flow alterations, endangered habitat, and riparian vegetation removal.

Traditionally, agriculture has been the dominant land use in the watershed with the bottomlands supporting a mixture of intensive irrigated row cropping and orchards systems. Agricultural lands are considered to be the major source of nutrient and sediment loading into the Pajaro River watershed. In recent years, other basinwide activities have also directly impacted water quality in the watershed. These activities have included low-density residential development, flood control projects, and mining. Due to the high demand for housing in recent

years, substantial portions of the upper watershed areas have now been developed for new residential subdivisions. Land use modifications have resulted in riparian and in-stream habitat loss, modified natural hydrologic features of rivers, streams, and groundwater basins, increased flooding occurrences, and reduced groundwater recharge capabilities. Many water quality concerns have a direct link with water rights. Improved communication and coordination with the Water Rights Division of the SWRCB would be beneficial. Wetlands are being degraded due to land development and current farming practices. Establishing riparian zones along sloughs, such as Harkin and Watsonville Slough, and implementation of other wetlands protection measures would improve the health of impacted wetlands. Mining activities have included abandoned mercury mines in Hernandez Lake sub-region, and gravel mines in the Pajaro River sub-region and have resulted in heavy metals accumulation and increased concentrations of other potentially toxic chemicals in the watercourses. Recent off-road vehicle use has exacerbated this problem. Furthermore, the continued outgrowth of flood control projects occurring in the watershed has resulted in increased sediment transport and excessive nutrients loading.

Due to the close proximity of the watershed to large urban centers and the extent of urbanization occurring, pollutant loads to rivers and streams have significantly affected overall water quality for the entire watershed.

The Pajaro River Watershed Water Quality Management Plan was completed in May 1999 to address many of these issues, and provides a watershed-wide plan for implementation and monitoring of activities significantly effecting water quality in the Region. The Monterey Bay Marine Sanctuary's Water Quality Protection Program continues to implement its Action Plans. They are finalizing the Action Plan for Agriculture in conjunction with the Farm Bureau. The Farm Bureau is initiating pilot projects through their Nonpoint Source Initiative.

Other Watersheds

Coastal-draining streams in the Big Basin and Santa Lucia Hydrologic Units are impacted mostly by timber harvesting and land development. Sedimentation resulting from these activities are affecting fish habitat and other beneficial uses in the streams.

Central Watershed Management Area

The Central WMA includes Monterey County and parts of San Luis Obispo County. The centrally located Salinas Hydrologic Unit (309) covers the majority of the Central WMA and drains to the Pacific Ocean through Monterey Bay. The Bolsa Nueva Hydrologic Unit (306) lies in the northern area of the Central WMA and drains to the Pacific Ocean through Elkhorn Slough. The Estrella River Hydrologic Unit (317) lies in the southern area of the Central WMA and is tributary to the Salinas River. The Salinas River Watershed is a targeted, high priority watershed.

Descriptions of the Watersheds

Salinas River Watershed

The Salinas River Watershed covers approximately 4,600 square miles and lies within San Luis Obispo and Monterey Counties. The Salinas River, which originates in San Luis Obispo County, flows northwestward into Monterey County and continues through the entire length of the Salinas Valley. The watershed's main tributaries are the Arroyo Seco, Nacimiento, San Antonio, and Estrella Rivers. The two primary ground water basins within the Salinas Watershed are the Salinas Valley Ground Water Basin and the Paso Robles Ground Water Basin.

Agriculture is the dominant land use throughout the Salinas Watershed, and nonpoint source pollution has had serious impacts on water resources. As a result of overpumping for irrigation, seawater has intruded nearly six miles inland in the Castroville area and necessitated abandonment of several water supply wells. Additionally, nitrate contamination is widespread throughout the Salinas Valley Ground Water Basin.

In addition to agriculture, other activities in the Salinas River Watershed include contact and non-contact water recreation (associated mainly with the Nacimiento and San Antonio Reservoirs), military uses (associated with Fort Hunter Liggett, Camp Roberts, and until 1993, Fort Ord), urbanization, and mining of mineral and oil reserves from various locations throughout the watershed.

As previously stated, the Salinas River Watershed encompasses most of two counties. It is an area that is extremely productive and culturally and geographically diverse, where many groups and individuals are working to protect and improve resources, preserve a rich agricultural heritage and assure that water resources are protected for the future. Although in reality the Salinas River Watershed is one hydrologic unit, geographic, political, land uses, and groundwater divisions facilitate discussing the upper and lower areas as somewhat separate entities.

The Upper Salinas Watershed begins at the headwaters of the Salinas River in the La Panza Range southeast of Santa Margarita Lake and extends to the Bradley narrows, past the confluences of the Nacimiento and San Antonio Rivers. The main subwatersheds of the Upper Salinas River include the drainages of the Estrella, Nacimiento and San Antonio Rivers. The Upper Salinas overlies the Paso Robles Ground Water Basin and lies mostly in San Luis Obispo County.

Agriculture is the primary land use within the Upper Salinas Watershed. Grazing and pasture lands and dryland farming have historically been the dominant land use in the Upper Salinas Watershed, but vineyards and wineries are becoming increasingly economically important. Prime agricultural lands located adjacent to the Salinas River floodplain and in smaller patches throughout the watershed are being converted to irrigated agriculture (primarily vineyards) while less productive areas farther from the floodplain remain as grazing land or dryland farming.

Urban development is occurring in the corridor along the Salinas River and Highway 101, particularly in the communities of Santa Margarita, Atascadero, Templeton, and Paso Robles. Outlying suburban areas are being subdivided into one to five acre ranchettes. Until the 1970s, population growth was slow. Between 1970 and 1990, the population growth rate averaged approximately five percent per year. Although the growth rate for San Luis Obispo County slowed during the early 1990s, the growth rate for Paso Robles and Atascadero is faster than for other cities in the County. The population of north San Luis Obispo County is projected to increase from approximately 74,000 in 1994 to 104,650 by 2015.

Other land uses in the Upper Salinas Watershed include recreational uses of the Nacimiento and San Antonio reservoirs, and military uses at Camp Roberts and Fort Hunter Liggett. In the past, mercury was mined within the Nacimiento subwatershed.

Every two years, the State of California publishes a compilation of water quality assessment information from the State's nine RWQCBs. Although available data are often limited, the assessment attempts to give a qualitative overview of the state of water bodies in each Region. Identified impacts to water bodies in the Upper Salinas Watershed are primarily related to mercury mining. In the 1996 Water Quality Assessment Report, the Nacimiento Reservoir is listed for metals (mercury) in fish tissue, Las Tablas Creek for sedimentation, total dissolved solids, electrical conductivity, sulfate, and nickel, and the north and south forks of Las Tablas Creek are listed for excessive metal (mercury) concentrations. Ten percent of the Paso Robles Ground Water Basin has been assessed and listed as only partially supporting beneficial uses, primarily due to salt concentrations.

Current information available about ground water overdraft in the Paso Robles Ground Water Basin is incomplete and conflicting. Nitrates have not been as systematically evaluated as in the Salinas Valley and therefore less is known about the extent of contamination. The extent of salt build up has not been well quantified. The North County Water Resource Agency is currently studying ground water quantity. A geo-thermal pressure aquifer is located approximately 650 feet below the surface in the Paso Robles and Templeton areas. The water contained in this pressure aquifer is hot (122 degrees +), high in total dissolved solids and other minerals, including Boron. Improper construction of wells in the area may be contributing to contamination of the upper aquifer. CCRWQCB staff is working with San Luis Obispo County staff to quantify the impacts from the geothermal formation. Some of the improperly constructed wells have been located and have been sealed or retrofitted to prevent migration between the aquifers.

Most of the land overlying the Paso Robles Ground Water Basin is used for grazing or is being developed into vineyards. The amount of acreage under cultivation has been expanding in the area, and there is increasing urban development. Therefore, more demands are being placed on ground water supplies, and it is reasonable to conclude that the possibility of overdraft exists in some areas. Considering recent conversion of grazing lands to vineyards, row crops, and ranchettes, it is likely that nitrates in groundwater will also increase in the future unless preventative measures are taken in the short term.

The extent of impacts from grazing within the Upper Salinas Watershed has not been well quantified, nor the impacts of increasing urbanization and development of ranchettes on rates of erosion and sedimentation. The extent of impacts from inactive mercury mines is still being assessed, and an enforcement case is underway for two mercury mines.

The Lower Salinas Watershed encompasses the area from north of Bradley to Monterey Bay. The principle subwatershed of the Lower Salinas River is the drainage of the Arroyo Seco River. The Lower Salinas overlies the Salinas Ground Water Basin and is entirely within Monterey County. As in the Upper Salinas Watershed, the dominant land use in the Lower Salinas Watershed is agriculture; however, irrigated cropland is much more predominant than in the Upper Salinas Watershed. The Lower Salinas Watershed encompasses the Salinas Valley, one of the most productive agricultural areas in the world with a gross annual value of nearly $2 billion. Urban development occurs primarily in small to medium-sized cities along the Salinas River. The largest city, Salinas, has a population of over 100,000. Other land uses include grazing and dryland farming in the upland areas away from the floodplain, confined animal facilities, and some public land and open space throughout the watershed.

Almost all of the water used to support the huge agricultural industry in the Lower Salinas Watershed comes from underlying aquifers. As a result, demand has exceeded supply in many parts of the watershed, resulting in overdraft and seawater intrusion. In addition, there is widespread contamination of the upper aquifers by nitrates. Large scale use of groundwater for irrigated agriculture in the Salinas Valley began just before the turn of the century. As both irrigated agriculture and urban development increased during the past several decades, groundwater demand has exceeded available recharge. As a result, groundwater levels have dropped below sea level, allowing seawater to intrude from Monterey Bay into aquifers located 180 and 400 feet below ground surface. Seawater intrusion was first documented in a few wells in the Castroville area in 1932. By the 1940s, many agricultural wells in the Castroville area had become so salty that they had to be abandoned. Currently, more than 16,000 acres of agricultural land near the coast overlie groundwater too salty for agricultural use. As a result of overdraft, seawater has intruded approximately six miles inland in the most shallow regional (180-foot) aquifer, and two miles inland in the second-deepest regional (400-foot) aquifer. Thus far, the 900-foot regional aquifer is not known to be impacted by seawater intrusion.

Nitrate contamination of groundwater has been identified as a serious water quality problem in the Salinas Valley Ground Water Basin for many years. Agricultural wells indicate the presence of nitrates in groundwater throughout the Basin. Although septic systems, improper handling and storage of farm chemicals, and relatively small-scale confined animal facilities have most likely contributed to the nitrate loading, there is general agreement that crop application is the primary nitrate source. As of 1993, average nitrate concentrations in the 180-foot aquifer approached or exceeded the maximum drinking water standard (45 mg/L nitrate as NO_3) in three of the Basin's four hydrologic sub-basins.

Between 1987 and 1993, average nitrate concentrations increased in the second-deepest regional (400-foot) aquifer. This signifies that nitrate contamination is spreading from the uppermost regional (180-foot) aquifer to a deeper zone that had been characterized by higher quality water.

Several water bodies in the Lower Salinas Watershed have been listed in the 1996 Water Quality Assessment Report as only partially supporting beneficial uses, primarily due to elevated levels of organic pesticides in shellfish and fish tissues. Both the Old Salinas River Estuary and the Salinas River Lagoon have been impacted by nutrients, pesticides, and sedimentation and are listed as impaired water bodies under Section 303(d) of the CWA. Other listed water bodies are the Blanco Drain, Old Salinas River, Espinosa Slough, Moro Cojo Slough, and Tembladero Slough due to the presence of organic pesticides in fish, shellfish, and sediments. The entire Salinas Valley Ground Water Basin, which includes four sub-basins, is listed as impaired and as only partially supporting beneficial uses due to nitrate contamination and seawater intrusion.

Current priority problems identified for the Salinas River Watershed through selection of the Salinas Watershed as the Central Coast Region's first priority watershed, through the Water Quality Assessment process, and through preliminary outreach and analysis by Team members are (1) nitrates in the Salinas Groundwater Basin, (2) mercury in 303(d) listed water bodies in the Upper Salinas River Watershed, (3) persistent pesticides in tissue and sediments as identified in 303(d) listed water bodies in the Lower Salinas Watershed, (4) nutrients in surface water as identified in 303(d) listed water bodies in the Lower Salinas Watershed, and (5) erosion and sedimentation.

Elkhorn Slough Watershed

The Elkhorn Slough watershed is located in Northern Monterey County and western San Benito County and includes the drainage areas tributary to Elkhorn and Moro Cojo Sloughs. The primary water quality concerns currently confronting the Elkhorn Slough watershed are erosion, pesticides, bacteria, and scour. Many of these water quality concerns are generated from surrounding agricultural activities. Several Moss Landing Harbor activities, including ongoing dredging, impact the slough at its confluence with the harbor.

The problems of erosion and pesticide runoff have been identified as having significant impacts on the watershed region by the Monterey Coast RCD and USDA, NRCD through the Elkhorn Slough Watershed Project. The surrounding agricultural lands are a major source of eroded soils and agricultural chemicals. Soil loss from strawberry and cropped lands has resulted in sediment deposition on roads, drainage channels, and ultimately in wetland habitat in the slough area. Existing economic and social conditions of many growers in the area have prevented effective erosion control systems from being implemented on the most erodible lands in the watershed. Furthermore, public sponsored soil conservation programs currently being implemented in the area have been largely ineffective in financially assisting the most limited-resource growers. To address soil erosion, the Region 3 is currently funding the Elkhorn Slough Agricultural Outreach Project with State Cleanup and Abatement Funds. This project funds a Watershed Coordinator who works to establish constructive relationships between stakeholders in the watershed. The Watershed Coordinator helps landowners and farmers learn about and implement soil conservation measures. The project is funded at $347, 000 over five years and is currently in its third year.

Bacteria is significantly impacting water quality in the watershed as well. A number of sources in the watershed have been identified as directly attributing to this problem. Moss Landing

Harbor occupies over 600 vessels year round, many of which contain liveaboards/stayaboards who utilize substandard wastewater storage and disposal systems which contaminate waters. The slough is also home to a harbor seal haulout and is a designated wildlife sanctuary. Coupled with the presence of a large dairy and dairy waste lagoons, and residential on-site septic systems, coliform levels in the lagoon are significantly affecting overall water quality in the slough. Recent chemical analysis studies conducted by DFG have also revealed increased levels of DDT, DDE, DDD, and toxaphene in tissues and eggshells of the Caspian tern. DFG has postulated these chemicals are introduced through remobilization and transportation of sediment by heavy water flows from both Salinas and Pajaro Rivers. These pollution sources and other factors influencing water quality have restricted shellfish growing in the slough and substantially reduced overall water quality for the area. Currently, there are no corrective measures being implemented to address the bacteria problem.

South Watershed Management Area

The South WMA falls within portions of San Luis Obispo, Santa Barbara, and Ventura Counties. The major watershed areas in the South WMA include Estero Bay, Carrizo Plain, Santa Maria, San Antonio, Santa Ynez, South Coast, and Santa Barbara Channel Islands Hydrologic Units (310, 311, 312, 313, 314, 315, 316, respectively). All the hydrologic units are grouped together in the Region except the Estero Bay Hydrologic Unit. The Estero Bay Hydrologic Unit extends along the coast from Arroyo Grande in the south, north to the Monterey County line, where it meets the Carmel River Hydrologic Unit of the North WMA. It is bordered by the Central WMA on the east. This hydrologic unit and the South Coast Hydrologic Unit drain to the Pacific Ocean through coastal streams. The Santa Maria, San Antonio, and Santa Ynez Hydrologic Units drain to the Pacific Ocean through rivers that originate ten or more miles inland, to the east. The Santa Barbara Channel Islands Hydrologic Units drain to the Pacific Ocean through streams and minor drainages on each of the islands. Morro Bay, Santa Maria River and Santa Ynez River watersheds are targeted in the South WMA, with Morro Bay watershed one of the Region's high priority watersheds.

Descriptions of the Watersheds

Morro Bay Watershed

The primary water quality concerns confronting Morro Bay are sedimentation, nutrient enrichment, bacterial contamination, and heavy metals. Several related problems, including habitat loss and degradation, and excessive water diversion, exacerbate these water quality concerns. Because of the extreme amount of public interest in the health of Morro Bay, a considerable amount of attention and funding has been focused on addressing these problems.

Morro Bay is one of 28 estuaries participating in the National Estuary Program, which provided to develop a watershed plan (Comprehensive Conservation and Management Plan or CCMP) to address these problems. This plan was completed in November 1999. The program will also provide implementation funds for several years following plan completion. This will afford a tremendous long-term opportunity to improve water quality within the watershed. The National Estuary Program is directed by the Local Policy Committee, which includes local, State

and federal agencies, and private stakeholders. Region 3's responsibilities to the National Estuary Program include managing contracts, developing and writing action plans and other required documents, providing technical expertise, attending public meetings, and participating on the Local Policy Committee.

One of 17 National Monitoring Programs is located in the Morro Bay watershed. The National Monitoring Program provides the data necessary to evaluate and prioritize BMPs to develop TMDLs, make long-term management decisions, and transfer lessons learned to other watersheds. The National Estuary Program is relying on the data from the National Monitoring Program to provide a foundation for its water quality monitoring program. Region 3's responsibilities to the National Monitoring Program include managing contracts, collecting and analyzing data, preparing technical and progress reports, and organizing and facilitating technical advisory committee meetings.

Listed below are water quality issues in the Morro Bay watershed:

- Sedimentation and erosion control—Sedimentation has resulted in the loss of 25 percent of the tidal capacity of the bay in the last century, and is considered by many as the most serious problem confronting the Bay. The NRCS implements a watershed enhancement program supported by various federal funds. The CCRWQCB implements the National Monitoring Program with CWA Section 319(h) funds. This program is providing the extremely valuable data that is demonstrating the effectiveness of BMPs at reducing sedimentation and which support development of TMDLs. It has broad application for similar lands in the Region and statewide. The National Estuary Program will implement corrective actions based on various action plans. The CCRWQCB is developing a TMDL for siltation.

- Pathogens—Bacterial contamination in Morro Bay has increased to a point where many of the shellfish growing beds are no longer viable. Bacterial levels exceed standards for shellfish growing in half of the sampled locations in the shellfish beds and often exceed County and State limits for body contact recreation. The predominant sources are failing septic tanks, agricultural sources, recreational boaters, and urban runoff. The CCRWQCB, in cooperation with the National Estuary Program, has formed a technical advisory committee, and is developing action plans for reducing bacteria levels and a monitoring plan for tracking long term success. This group's work will be integrated into National Estuary Program action plans for future implementation. The Los Osos Community Services District (CSD) was formed in 1998 and replaces San Luis Obispo County as the governing body for the unincorporated communities of Baywood Park and Los Osos. The CSD has abandoned San Luis Obispo County's sewer system project and is in the initial stages of developing a new plan for managing wastewater in those communities. The CCRWQCB is developing a TMDL for pathogens.

- Nutrient Enrichment—Ground water nitrate levels in Los Osos and Chorro Creek basins are elevated, sometimes in excess of drinking water standards. Nitrates and phosphates in surface water contribute to growth of nuisance algae and decreased dissolved oxygen levels, sometimes in violation of Basin Plan water quality objectives. Sources include septic systems, fertilizers, urban runoff, and animal waste. A study of nutrient impacts on

Bay resources will be undertaken as part of the National Estuary Program process, and National Estuary Program action plans specifically address solutions to this issue. The CCRWQCB is developing the Morro Bay volunteer monitoring program and is participating in data collection on this and other water quality issues. The CCRWQCB is also developing a TMDL to address this problem. The Los Osos CSD's future wastewater management strategy will help address this issue.

- Heavy metals in sediments—Abandoned mines in the upper watershed bring sediments high in chromium, nickel, and other metals into Morro Bay. Sediments in the upper watershed at times exceed Hazardous Waste Standards. Sediment levels near offshore boatyards are elevated with mercury and other metals. Action plans are being developed by the National Estuary Program for cleanup of urban runoff. The CCRWQCB is developing TMDLs for metals from the mines and for metals impacting the Bay.

Santa Maria River Watershed

The Santa Maria River Watershed is located in southern San Luis Obispo County and northern Santa Barbara County. The Santa Maria River Watershed includes all areas tributary to the Cuyama River, Sisquoc River, and Santa Maria River. At 1,880 square miles (1.2 million acres) the Santa Maria River Watershed is one of the larger coastal drainage basins of California. The Cuyama River and Sisquoc River originate in wilderness areas of the Los Padres National Forest. The Santa Maria River is formed by the confluence of the Cuyama and Sisquoc approximately seven miles south-west of Santa Maria. The Twitchell Reservoir Dam on the Cuyama River, six miles up-river from the confluence with the Sisquoc, and the extensive levee system along the majority of the Santa Maria River are the most significant manmade structures in the watershed. The Twitchell Reservoir is operated to provide groundwater recharge for water supply and flood control. The major groundwater basins are the Santa Maria Valley and the Cuyama Valley aquifers.

The Upper Cuyama and Sisquoc Rivers are in a relatively natural state. From its origin to the USFS boundary, the Sisquoc River is a designated National Wild and Scenic River. However, downstream of the USFS boundary, two in-stream gravel operations alter the riverbed. The Upper Cuyama River watershed contains vast area of recent marine deposits. The soils are sparsely vegetated and highly erosive. Periodic high stream flows cause large sediment loads from the upper watershed to be deposited down stream in the Twichell Reservoir. Sediment deposits are threatening the operation capability of the dam and reducing ground water recharge capacity. It can be assumed that reduction in sediment delivery caused by the dam and in-stream mining is threatening the ecological integrity of the estuary and extensive dune complex at the mouth of the Santa Maria River.

The lower Santa Maria River Watershed is highly altered. Below Sierra Madre Road, the Cuyama River was shortened by removing meander to provide better alignment of State Highway 166. The Santa Maria River is leveed along the majority of its reach. The Santa Maria Valley is a broad flat valley protected from flooding by the River levee and a series of flood control channels and basin. The Valley is intensively farm and is home to the Cites of Santa Maria (Population, 70,800) and Guadalupe (Population, 6,500). The flat topography

results in the majority of surface runoff from the urbanized area surrounding and including the City of Santa Maria being contained by infiltration basins versus flowing directly to the River. The Santa Maria River is the major source of recharge to the Santa Maria groundwater basin. The Solomon (Orcutt) Creek is a mainly constructed drainage in the southern most area of the lower watershed. The Creek joins the Santa Maria River near its outlet to the Pacific Ocean. The area drained by Solomon Creek once contained a vast wetland dominated area, but since being drained in the late 1800s, it has become a productive agricultural area.

Both the Santa Maria Valley and Cuayama Valley groundwater basins have impaired water quality, which is mainly attributed to nonpoint source pollution from agricultural and urban activities. The majority of groundwater data and knowledge pertains to the Santa Maria Groundwater basin. Groundwater has been impacted by nitrates and total dissolved solids (salts). Ground water quality worsens across the Valley in the direction of flow (west). No ongoing or contemporary study of the condition exists; however, previous studies and current point source data indicate the levels of Total Dissolved Solids, Sodium, Chloride, and Nitrate impact beneficial uses of groundwater across the Valley. Significant changes in farming practices have occurred in recent years (e.g., drip irrigation, more prudent use of chemicals); at the same time, population continues to grow. A comprehensive look at historic and current groundwater data is needed to determine what effect these and other changes (e.g., wet/dry climate cycles, natural mineral sources) are having on the groundwater basin.

Surface water impacts are less well-defined, currently the most evident surface water issue is reduction in Twitchell Reservoir capacity by sedimentation. The CCRWQCB has awarded grant funds from the Guadalupe Oil Field Settlement to the California Coastal Conservancy to prepare a Santa Maria River Estuary Plan. The project was scheduled to commence January 2000 and was intended to address issues related to sediment transport and estuary health.

Currently a project is underway to study the nonpoint source pollution of surface and groundwater within the Santa Maria River drainage basin. The project is funded with CWA Section 205(j) grant funds and is being conducted by the Cachuma RCD in conjunction with other watershed partners and CCRWQCB staff. The plan will include recommendations for restoring degraded riparian and aquatic habitat. Unfortunately, a comprehensive data gathering and management exercise that would provide needed information for basinwide groundwater assessment is beyond the scope of the project.

Several oilfields have operated in this watershed for many years. Although evaluation of groundwater data is limited, only localized problems from petroleum have presented themselves. One case has resulted in a significant discharge of petroleum, Unocal's Guadalupe Oil Field. This site released diluent, a refined petroleum product, from a pipeline system over a 40-year period. Both groundwater and surface waters in the vicinity of the site have been contaminated by the leaks. A monetary civil settlement reached between Unocal and the State in July 1998 included $15 million to fund water quality projects. This money was distributed as grants to projects that refine the current assessment of nonpoint source impacts (which is preliminary) and/or implement appropriate actions to correct identified problems. The first round of projects to be funded was presented to CCRWQCB in May 1999.

Santa Ynez River Watershed

The Santa Ynez River Watershed is located in Santa Barbara County and includes Lake Cachuma, the Santa Ynez River and other smaller tributaries within the area. The major areas of concern regarding water quality within the watershed include effects of water rights adjudication, erosion, sedimentation, flood control and habitat loss (especially for steelhead). Urban development, increased groundwater pumping, ranching, irrigated agriculture, and expanding recreational use all contribute to the degradation of water quality.

The Santa Ynez River Fish Management Plan has been developed to improve the steelhead fishery through habitat restoration, increased flows, etc. NRCS is implementing a range management plan to control resultant nonpoint source pollution along tributaries to the Santa Ynez River. The CCRWQCB staff is active on the technical advisory committees for both of these projects. Additionally, staff participates on the steering committee for the Lompoc Groundwater Management effort to facilitate implementation of nonpoint source management measures to enhance fish habitat.

This watershed needs initiation of an updated assessment of nonpoint source impacts in the watershed in order to better target appropriate actions to correct identified problems.

South Coast Watersheds

The South Coast watersheds consist of numerous coastal-drainage streams, which originate on the upper slopes of the south flank of the Santa Ynez mountain range in Santa Barbara County. The County's Environmental Health Services Department (EHS) conducts routine monitoring of the ocean near creek mouths for bacteria. EHS has frequently found bacteria in violation of water quality standards and has subsequently closed beaches to public access. Beach closures sparked substantial public outcry and subsequent efforts to improve water quality in the creeks and nearshore ocean. City and County governments funded a major effort, Project Clean Water, designed to identify the sources of bacterial pollution and develop and implement control measures. In addition to staffs of city and County governments, the Project Clean Water organization includes a number of working groups associated with potential pollution sources, such as illegal and unsanitary encampments, failing septic systems, sewer system leaks, etc. Working groups are comprised of public and private members. The Project has identified many creeks where pollution from nonpoint sources could be reduced by stream restoration and bank stabilization projects. Creeks identified as needing the most attention with identified improvement projects include the following creeks: Arroyo Burro (three locations), Mission (six locations), Rincon, Carpinteria (four locations), and Arroyo Quemado Creeks. Project Clean Water has identified other creeks where stream restoration, riparian restoration, and other actions are designed to reduce pollution from nonpoint sources and improve water quality via other means such as shading. Projects of this type have been identified for the following Creeks: Gaviota (two locations), Refugio (two locations), Devereux (two locations), Atascadero (three locations), Maria Ygnacio (three locations), Cieneguitas (two locations), Las Positas, Laguna, and El Estero. The CCRWQCB staff has participated and will continue to

participate in Project Clean Water groups working on water quality issues including wetlands and riparian restoration, septic tank management, illegal encampments, and sewer system spills.

Other Watersheds

- San Luis Obispo Creek Watershed: The San Luis Obispo Creek Watershed encompasses the City of San Luis Obispo and extends to the Pacific near Avila Beach where San Luis Obispo Creek drains into the ocean. The major problems facing this watershed are nonpoint source pollution including land development, hydromodification, and traditional agricultural land practices. Studies have shown that the Creek is impacted by excessive nutrient loading and sedimentation. Beneficial uses threatened or impaired by this water quality degradation include both water contact and non-contact recreation, wildlife habitat, fish habitat, and fish migration. The City and County of San Luis Obispo are currently developing a Riparian Corridor Management Plan for the San Luis Obispo Creek Watershed. The CCRWQCB will coordinate development of the TMDL with this effort to address nonpoint source pollution in the watershed.

- Santa Barbara Channel Islands: Cattle grazing occurred historically on the Channel Islands and was allowed to continue when the National Parks Service assumed operation and management of the lands. The grazing caused erosion from steep hillsides. Poorly managed roads also contributed to the erosion. After working with the National Park Service and grazing operators to improve conditions, the CCRWQCB issued a Cease and Desist Order to halt excessive sedimentation. This was followed by a third-party lawsuit and then a settlement agreement that resulted in removal of the cattle. Additionally, the National Park Service is implementing a riparian zone recovery plan and a road management plan. The CCRWQCB staff will provide technical assistance as needed to facilitate implementation of the settlement agreement.

Los Angeles Region (Region 4)



The Los Angeles Regional Water Quality Control Board (LARWQCB) and Watershed Management

The Los Angeles Region has jurisdiction over all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast in western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente). The LARWQCB's jurisdiction also includes all coastal waters within three miles of the continental and island coastlines.

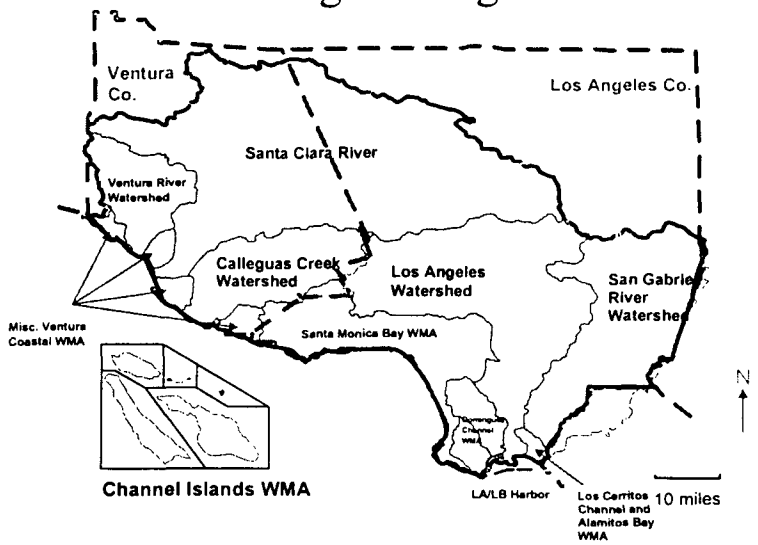
The Los Angeles Region is the State's most densely populated and industrialized region. Over 1,000 discharges of wastewater from point sources in this Region are regulated by the LARWQCB. Over 700 of these point source discharges are discharged to surface waters and are regulated under the NPDES. In addition, the LARWQCB prescribes WDRs for the remaining discharges, which are primarily to groundwater and landfills. However, the quality of many waters continue to be degraded from pollutants discharged from diffuse and diverse nonpoint sources. Future success in reducing pollutants from nonpoint sources and achieving additional reductions in pollutants from point sources requires a shift to a more geographically-targeted approach.

A watershed management approach integrates the LARWQCB's many diverse programs, particularly permitting, planning, and other surface-water oriented programs which have tended to operate somewhat independent of each other. This approach will enable us to better assess cumulative impacts of pollutants from all (point and nonpoint) sources and more efficiently develop watershed-specific solutions that balance the environmental and economic impacts of our actions.

The involvement of stakeholders is critical to the success of watershed management; however, the process to involve stakeholders demands more of regulators in terms of public outreach, education, and consensus building.

We have designated ten watershed management areas in the Los Angeles Region as shown in the figure below.

Watershed Management Areas of the Los Angeles Region

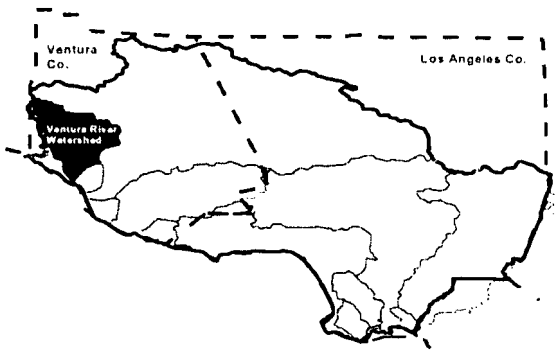


Initially, implementation of watershed management in the Los Angeles Region occurred in phases over a seven-year cycle for our pilot watersheds Ventura River and Calleguas Creek. We are now shifting to a five-year cycle to be in line with the standard permit life and to equalize workloads over the years. This shift in our watershed cycle is illustrated in the figure on the next page. The majority of permit-related tasks such as permit renewals/revisions and regional monitoring program development, as well as preparation of state of watershed reports, will occur during the first approximately twelve months of the watershed's five-year cycle. Much of the rest of the five-year cycle will be spent developing and implementing, with the input of stakeholders, measures for management of more complex pollutants from point and/or nonpoint sources. Many of the Region's TMDLs will be implemented during the second cycle of permit renewals.

VENTURA RIVER WATERSHED

This was a targeted watershed for permitting purposes in FY 1995-96 and will be targeted next in FY 2000-01.

Overview of Watershed



The Ventura River and its tributaries drain a coastal watershed in western Ventura County. The watershed covers a fan-shaped area of 235 square miles, which is situated within the western Transverse Ranges (the only major east-west mountain ranges in the continental United States.). From the upper slopes of the Transverse Ranges, the surface water system in the Ventura River watershed generally flows in a southerly direction to an estuary, located at the mouth of the Ventura River. Groundwater basins, composed of alluvial aquifers deposited along the surface water system, are highly interconnected with the surface water system and are quickly recharged or depleted according to surface flow conditions. Topography in the watershed is rugged, and as a result, the surface waters that drain the watershed have very steep gradients ranging from 40 feet per mile at the mouth to 150 feet per mile at the headwaters.

Beneficial Uses in Watershed:

Estuary	*Above Estuary*
Navigation	Municipal supply
Commercial & sportfishing	Industrial service supply
Estuarine habitat	Industrial process supply
Marine habitat	Agricultural supply
Contact & noncontact water recreation	Contact & noncontact water recreation
Warmwater habitat	Warmwater habitat
Wildlife habitat	Wildlife habitat
Preservation of rare & endangered species	Preservation of rare & endangered species
Migratory & spawning habitat	Migratory & spawning habitat
Wetlands habitat	Wetlands habitat
Shellfish harvesting	Coldwater habitat
	Groundwater recharge
	Freshwater replenishment

Precipitation varies widely in the watershed. Most occurs as rainfall during just a few storms between November and March. Summer and fall months are typically dry. Although snow occurs at higher elevations, melting snowpack does not sustain significant runoff in warmer months. The erratic weather pattern, coupled with the steep gradients throughout most of the watershed, results in high flow velocities with most runoff reaching the ocean.

Water Quality Problems and Issues

The majority of water quality problems involve eutrophication (excessive nutrients and effects), especially in the estuary/lagoon although some DDT and metals have been found in mussel and fish tissue (on the 303(d) list for these). A large storm drain enters the River near the estuary and homeless persons live in and frequent the river bed. Sediment in the estuary, however, appears relatively uncontaminated; and in laboratory tests conducted through the Bay Protection and Toxic Cleanup Program , little sediment toxicity was found. In some sub-watersheds, high TDS concentrations impair the use of water for agriculture. The watershed's water quality problems for the most part are nonpoint source-related. There have also been incidents of releases of toxic materials into storm drains entering the lower river.

The Ventura River Watershed

- One major discharger (POTW)
- 22 dischargers covered under industrial storm water permit
- Eutrophication concerns, especially in lagoon
- Some bioaccumulation of DDT and metals
- TDS concerns in some subwatersheds
- Impediments to steelhead trout migration (but much high quality habitat)
- More nonpoint source rather than point source problems

There is only one major discharger, a small POTW (3.0 MGD) in the middle reach of the Ventura River which has recently upgraded (end of 1997) to tertiary treatment. The treatment plant effluent had been implicated in nuisance growth of aquatic plants and low dissolved oxygen found at times downstream of the discharge. For much of the year, the facility's effluent can make up two-thirds of the total river flow. The major concern was the facility's inability to meet the nutrients and suspended solids discharge limitations in its NPDES permit. Additionally, high biochemical oxygen demand (BOD) in the effluent resulted in dissolved oxygen concentrations in the River that could not support cold water aquatic habitat. The facility was required to upgrade under an LARWQCB Cease and Desist Order. The most recent monitoring has shown the quality of the effluent has significantly improved, including a reduction of nitrate-nitrogen from 20 mg/l to 4 mg/l, a reduction of suspended solids from 12 mg/l to 2 mg/l, and a reduction of BOD from 10 mg/l to 2 mg/l. Dissolved oxygen (DO) levels in the River have improved dramatically to about 11 mg/l and algal growth is greatly reduced below the plant; however, nonpoint sources (agriculture and horse stables) still appear to be contributing to algal growth above the plant.

Water diversions, dams, and groundwater pumping also are thought to limit surface water resources needed to support a high quality fishery. Reduced water supplies affect water quality and thus beneficial uses, particularly with regard to the endangered steelhead trout (steelhead trout are known to utilize the River and some of its tributaries historically supported annual steelhead runs of 5,000 – 6,000 adults). Removal of the Matilija Dam (upper river) has recently been identified as a high priority.

The table below gives examples of typical data ranges which led to the 1998 303(d) listings.

IMPAIRMENTS:

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
DDT	Basin Plan narrative objective	23.0 ng/g (tissue)	Ventura River Estuary
Algae	Basin Plan narrative objective		Ventura River Reach 2 (Main St. to Weldon Canyon) Ventura River Reach 1 (estuary to Main St.) Ventura River Estuary
Pumping, Water diversions	Basin Plan narrative objective		Ventura River Reach 4 (Coyote Creek to Camino Cielo Rd.) Ventura River Reach 3 (Weldon Canyon to confl. w/ Coyote Cr.)
Copper	Basin Plan narrative objective	4.1 ug/g (tissue)	Ventura River Reach 2 (Main St. to Weldon Canyon) Ventura River Reach 1 (estuary to Main St.)
Silver	Basin Plan narrative objective	0.03 ug/g (tissue)	Ventura River Reach 2 (Main St. to Weldon Canyon) Ventura River Reach 1 (estuary to Main St.)
Zinc	Basin Plan narrative objective	40.0 ug/g (tissue)	Ventura River Reach 2 (Main St. to Weldon Canyon) Ventura River Reach 1 (estuary to Main St.)
Trash	Basin Plan narrative objective		Ventura River Estuary
Se	Basin Plan narrative objective	2.2 ug/g (tissue)	Ventura River Reach 2 (Main St. to Weldon Canyon)

CURRENTLY SCHEDULED TMDLS

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Eutrophication	Ventura River Reaches 1 and 2 Ventura River Estuary	2002-03

Stakeholder Group

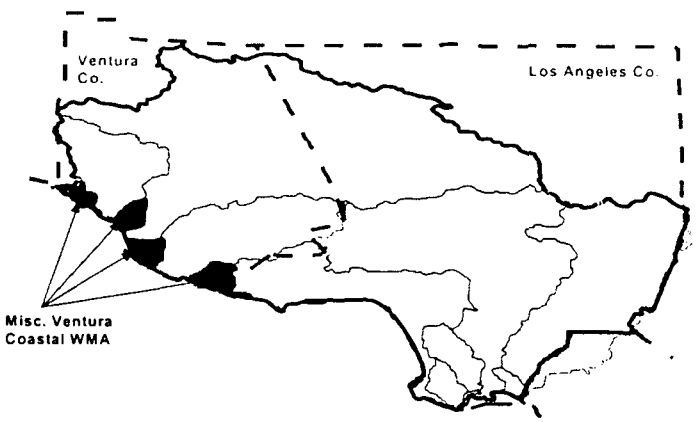
Ventura River Steelhead Restoration and Recovery Plan Group A Plan was developed in response to the listing of steelhead trout as an endangered species by the National Marine Fisheries Service (NMFS) in August 1997. The plan was developed (1) to identify measures to mitigate impacts of ongoing operations and maintenance activities, (2) to identify future projects, and (3) to identify and evaluate opportunities to promote recovery and restoration of the steelhead trout in the watershed. One staff person will continue to remain involved with the group, as needed.

MISCELLANEOUS VENTURA COASTAL WMA

This Watershed Management Area will be targeted for permitting purposes in FY 2000-01.

Overview of WMA

Channel Islands Harbor: Channels Islands Harbor is located south of the Santa Clara River and is in the immediate vicinity of considerable residential development and some agricultural land. The Southern California Edison inlet canal to the Ormond Beach Generating Station is located at the north end of the harbor. The harbor is home to many recreational boats and two boatyards.



Port Hueneme Harbor: Port Hueneme is a medium-sized deepwater harbor located in Ventura County, north of Mugu Lagoon. Part of it was operated by a U.S. Navy Construction Battalion until very recently while the rest of the harbor serves as a commercial port operated by the Oxnard Harbor District. The construction of a majority of the harbor was completed in 1975. The commercial side generally serves ocean-going cargo vessels and oil supply boats; the latter serve the oil platforms in the Santa Barbara Channel. Two endangered bird species may use the harbor, the California Brown Pelican and the California Least Tern.

Ventura Marina: Ventura Marina is a small craft harbor located between the mouths of the Ventura and Santa Clara Rivers. It is home to numerous small boats and two boatyards. The "Ventura Keys" area of the marina is a residential area situated along three canals. The marina is surrounded by agricultural land and a large unlined ditch drains into the Keys area. Since the

marina is between the mouths of two rivers which discharge large sediment loads from their relatively undeveloped watersheds, the marina has a constant problem with keeping the entrance channel open.

McGrath Lake: McGrath Lake is a small brackish water body located just south of the Santa Clara River. The Lake is located partially on State Parks land and partially on privately-owned oil fields in current production. A number of agricultural ditches drain into the Lake. A State beach is located off the coastal side of the Lake. The habitat around the Lake is considered to be quite unique, and it is utilized by a large number of overwintering migratory birds.

Open Coastline: A major feature of the coastline north of Mugu Lagoon is Ormond Beach and Ormond Beach Wetlands. There are a number of scenarios under consideration for restoration of this degraded yet valuable wetlands.

Water Quality Problems and Issues

Channel Islands Harbor: The Harbor is on the 1998 303(d) list for lead and zinc. During the early to mid-1980s, the SMWP found low to intermediate levels of metals and organics except for one especially high accumulation of DDT. Sediment sampling for metals conducted by LARWQCB staff in 1988 revealed slightly to moderately elevated levels. Copper at one site was nearly 50 ppm, and zinc was as high as 76 ppm. Arsenic was slightly elevated (4 ppm) at a sampling site located next to a drain possibly connected to a nearby agricultural field. Under the Bay Protection and Toxic Cleanup Program (BPTCP), the Harbor is listed as a site of concern due to DDT and silver sediment concentrations and sediment toxicity (but not recurrent toxicity); further monitoring is needed here.

Port Hueneme Harbor: The Harbor is on the 1998 303(d) list for PAHs, DDT, PCBs, TBT, and zinc. The SMWP has found elevated levels of Cu, Zn, PAHs, and PCBs. Zinc was at elevated levels on the commercial side while PCBs were very high on the U.S. Navy side. The U.S. Navy side is suspected of using large amounts of pentachlorophenol (PCP) for treatment of wood pilings. A USCOE Draft Environmental Impact Report (DEIR) released in 1985 covering extension of one channel stated that water quality was good. The document also briefly discussed the port's biota which DFG found to be "fairly healthy" and typical of southern California harbors. Sediment core samples were collected in 1985 as part of a proposed dredge project. Relatively low levels of metals were found and no pesticides were detected. It may well be that flushing is good in the harbor and only locating a station directly next to a source will result in bioaccumulation. The BPTCP found fairly minimal levels of sediment toxicity in recent testing, but the harbor is considered a site of concern under the program due to accumulation of DDT, PCBs, TBT, PAHs, and zinc in mussel tissue. Further monitoring is needed here.

The harbors
- One deepwater harbor and two small-craft marinas
- Accumulation of metals, PCBs, and historic pesticides in sediment and tissue
- Support considerable marine life

The wetlands and coast
- Historic pesticide contamination
- Loss of quality habitat
- Impacts from oil spills
- Use by endangered species

Ventura Marina: The Marina (the Keys area) is on the 1998 303(d) list for coliform problems. The City of Ventura monitors six stations within the Keys and the nearby Arundell Barranca (open drain carrying mostly agricultural runoff) for coliform on a regular basis. There are currently ongoing discussions concerning the possibility of rerouting the Barranca away from the Marina. The SMWP has found moderately elevated levels of metals, DDT, and chlordane in the Marina from sampling conducted in the late 1980s; however, it is not listed as a site of concern under the BPTCP.

McGrath Lake: The Lake is on the 1998 303(d) list for pesticides. The BPTCP found varying amounts of sediment toxicity, and sediment levels of many pesticides were very high. The Lake is listed as a toxic hot spot due to sediment concentrations of DDT, chlordane, dieldrin, toxaphene, and endosulfan above sediment quality guidelines. A characterization study is ongoing and restoration work is being planned. A major crude oil spill into the Lake occurred in late 1993, and runoff from nearby agricultural fields is ongoing.

Open Coastline: Little is known of water quality in the Ormond Beach area. The Oxnard Treatment Plant discharges secondary effluent to the ocean off of Oxnard. The facility is currently investigating approaches to remove upstream brine dischargers in order to move toward water reclamation. Part of the reclaimed water is proposed for use in a seawater intrusion barrier project to protect the Oxnard Plain groundwater basin. The ocean immediately off of the coast was part of Bight '98 and the 1994 Southern California Bight Pilot Project.

The table below gives examples of typical data ranges which led to the listings.

IMPAIRMENTS:

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Beach closures	Basin Plan narrative objective	10 - 37 days/year closed	McGrath Beach Mandalay Beach
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/ 100 ml. Beaches: total coliform not to exceed 1,000 MPN/100ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	Objective was exceeded from 32 - 75% of time	Santa Clara River Estuary Beach/Surfers Knoll McGrath Beach Ventura Harbor: Ventura Keys
Sediment toxicity	Basin Plan narrative objective		McGrath Lake
Chlordane (sediment)	Basin Plan narrative objective	160 ng/g	McGrath Lake
DDT (sediment & Tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	3,000 ng/g (sediment) 700 ng/g (tissue)	McGrath Lake Port Hueneme Harbor
PCBs (tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	2,000 ng/g	Port Hueneme Harbor
PAHs	Basin Plan narrative objective	10,000 ng/g	Port Hueneme Harbor
Zinc (sediment & tissue)	Basin Plan narrative objective	320 - 400 ng/g (tissue) 380 ng/g (sediment)	Port Hueneme Harbor Channel Islands Harbor

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Lead (sediment)	Basin Plan narrative objective	180 ng/g	Channel Islands Harbor
Tributyltin (tissue)	Basin Plan narrative objective	7,000 ng/g	Port Hueneme Harbor

CURRENTLY SCHEDULED TMDLS

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled For Completion (FY)
coliform	McGrath Beach Mandalay Beach	2001-02
zinc	Port Hueneme Harbor	2004-05

Stakeholder Group

Ormond Beach Task Force: Ormond Beach is part of the miscellaneous Ventura Coastal WMA. The area includes a somewhat degraded wetlands which has considerable restoration potential. The Task Force was formed in 1993 and meets on an infrequent basis to address issues and projects which may affect the beach and wetlands.

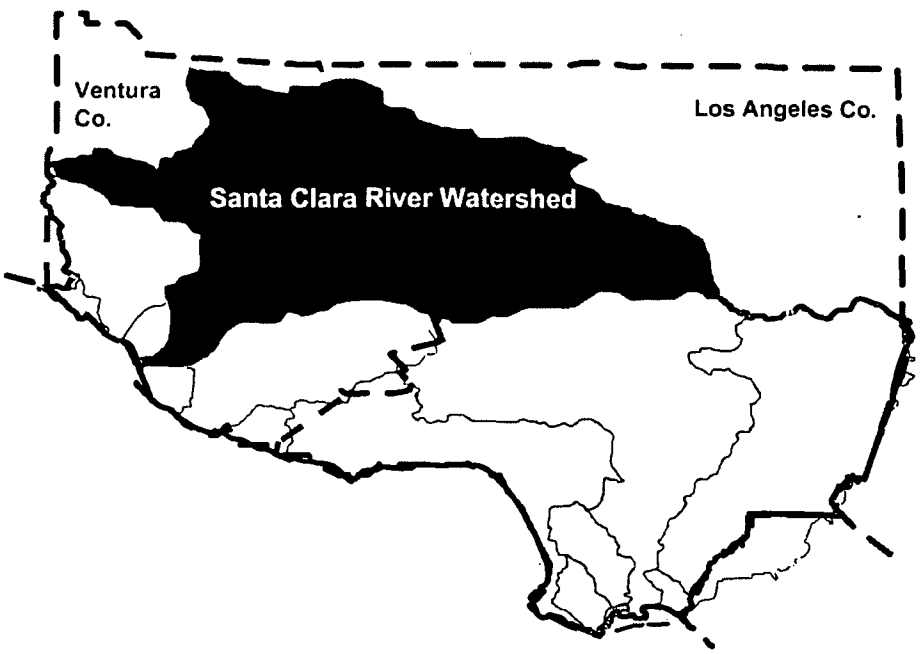
SANTA CLARA RIVER WATERSHED

This watershed will be targeted for permitting purposes in FY 2001-02.

Overview of Watershed

Size of watershed: approximately 1,200 sq. mi.

Length of River: approximately 100 miles



The Santa Clara River is the largest river system in southern California that remains in a relatively natural state. This is a high quality natural resource for much of its length. The River originates in the northern slope of the San Gabriel Mountains in Los Angeles County, traverses Ventura County, and flows into the Pacific Ocean halfway between the cities of San Buenaventura and Oxnard.

Extensive patches of high quality riparian habitat are present along the length of the River and its tributaries. The endangered fish, the unarmored stickleback, is resident in the River. One of the largest of the Santa Clara River's tributaries, Sespe Creek, is designated a wild trout stream by the State of California and supports significant spawning and rearing habitat. The Sespe Creek is also designated a wild and scenic river. Piru and Santa Paula Creeks, which are tributaries to the Santa Clara River, also support good habitat for steelhead. In addition, the River serves as an important wildlife corridor. A lagoon exists at the mouth of the River and supports a large variety of wildlife.

Water Quality Problems and Issues

Beneficial Uses in watershed:

Estuary	*Above Estuary*
Contact & noncontact water recreation	Contact & noncontact water recreation
Wildlife habitat	Wildlife habitat
Preservation of rare & endangered species	Preservation of rare & endangered species
Migratory habitat	Migratory habitat
Wetlands habitat	Wetlands habitat
Spawning habitat	Municipal supply
Estuarine habitat	Industrial service supply
Marine habitat	Industrial process supply
Navigation	Agricultural supply
Commercial & sportfishing	Groundwater recharge
	Freshwater replenishment
	Warmwater habitat
	Coldwater habitat

Increasing loads of nitrogen and salts in supplies of groundwater threaten beneficial uses including irrigation and drinking water. Other threats to water quality include increasing development in floodplain areas which has necessitated flood control measures such as channelization that results in increased runoff volumes and velocities, erosion, and loss of habitat. In many of these highly disturbed areas the exotic giant reed (*Arundo donax*) is gaining a foothold.

Many of the smaller communities in this watershed remain unsewered. In particular, in the Agua Dulce area of the upper watershed, impacts on drinking water wells from septic tanks is a major concern. The community is undertaking a wellhead protection effort with oversight by LARWQCB staff. Development pressure, particularly in the upper watershed, threatens habitat and the water quality of the River.

Permitted discharges:

- Four POTWs (one discharge in estuary, one in middle reaches, two in upper watershed)
- 98 dischargers covered under an industrial storm water permit
- 190 dischargers covered under a construction storm water permit

IMPAIRMENTS: Limited data (beyond mineral quality and nitrogen) is available for much of the Santa Clara River. The Santa Clara River Estuary and beach is on the 1998 303(d) list for coliform while a portion of the River upstream of the estuary is listed for ammonia and coliform. Portions of the River have chloride exceedances. The Estuary is also listed for DDT in fish tissue. Two small lakes in the watershed are also on the 1998 303(d) list for eutrophication, trash, DO, and pH problems. Two major spills of crude oil into the River have occurred in the last six years although recovery has been helped somewhat by winter flooding events. Natural oil seeps discharge significant amounts of oil into Santa Paula Creek. The table below gives examples of typical data ranges which led to the listings.

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Chloride	Basin Plan numeric objective: 80 - 100 mg/l	10 - 138 mg/l (mean of 105 ± 21)	Santa Clara River Reach 9 (Bouquet Cyn Rd to above Lang Gaging) Santa Clara River Reach 8 (W. Pier Hwy 99 to Bouquet Cyn Rd Bridge) Santa Clara River Reach 7 (Blue Cut to West Pier Hwy 99) Santa Clara River Reach 3 (Dam to above Santa Paula (SP) Crk./below Timber Cyn)
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature but the general range is 0.53-2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity, and 2.3-28.0 mg/l to protect against acute toxicity.	ND - 4.9 mg/l (mean of 1.4 ± 1.3)	Santa Clara River Reach 8 (W Pier Hwy 99 to Bouquet Cyn Rd. Bridge) Santa Clara River Reach 7 (Blue Cut to West Pier Hwy 99) Santa Clara River Reach 3 (Dam to above SP. Crk./below Timber Cyn)
Nitrate + nitrite	Basin Plan numeric objective: no greater than 10 mg/l	0.3 - 15.4 mg/l (mean of 5.7 ± 2.4)	Wheeler Canyon/Todd Barranca Torrey Canyon Creek Brown Barranca/Long Canyon Mint Canyon Creek Reach 1 Santa Clara River Reach 8 (W Pier Hwy 99 to Bouquet Cyn Rd Bridge)
Org. enrichment/ Low DO	Basin Plan narrative objective Basin Plan numeric objective: annual mean greater than 7.0 mg/l no single sample less than 5.0 mg/l	0.8 - 11.0 mg/l (mean of 7.7 ± 2.5)	Santa Clara River Reach 9 (Bouquet Cyn Rd/ to above Lang Gaging) Santa Clara River Reach 8 (West Pier Hwy 99 to Bouquet Cyn Rd. Bridge) Santa Clara River Reach 3 (Dam to above SP. Crk./below Timber Cyn) Elizabeth Lake
PH	Basin Plan numeric objective: 6.5 - 8.5 pH units	7.3 - 9.6 pH units (mean of 8.5 ± 0.7)	Elizabeth Lake
Odors	Basin Plan narrative objective		Lake Hughes

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 MPN/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100ml. Beaches: total coliform not to exceed 1,000 MPN/100ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	20 – 24,000 MPN/100ml	Santa Clara River Reach 8 (W. Pier Hwy 99 to Bouquet Cyn Rd. Bridge) Santa Clara River Estuary
Sulfate	Basin Plan numeric objective: 150 mg/l		Santa Clara River Reach 9 (Bouquet Cyn Rd. to above Lang Gaging)
E utrophication	Basin Plan narrative objective		Elizabeth Lake Lake Hughes Munz Lake
Algae	Basin Plan narrative objective		Lake Hughes
Fish kills	Basin Plan narrative objective		Lake Hughes
Trash	Basin Plan narrative objective		Elizabeth Lake Munz Lake Lake Hughes
ChemA*	National Academy of Science (NAS) Guideline (tissue): 100 ng/g		Santa Clara River Estuary
Toxaphene	SWRCB numeric objective (tissue): Max. Tissue Residue Level 8.8 ng/g		Santa Clara River Estuary

* Chem A refers to the sum of the chemicals aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH (including lindane), endosulfan, and toxaphene.

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Chloride	Santa Clara River Reaches 3, 7, and 8	1999-00
Nitrogen	Santa Clara River Reaches 3, 7, and 8 Wheeler Canyon/Todd Barranca Torrey Canyon Creek Brown Barranca/Long Canyon Mint Canyon Creek Reach 1	2001-02
Coliform	Santa Clara River Reaches 8 and 9 Santa Clara River Estuary Santa Clara River Estuary Beach/Surfers Knoll	2001-02
Eutrophication	Elizabeth Lake Munz Lake Lake Hughes	2003-04
Trash	Elizabeth Lake Munz Lake Lake Hughes	2004-05

Stakeholder Groups

Santa Clara River Enhancement and Management Plan Steering Committee The 26-member Project Steering Committee is currently directing preparation of an Enhancement and Management Plan. The Committee consists of representatives of the following individuals and agencies:

Acton Town Council *	Los Angeles Department of Regional Planning - APIS
Aggregate Producers	Newhall Land & Farming Company
Agriculture/Private Land Ownership	Santa Clara Valley Property Owners Association
Beach Erosion Authority for Operations & Nourishment *	State of California Coastal Conservancy *
Castaic Lake Water Agency	State of California Department of Fish and Game *
Cities of Fillmore/Santa Paula *	State of California Department of Parks and Recreation *
City of Oxnard	State of California Department of Transportation * - District 7
City of San Buenaventura *	State of California Water Quality Control Board - L.A. Region *
City of Santa Clarita *	United Water Conservation District
County of Ventura – Resource Management Agency *	U.S. Army Corps of Engineers *
Friends of the Santa Clara River * (environmental organization umbrella group)	U.S. Fish & Wildlife Service *
Los Angeles County Flood Control District *	Valley Advisory Committee
Los Angeles County Sanitation District	Ventura County Flood Control District *

* Additionally indicated support for the River study by signing a Memorandum of Cooperation.

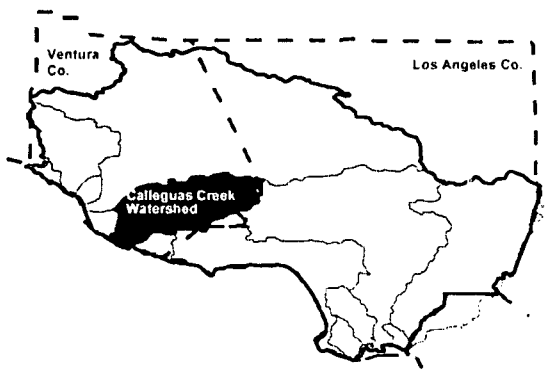
Six subcommittees worked with a consultant to collect the information necessary for a river management plan: agriculture, flood control, water resources, aggregate industry, recreation, and biology were the areas focused on. These subcommittees worked on determining river dynamics and areas where the interests of diverse groups overlap along the River; the critical issues areas were identified. Reports were developed by the subcommittees that provide background information, goals, and recommendations for the River on the issue areas. A series of computer-based maps have been produced, which are currently being used in a GIS overlay process to identify conflicts and opportunities and facilitate decisions regarding use of the river floodplain.

Friends of the Santa Clara River This non-profit stakeholder group has been involved with watershed activities along the length of the River with a focus on the protection, enhancement, and management of the River's resources. More information about this group may be found at their website http://www.scopeorg.

Santa Clarita Organization for Planning the Environment (SCOPE) This group has been involved with educating the public about planning and environmental issues, including those involving the River, particularly in the area around the Santa Clarita Valley. More information about this group may be found at their website http://www.scopeorg.

CALLEGUAS CREEK WATERSHED

Overview of Watershed



Calleguas Creek and its major tributaries, Revolon Slough, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa, and Arroyo Simi drain, an area of 343 square miles in southern Ventura County and a small portion of western Los Angeles County. This watershed, which is elongated along an east-west axis, is about 30 miles long and 14 miles wide. The northern boundary of the watershed is formed by the Santa Susana Mountains, South Mountain, and Oak Ridge; the southern boundary is formed by the Simi Hills and Santa Monica Mountains.

Land uses vary throughout the watershed. Urban developments are generally restricted to the city limits of Simi Valley, Moorpark, Thousand Oaks, and Camarillo. Although some residential development has occurred along the slopes of the watershed, most upland areas are still open space, however, golf courses are becoming increasingly popular to locate in these open areas. Agricultural activities, primarily cultivation of orchards and row crops, are spread out along valleys and on the Oxnard Plain.

Mugu Lagoon, located at the mouth of the watershed, is one of the few remaining significant saltwater wetland habitats in southern California. The Point Mugu Naval Air Base is located in the immediate area, and the surrounding Oxnard Plain supports a large variety of agricultural crops. These fields drain into ditches which either enter the Lagoon directly or through Calleguas Creek and its tributaries. Other fields drain into tile drain systems which discharge to drains or creeks. Also in the area of the base are freshwater wetlands created on a seasonal basis to support duck hunting clubs. The lagoon borders on an Area of Special Biological Significance (ASBS) and supports a great diversity of wildlife including

Beneficial Uses in watershed:

Estuary	*Above Estuary*
Wildlife habitat	Wildlife habitat
Contact & noncontact water recreation	Contact & noncontact water recreation
Estuarine habitat	Industrial service supply
Marine habitat	Industrial process supply
Preservation of rare & endangered species	Preservation of rare & endangered species
Navigation	Agricultural supply
Preservation of biological habitats	Groundwater recharge
Wetlands habitat	Wetlands habitat
Migratory & spawning habitat	Freshwater replenishment
Shellfish harvesting	Warmwater habitat

several endangered birds and one endangered plant species. Except for the military base, the lagoon area is relatively undeveloped.

Supplies of groundwater are critical to agricultural operations and industry (sand and gravel mining) in this watershed. Moreover, much of the population in the watershed relies upon groundwater for drinking.

Water Quality Problems and Issues

Aquatic life in both Mugu Lagoon and the inland streams of this watershed has been impacted by pollutants from nonpoint sources. DDT, PCBs, other pesticides, and some metals have been detected in both sediment and biota collected from surface water bodies of this watershed. Additionally, ambient toxicity has been revealed in several studies from periodic toxicity testing in the watershed (ammonia from POTWs and pesticides such as diazinon and chlorpyrifos are implicated). Fish collected from Calleguas Creek and Revolon Slough exhibit skin lesions and have been found to have other histopathologic abnormalities. High levels of minerals and nitrates are common in the water column as well as in the groundwater. Sediment toxicity is also elevated in some parts of the lagoon. Reproduction is impaired in the resident endangered species, the light-footed clapper rail due to elevated levels of DDT and PCBs. Overall, this is a very impaired watershed. It appears that the sources of many of these pollutants are agricultural activities (mostly through continued disturbance and erosion of historically contaminated soils), which cover approximately 25 percent of the watershed along the inland valleys and coastal plain although the nearby naval facility has also been a contributor. Other nonpoint sources include residential and urban activities, which are present over approximately 25 percent of the watershed. The remaining 50 percent of the watershed is still open space although there is a severe lack of benthic and riparian habitat.

Permitted discharges:

- Six POTWs with NPDES permits (3 larger, 3 smaller)
- 82 dischargers covered under an industrial storm water permit
- Municipal storm water permit

Mugu Lagoon as well as the Calleguas Creek Tidal Prism is considered a candidate toxic hot spot under the BPTCP for reproductive impairment (the endangered clapper rail), exceedance of the Cal/EPA's OEHHA advisory level for mercury in fish, and exceedance of the NAS guideline level for DDT in fish, sediment concentrations of DDT, PCB, chlordane, chlorpyrifos, sediment toxicity and degraded benthic infaunal community.

Primary issues related to POTW discharges include ammonia toxicity and minerals (in part due to water supply).

The table below gives examples of typical data ranges which led to the 1998 303(d) listings.

IMPAIRMENTS:

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Nitrate + nitrite	Basin Plan numeric objective: No greater than 10 mg/l	11.9 - 70.0 mg/l (mean of 48.5 ± 13)	Fox Barranca Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy [23]) Arroyo Simi Reach 1 (Moorpark Fwy 23) to Brea Cyn) Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.)
Nitrogen	Basin Plan numeric objective: No greater than 10 mg/l		Rio de Santa Clara/Oxnard Drain #3 Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2(0.5 mi. S. of Broome Rd. to Potrero Rd.) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon Duck pond agric. drain/Mugu Drain/Oxnard Drain #2

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature, but the general range is 0.53 - 2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3 - 28.0 mg/l to protect Against acute toxicity.	0.1 - 20.2 mg/l (mean of 2.7 $\pm$ 3.6)	Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy [23]) Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2(0.5 mi. S. of Broome Rd. to Potrero Rd.) Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.)
Algae	Basin Plan narrative objective		Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Low DO/org. Enrichment	Basin Plan narrative objective Basin Plan numeric objective: annual mean greater than 7.0 mg/l no single sample less than 5.0 mg/l	2.6 - 10.9 mg/l (mean of 7.0 ± 1.8)	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.)
Chlorpyrifos (tissue)	Basin Plan narrative objective		Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.)
Toxicity	Basin Plan narrative objective	0 - 100 % survival	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Duck pond agric. drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Chloride	Basin Plan numeric objective: 150 mg/l	78 - 230 mg/l (mean of 173 ± 31)	Tapo Canyon Reach 1 Arroyo Simi Reach 1 (Moorpark Fwy (23) to Brea Cyn) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy (23)) Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Calleguas Creek Reach 3 (Potrero to Somis Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 4 (above Lynn Rd.)
Boron	Basin Plan numeric objective: 1.0 mg/l	0.4 - 1.4 mg/l (mean of 1.1 ± 0.3)	Fox Barranca Tapo Canyon Reach 1 Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Arroyo Simi Reach 2 (above Brea Canyon) Calleguas Creek Reach 3 (Potrero to Somis Rd.)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Sulfate	Basin Plan numeric objective: 250 mg/l	185 – 1,000 mg/l (mean of 642 ± 278)	Fox Barranca Tapo Canyon Reach 1 Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Arroyo Simi Reach 2 (above Brea Canyon) Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy (23)) Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.)
Total Dissolved Solids	Basin Plan numeric objective: 850 mg/l	460 – 1,470 mg/l (mean of 1023 ± 246)	Tapo Canyon Reach 1 Fox Barranca Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Arroyo Simi Reach 2 (above Brea Canyon) Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy [23]) Calleguas Creek Reach 3 (Potrero to Somis Rd.) Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
DDT (tissue & sediment)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	37.5 – 1,648.0 ng/g (sediment) 145.9 - 556.9 ng/g (tissue)	Arroyo Las Posas Reach 1 (Lewis/Somis Rd. to Fox Barranca) Arroyo Las Posas Reach 2 (Fox Barranca to Moorpark Fwy [23]) Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 1 (estuary to 0.5 mi. S of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S of Broome Rd. to Potrero Rd.) Duck pond agric. drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon Rio de Santa Clara/Oxnard Drain #3
Chlordane (tissue & sediment)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g	3.4 - 45.0 ng/g (sediment) 28.5 - 40.6 ng/g (tissue)	Conejo Creek/Arroyo Conejo N. Fork Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Duck pond agric. drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon Rio de Santa Clara/Oxnard Drain #3

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Chem A* (tissue)	NAS Guideline (tissue): 100 ng/g	695.9 – 1,910.1 ng/g (tissue)	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Duck pond agric. drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Rio de Santa Clara/Oxnard Drain #3
Dacthal (tissue & sediment)	Basin Plan narrative objective	ND - 120.1 ng/g (sediment) 1.8 - 5.7 ng/g (tissue)	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 3 (Thousand. Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Endosulfan (tissue & sediment)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 250 ng/g	ND - 144.2 ng/g (sediment) 42.3 - 294.0 ng/g (tissue)	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand. Oaks city limit) Conejo Creek Reach 3 (Thousand. Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 1 (estuary to 0.5 mi. S of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon
Toxaphene (tissue & sediment)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 8.8 ng/g	ND - 1900 ng/g (sediment) 238 - 468 ng/g (tissue)	Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand. Oaks city limit) Conejo Creek Reach 3 (Thousand. Oaks city limit to Lynn Rd.) Conejo Creek Reach 4 (above Lynn Rd.) Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Duck pond agric. drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon Rio de Santa Clara/Oxnard Drain #3

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Dieldrin (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 0.65 ng/g	4.7 - 6.6 ng/g (tissue)	Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.)
Sediment toxicity	Basin Plan narrative objective	14 - 71 % survival	Calleguas Creek Reach 1 (estuary to 0.5 mi. S. of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrero Rd.) Mugu Lagoon Rio de Santa Clara/Oxnard Drain #3 Duck pond agric. drain/Mugu Drain/Oxnard Drain #2
Siltation	Basin Plan narrative objective		Mugu Lagoon
Chromium (tissue)	Basin Plan narrative objective	0.51 - 0.58 ug/g (tissue)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.)
Silver (tissue)	Basin Plan narrative objective	0.03 - 0.04 ug/g (tissue)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn.) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.)
Nickel (tissue)	Basin Plan narrative objective	0.5 ug/g (tissue)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn.) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.) Mugu Lagoon

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Cadmium (tissue)	Basin Plan narrative objective	0.14 - 0.15 ug/g (tissue)	Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.)
Copper	USEPA water quality criteria: 2.9 ug/l		Mugu Lagoon
Zinc	USEPA water quality criteria: 86 ug/l		Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn)
Mercury	USEPA water quality criteria: 2.1 ug/l		Mugu Lagoon
Selenium	USEPA water quality criteria: 5.0 ug/l	11.0 ug/l (maximum)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.)
PCBs (tissue & Sediment)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	ND - 96.0 ng/g (sediment) 16.8 - 70.8 ng/g (tissue)	Calleguas Creek Reach 1 (estuary to 0.5 mi. S of Broome Rd.) Calleguas Creek Reach 2 (0.5 mi. S. of Broome Rd. to Potrereo Rd.) Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.) Mugu Lagoon Rio de Santa Clara/Oxnard Drain #3
Trash	Basin Plan narrative objective		Revolon Slough Main Branch (Mugu Lagoon to Central Ave.) Beardsley Channel (above Central Ave.)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Chromiun (tissue)	Basin Plan narrative objective	0/51-0.58 ug/g (tissue)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.)
Silver (tissue)	Basin Plan narrative objective	0.03-0.04 ug/g (tissue)	Arroyo Simi Reach 1 (Moorpark Fwy [23] to Brea Cyn) Conejo Creek Reach 3 (Thousand Oaks city limit to Lynn Rd.) Conejo Creek Reach 2 (Santa Rosa Rd. to Thousand Oaks city limit) Conejo Creek Reach 1 (confl. Calleguas to Santa Rosa Rd.)

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Chloride	Tapo Canyon Reach 1 Arroyo Simi Reach 1 Arroyo Las Posas Reaches 1 and 2 Calleguas Creek Reach 3 Conejo Creek Reaches 2 and 4	1999-00
Nitrogen	Fox Barranca Arroyo Las Posas Reaches 1 and 2 Arroyo Simi Reach 1 Calleguas Creek Reaches 1, 2 and 3 Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reaches 1, 2, 3, and 4 Revolon Slough Main Branch Beardsley Channel Mugu Lagoon Duck pond agric. Drain/Mugu Drain/Oxnard Drain #2	2000-01

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Pesticides (water-soluble)	Conejo Creek Reaches 1, 2, 3 and 4 Calleguas Creek Reaches 1 and 2 Duck pond agric. Drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch Beardsley Channel	2002-03
Other salts	Fox Barranca Tapo Canyon Reach 1 Arroyo Simi Reaches 1 and 2 Arroyo Las Posas Reaches 1 and 2 Calleguas Creek Reach 3 Conejo Creek/Arroyo Conejo N Fork Conejo Creek Reaches 1, 2, 3 and 4	2002-03
PCBs	Calleguas Creek Reach 1 Calleguas Creek Reach 2 Revolon Slough Main Branch Beardsley Channel Mugu Lagoon	2003-04
Pesticides (sediment-Bound)	Mugu Lagoon Arroyo Las Posas Reaches 1 and 2 Conejo Creek/Arroyo Conejo N. Fork Conejo Creek Reaches 1, 2, 3 and 4 Calleguas Creek Reaches 1 and 2 Duck pond agric. Drain/Mugu Drain/Oxnard Drain #2 Revolon Slough Main Branch Beardsley Channel	2003-04
metals	Arroyo Simi Reach 1 Conejo Creek Reaches 1, 2 and 3 Mugu Lagoon Revolon Slough Main Branch	2005-06

Stakeholder Group

Calleguas Creek Watershed Management Committee (and subcommittees) The committee and subcommittees have been actively meeting since November 1996 with the purpose of developing a watershed management plan. The technical subcommittees include Habitat/Recreation, Flood Protection/Sediment Management, Water Quality/Water Resources, Public Outreach/Education, and Geographical Information Systems (GIS). A Steering Committee attends to the details of management plan development. The full Management Plan Committee meets on a quarterly

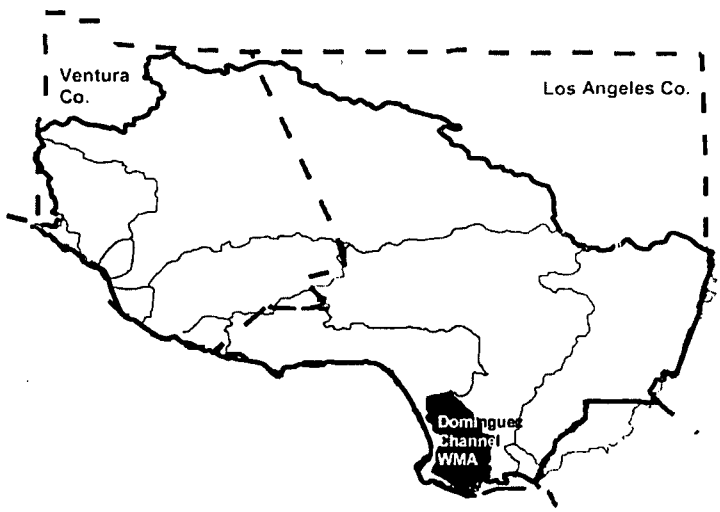
basis, generally conducting business in a half-day session. Two or three LARWQCB staff attend these meetings. The Flood Protection and Habitat Subcommittees meet bimonthly; one LARWQCB staff member attends each. The Water Quality Subcommittee is meeting bimonthly and 1-2 staff members attend. The Steering Committee is also meeting bimonthly with 1-2 staff members attending. LARWQCB staff are not currently assigned to the Public Outreach and GIS Subcommittees. For further information concerning this group, please visit their website at http://www.calleguas.com/cc.htm.

A number of committee members were also on the *Mugu Lagoon Task Force* which was formed in 1990 in response to concerns about sedimentation filling in Mugu Lagoon which is at the mouth of the Calleguas Creek Watershed. A major focus of the early meetings was exchange of information on the extent of sedimentation with related concerns such as pesticide transfer. A sediment and erosion control plan was prepared for the Ventura County RCD by the NRCS using Coastal Conservancy funds ("Calleguas Creek Watershed Erosion and Sediment Control Plan for Mugu Lagoon", May 1995). This group is not currently meeting; however, information gained from this effort continues to be used by the other Calleguas Watershed Committees.

DOMINGUEZ CHANNEL AND LOS ANGELES/LONG BEACH HARBORS WMA

This watershed will be targeted for permitting purposes in FY 2002-03.

Overview of WMA



The Los Angeles and Long Beach Harbors (LA/LB) are located in the southern portion of the Los Angeles Basin. Along the northern portion of San Pedro Bay is a natural embayment formed by a westerly extension of the coastline which contains both harbors, with the Palos Verdes Hills the dominant onshore feature. Historically, the area consisted of marshes and mudflats with a large marshy area, Dominguez Slough, to the north, and flow from the Los Angeles River entering where Dominguez Channel now drains. Near the end of last century and during the beginning of this one, channels were dredged, marshes were filled, wharves were constructed, the Los Angeles River was diverted, and a breakwater was constructed in order to allow deep draft ships to be directly offloaded and products be swiftly moved. The Dominguez Slough was completely channelized and became the drainage endpoint for runoff from a highly industrialized

area. Eventually, the greater San Pedro Bay was enclosed by two more breakwaters and deep entrance channels were dredged to allow for entry of ships with need of 70 feet of clearance. The LA/LB Harbor complex together is now one of the largest ports in the country.

Both harbors are considered to be one oceanographic unit. Despite its industrial nature, contaminant sources and low flushing ability, the inner harbor area supports fairly diverse fish and benthic populations and provides a protected nursery area for juvenile fish. The California least tern, an endangered species, nests in one part of the harbor complex.

Beneficial Uses in WMA

Dominguez Channel (above estuary)	*Dominguez Channel (in estuary)*
Noncontact water recreation	Contact & noncontact water recreation
Preservation of rare & endangered species	Preservation of rare & endangered species
	Industrial water supply
	Navigation
	Commercial & sportfishing
	Marine habitat
	Estuarine habitat
	Wildlife habitat
	Migratory & spawning habitat

Similar to LA Inner Harbor in many respects, LB Inner Harbor is dissimilar to the other Port in the higher number of privately-owned waterfront parcels which the Port has recently been in the process of the buying up and converting to Port-related uses, generally container terminals. Also, basins and slips in LB Inner Harbor are somewhat more separated from each other than in LA Inner Harbor which may possibly discourage contamination from spreading easily.

The outer part of both harbors (the greater San Pedro Bay) has been less disrupted and supports a great diversity of marine life. It is also open to the ocean at its eastern end and receives much greater flushing than the inner harbors.

Water Quality Issues and Problems

A POTW discharges secondary-treated effluent to the outer LA/LB Harbor and is under a time schedule order to remove the discharge. The discharger's plan consists of achieving full reclamation (mostly for industrial reuse purposes) by 2020 which would eliminate the discharge completely. They plan on achieving 40 percent reclamation by 1999 and about 80 percent reclamation by 2005. Two generating stations discharge to the inner harbor areas. Many smaller, non-process waste discharges also occur into the harbors and Dominguez Channel drains a highly industrialized area of the city resulting in poor water quality.

Permitted discharges:

- One POTW
- Two generating stations
- Six refineries
- 349 dischargers covered under an industrial storm water permit

Two areas within LA Harbor are considered to be toxic hot spots under the BPTCP: (1) Dominguez Channel/ Consolidated Slip, based on sediment concentrations of DDT, PCB, cadmium, copper, lead, mercury, zinc, dieldrin, chlordane (all exceed sediment quality guidelines), sediment toxicity, and degraded benthic infaunal community; and (2) Cabrillo Pier area, based on sediment concentrations of DDT, PCB and copper, sediment toxicity and issuance of a human health (fishing) advisory for DDT and PCB in white croaker, and exceedances of NAS guidelines for DDT in fish and shellfish. Several locations have been listed as sites of concern under the BPTCP: (1) Inner Fish Harbor, due to sediment concentrations of DDT, PCB, copper, mercury and zinc and sediment toxicity (not recurrent); (2) Kaiser International, due to sediment concentrations of DDT, PCB, PAH, copper and endosulfan; (3) Hugo Neu Proler, due to PCB sediment concentrations; (4) Southwest Slip, due to sediment concentrations of DDT, PCB, PAH, mercury, chromium, and sediment toxicity (not recurrent); (5) Cerritos Channel, due to sediment concentrations of DDT, PCB, metal, chlordane, TBT, sediment toxicity and accumulation in mussel tissue; (6) Colorado Lagoon, due to DDT, PCB, lead, zinc, chlordane, dieldrin, sediment toxicity and accumulation in mussel and fish tissue; (7) Shoreline Marina, due to sediment concentrations of zinc, DDT, PCB, chlordane and PAH, and sediment toxicity (not recurrent); (8) Long Beach Outer Harbor, due to sediment concentrations of DDT and chlordane and sediment toxicity (not recurrent); (9) West Basin, due to sediment concentrations of DDT and PCB, sediment toxicity (not recurrent) and accumulation in clam tissue; and (10) Alamitos Bay, due to sediment concentrations of DDT and chlordane. There is need for further monitoring in all of these areas to clarify their status. Potential sources of these materials are considered to be historical deposition, discharges from the nearby POTW (especially for metals), spills from ships and industrial facilities, as well as storm water runoff. Many areas of the harbors have experienced soil and/or groundwater contamination, which may result in possible transport of pollutants to the harbors' surface waters. Dredging and disposal of contaminated sediments and source control of pollutants in the harbors will be a major focal point for the Contaminated Sediment Task Force described further in the Regionwide Section of this document.

Potential sources of pollution:

- Historical deposits of DDT and PCBs in sediment
- Discharges from POTW & refineries
- Spills from ships and industrial facilities
- Leaching of contaminated groundwater
- Storm Water runoff

Los Angeles Inner Harbor

Although the area is dramatically cleaner now than 25 years ago, parts of LA Inner Harbor are still suffering the effects of historic deposits of pollutants in the sediment and current point and nonpoint source discharges. Fish caught in the East Basin have exhibited histopathological abnormalities (liver lesions). The abnormalities are indicative of aromatic and chlorinated hydrocarbon contamination. There is also significant degradation in the biological community of a part of Inner Harbor with high levels of PCB and DDT; and toxicity of the surface water microlayer of one part of the harbor to a test fish species (larval kelp bass). Additionally, OEHHA now advises against consumption of white croaker in the Harbor and recommends no more than one meal every two weeks of black croaker, queenfish, and surfperches if caught in the

Harbor. On the other hand, the benthic community in many other areas of the Inner Harbor are healthy and sediments, though high in many pollutants, do not cause a great deal of toxicity in controlled laboratory tests.

LA Inner Harbor is on the 1998 303(d) list due to DDT, metals, PAHs, chlordane, TBT, and PCBs. Some of the contamination in sediment is historic with resuspension potential. Dominguez Channel was the recipient of runoff from the Montrose Chemical Facility which manufactured DDT several decades ago. There are also mostly nonpoint source inputs from several problem sites, spills, and storm drain runoff. The problems tend to be exacerbated by the poor circulation and flushing. The Port is in the process of filling in a large part of Outer Harbor and deepening some channels as part of their "2020 Plan". As a result, the potential exists for greater stagnation and more problems from deposition of new contaminants.

Data from the SMWP have documented high levels of metals, PCBs, TBT, and PAHs in mussel tissue at several locations in LA Inner Harbor. The BPTCP has found a number of inner harbor areas with elevated pollutant levels but a smaller number of those have exhibited sediment toxicity.

Sediment data collected by LARWQCB staff, the Port of LA, and various other researchers, have revealed several areas of heavy contamination with metals, PCBs, DDT, and occasionally PAHs. LARWQCB data show that the level of contamination within particular regions of the inner harbor vary considerably from site to site. Additionally, it is difficult to separate the effects of historic contamination from current inputs. Bight '98 included samples within harbors, including a number of stations in LA/LB Harbor; toxicity, sediment chemistry, and benthic data will be available later in 1999.

Dominguez Channel: Little recent data exist for the Channel itself even though considerable heavy industrial facilities (including the old Montrose site) are located within the watershed. However, a consultant for Montrose conducted sediment sampling for DDT in the Channel during 1990. USEPA, in a letter to Montrose, cited this data and provided a comparison of those values with NOAA's "identified concentrations of DDT in sediment associated with adverse impacts. A sediment level of 3 ppb was associated with adverse impacts in 10 percent (ER-L) of the data reviewed by NOAA, and a level of 350 ppb total DDT was associated with adverse impacts in 50 percent (ER-M) of the data reviewed by NOAA" (USEPA letter to Montrose Chemical Corporation, November 27, 1991). The consultant found DDT levels of 300 - 13,000 ppb in the Channel. USEPA stated that adverse impacts in the biological community of Dominguez Channel and Consolidated Slip would be expected.

An LARWQCB study conducted in 1975 found that the aquatic biota of the Channel were largely marine in origin and were a continuation of LA Inner Harbor biota. The number and abundance of aquatic species declined with distance inland from the Harbor. A fairly abrupt decline in benthic species between Alameda and Wilmington Streets was attributed to the effects of

pollution. *Capitella capitata* was one of the most abundant benthic species in the area and is generally associated with polluted areas. An absence of benthic fish species adjacent to one oil refinery was considered to be indicative of oxygen-poor bottom water. There was a degraded benthic community at several stations in Consolidated Slip during BPTCP sampling.

Of major concern in the mid-1980s was discharge of zinc chromate as an additive in cooling water/boiler blowdown. There may have been some justification for that concern. Sediment sampling conducted by LARWQCB staff in 1988 revealed zinc levels as high as 447 ppm, chromium as high as 67 ppm, and lead as high as 231 ppm.

Long Beach Inner Harbor

While historic contamination is a definite problem in the older parts of the harbor (including the naval base), Pier J has only recently been constructed, utilizing some highly contaminated dredge material. Some other likely problem sites include: Cerritos Channel with its inputs at times from Consolidated Slip (water generally flows from LB to LA Harbors), a creosote manufacturing site, several oil terminals, a defunct ship repair yard (and several active ones), and the naval base, which is closed, while the attached shipyard remains open.

Contamination in the LB Inner Harbor is known to be sporadic. Little information is available on contamination in Southeast Basin except for TBT water concentrations of up to 380 PPT found in a 1988 statewide study of harbors and low levels of PCBs found in mussel tissue in 1986. The most recent SMW data for the Inner Harbor show some areas of elevated DDT, most notably at those stations located in or near Cerritos Channel.

Moderate PCB levels were found in mussel tissue in front of the creosote facility located in Channel 2 and somewhat higher levels were found in Cerritos Channel which is likely related to its proximity to Consolidated Slip and other LA Harbor point and nonpoint sources. Long Beach Inner Harbor is on the 1998 303(d) list for DDT, PAHs, and PCBs, while San Pedro Bay is listed for DDT, PAHs, PCBs, and some metals.

The table below gives examples of typical data ranges which led to the listings.

IMPAIRMENTS:

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Benthic comm. Effects	Basin Plan narrative objective		Dominguez Channel Estuary (to Vermont) Los Angeles Harbor: Consolidated Slip Long Beach Harbor (part. Main Ch., SE Basin, West Basin, Pier J, and breakwater)
ChemA* (tissue)	NAS Guideline (tissue): 100 ng/g		Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Machado Lake (Harbor Lake)
Chlordane (sediment & tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g	100 ng/g (sediment) 5.0 - 11.3 ng/g (tissue)	Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Los Angeles Harbor: Consolidated Slip Machado Lake (Harbor Lake)
DDT (sediment & tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	500 - 1,500 ng/g (sediment) 36 - 227 ng/g (tissue)	Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Los Angeles Harbor: Consolidated Slip Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) Long Beach Harbor (part. Main Ch., SE Basin, West Basin, Pier J, and breakwater) Cabrillo Beach (Inner) San Pedro Bay nearshore and offshore zone: Cabrillo Pier area Los Angeles Harbor: Southwest Slip Machado Lake (Harbor Lake)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
PCBs (sediment & tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	500 - 1,000 ng/g (sediment) 42.5 - 90.7 ng/g (tissue)	Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Los Angeles Harbor: Consolidated Slip Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) Los Angeles Harbor: Southwest Slip San Pedro Bay nearshore and offshore zone: Cabrillo Pier area Cabrillo Beach (Inner) Long Beach Harbor (part. Main Ch., SE Basin, West Basin, Pier J, and breakwater) Machado Lake (Harbor Lake)
Aldrin (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 0.33 ng/g		Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont)
Dieldrin (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 0.7 ng/g	0.9 - 2.1 ng/g (tissue)	Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Machado Lake (Harbor Lake)
Sediment toxicity	Basin Plan narrative objective		San Pedro Bay nearshore and offshore zone: Cabrillo Pier area Los Angeles Harbor: Southwest Slip Los Angeles Harbor: Consolidated Slip Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and Breakwater) Long Beach Harbor (part. Main Ch., SE Basin, West Basin, Pier J, and breakwater)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
PAHs (sediment)	Basin Plan narrative objective	2,000 - 15,000 ng/g (sediment)	Dominguez Channel (above Vermont) Dominguez Channel Estuary (to Vermont) Los Angeles Harbor: Consolidated Slip Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) Long Beach Harbor (part. Main Ch., SE Basin, West Basin, Pier J, and breakwater) San Pedro Bay nearshore and offshore zone: Cabrillo Pier area
Chromium (sediment)	Basin Plan narrative objective	100 - 200 ug/g (sediment)	San Pedro Bay nearshore and offshore zone: Cabrillo Pier area Dominguez Channel (above Vermont) Dominguez Channel Estuary (to Vermont) Los Angeles Harbor: Consolidated Slip
Zinc (sediment & tissue)	Basin Plan narrative objective	150 - 510 ug/g (sediment) 110 - 510 ug/g (tissue)	Los Angeles Harbor: Consolidated Slip Dominguez Channel (above Vermont) Dominguez Channel Estuary (to Vermont) Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) San Pedro Bay nearshore and offshore zone: Cabrillo Pier area

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Lead (sediment)	Basin Plan narrative objective	120 - 122 ug/g (sediment)	Los Angeles Harbor: Consolidated Slip Torrance Carson Channel Dominguez Channel Estuary (to Vermont) Dominguez Channel (above Vermont) Dominguez Channel (above Vermont) Wilmington Drain
Copper (sediment)	Basin Plan narrative objective	110 - 140 ug/g (sediment)	Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) Wilmington Drain Dominguez Channel (above Vermont) Torrance Carson Channel Dominguez Channel Estuary (to Vermont) San Pedro Bay nearshore and offshore zone: Cabrillo Pier area
Algae, eutroph.	Basin Plan narrative objective		Machado Lake (Harbor Lake)
Odors	Basin Plan narrative objective		Machado Lake (Harbor Lake)
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature, but the general range is 0.53 - 2.7 mg/l of total Ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3 - 28.0 mg/l to protect against acute toxicity.	ND - 18.0 mg/l	Machado Lake (Harbor Lake) Wilmington Drain Dominguez Channel (above Vermont) Dominguez Channel Estuary (to Vermont)

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Tributyltin	Basin Plan narrative objective	2,000 ng/g (tissue)	Los Angeles Harbor: Consolidated Slip Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater)
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100ml. Beaches: total coliform not to exceed 1,000 MPN/100ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	33 - 160,000 MPN/100ml	Dominguez Channel (above Vermont) Dominguez Channel Estuary (to Vermont) Torrance Carson Channel Wilmington Drain
Beach closures	Basin Plan narrative objective	2 – 11 days/year closed	Los Angeles Harbor (part. Main Ch., Fish Hbr, Cabrillo Pier, and breakwater) Cabrillo Beach (Inner)
Trash	Basin Plan narrative objective		Machado Lake (Harbor Lake)

* Chem A refers to the sum of the chemicals aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH (including lindane), endosulfan, and toxaphene.

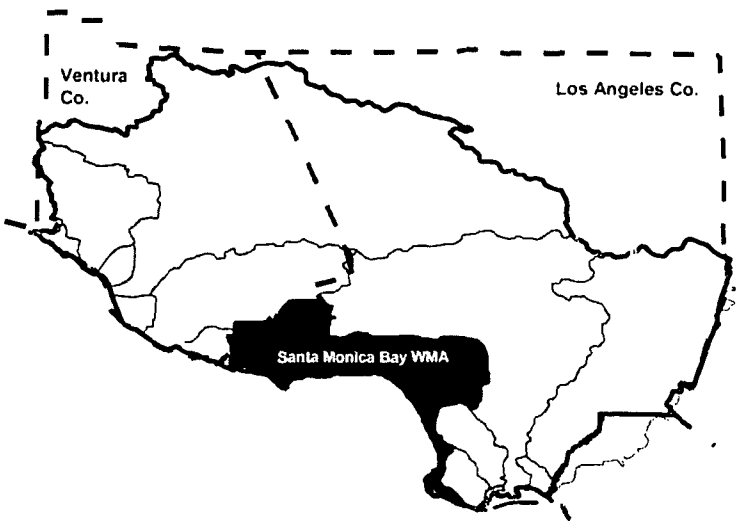
CURRENTLY SCHEDULED TMDLS:

Type of TMDL	303(d) Listed Waters/Reaches	Year Scheduled for Completed (FY)
Coliform	Dominguez Channel Dominguez Channel Estuary Torrance Carson Channel Wilmington Drain	2001-02
Coliform	Cabrillo Pier area Cabrillo Beach (inner)	2003-04

SANTA MONICA BAY WMA

This was the targeted watershed for permitting purposes in FY 1996-97 and will be targeted again in FY 2003-04.

Overview of WMA



The Santa Monica Bay WMA, which encompasses an area of 414 square miles, is quite diverse. Its borders reach from the crest of the Santa Monica Mountains on the north and from the Ventura-Los Angeles County line to downtown Los Angeles. From there it extends south and west across the Los Angeles plain to include the area east of Ballona Creek and north of the Baldwin Hills. South of Ballona Creek the natural drainage area is a narrow strip of wetlands between Playa del Rey and Palos Verdes. The WMA includes several watersheds the two largest being Malibu Creek to the north and Ballona Creek to the south. While the Malibu Creek area is exemplified by large undeveloped mountain areas, large acreage residential properties, and many natural stream reaches, Ballona Creek is predominantly channelized and highly developed with both residential and commercial properties.

As a nationally significant water body, Santa Monica Bay was included in the National Estuary Program in 1989. It has been extensively studied by the Santa Monica Bay Restoration Project (SMBRP) and a watershed plan was developed in 1994. A Santa Monica Bay Watershed Council was formed in 1994 to oversee implementation of the Plan. The Restoration Project staff will be coordinating with LARWQCB staff to carry out the Board's watershed approach in the Santa Monica Bay Watershed.

Water Quality Problems and Issues

Though relatively small in its size compared with watersheds for major rivers, lakes, or estuaries in other parts of the country, the Santa Monica Bay WMA embraces a remarkably high diversity in geological and hydrological characteristics, habitat features, and human activities. Almost every beneficial use defined in the Basin Plan is identified in water bodies somewhere in the WMA. Yet many of these beneficial uses have been impaired for years. While some of the impaired areas are showing signs of recovery, beneficial uses that are in relatively good condition face the threat of degradation.

Existing and potential beneficial use impairment problems in the watershed fall into two major categories: human health risk, and natural habitat (wildlife) degradation. The former are issues primarily associated with recreational uses of the Santa Monica Bay. The latter are issues associated with terrestrial, aquatic, and marine environments. Pollutant loadings that originate from human activities are common causes of both human health risks and habitat degradation.

Beneficial Uses in the WMA:

All of the beneficial uses defined in the Basin Plan for the Region occur somewhere in this WMA except for BIOL (preservation of biological habitats)

Permitted discharges:

- Seven major NPDES permit discharges
- Three POTWs (two direct ocean discharges), one refinery, and three generating stations
- 18 minor discharges
- 149 dischargers covered under general permits
- 150 discharges covered by an industrial storm water permit
- 120 dischargers covered by a construction storm water permit

Of the major NPDES dischargers in the Santa Monica Bay WMA, the three POTWs (particularly the two direct ocean discharges) are the largest point sources of pollutants to Santa Monica Bay. Pollutants from the minor discharges have been estimated to contribute less than two percent of the total pollutants being discharged to the Bay.

A considerable number of short-term as well as more long-lived monitoring programs have been implemented in the Santa Monica Bay WMA, particularly over the last 20 years. Sampling efforts tend to center around assessing urban runoff effects in general along the coastline and reservoirs of PCBs and DDT contaminated sediment in the area of the Palos Verdes Shelf. Three statewide monitoring programs, SMWP, BPTCP, and TSMP, focus on biological measurements.

The data from these programs indicate that in general the open coastline is much cleaner than the Bay's enclosed waters, except with regards to DDT and PCBs on the Palos Verdes Shelf. Pollutants of particular concern are chlordane, DDT, copper, and zinc. The BPTCP has listed the Santa Monica Bay - Palos Verdes Shelf area as a toxic hot spot for DDT and PCBs human health advisories (fishing) and NAS exceedances of DDT levels in fish. Marina Del Rey is listed as a toxic hot spot due to sediment concentrations of DDT, PCB, copper, mercury, nickel, lead, zinc and chlordane, and sediment toxicity; Marina Del Rey Entrance Channel (mouth of Ballona Creek) is listed due to sediment concentrations of DDT, zinc, lead, chlordane, dieldrin, and chlorpyrifos, and sediment toxicity. The BPTCP listed King Harbor as a site of concern, due to sediment concentrations of DDT and PCB and sediment toxicity (not recurrent).

Urbanization has had a significant impact on the riparian and wetland resources of the watershed, primarily through filling, alteration of flows, and decrease in water quality. It is estimated that 90 percent of the historic wetlands of the Santa Monica Bay WMA have been destroyed, with the remaining wetlands significantly degraded.

Although groundwater accounts only a limited portion of the Santa Monica Bay WMA's supply of fresh water, the general quality of groundwater in the watershed has degraded from background levels. Much of degradation reflects land uses.

Greater Santa Monica Bay

Santa Monica Bay is heavily used for fishing, swimming, surfing, diving, etc., activities classified as water contact recreation (REC-1). However, the ability for people to enjoy these activities has been lost to a certain degree because of the real or perceived risk to human health. The primary, and also the best documented, problems are acute health risk associated with swimming in runoff-contaminated surfzone waters, and chronic (cancer) risk associated with consumption of certain sport fish species in areas impacted by DDT and PCB contamination. The general public has also been concerned about potential health risks associated with the consumption of contaminated seafood from Santa Monica Bay. This is the primary pathway through which humans are exposed to toxic chemicals found in the marine environment. While recent studies have shown that health risks are limited to consumption of certain seafood species found at certain locations, the public perception remains that all seafood in the Bay is contaminated.

One of the most evident impacts in marine habitats is sediment contamination and damage to marine life that the contaminants cause when they are released from the sediment (through natural fluctuations or through disturbance of the sediment) into the food chain. Organic compounds such as DDT, PCBs, polycyclic aromatic hydrocarbons (PAHs), chlordane, and tributyltin (TBT) are found in sediments in concentrations that are harmful to marine organisms at various locations in the Bay. Also found in Bay sediments are heavy metals such as cadmium, copper, chromium, nickel, silver, zinc, and lead. The major historic sources of sediment contamination have been wastewater treatment facilities; thus, the accumulations are highest near treatment plant outfalls off of Palos Verdes and Playa del Rey.

Major Issues of Concern in Greater Santa Monica Bay

- Acute health risk associated with swimming in runoff-contaminated surfzone waters
- Chronic risk associated with consumption of certain sport fish species in areas impacted by DDT and PCB contamination
- Reduction of loadings from the two major POTWs in light of projected population increases
- Other impacts from urban runoff/storm water
- Historic deposits of DDT and PCBs in sediment; high levels in fish (Palos Verdes Shelf a Superfund site)
- Loadings of pollutants from other sources: sediment resuspension, atmospheric deposition
- The need to have a better understanding of the Bay's resources

Bioaccumulation of DDT in white croaker, dover sole, and California brown pelicans are well-known examples of the impacts caused by sediment contamination. Prior to the 1980s, high concentrations of DDT were found in muscle tissues of these organisms. DDT in these organisms are implicated in fin erosion and other diseases in fish as well as eggshell thinning and subsequent species decline in the California brown pelican.

The most recent Water Quality Assessment Report finds water quality in some streams within the Malibu Creek Watershed is impaired by nutrients and their effects, coliform and their effects, trash, and, in some instances, metals. While natural sources contribute, nonpoint source pollution from human activities is strongly implicated including ill-placed or malfunctioning septic systems and runoff from horse corrals. Nutrient inputs are also contributed by urban runoff and the POTW which discharges tertiary-treated effluent into the Creek about five miles upstream of Malibu Lagoon.

Major Issues of Concern in Malibu Creek Watershed

- Excessive freshwater, nutrients, and coliform in lagoon; contributions from POTW
- Urban runoff from upper watershed
- Impacts to swimmers/surfers from lagoon water
- Septic tanks in lower watershed
- Appropriate restoration and management of lagoon
- Access to creek and lagoon by endangered fish (steelhead trout and tidewater goby)

A nutrient TMDL for the mainstem of the Creek is nearly complete except for the lack of ecologically-relevant nutrient objectives which will be developed as part of a study in-progress to lead to more effective management of the Lagoon and its resources as the restoration process continues.

Historically, the Lagoon was much larger than its current day size and although the flow dynamics of the Creek as well as the ocean's influence on the Lagoon in the past can only be extrapolated, it is likely Creek flow was much less than today during the dry season, and a marine influence may have dominated, keeping the lagoon entrance open much of the year as occurs in the larger Mugu Lagoon to the north. This also would have facilitated migration of the now endangered steelhead trout. And though Creek flow was likely less, more of the watershed was available for the trout's' use, at least prior to the construction of Rindge Dam in the 1920s. Most important, during the dry season there would be access to deep shaded pools in many parts of the watershed where the fish could mature until rain created the flows needed to reach the ocean.

Today, the flow regime is quite different and a major issue of concern. Both increased urban runoff from the more developed upper watershed and discharges from the POTW have increased baseline flows. However, recently the POTW which discharges to Malibu Creek came under a discharge prohibition starting each May 1 or at the first natural closure of Malibu Lagoon by sand buildup (whichever is later) through and including October 31 of each year, except during times of plant upset, storm events, or the existence of minimal streamflow conditions that require flow augmentation in Malibu Creek to sustain endangered species. In the long-run, this discharge prohibition may have many other implications on water quality and quantity in the Creek and Lagoon.

The Lagoon size is much reduced from historic times and it currently remains closed much of the year except for during the winter when ocean influences breach the sandbar and Creek flows help

maintain the opening. This had led to decreasing salinity or at times greatly fluctuating salinity which has disturbed efforts to restore the Lagoon. This also leads to elevated groundwater levels adjacent to the lagoon, assuring failure of septic systems in the area. Additionally, surfing and swimming is popular off the beaches in the immediate area, and there is considerable concern over contaminated Lagoon water reaching these people.

Ballona Creek Watershed

The most recent Water Quality Assessment Report indicates impairment in this watershed due to coliform and its effects such as shellfish harvesting advisories; trash; PCBs, and pesticides of historical origin such as DDT, chlordane, and dieldrin, as well as their effects such as sediment toxicity; metals such as lead, silver, arsenic, copper, cadmium, and zinc, as well as their effects such as water column toxicity; and tributyltin.

Ballona Creek is completely channelized to the ocean except for the estuarine portion which has a soft bottom. While at one time it drained into a large wetlands complex, it now has no direct connection to the few wetlands remaining in the area although tide gates exist in the channel which connect to Ballona Wetlands. However, Ballona Creek may more often affect the nearby wetlands due to wave action moving trash, suspended material, and dissolved contaminants from the ocean to the nearby Ballona Wetlands and Marina del Rey Harbor within which complex Ballona Lagoon is located.

The USCOE and Los Angeles County Department of Beaches and Harbors have conducted routine dredging operations in order to keep the entrance to Marina del Rey Harbor open. Led by the Los Angeles Basin Contaminated Sediment Task Force (for further information on this Task Force, see website http://www.swrcb.ca.gov/rwqcb4/html/programs/regional_programs.html1#Watershed for the Regionwide Section of this document), the USACE is conducting a study to identify sources of heavy metals loadings within the watershed. The results of the study could provide useful information to develop a TMDL for selected heavy metals.

Major Issues of Concern in Ballona Creek Watershed and Wetlands

- Trash loading from creek
- Wetlands restoration
- Sediment contamination by heavy metals from creek to Marina del Rey Harbor and offshore)
- Toxicity of both dry weather and storm runoff in creek
- High bacterial indicators at mouth of creek

Both dry weather and storm runoff from the main channel and two major tributaries were found to be toxic to marine organisms. Toxicity was also found during storms in the ocean near the mouth of the Creek. Preliminary investigations show that the sources of toxicity vary, and were associated with metals on one occasion and with organic chemicals on another occasion. Further efforts are needed to identify the sources of toxicity.

Bacterial indicator levels measured at stations near the mouth of Ballona Creek frequently exceed the level of concern. As a result, warning signs are posted permanently on each side of the Creek. The number of beach closures due to sewage spills rose again in 1998 after a long declining trend over the last ten years.

The BPTCP lists the Marina del Rey Entrance Channel and Marina del Rey back channels as Toxic Hot Spots; however, since they are not high priority sites, we have not yet developed preliminary remediation plans or cost estimates.

Other Urban Watersheds

The most recent Water Quality Assessment Report indicates impairment in many of these smaller drainages, which discharge directly to the ocean due to one or several of the following: coliform, ammonia, lead, copper (and toxicity likely associated with metals), trash, and low dissolved oxygen. Due to the frequency of high bacterial indicator levels, warning signs are posted permanently at many of these locations (i.e., storm drain outlets). It should be noted that there are plans to divert many of these storm drains to the sewer system during dry weather.

IMPAIRMENTS:

The table below gives examples of typical data ranges which led to the 1998 303(d) listings.

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Beach closures	Basin Plan narrative objective	1 - 15 days/year closed	Marina Del Rey Harbor Beach Santa Monica Bay beaches
Swimming restrictions	Basin Plan narrative objective		Malibu Lagoon
Shellfish harvesting adv.	Basin Plan narrative objective		Malibu Lagoon Ballona Creek Estuary
Enteric viruses	Basin Plan narrative objective		Malibu Lagoon Pico Kenter Drain Ballona Creek
Pathogens	Basin Plan narrative objective		Palos Verdes Shoreline Point Beach
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100ml. Beaches: total coliform not to exceed 1,000 MPN/100 ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	Exceedances occurring on up to 53% of sample dates	Marina Del Rey Harbor Beach Marine del Rey Harbor - Back Basins Medea Creek Reach 2 (above Confl. with Lindero) Medea Creek Reach 1 (lake to confl. with Lindero) Las Virgenes Creek Malibu Lagoon Malibu Creek: lagoon to Malibu Lake Stokes Creek Lindero Creek Reach 1 Lindero Creek Reach 2 (above lake) Palo Comado Santa Monica Bay beaches Santa Monica Canyon Ashland Avenue Drain Sepulveda Canyon Pico Kenter Drain Ballona Creek Estuary Ballona Creek

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Algae	Basin Plan narrative objective		Malibu Creek: Lagoon to Malibu Lake Las Virgenes Creek Lindero Creek Reach 2 (above lake) Medea Creek Reach 2 (abv. confl. with Lindero) Medea Creek Reach 1 (lake to confl. with Lindero) Lindero Creek Reach 1 Malibou Lake Lake Lindero Westlake Lake Lake Sherwood
Eutroph.	Basin Plan narrative objective		Malibu Lagoon Malibou Lake Lake Lindero Westlake Lake Lake Sherwood
Unnatural Scum/Foam	Basin Plan narrative objective		Malibu Creek: lagoon to Malibu Lake Las Virgenes Creek Lindero Creek Reach 2 (above lake) Lindero Creek Reach 1
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature, but the general range is 0.53 - 2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3-28.0 mg/l to protect against acute toxicity.	ND - 5.77 mg/l	Westlake Lake Lake Sherwood Sepulveda Canyon Pico Kenter Drain

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Odors	Basin Plan narrative objective		Lake Lindero
Low DO, organic enrichment	Basin Plan narrative objective Basin Plan numeric objective: annual mean greater than 7.0 mg/l no single sample less than 5.0 mg/l	0.1 - 19.3 mg/l (mean of 4.9 ± 4.5)	Las Virgenes Creek Malibou Lake Westlake Lake Lake Sherwood Ashland Avenue Drain
Trash	Basin Plan narrative objective		Ballona Wetland Ballona Creek Medea Creek Reach 2 (abv. confl. With Lindero) Medea Creek Reach 1 (lake to confl. with Lindero) Lake Lindero Lindero Creek Reach 2 (above lake) Lindero Creek Reach 1 Malibu Creek: lagoon to Malibu Lake Las Virgenes Creek Pico Kenter Drain
mercury (water & tissue)	USEPA water quality criteria: 0.012 ug/l SWRCB numeric objective (tissue): Max. Tissue Residue Level 1,000 ng/g	1.0 ug/l (maximum – water)	Santa Monica Bay Nearshore and Offshore Zone Lake Sherwood Triunfo Cyn Creek Reach 1 Triunfo Cyn Creek Reach 2

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Lead (water & sediment)	Basin Plan narrative objective USEPA water quality criteria: varies based on hardness but typically 3.2 - 25 ug/l	100 – 306 ng/g (sediment) 91 - 240 ug/l (water)	Marina del Rey Harbor - Back Basins Topanga Cyn Creek Sepulveda Canyon Pico Kenter Drain Santa Monica Bay Nearshore and Offshore Zone Ballona Creek Estuary Santa Monica Canyon Westlake Lake Triunfo Cyn Creek Reach 1 Triunfo Cyn Creek Reach 2
Cadmium (sediment)	Basin Plan narrative objective		Ballona Creek Santa Monica Bay Nearshore and Offshore Zone
Copper (sediment, tissue, & water)	Basin Plan narrative objective USEPA water quality criteria: varies based on hardness but typically 12 - 47 ug/l	100 ng/g (tissue) 117 - 293 ug/l (water)	Santa Monica Bay Nearshore and Offshore Zone Marina del Rey Harbor - Back Basins Ballona Creek Pico Kenter Drain Westlake Lake Malibou Lake Lake Calabasas
Nickel (sediment)	Basin Plan narrative objective		Santa Monica Bay Nearshore and Offshore Zone
Silver (sediment)	Basin Plan narrative objective		Santa Monica Bay Nearshore and Offshore Zone Ballona Creek
Arsenic (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 200 ng/g		Ballona Creek Ballona Wetland

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Zinc (tissue & sediment)	Basin Plan narrative objective	500 ng/g (sediment) 500 ng/g (tissue)	Santa Monica Bay Nearshore and Offshore Zone Marina del Rey Harbor - Back Basins Ballona Creek Estuary Lake Calabasas
Selenium (water)	USEPA water quality criteria: 5.0 ug/l	8 - 38 ug/l	Lake Lindero Medea Creek Reach 2 (abv. confl. With Lindero) Medea Creek Reach 1 (lake to confl. with Lindero) Las Virgenes Creek Lindero Creek Reach 2 (above lake) Lindero Creek Reach 1
Tributyltin (sediment & tissue)	Basin Plan narrative objective	6,000 ng/g (tissue)	Ballona Creek Marina del Rey Harbor – Back Basins
Toxicity	Basin Plan narrative objective		Ballona Creek Ashland Avenue Drain Pico Kenter Drain
Benthic Comm. Effects	Basin Plan narrative objective		Marina del Rey Harbor - Back Basins Malibu Lagoon
Fish Consumption Advisory	Basin Plan narrative objective		Santa Monica Bay Nearshore and Offshore Zone Marina del Rey Harbor - Back Basins
Sediment toxicity	Basin Plan narrative objective		Santa Monica Bay Nearshore and Offshore Zone Marina del Rey Harbor - Back Basins Ballona Creek Ballona Creek Estuary

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Chem A*	NAS Guideline (tissue): 100 ng/g		Ballona Creek
PAHs (sediment)	Basin Plan narrative objective	5,000 – 6,509 ng/g	Ballona Creek Estuary Santa Monica Bay Nearshore and Offshore Zone
DDT (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	52 – 88 ng/g	Marina del Rey Harbor - Back Basins Ballona Creek Estuary Ballona Creek Santa Monica Bay Nearshore and Offshore Zone Santa Monica Bay beaches
Pesticides	Basin Plan narrative objective		Palos Verdes Shoreline Point Beach
PCBs (sediment & tissue)	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	200 ng/g (sediment) 29 – 162 ng/g	Marina del Rey Harbor - Back Basins Ballona Creek Estuary Ballona Creek Malibou Lake Santa Monica Bay Nearshore and Offshore Zone Santa Monica Bay beaches
Dieldrin (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 0.65 ng/g	4.8 - 16.8 ng/g	Ballona Creek Marina del Rey Harbor - Back Basins
Chlordane	Basin Plan narrative objective SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g	100 ng/g (sediment) 15.3 - 55 ng/g (tissue)	Ballona Creek Santa Monica Bay Nearshore and Offshore Zone Ballona Creek Estuary Marina del Rey Harbor - Back Basins Westlake Lake Malibou Lake

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Exotic Vegetation	Basin Plan narrative objective		Ballona Wetland
Habitat Alteration, Hydromodification, reduced tidal flushing	Basin Plan narrative objective		Ballona Wetland
Debris	Basin Plan narrative objective		Santa Monica Bay Nearshore and Offshore Zone
Chloride	Basin Plan Numeric Objective: 250 mg/l	89-330-mg.l (mean of 244 ± 76)	Lake Lindero
Specific conductance	Basin Plan narrative objective	1,325 – 3,530 mg/l (mean of 2,937 ± 747	Lake Lindero

* Chem A refers to the sum of the chemicals aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH (including lindane), endosulfan, and toxaphene.

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Trash	Ballona Wetland Ballona Creek	2000-01
Nutrients and their effect	Malibu Lagoon Malibu Creek: Lagoon to Malibu Lake Lindero Creek Reaches 1 and 2 Las Virgenes Creek Medea Creek Reaches 1 and 2 Malibou Lake Lake Lindero Westlake Lake Lake Sherwood	2001-02
coliform and its effect	Medea Creek Reaches 1 and 2 Lindero Creek Reaches 1 and 2 Las Virgenes Creek Malibu Lagoon Malibu Creek: lagoon to Malibu Lake Stokes Creek Palo Comado	2001-02

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled for Completion (FY)
Trash	Bollona Wetland Ballona Creek	2000-01
Nutrients and their Effect	Malibu Lagoon Malibu Creek: Lagoon to Malibu Lake Lindero Creek Reaches 1 and 2 Las Virgenes Creek Medea Creek Reaches 1 and 2 Malibu Lake Lake Lindero Westlake Lake Lake Sherwood	2001-02
Coliform and its Effect	Medea Creek Reaches 1 and 2 Lindero Creek Reaches 1 and 2 Las Virgenes Creek Malibu Lagoon Malibu Creek: lagoon to Malibu Lake Stokes Creek Palo Comado	2001-02
Coliform and its Effect	Greater Santa Monica Bay beaches Santa Monica Canyon Ashland Avenue Drain Sepulveda Canyon	2001-02
Coliform and its Effect	Marina Del Rey Harbor Beach Marina Del Rey Harbor – Back Basins	2002-03
Metals and their Effects	Ballona Creek Ballona Creek Estuary Ballona Wetland	2002-03
Coliform and its Effect	Ballona Creek Estuary	2003-04
Metals	Santa Monica Bay Nearshore and Offshore Zone	2003-04
Hist. PCBs, Pest. and Effects	Ballona Creek Ballona Creek Estuary	2003-04
Metals	Marina del Rey Harbor - Back Basins	2003-04
Hist. PCBs, Pest. and Effects	Marina del Rey Harbor - Back Basins	2004-05

Stakeholder Groups

- *Malibu Creek Watershed Advisory Council and Executive Committee (with subcommittees)* A number of stakeholder groups began meeting in the late 1980s/early 1990s in the Malibu area. One short-term facilitated group (in conjunction with the Advisory Council) formulated a list of priority issues that need to be resolved while the Executive Committee worked with the Advisory Council to exchange information and develop a Natural Resources Plan for the watershed prepared by the NRCS. Separate task forces and subcommittees formed and reformed and eventually one group emerged with its associated subcommittees (and task forces as needed) as the main stakeholder forum. The Malibu Lagoon Task Force is currently quite active, and the group is involved with offering advice on watershedwide monitoring and coordination on development of a Malibu Lagoon Enhancement and Management Plan. Also currently active is the Volunteer Water Quality Monitoring Task Force, Monitoring and Modeling Subcommittee (tasked with developing a watershedwide monitoring program), Human Health Subcommittee, and Wildlife Subcommittee. Joint Advisory Council/Executive Committee meetings occur quarterly with 1-2 staff members attending. Various subcommittees and task forces are active as needed but usually 1-2 other groups will be meeting quarterly with 1-2 staff members attending.

- *Santa Monica Bay Restoration Project (Watershed Council, Bay Oversight Committee, Implementation Committee,* and *Technical Advisory Committee)* The SMBRP was formed in 1989 under the National Estuary Program and is charged with the responsibility of assessing the Bay's problems, developing solutions, and identifying implementation procedures. A Bay Restoration Plan was developed and is in the process of being implemented. One or two LARWQCB staff will attend the quarterly meetings of the Oversight Committee while another staff member will attend the quarterly Technical Advisory Committee meetings. More information about this group may be found at its website

http://www.smbay.org./.

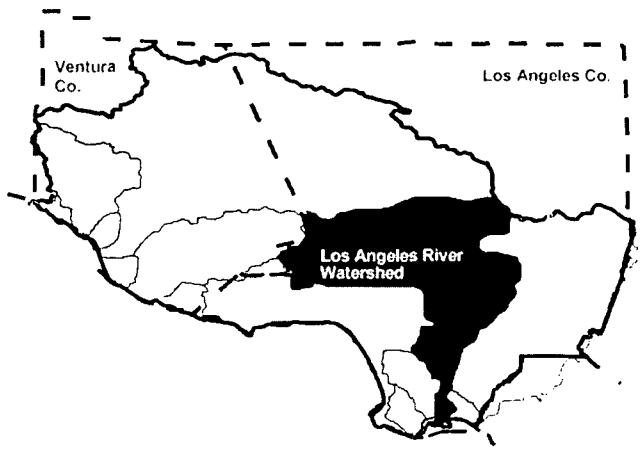
- *Topanga Watershed Committee* The committee was formed in 1998 as a followup to a previous community group working on developing alternatives to traditional flood control measures. Its focus has expanded to include general watershed management and protection activities, as well as volunteer monitoring. More information about this group may be found at its website

http://www.topangaonline.com/twc/index.html.

LOS ANGELES RIVER WATERSHEDANGELES RIVER WATERSHED

This was the targeted watershed for permitting purposes in FY 1997-99 and will be targeted again in FY 2004-05.

Overview of Watershed



Size of watershed: 824 square miles

Length of River: 55 miles

The Los Angeles River (River) Watershed is one of the largest in the Region. It is also one of the most diverse in terms of land use patterns. Approximately 324 square miles of the watershed are covered by forest or open space land including the area near the headwaters which originate in the Santa Monica, Santa Susana, and San Gabriel Mountains. The rest of the watershed is highly developed. The River flows through the San Fernando Valley past heavily developed residential and commercial areas. From the Arroyo Seco, north of downtown Los Angeles, to the confluence with the Rio Hondo, the River flows through industrial and commercial areas and is bordered by railyards, freeways, and major commercial and government buildings. From the Rio Hondo to the Pacific Ocean, the River flows through industrial, residential, and commercial areas, including major refineries and petroleum products storage facilities, major freeways, rail lines, and rail yards serving the Ports of Los Angeles and Long Beach.

Major tributaries to the River in the San Fernando Valley are the Pacoima Wash, Tujunga Wash (both drain portions of the Angeles National Forest in the San Gabriel Mountains), Burbank Western Channel, and Verdugo Wash (both drain the Verdugo Mountains). Due to major flood events at the beginning of the century, by the 1950s most of the River was lined with concrete. In the San Fernando Valley, there is a section of the River with a soft bottom at the Sepulveda Flood Control Basin. The Basin is a 2,150-acre open space upstream of the Sepulveda Dam designed to collect flood waters during major storms. Because the area is periodically inundated, it remains in a semi-natural condition and supports a variety of low-intensity uses, as well as supplying habitat. At the eastern end of the San Fernando Valley, the River bends around the Hollywood Hills and flows through Griffith and Elysian Parks in an area known as the Glendale Narrows. Since the water table was too high to allow laying of concrete, the River in this area has a rocky, unlined bottom with concrete-lined or rip-rap sides. This stretch of the River is fed by natural springs and supports stands of willows, sycamores, and cottonwoods. The many trails and paths along the River in this area are heavily used by the public for hiking, horseback riding, and bird watching.

South of the Glendale Narrows, the River is contained in a concrete-lined channel down to Willow Street in Long Beach. The main tributaries to the River in this stretch are the Arroyo Seco (which drains areas of Pasadena and portions of the Angeles National Forest in the San Gabriel Mountains), the Rio Hondo, and Compton Creek. Compton Creek supports a wetland habitat just before its confluence with the River. The River is hydraulically connected to the San Gabriel River Watershed by the Rio Hondo through the Whittier Narrows Reservoir. Flows from the San Gabriel River and Rio Hondo merge at this reservoir during larger flood events, thus flows from the San Gabriel River Watershed may impact the River. Most of the water in the Rio Hondo is used for groundwater recharge during dry weather seasons. The San Gabriel River drains approximately 689 square miles, which includes the eastern San Gabriel Mountains and portions of the Chino, San Jose, and Puente Hills.

Beneficial Uses in watershed:

Estuary	*Above estuary*
Industrial service supply	Groundwater recharge
Contact & noncontact water recreation	Contact & noncontact water recreation
Navigation	Warmwater habitat
Commercial & sportfishing	Wetlands Habitat
Protection of rare & endangered species	Protection of rare & endangered species
Wildlife habitat	Wildlife habitat
Marine habitat	
Migration of aquatic organisms	
Spawning	
Estuarine habitat	

The River tidal prism/estuary begins in Long Beach at Willow Street and runs approximately three miles before joining with Queensway Bay located between the Port of Long Beach and the City of Long Beach. The channel has a soft bottom in this reach with concrete-lined sides. Queensway Bay is heavily water recreation-oriented; however, major pollutant inputs are likely more related to flows from the River which carries the largest storm flow of any river in southern California.

Also part of the watershed are a number of lakes including Peck Road Park, Belvedere Park, Hollenbeck Park, Lincoln Park, and Echo Park Lakes, as well as Lake Calabasas. These lakes are heavily used for recreational purposes.

Four basins in the San Fernando Valley area contain substantial deep groundwater reserves and are recharged mainly through runoff and infiltration although the increase in impermeable surfaces has decreased infiltration. Groundwater basins in the San Gabriel Valley are not separated into distinct aquifers other than near the Whittier Narrows. Active recharge occurs in some of these areas through facilities operated by Los Angeles County. Spreading grounds recharge two basins in the coastal plain of Los Angeles west of the downtown area.

Water Quality Problems and Issues

Pollutants from dense clusters of residential, industrial, and other urban activities have impaired water quality in the middle and lower watershed. Added to this complex mixture of pollutant sources (in particular, pollutants associated with urban and storm water runoff), is the high number of point source permits.

IMPAIRMENTS: The majority of the Los Angeles River Watershed is considered impaired due to a variety of point and nonpoint sources. The 1998 303(d) list implicates pH, ammonia, a number of metals, coliform, trash, scum, algae, oil, chlorpyrifos, as well as other pesticides and volatile organics in that impairment. Some of these constituents are of concern throughout the length of the River while others are of concern only in certain reaches (see chart below). Impairment may be due to water column exceedances, excessive sediment levels of pollutants, or bioaccumulation of pollutants. The beneficial uses threatened or impaired by degraded water quality are aquatic life, recreation, groundwater recharge, and municipal water supply.

Permitted discharges:

- Six major NPDES dischargers (four POTWs)
- 30 minor permits
- 114 dischargers covered by general permits
- Minor permits cover miscellaneous wastes such as groundwater dewatering, recreational lake overflow, swimming pool wastes, and groundwater seepage. Other permits are for discharge of treated contaminated groundwater, noncontact cooling water, and storm water
- 1,258 dischargers covered under an industrial storm water permit
- 215 dischargers covered under a construction storm water permit

The table below gives examples of typical data ranges which led to the listings.

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature, but the general range is 0.53 - 2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3 – 28.0 mg/l to protect against acute toxicity.	ND - 34.9 mg/l (mean of 10.7 ± 4.8)	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reach 5 (within Sepulveda Basin) Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 3 (Riverside Dr. to Figueroa St.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Burbank Western Channel Rio Hondo Reach 2 (from Whittier Narrows Flood Cntrl Basin to Spreading Grounds) Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Lincoln Park Lake Echo Park Lake Lake Calabasas
Nutrients (algae)	Basin Plan narrative objective Basin Plan numeric objective: nitrates-N + nitrites-N not greater than 10 mg/l	0.2 - 14.5 mg/l (mean of 2.7 ± 3.2)	Los Angeles River Reach 5 (within Sepulveda Basin) Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 3 (Riverside Dr. to Figueroa St.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Burbank Western Channel Verdugo Wash (Reaches 1 & 2) Arroyo Seco Rch. 1 (d/s Devil's Gate Dam) & Rch. 2 (W. Holly Ave. to Devil's Gate) Lincoln Park Lake Echo Park Lake Lake Calabasas

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Scum, Odors	Basin Plan narrative objective		Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reach 5 (within Sepulveda Basin) Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 3 (Riverside Dr. to Figueroa St.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Burbank Western Channel Peck Rd Lake Lincoln Park Lake Echo Park Lake Lake Calabasas
PH	Basin Plan numeric objective: 6.5 - 8.5 pH units	7.0 - 10.6 pH units (mean of 9.2 ± 0.9)	Los Angeles River Reach 1(u/s Carson St. to estuary) Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Compton Creek Echo Park Lake Lake Calabasas
Low DO/Organic Enrichment	Basin Plan narrative objective Basin Plan numeric objective: annual mean greater than 7.0 mg/l no single sample less than 5.0 mg/l	0.2 - 15.2 mg/l (mean of 6.0 ± 4.0)	Lincoln Park Lake Peck Rd Lake Lake Calabasas

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Trash	Basin Plan narrative objective		Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reach 5 (within Sepulveda Basin) Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 3 (Riverside Dr. to Figueroa St.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Burbank Western Channel Verdugo Wash (Reaches 1 & 2) Arroyo Seco Reach 1 (d/s Devil's Gate Dam) & Reach 2 (W. Holly Ave. to Devil's Gate) Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Peck Rd. Lake Echo Park Lake Lincoln Park Lake
Copper	USEPA water quality criteria: varies based on hardness but typically 12 - 47 ug/l	63 ug/l (maximum)	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Compton Creek Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Echo Park Lake Lake Calabasas

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Lead	USEPA water quality criteria: varies based on hardness but typically 3.2 - 25 ug/l	140 ug/l (maximum)	Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Monrovia Cyn Creek Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Compton Creek Peck Rd. Lake Lincoln Park Lake Echo Park Lake
Cadmium	USEPA water quality criteria: varies based on hardness but typically 1.1 - 4.0 ug/l	3 ug/l (maximum)	Burbank Western Channel
Zinc	USEPA water quality criteria: varies based on hardness but typically 106 - 414 ug/l	1,340 ug/l (maximum)	Lake Calabasas Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River)
Selenium	USEPA water quality criteria: 5.0 ug/l	9.3 ug/l (maximum)	Aliso Canyon Wash

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100ml. Beaches: total coliform not to exceed 1,000 MPN/100ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	ND - 93,000 MPN/100ml	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reach 6 (u/s of Sepulveda Basin) Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.) Los Angeles River Reach 2 (Figueroa St. to u/s Carson St.) Los Angeles River Reach 1(u/s Carson St. to estuary) Verdugo Wash (Reaches 1 & 2) Arroyo Seco Rch 1 (d/s Devil's Gate Dam) & Rch 2 (W. Holly Ave. to Devil's Gate) Rio Hondo Reach 1 (Santa Ana Fwy to Los Angeles River) Rio Hondo Reach 2 (Whittier Narrows Flood Control Basin to Spreading Grounds) Compton Creek Bell Creek
Chlorpyrifos	Basin Plan narrative objective		Los Angeles River Reach 5 (within Sepulveda Basin)
Chem A*	NAS Guideline (tissue): 100 ng/g		Los Angeles River Reach 5 (within Sepulveda Basin)
PCBs	SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g		Echo Park Lake
DDT	SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g		Peck Rd. Lake Lake Calabasas
Chlordane	SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g		Peck Rd. Lake

* Chem A refers to the sum of the chemicals aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH (including lindane), endosulfan, and toxaphene.

Potential sources of pollution:

- POTWs
- Industrial discharges
- Septic systems
- Landfills
- Nonpoint sources (horse stables, golf courses)
- Illegal trash dumping
- Cross-contamination between surface and groundwater

Groundwater resources in the watershed are also impacted. Impacts, both real and threatened, include those from hundreds of cases of known leaking USTs that have contaminated soil and/or groundwater with petroleum hydrocarbons and volatile organic compounds. There are also a number of cases of refineries/tank farms that have contaminated soil and/or groundwater. Seawater intrusion (chloride) is of concern in other areas of the watershed which has necessitated wellhead treatment, shutdown, or blending. Finally, a number of wells have been shut down due to nitrate contamination with septic systems as a likely source.

ISSUES: The major issues of concern in the watershed include: (1) protection and enhancement of fish and wildlife habitat, (2) removal of exotic vegetation, (3) enhancement of recreational areas, (4) attaining a balance between water reclamation and minimum flows to support habitat, (5) management of storm water quality, (6) assessment of other nonpoint sources, including horse stables, golf courses, and septic systems, (7) pollution from contaminated groundwater, (8) groundwater recharge with reclaimed water, (9) contamination of groundwater by volatile organic compounds, (10) leakage of MTBE from USTs, and (11) contaminated sediments within the Los Angeles River estuary. Some of these issues are only indirectly related to water quality but are those identified by stakeholder groups.

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled For Completion (FY)
Trash	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reaches 1, 2, 3, 4, 5 Burbank Western Channel Verdugo Wash Reaches 1 & 2 Arroyo Seco Reaches 1 and 2 Rio Hondo Reach 1	2000-01
Nitrogen and Related Effects	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Los Angeles River Reaches 1, 2, 3, 4, 5 Burbank Western Channel Verdugo Wash Reaches 1 & 2 Arroyo Seco Reaches 1 and 2 Rio Hondo Reaches 1 and 2 Compton Creek	2000-01
Coliform	Los Angeles River Reaches 1, 2, 4, and 6 Tujunga Wash (d/s Hansen Dam to Los Angeles River) Verdugo Wash Reaches 1 and 2 Arroyo Seco Reach 1 Rio Hondo Reaches 1 and 2 Compton Creek	2000-01
Metals	Tujunga Wash (d/s Hansen Dam to Los Angeles River) Compton Creek Burbank Western Channel Los Angeles River Reaches 1, 2, 4 Rio Hondo Reach 1 Monrovia Cyn Creek Aliso Canyon Wash	2003-04
Pesticide	Los Angeles River Reach 5 (within Sepulveda Basin)	2004-05

Stakeholder Groups

Los Angeles/San Gabriel Rivers Watershed Council. The group was formed in 1995 following a large watershed conference held in the area which served as a springboard. The Council has a board of directors and became incorporated as a nonprofit organization in 1996. The group is tracking watershed activities, but has primarily focused on flood control issues in the Los Angeles River, as well as opportunities to create greenbelts and restore habitat. Three

committees have been formed recently: water resources, water quality, and multi-use projects. The Council's goal is to help facilitate a process to preserve, restore, and enhance all aspects of the two watersheds. Preparation of a watershed management plan by this group is unlikely since it intends to emphasize public education and encouragement of public-private partnerships for river enhancement purposes. Generally one staff person attends these monthly council meeting, as well as monthly board of directors meetings. More information about this group may be found at its website

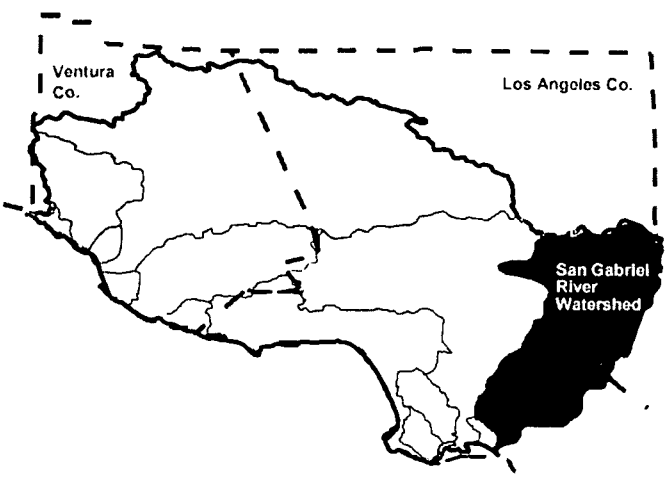
http://www.lasgriverswatershed.org/.

Los Angeles Basin Contaminated Sediment Task Force. Contaminated dredged material disposal is a major issue in the Los Angeles Region due to its large commercial ports and the several major marina complexes and small vessel harbors. Queensway Bay, at the mouth of the watershed, receives a large sediment load that impacts recreational uses. The need for a long-term management strategy for dealing with contaminated sediments in the Los Angeles area has been identified and the Task Force will prepare this strategy. Representatives on the Task Force include a number of federal and State agencies, as well as port and environmental group representatives. More information about this group may be found in the Regionwide Section of this Chapter.

SAN GABRIEL RIVER WATERSHED

This watershed will be targeted for permit renewal purposes in FY 2005-06.

Overview of Watershed



Size of watershed: 689 sq. mi.

The San Gabriel River receives drainage from a large area of eastern Los Angeles County; its headwaters originate in the San Gabriel Mountains. The watershed consists of extensive areas of undisturbed riparian and woodland habitats in its upper reaches. Much of the watershed of the West Fork and East Fork of the River is set aside as a wilderness area; other areas in the upper watershed are subject to heavy recreational use. The upper watershed also contains a series of flood control dams. Further downstream, towards the middle of the watershed, are large spreading grounds utilized for groundwater recharge. The watershed is hydraulically connected to the Los Angeles River through the Whittier Narrows Reservoir (normally only during high storm flows). The lower part of the River flows through a concrete-lined channel in a heavily urbanized portion of the county before becoming a soft bottom channel once again near the ocean in the City of Long Beach. Large electrical power poles line the River along the channelized portion, and nurseries, small stable areas, and a large turkey farm are located in these areas.

Beneficial Uses designated in the watershed:

Estuary	*Above Estuary*
Contact & noncontact water recreation	Contact & noncontact water recreation
Industrial service supply	Industrial service supply
Protection of rare & endangered species	Protection of rare & endangered species
Wildlife habitat	Wildlife habitat
Spawning	Spawning
Marine habitat	Warm- & coldwater habitat
Estuarine habitat	Municipal water supply
Navigation	Groundwater recharge
Commercial & sportfishing	Industrial process supply
Migratory	Agricultural supply

Water Quality Problems and Issues

Pollutants from dense clusters of residential and commercial activities have impaired water quality in the middle and lower watershed. Tertiary effluent from several sewage treatment plants enters the River in its middle reaches (which is partially channelized) while two power generating stations discharge cooling water into the River's estuary. The watershed is also covered under the municipal storm water NPDES permit. Several landfills are also located in the watershed.

Several reservoirs, which exist primarily for flood control purposes, occur in the upper part of the watershed. Frequent removal of accumulated sediments is necessary to maintain the flood control capacity of these reservoirs. Some of the removal methods previously used have had short-term water quality impacts. Continued need for such maintenance could cause longer-term impacts.

Significant Issues:

- Sluicing of reservoirs
- Protection of groundwater recharge areas
- Trash in upper watershed
- Mining/stream, modifications
- Ambient toxicity
- Urban and storm water runoff quality
- Nonpoint source loadings from nurseries and horse stables
- Estuary dynamics

Permitted discharges:

- Nine major NPDES dischargers (five POTWs)
- 25 minor permits
- 39 discharges covered under general permits
- 536 dischargers covered under an industrial storm water permit
- 170 dischargers covered under a construction storm water permit

IMPAIRMENTS: The upper reaches of the River (in the Angeles National Forest) are heavily used for recreational purposes and have been impacted from trash, debris, and habitat destruction. Various reaches of the River are on the 1998 303(d) list due to nitrogen and its effects, trash, PCBs and pesticides, metals, and coliform. The table below gives examples of typical data ranges which led to the listings.

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature but the general range is 0.53 - 2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3-28.0 mg/l to protect against acute toxicity.	ND - 21.1 mg/l (mean of 10.1±4.1)	San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam) San Gabriel River Reach 1 (Estuary to Firestone) San Jose Creek Reach 2 (Temple to I-10 at White Ave.) San Jose Creek Reach 1 (SG confluence to Temple St.) Coyote Creek Legg Lake El Dorado Lakes

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Toxicity	Basin Plan narrative objective	0 – 100% survival	San Gabriel River Reach 3 (Whittier Narrows to Ramona) San Gabriel River Reach 1 (Estuary to Firestone) Coyote Creek Walnut Creek
Algae	Basin Plan narrative objective		San Gabriel River Reach 1 (Estuary to Firestone) San Jose Creek Reach 2 (Temple to I-10 at White Ave.) San Jose Creek Reach 1 (SG confluence to Temple St. Coyote Creek El Dorado Lakes
Eutrophication	Basin Plan narrative objective		El Dorado Lakes
PH	Basin Plan numeric objective: 6.5 - 8.5 pH units	6.9 - 9.4 pH units (mean of 8.5±0.6)	Walnut Creek El Dorado Lakes Legg Lake Santa Fe Dam Park Lake
Odors	Basin Plan narrative objective		Legg Lake
Low DO, Organic Enrichment	Basin Plan narrative objective		Puddingstone Reservoir Crystal Lake
	Basin Plan numeric objective: annual mean greater than 7.0 mg/l no single sample less than 5.0 mg/l	0.1 - 14.9 mg/l (mean of 4.3±3.5)	
Trash	Basin Plan narrative objective		San Gabriel River East Fork Legg Lake

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Lead	USEPA water quality criteria: varies based on hardness but typically 3.2 - 25 ug/l	100 ug/l (maximum)	San Jose Creek Reach 2 (Temple to I-10 at White Ave.) San Jose Creek Reach 1 (SG confluence to Temple St.) San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam) San Gabriel River Reach 1 (Estuary to Firestone) Coyote Creek Santa Fe Dam Park Lake El Dorado Lake Legg Lake
Arsenic (tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 200 ng/g	240 - 300 ng/g (tissue)	San Gabriel River Estuary
Chromium	USEPA water quality criteria: 11 ug/l	90 ug/l (maximum)	Coyote Creek
Copper	USEPA water quality criteria varies based on hardness but typically 12 - 47 ug/l	90 ug/l (maximum)	Coyote Creek Legg Lake El Dorado Lakes Santa Fe Dam Park Lake
Silver	USEPA water quality criteria varies based on hardness but typically 4.1 - 65 ug/l	30 ug/l (maximum)	Coyote Creek
Mercury (tissue)	NAS guidelines (tissue): 500 ng/g	510 ng/g (tissue)	Puddingstone Reservoir El Dorado Lakes
Chloride	Basin Plan numeric objective: 230 mg/l	53 - 405 mg/l (mean of 182 ± 58)	Coyote Creek
Coliform	Basin Plan numeric objective: fecal coliform not to exceed log mean of 200mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100 ml	ND – 24,0000 MPN/100ml	San Jose Creek Reach 1 (SG confluence to Temple St.) San Jose Creek Reach 2 (Temple to I-10 at White Ave.) San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam) San Gabriel River Reach 1 (Estuary to Firestone) Coyote Creek

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
DDT	SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	25 - 36 ng/g (tissue)	Puddingstone Reservoir
PCBs	SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	54 - 65 ng/g (tissue)	Puddingstone Reservoir
Chlordane	SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g	16.1 - 31.7 ng/g (tissue)	Puddingstone Reservoir
Abnormal Fish Histology	Basin Plan narrative objective		Coyote Creek San Gabriel River Reach 1 (Estuary to Firestone) San Gabriel River Estuary

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled For Completion (FY)
Nitrogen and Its effects	San Gabriel River Reaches 1, 2, 3 San Jose Creek Reach 1 Coyote Creek Walnut Creek	2002-03
Nitrogen and its effects	El Dorado Lakes Puddingstone Reservoir Legg Lake Santa Fe Dam Lake Crystal Lake	2002-03
Coliform	San Gabriel River Reaches 1 and 2 Coyote Creek	2003-04
Metals	San Jose Creek Reaches 1 and 2 San Gabriel River Reaches 1 and 2 San Gabriel River Estuary Coyote Creek	2004-05

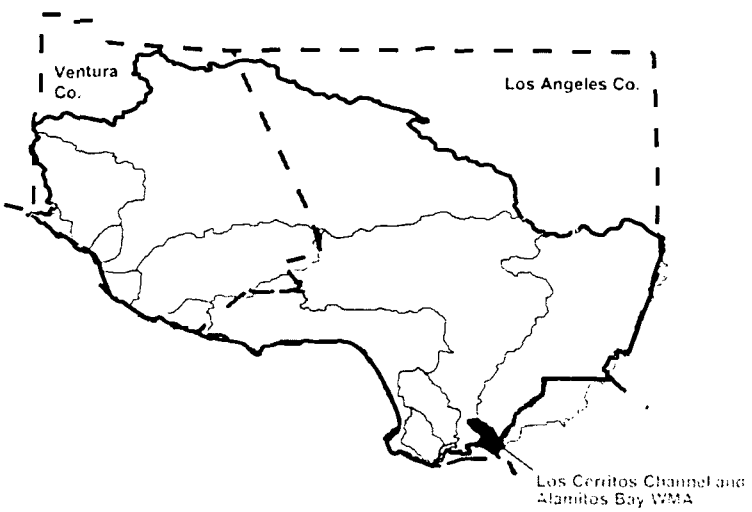
Stakeholder Groups

Los Angeles/San Gabriel Rivers Watershed Council: This group was formed in 1995 following a large watershed conference held in the area which served as a springboard for other efforts. The Council has a board of directors and became incorporated as a nonprofit organization in 1996. The group is tracking watershed activities, but has primarily focused on flood control issues in the Los Angeles River, as well as opportunities to create greenbelts and restore habitat. The Council's goal is to help facilitate a process to preserve, restore, and enhance all aspects of the two watersheds. There has been interest recently to convene a subcommittee to address water quality issues in more detail.

LOS CERRITOS CHANNEL AND ALAMITOS BAY WMA

This watershed will be targeted for permit renewal purposes in FY 2005-06.

Overview of WMA



Los Cerritos Channel, Tidal Prism, and Wetlands: The Los Cerritos Channel is concrete-lined above the tidal prism and drains a relatively small area of east Long Beach, albeit a densely urbanized one. The Channel's tidal prism starts at Anaheim Road and connects with Alamitos Bay through the Marine Stadium; the wetlands connects to the Channel a short distance from the lower end of the Channel. The wetlands and a portion of the Channel near the wetlands is an overwintering site for a great diversity of birds (up to 50 species) despite its small size. An endangered bird species, the Belding's Savannah Sparrow, may nest there; and an area adjacent to the wetlands is a historic least tern colony site. One small marina is located in the Channel which is also used by rowing teams and is a popular fishing area.

Alamitos Bay: Alamitos Bay is composed of the Marine Stadium, a recreation facility built in 1932 and used for boating, water skiing, and jet skiing; Long Beach Marina, which contains five smaller basins for recreational craft and a boatyard; a variety of public and private berths; and the Bay proper which includes several small canals, a bathing beach, and several popular clamming areas. A small bathing lagoon, Colorado Lagoon in Long Beach, has a tidal connection with the Bay and a small wildlife pond, Sims Pond, also has a tidal connection. The latter is heavily used by overwintering migratory birds.

Beneficial uses designated in the watershed:

Estuary (marina, wetlands, bay)	*Above Estuary*
Contact & noncontact water recreation	Wildlife habitat
Industrial service supply	
Navigation	
Intermittent uses:	
Commercial & sportfishing	Noncontact water recreation
Estuarine habitat	Warmwater habitat
Marine habitat	
Wildlife habitat	
Preservation of rare & endangered species	
Migration of aquatic organisms	
Spawning habitat	
Shellfish harvesting	
Wetlands habitat	

Water Quality Problems and Issues

A considerable amount of leaching of boat paint likely occurs in the Bay, particularly in the marina. Nonpoint source runoff from storm drains are is also a likely source of problems.

Significant Issues:

- Loss of wetlands habitat in Los Cerritos area
- Impacts from antifouling paint in marinas
- Urban and storm water runoff impacts on isolated water bodies

IMPAIRMENTS: Beneficial uses in the wetlands area are considered fully supported while those in the channel are not. Beneficial uses in the Bay for the most part are considered fully supported although Long Beach Marina is considered a site of concern due to elevated sediment concentrations of metals. The table below gives examples of typical data ranges which led to the listings.

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Ammonia	Basin Plan narrative objective Basin Plan numeric objective: varies depending on pH and temperature, but the general range is 0.53 - 2.7 mg/l of total ammonia (at average pH and temp.) in waters designated as WARM to protect against chronic toxicity and 2.3-28.0 mg/l to protect against acute toxicity.	ND - 2.19 mg/l (mean of 0.34 ± 0.41)	Los Cerritos Channel
Copper (in tissue)	Basin Plan narrative objective		Los Cerritos Channel
Lead (in sediment)	Basin Plan narrative objective	510 ug/g (sediment)	Colorado Lagoon Los Cerritos Channel
Zinc (in sediment)	Basin Plan narrative objective	690 ug/g (sediment)	Colorado Lagoon Los Cerritos Channel
Chlordane (in tissue)	SWRCB numeric objective (tissue): Max. Tissue Residue Level 1.1 ng/g	64.9 ng/g (tissue)	Colorado Lagoon
DDT	SWRCB numeric objective (tissue): Max. Tissue Residue Level 32.0 ng/g	59.9 ng/g (tissue)	Colorado Lagoon
PCBs	SWRCB numeric objective (tissue): Max. Tissue Residue Level 2.2 ng/g	42.0 ng/g (tissue)	Colorado Lagoon
Dieldrin	SWRCB numeric objective (tissue): Max. Tissue Residue Level 0.65 ng/g	18.2 ng/g (tissue)	Colorado Lagoon

Impairments	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/Reaches
Sediment Toxicity	Basin Plan narrative objective		Colorado Lagoon
Coliform	Basin Plan numeric objective: Inland: fecal coliform not to exceed log mean of 200 mpn/100ml in 30-day period and not more than 10% of samples exceed 400 MPN/100ml. Beaches: total coliform not to exceed 1,000 MPN/100ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100ml at any time.	2 – 17,000 MPN/100ml	Los Cerritos Channel
PAHs	Basin Plan narrative objective	10,000 ng/g (sediment)	Colorado Lagoon

CURRENTLY SCHEDULED TMDLS:

Type of TMDL	Listed Waters/Reaches in TMDL	Year Scheduled For Completion (FY)
Coliform	Los Cerritos Channel	2004-05
Ammonia	Los Cerritos Channel	2004-05
Metals	Los Cerritos Channel Colorado Lagoon	2004-05
PAHs	Colorado Lagoon	2004-05
Historic Pesticides	Colorado Lagoon	2004-05

Stakeholder Group

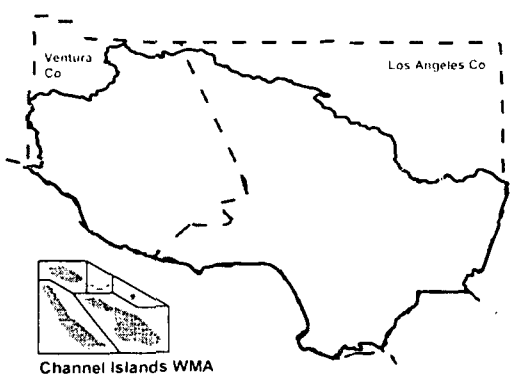
It is anticipated the Los Angeles/San Gabriel Watersheds Council will function, at least initially, as this WMA's stakeholder group. The Los Cerritos WMA is located between the Los Angeles and San Gabriel Rivers and drains to the same general area as the San Gabriel River. There is also a minor hydraulic connection between the lower San Gabriel River and Los Cerritos Channel due to the location of a power plant intake with the Long Beach Marina. The discharge from this facility flows into the San Gabriel River estuary. Another potential stakeholder group is the Los Cerritos Wetlands Task Force

http://www.loscerritos.org/.

THE CHANNEL ISLANDS WMA

This watershed will be targeted for permit renewal purposes in FY 2005-06.

Overview of WMA



The Channel Islands within the Region's boundaries are: Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente Islands. Anacapa and Santa Barbara Islands are part of the Channel Islands National Park. The waters within six nautical miles of Anacapa and Santa Barbara Islands are designated a national marine sanctuary. The ocean waters adjacent to the islands (not the entire circumference of Santa Catalina however) were designated Areas of Special Biological Significance by the State of California. The west side of San Nicolas supports a large gull rookery and elephant seal breeding area. The U.S. Navy has facilities on San Nicolas (and a desalination plant) and San Clemente Islands with a small package treatment plant on the latter. The City of Avalon is located on Santa Catalina Island and also has a small treatment plant.

Water Quality Problems and Issues

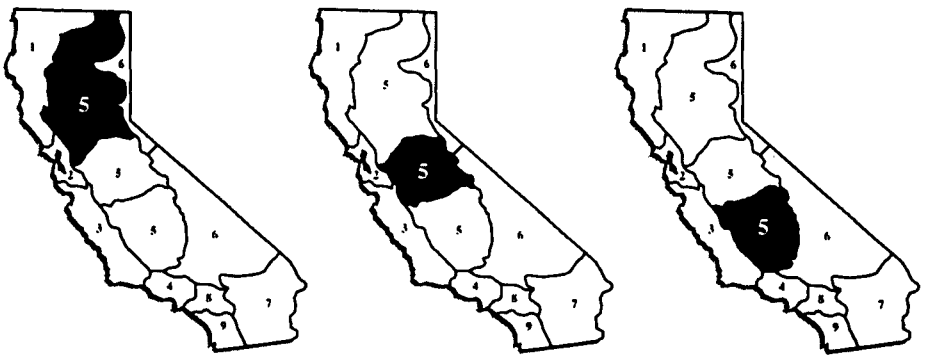
Water quality in the vicinity of the islands is uniformly good. There are some potential threats from naval facilities and small treatment plants; however, no part of this watershed management area is on the 303(d) list.

Stakeholder Group

There is currently no stakeholder group organized for the islands.

Beneficial Uses of Island Watercourses
Municipal supply
Groundwater recharge
Contact & noncontact water recreation
Warmwater habitat
Wildlife habitat
Preservation of rare & endangered species

Central Valley Region (Region 5)



This section contains excerpts of the *State of the Watershed Reports* for the three major watersheds in the Region (Sacramento River, San Joaquin River and Tulare Basin) and for sub-watersheds in which there is focused staff activity (Pit River, North, and Middle Fork Feather River, Cache Creek, American River, and the Delta). Each State of the Watershed Report contains a Watershed Description, and *Water Quality Assessment,* which includes a description of water quality problems and issues in the watershed (or sub-watershed). *Current Activities and Strategies to Address Problems*, which includes the priorities for the watershed and a description of current programs and activities that are underway to address the problems and strategies for the future can be found in the full WMI Chapter. Under these *Activities and Strategies,* for each water quality issue, there is a description of activities that the Central Valley Regional Water Quality Control Board (CVRWQCB) proposes to undertake in the next two years with existing resource allocations. There is also identification in general terms of where additional resources are needed to fully address a water quality issue. This includes both staff resources and monitoring needs.

This section focuses on nonpoint source problems and programs because point source programs are well established and easily defined and because the majority of the significant water quality problems in the Region are related to nonpoint source discharges.

STATE OF THE WATERSHED REPORT
SACRAMENTO RIVER WATERSHED

Watershed Description

The Sacramento River flows southward, draining the northern part of the Central Valley Basin. The Sacramento River Basin covers 27,210 square miles and includes the area drained by the Sacramento River. For planning purposes, this includes all watersheds tributary to the Sacramento River that are north of the Cosumnes River watershed. It also includes the closed basin of Goose Lake, the drainage sub-basins of Cache and Putah Creeks, and the Yolo and Sutter Bypasses.

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 percent of the flow) come from streams entering from smaller watersheds along the River and from agricultural and storm drain systems. The Sacramento River basin supplies greater than 80 percent of the freshwater flows to the Sacramento-San Joaquin Delta. There are over 50 sub-basins or tributaries to the Sacramento River.

Department of Water Resources (DWR) Bulletin 118-80 identifies 63 groundwater basins in the Sacramento watershed area. The Sacramento Valley floor is divided into two groundwater basins. There are areas other than those identified in the DWR Bulletin with groundwaters that have beneficial uses.

There are separate State of the Watershed Reports for the Pit River, Feather River, American River, Cache Creek, and Delta sub-watersheds. Because most of the Delta is in the San Joaquin River watershed, the Delta sub-watershed report is attached to the San Joaquin River Watershed Report.

Water Quality Assessment

SURFACE WATER

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 SWRCB released the final project report for the *Sacramento River Toxic Chemical Risk Assessment Project*. 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 potential sources of pollution. Since 1987, CVRWQCB staff has conducted a series of toxicity surveys of various portions of the Sacramento River

watershed. 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.

The following is a discussion of the nonpoint source problems and issues for those watersheds within the CVRWQCB area of Modoc, Lassen, Siskiyou, Shasta, Tehama, Plumas, and Butte Counties.

Pit River Watershed (including Pit River, Fall River, Hat Creek, and Burney Creek)

This watershed area extends from the headwaters of the Pit River in the Warner Mountains through portions of Modoc, Lassen, and Shasta Counties to Shasta Lake. Point source discharges are limited to lumber mills and treated domestic wastewater from Alturas, Bieber, Adin, and Burney. Nonpoint source discharges associated with agriculture, livestock grazing, timber harvest, and hydrologic modification have had a much more significant impact on Pit River water quality and beneficial uses than have point source discharges.

For purposes of this discussion, the Goose Lake watershed basin will be included with the Pit River; however, this basin is actually a separate hydrologic unit. Past land management practices and extended drought conditions in the 1980s and early 1990s caused deterioration of water quantity, quality and aquatic habitat leading to the severe decline of the Goose Lake Redband Trout and other native fish species. Though protection/restoration efforts are underway, some streams are still impacted by degraded aquatic habitat, low summer flows, high temperature, and channel erosion and incisement.

Previous monitoring surveys have documented water quality problems in the mainstem Pit River. These include high nutrient input and nuisance algae conditions, low dissolved oxygen, high turbidity/suspended sediment, and high water temperature. These parameters and overall aquatic habitat conditions in the Pit River and its tributaries are influenced by a variety of factors which impact watershed quality. These include some natural factors, such as low summer flow, turbidity from fine suspended sediments (volcanic clays), and thermal/chemical contributions from mineralized hot springs. Nonpoint discharges associated with land management practices include livestock grazing, agriculture, and timber harvest operations, in addition to flow depletion from irrigation and hydroelectric diversions. Previous channel modification projects in some locations have contributed to progressive channel erosion and incisement. The Pit River is currently included on the 303d list for impairment from nutrient enrichment, low dissolved oxygen, and high temperature.

The Fall River enters the Pit River near the town of Fall River Mills. The Fall River is a unique spring-fed river system that flows approximately 14 miles in total length and supports an exceptional wild trout fishery. In recent years, it was observed that upper Fall River was being

adversely impacted by sediment deposition which had degraded aquatic vegetation, macroinvertebrates, and the wild trout fishery. The source of this sediment load is believed to be from a variety of past land management practices and excessive channel erosion, principally in the Bear Creek watershed which is the only major tributary to Fall River. Fall River has been included on the 303d list because of the sedimentation problem.

Numerous other tributaries to the Pit River have some reaches that are impacted by degraded aquatic habitat conditions, excessive channel erosion and incisement, and increased temperature and sediment loading. These conditions are caused by a variety of land management practices, including livestock grazing, road construction, logging, and channel modifications.

McCloud River Watershed

The McCloud River originates in the Cascade Range east of Mount Shasta and flows approximately 20 miles to its confluence with Lake Shasta. McCloud Reservoir was constructed in 1965 in the upper portion of the watershed to augment the Pacific Gas and Electric Company (PG&E) McCloud-Pit Hydroelectric Project. The McCloud River remains, for the most part, a pristine watershed. Notwithstanding, there is concern about the possible impacts of McCloud Reservoir on sediment transport, water temperature, and flow regime. Some studies are underway to document existing conditions and identify potential problems.

Upper Sacramento River Watershed

This watershed area includes the Sacramento River and tributaries from its headwaters downstream to Lake Shasta (including Lake Siskiyou). Water quality is generally good and no specific problems have been identified. Potential problems are from erosion and sediment discharge from logging, road construction and other land disturbing activities, urban storm water discharge from the Dunsmuir and Mt. Shasta City areas, future spill events from the Sacramento River canyon transportation corridor, municipal waste discharges from unsewered areas, and temperature increases in the lower reach to the River. Studies are currently underway to document existing water quality conditions and evaluate these potential problems.

Lake Shasta Watershed

This includes Lake Shasta, Keswick Reservoir, and tributaries thereto. The principal water quality issue is acid mine drainage from abandoned and inactive copper mines that operated in the early 1900s. Several streams tributary to Shasta and Keswick Reservoirs are severely impacted by continuing discharges of acid mine drainage and are currently on the 303d list for contamination from acid and heavy metals. These include Spring Creek, Squaw Creek, Lt. Backbone Creek, Horse Creek, and Town Creek. Portions of Shasta and Keswick Reservoirs have poor water quality and periodic fish kills where these tributaries enter the lakes.

There is some concern with bacteria concentrations from high density recreational use in Shasta Lake, but no specific problems have been identified.

Clear Creek Watershed

This includes upper Clear Creek (above Whiskeytown Reservoir), Whiskeytown Reservoir, lower Clear Creek (below Whiskeytown), and tributaries thereto.

Willow Creek (tributary to Clear Creek) is on the 303d list due to acid mine drainage from Greenhorn Mine (inactive copper mine). Whiskeytown Reservoir is on the 303(d) list due to past studies that found elevated bacteria concentrations from high density recreational use. With these exceptions, no specific water quality problems have been identified. There is a general concern with erosion and sediment discharges throughout the watershed and with storm water runoff from the urban area in the lowermost reach of the Clear Creek.

Sacramento River (Shasta Dam to Hamilton City)

This portion of the Sacramento River is important for spawning and propagation of salmon, steelhead, and a resident trout fishery, provides municipal supply water for Redding and surrounding communities, and is a high use recreational area. Abandoned/inactive mines in the Redding and Shasta Lake area have historically impacted water quality and aquatic life in the Sacramento River and its tributaries. CVRWQCB monitoring during the period of 1988 through 1993 found numerous exceedances of water quality objectives for copper, cadmium, and zinc in the Sacramento River downstream of Keswick Reservoir. These elevated metal concentrations threaten anadromous fish and other aquatic life. CVRWQCB studies conducted in 1991 and 1992 detected algal toxicity 75 percent of the time and invertebrate (*Ceriodaphnia*) toxicity 38 percent of the time in the Sacramento River below Keswick Dam. In these studies, toxicity was linked to copper and zinc. Algal toxicity was observed to extend downstream as far as the City of Colusa. In recent years (post-1994), remediation efforts at Iron Mountain Mine and other inactive mines have resulted in a substantial reduction in metal loading to the Sacramento River. Sampling conducted since February 1995 suggests that Basin Plan objectives for copper, cadmium, and zinc in the upper Sacramento River have been rarely exceeded. Toxicity tests conducted in 1997 and 1998 have not detected toxicity below Keswick Reservoir. Remediation efforts are continuing to address the residual loading of acid mine drainage from these mines.

Other potential problems include storm water discharge from the Redding urbanized area, erosion and sediment discharges from land disturbing activities, and high turbidity from water releases through Shasta Dam.

Further downstream there is some indication of elevated mercury concentrations in the River reach below Red Bluff. The extent of mercury loading and the source has not been documented, but a likely source would be the high sediment load from the westside tributaries.

North Sacramento River Basin Tributaries

The principal watersheds here include Churn Creek, Stillwater Creek, Cow Creek, Bear Creek, and smaller drainages within the Redding urban area.

While there are no specifically identified water quality and beneficial use problems, potential problems exist from municipal and industrial storm water discharges, from erosion and sediment discharges from construction and other land disturbing activities, and from bacteria contamination of those waters commonly used for contact recreation. These watercourses currently support or have potential to support anadramous fish populations; therefore, protection of aquatic habitat is also an important issue.

Westside Sacramento River Tributaries

The principal watersheds here include Cottonwood Creek, Reeds Creek, Redbank Creek, Elder Creek, and Thomes Creek.

Tributary watersheds on the westside of the Sacramento River have relatively high erosion and sediment yields resulting from a combination of unstable geology and past and ongoing land use practices, including urbanization, livestock grazing, road construction, gravel mining, agriculture, and wildfires. While no specific water quality and beneficial use problems have been identified, it is believed that these high sediment yields and the channel instability conditions are adversely impacting water quality and aquatic habitat throughout most of these watersheds. The overall objective here is to increase water retention capacity to reduce peak flows and increase base flows, increase the quality and diversity of aquatic life and riparian habitat, and reduce total sediment load to the Sacramento River.

Eastside Sacramento River Tributaries

The principal watersheds here include Battle Creek, Antelope Creek, Mill Creek, Deer Creek, Big Chico Creek, and upper Butte Creek.

These streams represent some of the State's largest undamned watersheds and provide valuable habitat for anadramous fish particularly spring-run salmon and steelhead. Water quality conditions are generally good; however, there are potential problems with low summer flow, high water temperatures, and erosion/sediment discharge. Some reaches in the upper portions of these watersheds show evidence of channel instability and degraded aquatic habitat, principally from past and ongoing livestock grazing practices. Overall, the objective is to protect the existing high quality of these watersheds and implement site specific projects which reduce erosion/sedimentation and improve aquatic habitat.

Another potential problem is municipal and industrial storm water discharge from the urbanized area of Chico.

Upper Feather River Watershed

The North Fork/Middle Fork Feather River watershed covers 3,222 square miles from the crest of the Sierra Nevada downstream to Lake Oroville. Past and ongoing land management practices have increased stream channel instability and incisement leading to accelerated erosion/sediment

discharge, increased water temperature, and other adverse impacts on water quality, fisheries, and aquatic habitat. These land management practices include mining, livestock grazing, wildfire, timber harvest, and railroad and highway construction and maintenance.

Table SR-1 contains a listing of water bodies that are included on the CWA Section 303(d) list (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology).

Lower Sacramento River and Feather River Watersheds

Pesticides

Pesticides are frequently detected in the Sacramento River Watershed at levels of concern. These pesticides originate from use in agriculture (i.e., orchards and alfalfa) and use in urban areas.

Orchards: There are about 900,000 acres of stone fruit and nut orchards in California. About 96 percent of these are located within the Central Valley. Dormant spray insecticides are applied to these orchards during the winter. The off site movement of the insecticides, diazinon, chlorpyrifos, and methidathion has been detected for several years by several programs. Toxicity to *Ceriodaphnia* also has been detected in agricultural drains, small streams, and the Sacramento and Feather Rivers following rainfall events after the dormant spray application period. Toxicity Identification Evaluations conducted on Sacramento and Feather River water linked this toxicity to diazinon. Following the dormant season, toxicity associated with chlorpyrifos use in orchards is detected in agricultural drains and small streams.

High levels of diazinon and chlorpyrifos were detected in Central Valley rainfall in January and February 1995. The spatial and temporal patterns of pesticide detections in the rain suggests that the diazinon originated from orchards. Chlorpyrifos may also be originating from orchards, but there appears to have been an additional source, potentially alfalfa. The receiving waters in several urban areas, including Sacramento, are impacted by these rainfall events. No water quality objectives exist for diazinon or chlorpyrifos; however, DFG has developed criteria for both these insecticides. These criteria are routinely exceeded in urban creeks during storm events. The criterion for diazinon is also exceeded in the Sacramento and Feather Rivers following storm events during the dormant spray period. Novartis has conducted a probabilistic risk assessment for diazinon in the Sacramento River. The authors conclude that diazinon is not causing ecological impacts to fish in the Sacramento River. The study acknowledges that the potential for ecological impacts increase in the tributaries where concentrations are higher and exposure durations are longer.

Alfalfa: Alfalfa is one of the major agricultural commodities in California. It is a primary food source used by dairies, and presently there are approximately 1.2 million dairy animals in the Central Valley. County Agricultural Commissioners' 1998 data indicates that throughout the State, over one million acres are dedicated to alfalfa. Over 65 percent of that acreage is located

in Region 5, with approximately 37,000 acres in the northern mountain counties, 127,000 acres in the Sacramento Valley, 188,000 acres in the San Joaquin Valley, and 347,000 in the Tulare Basin.

Organophosphorous (OP) pesticides are used to control pests such as weevils, army worms, alfalfa caterpillars, and aphids. According to the DPR's 1998 Annual Pesticide Use Report, over 780,000 pounds of OP pesticide active ingredient were applied to alfalfa in 1998. Primary OP pesticides used were chlorpyrifos (282,130 lbs.) and malathion (260,526 lbs.), followed by dimethoate (84,884 lbs.), phosmet (69,864 lbs.), and methamidophos (61,568 lbs.). A host of other OP pesticides were used as well, but in smaller quantities.

OP pesticides used on alfalfa have been identified as the cause of toxicity to aquatic species in watersheds throughout the State. The transport mechanism of the OP pesticides from alfalfa fields to surface water is believed to be primarily due to storm and irrigation water runoff. During the 1997 growing season, an SWRCB project in Yolo County documented toxic concentrations of chlorpyrifos in irrigation run-off from an alfalfa field. Chlorpyrifos persisted at toxic levels in the runoff for more than 80 days after its application to the field. Runoff from this field discharged into a major waterway in the Willow Slough watershed in Yolo County. Off-site movement of chlorpyrifos with alfalfa irrigation runoff was confirmed in a UCCE project funded by the SWRCB in 1999. Concentrations of chlorpyrifos at levels toxic to *Ceriodaphnia* were found in alfalfa tail water samples up to seven irrigations after treatment with chlorpyrifos. *Ceriodaphnia* toxicity due to chlorpyrifos has also been observed in the San Joaquin River and Delta watersheds. See the respective State of the Watershed Reports for details of the assessments in those watersheds.

In addition to *Ceriodaphnia* toxicity from chlorpyrifos, algal toxicity has been observed in surface waters. The herbicide, diuron, has been identified as one of the causes. Potential sources are alfalfa runoff, urban storm runoff, and applications to rights of way. Approximately 222,000 lbs. of diuron was applied to alfalfa in the State in 1998 according to DPR's Annual Pesticide Use Reports. Additional causes of algal toxicity are unknown at this time.

Urban Runoff: Urban runoff consistently causes acute toxicity to *Ceriodaphnia* in Sacramento area urban creeks and infrequently causes toxicity in both the Sacramento and American Rivers. Toxic conditions can be expected in other urban areas in the watershed. Toxicity to *Ceriodaphnia* has been linked to the insecticides, diazinon and chlorpyrifos. Toxicity to the algal test species, *Selenastrum*, has been linked to the herbicide, diuron. Additional algal toxicity exists, but has not been linked to a specific chemical. Malathion has also been detected at concentrations exceeding the USEPA water quality criterion. A number of Sacramento urban creeks were added to the 303(d) list as part of the 1998 revision.

NPDES: Pesticides are included in laboratory screening done once every five years as part of the NPDES renewal process. If pesticides are found at levels of concern, monitoring and effluent limits may be prescribed as is appropriate, such as was recently done for the City of Woodland Waste Water Treatment Plant. Diazinon has been detected at toxic concentrations at the Sacramento Regional Wastewater Treatment Plant. Nationally, USEPA reports that 30 percent

of the POTWs that have *Ceriodaphnia* toxicity in their effluent have identified diazinon as the primary cause of whole effluent toxicity (WET). In the SFBRWQCB program, both diazinon and chlorpyrifos toxicity have been detected at five treatment facilities. It is likely that many of the treatment plants within the watershed also discharge these pesticides.

Organochlorine Pesticides: A USFWS study in 1980-81 found fish and fish eggs from the Sacramento River had elevated concentrations of organochlorine compounds, including PCBs, DDT and its metabolites DDD and DDE, toxaphene, and chlordane. More recent monitoring by the Sacramento River Watershed Program from 1997-99 indicates these compounds are still present (draft report). The pesticides are thought to result primarily from past agricultural use. Agricultural use of chlordane, DDT, and toxaphene has been banned. Some compounds (DDT, PCBs, and specific aromatic hydrocarbons) were significantly correlated with reduced reproductive capacity, egg viability, and larval toxicity in striped bass. Later studies indicate fish concentrations of these compounds may have declined, but are still high. The Basin Plan prohibits detectable concentrations of persistent organochlorine pesticides in receiving water. As municipal NPDES permits are reviewed, it appears that some cities do not comply with this limit, particularly for lindane.

Metals

Mercury: Mercury is a concern downstream of Knights Landing because there is a consumer advisory in effect for the Delta, and levels of mercury in this reach of the Sacramento River, at times, greatly exceed USEPA criteria. The sources of the mercury are past mining activities in the Coast Range and the Sierra Nevada Range. There are numerous mercury mines in the Coast Range, and mercury was used in the Sierra gold mining operations. Several studies have focused on determining mercury load estimates from the Sacramento River watershed. From May through December 1994 (low flow), an estimated 20 kilograms of mercury entered the Delta from the Sacramento River. From January through April 1995 (high flow), 406 kilograms of mercury entered the Delta from the Sacramento River; and an additional 375 kilograms entered via the Yolo Bypass. The Cache Creek Basin is believed to be the source of this additional mercury load in the Bypass. The major source of mercury in the Sacramento River appears to be above the Feather River.

A loading study conducted by Larry Walker and Associates estimated that 640 kg of mercury were exported by the Sacramento River watershed to the Estuary from October 1994 to September 1995. Most of the material was contributed during winter high flow periods The Feather and American River watersheds accounted for approximately 25 percent of the load; the majority of the mercury appeared to originate from the Sacramento River watershed above the confluence of the Feather River. The bioavailability of these sources of mercury is unknown.

Reported concentrations of mercury in aquatic indicator organisms increased in a predictable fashion with increasing trophic feeding level. A separate study looked at benthic invertebrates in the upper Cache Creek basin to determine local mercury bioavailability. All invertebrate tissue samples with mercury concentrations greater than background were associated with known mercury mines or geothermal hot springs. The highly localized nature of these sites was

demonstrated by the lower biotic tissue concentrations in adjacent streams without historic mercury mining activity. Invertebrates collected in the upper mainstem of Cache Creek away from all historic mining activity had tissue concentrations comparable to similar indicator organisms obtained from mainstem Sierra Nevada River gold mining activity indicating the Coast Range mercury is at least as bioavailable as that in the Sierras. Tissue concentrations in Cache Creek decreased downstream suggesting that much of the large bulk loads of mercury observed by the CVRWQCB might not be very biologically available in the lower watershed.

In 1997, the Sacramento River Watershed Program monitored fish tissue for mercury. Mercury levels in white catfish collected from the lower Sacramento River are similar to the levels detected in stripped bass in the Delta and Bay. Based on these levels in striped bass, OEHHA issued a fish consumption advisory for the Bay. More information is needed on fish tissue levels and sources of bioavailable mercury in the watershed.

NPDES permits being adopted do not contain concentration limits for mercury due to the lack of criteria to establish an effluent limit, but caps on mass discharge are being considered, and major municipal dischargers are required to lower mercury discharges through pretreatment activities.

Urban Storm Runoff: Urban runoff also contributes to metal loads in the watershed. Urban runoff is a major source of lead. The Sacramento Storm water Program estimates an annual load of 5,000 pounds of lead is contributed from the Sacramento urban area. Copper, zinc, and nickel in urban runoff have been linked to observed toxicity in urban runoff. Mercury levels in urban runoff need to be determined.

More details on mercury are provided in the Delta and Cache Creek Watershed summaries.

Toxicity

Toxicity to *Ceriodaphnia* and *Selenastrum* was detected approximately 30 percent of the time in the Sacramento River from 1988 to 1990. Toxicity to both species in the Feather and American Rivers was detected approximately 50 percent of the time. The specific chemicals responsible for about half of these incidents have not been identified. Intermittent fish toxicity on the Sacramento River has been detected in a number of CVRWQCB studies and studies conducted by the City and County of Sacramento. Again, the chemical basis for the toxicity remains to be determined. During a 1996-97 toxicity survey of the watershed, fathead minnow mortality in toxicity tests was common. Adding antibiotics to water samples eliminated the fish mortality in most samples. The significance of infection as a possible or contributing cause of fish mortality is being investigated.

In 1997 CVRWQCB staff conducted a toxicity survey of the Sacramento River watershed using rainbow trout embryos. Significant mortality occurred in urban runoff-dominated creeks during the early portion of the storm season. The cause of this toxicity is unknown. Because of the number of salmonid species that are in decline, further study is critical, but no resources are available for this purpose.

The San Francisco Estuary Institute conducts both water column and sediment toxicity tests in San Francisco Bay. Their most upstream site is in the Sacramento River watershed. Both sediment and water column toxicity are frequently detected, but the chemical basis of the toxicity has not been determined.

A number of the NPDES facilities on the western side of the Sacramento River are not passing their WET testing. Chronic *Ceriodaphnia* toxicity (low reproduction) is common. These facilities all rely on groundwater as their water supply. A review of the constituent levels in the groundwater suggests that toxicity may be due to some component responsible for high dissolved solids or alkalinity. Nickel and chromium levels are also high. CVRWQCB staff is assisting a number of the dischargers who are working together on a collaborative Toxicity Identification Evaluation.

Drinking Water Quality Concerns

The Sacramento River and San Joaquin River watersheds and the Sacramento-San Joaquin Delta provide drinking water for over two thirds of the people in California (more than 20 million people). Most of Southern California, a major portion of the San Francisco Bay Area, and many Central Valley communities rely on these watersheds for part of their drinking water. Most water supply agencies rely on the multiple barrier approach to water treatment. This approach includes watershed management to control contaminants at the source, along with water treatment and distribution system water quality management, to provide high quality drinking water to customers. The USEPA and the California Department of Health Services (DHS) encourage water suppliers to include watershed management as an element of providing high quality drinking water. Some Sacramento area urban water supply agencies have joined in the Sacramento North Area Groundwater Management Authority and the American River Basin Cooperating Agencies to move toward a coordinated planning for watershed management, including conjunctive use of surface and groundwaters. CVRWQCB staff is discussing with the California Urban Water Agencies (CUWA) and the DHS some work on drinking water as was proposed in the Basin Plan Triennial Review.

The Sacramento River and its tributaries are the source of drinking water for residents of Sacramento, West Sacramento, Roseville, and a number of smaller communities. In addition, water is pumped from Barker Slough, a tributary to the Sacramento River, into the North Bay Aqueduct to provide drinking water to communities in the North Bay Area. The Sierra tributaries to the Sacramento River provide high quality drinking water sources that have low levels of most drinking water contaminants of concern. As the water flows out of the foothills and into the valley, contaminants from a variety of urban, industrial, and agricultural sources degrade the quality of the Sacramento River. The key drinking water contaminants in the Sacramento River are discussed below.

Organic Carbon: Organic carbon combines with chlorine used in the disinfection process for drinking water to form trihalomethanes and haloacetic acids (commonly called disinfection byproducts). These disinfection byproducts are carcinogenic and are regulated under the Safe Drinking Water Act. Organic carbon occurs naturally in surface waters. Natural organic matter

has many origins including organic soils and sediments, algal growth, riparian vegetation, and animal waste. Anthropogenic sources include wastewater and urban runoff discharges, crop vegetation, and wastes from confined and grazing animals. A study conducted for CUWA found that it was not possible to quantify the loading of organic carbon from various sources in the watershed due to insufficient data.

CALFED established a water quality target range of 2 to 4 mg/L total organic carbon for Delta raw water supplies. The DWR Municipal Water Quality Investigations (MWQI) Program has monitored the Delta and its tributaries for parameters of interest to drinking water suppliers. Dissolved organic carbon concentrations range from 1.4 to 7.7 mg/L with a median of 2.1 mg/L in the Sacramento River at Greene's Landing[1].

Concentrations of dissolved organic carbon in the American River range from 1.4 to 4.3 mg/L with a median of 1.9 mg/L at the Fairbairn Water Treatment Plant which is located downstream of a significant portion of the Sacramento urban area.

Bromide: Bromide is present in seawater that intrudes into the Sacramento-San Joaquin Delta and in marine deposits in the Sacramento and San Joaquin basins. Bromide reacts with chlorine and organic matter during the disinfection process to form brominated species of trihalomethanes and haloacetic acids. When ozone is used as the primary disinfectant, bromate is formed.

CALFED did not establish a water quality target level for bromide in the Sacramento River, but established a water quality target range of 50 to 150 ug/L for bromide in the Delta. Many of the urban water agencies have recommended a target of 50 ug/L, which is based on controlling the formation of bromate when ozone is used as the primary disinfectant in water treatment plants. Bromide is not a problem in the Sacramento River watershed. The concentrations in the Sacramento River at Greene's Landing range from "not detected" (<1 ug/L) to 80 ug/L with a median of 20 ug/L.

Total Dissolved Solids: Total dissolved solids (TDS) or salinity is a critical drinking water quality issue for a number of reasons. TDS is regulated by DHS as an aesthetic standard, but increases in TDS can have significant economic costs due to more rapid corrosion of infrastructure and appliances. Elevated TDS can severely affect wastewater reclamation programs, groundwater conjunctive use programs, and blending projects. Potential sources of TDS in the Sacramento River basin are agricultural drainage, urban runoff, and municipal and industrial wastewater discharges. Approximately 60 to 70 percent of the load to the Sacramento River at Greene's Landing comes from unidentified sources with about 26 to 33 percent coming from the Colusa Basin Drain and Sacramento.

CALFED did not establish a water quality target for TDS in the Sacramento River. TDS concentrations in the Sacramento River at Greene's Landing range from 39 to 132 mg/L. This is considered high quality drinking water. These concentrations are likely to increase as the population of the Sacramento Valley increases.

[1] Greene's Landing is located on the Sacramento River, 20 miles downstream of the City of Sacramento.

Pathogens: Surface water supplies contain a variety of microorganisms, such as coliform bacteria, *Giardia*, *Cryptosporidium*, and viruses. Coliform bacteria are generally not harmful to humans, but are an indicator of the general level of urban and animal contamination of a surface water. Coliforms indicate that other pathogenic organisms may be present. *Giardia* and *Cryptosporidium* are protozoan parasites that can exist in animal hosts and can be passed on to humans through untreated or inadequately treated drinking water. These pathogens are resistant to disinfection. There are dozens of species of enteric viruses that are known to be transmitted by water. Important virus types are hepatitis A, Norwalk, rotoviruses, adenoviruses, enteroviruses, and reoviruses. Pathogens are ubiquitous in warm-bodied animals. All watersheds should be presumed to have some pathogens present. Potential sources of pathogens in the Sacramento River watershed include urban runoff, Sacramento combined-sewer discharges, wastewater discharges, dairies, and other confined animal facilities.

Historically, pathogenic microorganisms were not monitored in surface waters or discharges. The USEPA's Information Collection Rule now requires all large utilities to monitor their raw and finished water for *Giardia*, *Cryptosporidium*, and viruses monthly for 18 months. The DWR MWQI Program is currently conducting a pathogen-monitoring program throughout the State Water Project (SWP) system. The results of the first year of the study are questionable because of poor performance of Quality Assurance (QA) samples. New techniques are being used in ongoing monitoring. Metropolitan Water District conducted a study that included the Sacramento River at Greene's Landing in 1992 and 1993. *Giardia* was detected in 42 percent of the samples at levels up to 82 cysts per 100 L. *Cryptosporidium* was detected in 50 percent of the samples at levels up to 132 cysts per 100 L.

Turbidity: Turbidity is of concern in drinking water supplies because it can render water aesthetically unacceptable to the consumer, reduce the efficiency of disinfection by shielding microorganisms, and act as a vehicle for the concentration, transport, and release of organic and inorganic contaminants, bacteria, and viruses. CALFED established a water quality target of 50 Nephelometric Turbidity Unit (NTU) for the Delta. Turbidity concentrations fluctuate in the Sacramento River with the highest concentrations occurring during and immediately after major storm events. Turbidity levels in the Sacramento River at Greene's Landing range from 4 to 70 NTU.

MTBE

Methyl tertiary butyl ether (MTBE) has been mixed with gasoline in the Central Valley Region since the mid-1970s as a small percentage to as much as 15 percent in the late 1990's. MTBE is soluble in water at 42,000 mg/l allowing it to move in groundwater at the same velocity. Except for dilution, the compound is very resistant to natural attenuation in either surface or groundwater. Commonly used treatment systems used for gasoline, such as vapor extraction, are ineffective for treating MTBE.

DHS has designated MTBE as a potential carcinogen with the primary MCL established at 14 ug/l and the secondary taste and odor threshold, at 5 ug/l.

Currently, CVRWQCB has recorded over 900 sites with MTBE releases with 24 drinking water wells impacted. MTBE also has been shown to cause high mortality to aquatic microorganisms (food for fish). The sources of MTBE include above and UST systems, pipelines, landfills, and wastewater treatment plants.

There is growing evidence that MTBE is a concern in surface waters. During June 1999, major sewage treatment plants tested their effluents for MTBE. In most cases, the results were non-detect. Five out of 16 Treatment plants found MTBE in their effluent, including the largest plant, Sacramento Regional Wastewater Treatment Plant (WTP). The highest detected discharge was 15.3 µg/l in a sample taken from the Yuba City effluent. A separate sample from this discharge was at 0.7 µg/l, suggesting significant variation. Likewise, the City of Roseville found 1.1 and 9.3 µg/l in its effluent. The much larger Sacramento Regional WTP found 1.8, 1.4, 2.2 µg/l and non-detect in its discharge. These numbers are of concern not only because of their possible impact on domestic water use, but also because MTBE is highly toxic to aquatic microorganisms. Apparently, MTBE is not significantly treated in the sewage treatment process. Inflow to a sewage treatment plant will likely result in a discharge to surface waters. MTBE in surface waters has also been associated with other sources including: unburned fuel from two stroke marine engines, leaking USTs, aboveground storage tanks, leaking pipelines, and possibly rainfall.

In addition to the overall MTBE problem in surface waters, a specific problem occurred in 1999 in Hangtown Creek in El Dorado County. In this case, MTBE from leaking USTs at two sites entered Hangtown Creek and degraded more than a mile of stream. The CVRWQCB's Executive Officer issued Cleanup and Abatement Orders, and staff worked closely with all responsible parties and the State's Cleanup Fund to cease the discharge and remediate site contamination.

Sedimentation

Many tributaries in the watershed are adversely impacted by land use practices that cause excessive erosion and sedimentation, change flow regimes, or alter stream morphology. (See the Pit River and Feather River sub-watershed reports for more detailed descriptions of these types of problems.) Degradation of upstream watersheds can also impact downstream beneficial uses (i.e., decreasing reservoir life, silting in spawning beds, etc.). Many of the tributary watersheds have active stewardship and conservancy groups, which have identified sedimentation as the major water quality problem in many areas. The sources of the sediment include stream bank erosion, erosion following fires, erosion associated with timber harvest activities, road construction, cattle grazing, and urban construction activities.

Forestry Activities

Forestry activities have the potential to cause water quality impairments. Principal concerns are temperature, sediment and siltation, and herbicides. Activities that cause problems include road construction, water crossings, harvesting, and application of herbicides. Inadequate fuel

management programs may result in catastrophic fires with resulting impacts on water quality. Local stewardship efforts in a number of watersheds are focusing on healthy forests to promote better water quality. Additional resources are necessary for staff participation in these programs. Staff also supports using bioasssessment as a tool to assess water quality in wadable streams.

Temperature

The major reservoirs in the watershed change the flow regimes in the downstream rivers. One of the consequences is change in downstream temperature. Elevated temperatures pose a threat to salmon and steelhead, and are a concern in Mill, Deer, Battle, Butte, Antelope, Clear, and Big Chico Creeks. DFG has recommended that the Basin Plan objectives be amended to protect salmon runs in these streams. Temperature increases are associated with loss of riparian habitat and agricultural and urban run-off.

Polychlorinated Biphenyls (PCBs)

The San Francisco Regional Monitoring Program demonstrated in 1993 and 1994 that total PCB concentrations were above USEPA recommended criteria to protect human health at all sites surveyed in San Francisco Bay, including at the confluence of the Sacramento and San Joaquin Rivers in the Delta. In addition, clam transplant studies demonstrated that some of the highest tissue concentrations were obtained from animals located in the Sacramento and San Joaquin Rivers. The data were interpreted to mean that the Rivers were a source of PCBs. The Sacramento River Watershed Program is in the process of screening fish collected from the lower part of the watershed to obtain more information on fish tissue levels.

Confined Animal Facilities

There are 202 dairies operating in the watershed, the majority of which are not regulated by waste discharge requirements. Many of the facilities may not be implementing practices that are protective of water quality. Over the past year, a more comprehensive program has been implemented for assessing the impacts from dairies. This effort is described in the San Joaquin River Watershed section of this chapter.

National Pollutant Discharge Elimination System (NPDES)

In the Sacramento River watershed, there are about 166 NPDES permittees discharging into the basin. The NPDES permittees include 55 POTWs, 10 water treatment plants, 6 other public utilities, 56 industries, 17 lumber mills, 15 fish hatcheries, and 8 mines. There are localized water quality problems associated with some of the discharges, especially where facilities discharge to water bodies that provide little dilution. Many facilities are having difficulty complying with Basin Plan objectives for turbidity, temperature, pH, and bacteria. Studies are underway or planned by a number of dischargers to evaluate and possibly modify Basin Plan objectives for turbidity, temperature, and pH for discharges to effluent dominated water bodies.

Effluent Dominated Water Bodies

There are many bodies of water in the watershed that are dominated by discharges from agriculture, urban areas, and NPDES facilities. Some of these water bodies support valuable aquatic resources and provide terrestrial habitat for many species. Other effluent dominated water bodies are barren and support few beneficial uses. As discussed in previous sections, excess levels of toxicant chemicals may seriously limit a water body's beneficial uses. However, there can be other reasons (e.g. erratic or fluctuating flow, stream morphology and hydrology, temperature fluctuations, seasonal elimination of flow, and unstable substrate) for this limitation.

GROUNDWATER

Nitrates

There are roughly 300 square miles of groundwater in the watershed with elevated levels of nitrates. The primary areas of concern are in the vicinity of Chico, much of Sutter County, and the Antelope area in Tehama County. The Antelope area of Tehama County is part of the City of Red Bluff, but is currently without sewers. The total size of the area is approximately three square miles, with a population of about 3,000 residents. The Chico area is comprised of approximately 25 square miles, with an unsewered population of approximately 38,000. Less severe impacts are found in the vicinity of Knights Landing, Arbuckle, Yuba City, and Willows. Many counties in the watershed depend extensively on septic systems for household wastewater treatment. For example, Butte County with a population of slightly over 200,000 relies on septic systems for approximately 150,000 of its citizens. Not only do septic systems contribute to contamination of groundwater, but improperly located and designed, constructed or maintained systems, represent a significant threat to surface water. Nitrates are also a major concern at confined animal facilities either through inadequate liners in storage ponds to contain wastes or over-application of wastes on cropland, with the resultant leaching of nitrate and salts to groundwater.

MTBE

As previously discussed, gasoline sold in the Central Valley Region has been mixed with MTBE since the mid-1970s. Initially at a low percentage, the content of MTBE has increased to as much as 15 percent by the late 1990s. Leaks and spills from service stations in combination with the high solubility of MTBE allowed MTBE to move quickly into groundwater. Except for dilution, MTBE is very resistant to natural attenuation in either surface or groundwater. Commonly used systems for the treatment of contamination from gasoline leaks or spills, such as vapor extraction, are ineffective for treating MTBE. Due to increasing concerns over MTBE impacts on the beneficial uses of groundwater and the difficulty of cleanup, Governor Davis signed Order No. D-5-99 in spring 1999. This Order requires the phase out of MTBE in gasoline and CVRWQCB actions to expedite MTBE cleanups.

DHS has designated MTBE as a potential carcinogen with the primary MCL established at 14 μg/l and the secondary taste and odor threshold, at 5 μg/l. Using these numbers and SWRCB Order No. 92-49, the CVRWQCB is working to prevent any impact on either existing beneficial uses of groundwater or foreseeable future uses of groundwater.

Underground Storage Tanks (UST)

USTs containing hazardous petroleum products have impacted groundwater resources through leaks and spills. Impacts are at scattered sites in the watershed and are typically associated with service stations for fueling motor vehicles. Contaminants include benzene, toluene, ethylene, xylene and MTBE. Over 700 active cases had groundwater contamination at the beginning of FY 1999-00. MTBE has impacted groundwater at over 300 of these sites.

Other

More than 30 square miles of groundwater in the watershed have been impacted by pesticides. Bentazon has been found in wells in Glenn, Colusa, Sutter, Yolo, and Yuba Counties, as have other pesticides but to a lesser degree. In addition, roughly 40 square miles of groundwater have been impacted by petroleum products, solvents, and other organics. There are hundreds of sites that have degraded groundwater associated with discharges from agricultural operations, underground and above ground tanks, industrial facilities, commercial facilities, military facilities, landfills, waste management units, and other point and nonpoint sources. Most of these sites are associated with urban areas.

STATE OF THE WATERSHED REPORT
PIT RIVER SUB-WATERSHED

Watershed Description

The Pit River watershed extends from the headwaters of the Pit River in the Warner Mountains east of Alturas through portions of Modoc, Lassen, and Shasta Counties to Shasta Lake. The watershed includes all of the tributaries to the Pit River, including the Fall River. The Pit River has been extensively modified by PG&E for hydroelectric power generation. Point source discharges are limited to lumber mills, and treated domestic wastes from Alturas, Bieber, Adin, and Burney. Nonpoint source discharges associated with agriculture, livestock grazing, timber harvest, and hydrologic modification have had a much more significant impact on Pit River water quality and beneficial uses than point sources.

Water Quality Assessment

Previous monitoring surveys have documented water quality problems including high nutrients and nuisance algae conditions, low dissolved oxygen, high turbidity/suspended sediment, and high water temperature. These water quality parameters and aquatic habitat conditions in the Pit River are influenced by a variety of factors which detract from overall watershed quality. These include some natural factors, such as low summer flows, turbidity from fine suspended sediments (volcanic clays), and thermal/chemical contributions from mineralized hot springs. Human factors associated with nonpoint source discharge include grazing, forestry, and agricultural practices, in addition to flow modifications from irrigation and hydroelectric diversions. Previous channel straightening projects have contributed to channel incisement which drains meadows and causes constrained channel reaches in narrow, straight courses where their increased erosive energy caused bank erosion, down cutting, and downstream sedimentation.

The Pit River is on the CWA Section 303(d) list (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of dissolved oxygen, temperature, nutrients and sediment. The Fall River is on the 303(d) list because of erosion/sedimentation in the upper watershed which has adversely impacted aquatic life and habitat conditions.

STATE OF THE WATERSHED REPORT
NORTH FORK/MIDDLE FORK FEATHER RIVER SUB-WATERSHED

Watershed Description

The North Fork/Middle Fork Feather River watershed above Lake Oroville covers 3,222 square miles. The watershed begins at the crest of the Sierra Nevada Range and drains west into the Sacramento River and the Central Valley of California. Much of the upper Feather River watershed has been affected by 140 years of intensive human use. Mining, grazing, timber harvesting, wildfire, and railroad and road construction have all contributed to watershed degradation, which down cutting and widening of tributary streams, causing erosion/sedimentation, increased water temperature, and other adverse impacts on water quality, fisheries, and aquatic habitat.

Water Quality Assessment

Existing conditions in the watershed are a result of five major historical and current land uses. They are (1) mining, (2) wildfire, (3) livestock grazing, (4) timber harvest with its associated roads, skid trails, and log landings, and (5) railroad and highway construction and maintenance. A recent survey of the North Fork Feather River found that at least 60 percent of the watershed has been adversely impacted, resulting in decreased soil productivity, degraded water quality, greatly reduced riparian plant and wildlife communities, lowered water tables, and frequent damaging flood flows. The watershed was inventoried for water quality problems. Based on this inventory, it is estimated that as much as 50 percent of all stream channels are in a degraded condition as are the wetlands, meadows, and rangelands. In many areas, disturbance related to human activity has caused an estimated 6 to 12 inches of top soil loss from meadows and upland areas, and has contributed to the formation of numerous large and small gullies. Annually, 1.1 million tons of sediment is delivered to Rock Creek Dam at the downstream end of the North Fork Feather River watershed, an estimated 80 percent of this yearly sediment yield is from "accelerated," human caused, erosion in the watershed.

The principal water quality impacts from this degraded watershed condition are increased sedimentation, increased water temperatures from the loss of riparian shade canopy and the progressive widening and shallowing of the stream channels, and loss of the water holding capacity of the watershed (in the extensive meadow systems) due to stream channel incisement.

STATE OF THE WATERSHED REPORT
CACHE CREEK SUB-WATERSHED

Watershed Description

Cache Creek watershed drains 1,150 square miles on the eastern slope of the northern part of the California Coast ranges in Lake, Colusa, and Yolo Counties. The watershed extends from the tributaries of Clear Lake to the Yolo Bypass, 10 miles northwest of Sacramento. There are three main tributaries: the South Fork of Cache Creek including the Clear Lake drainage, the North Fork of Cache Creek including Indian Valley Reservoir, and Bear Creek.

Water Quality Assessment

The most significant water quality problems in Clear Lake are nutrients and mercury. Nutrients entering the lake cause nuisance algal blooms. There is a fish consumption advisory recommending limited human consumption of fish from the lake because of elevated levels of mercury in fish. The main source of mercury is deposited in lakebed sediments and continues to enter the lake is the Sulfur Bank Mercury Mine. Lesser amounts of mercury enter via tributary streams from erosion and geothermal activity at natural mercury deposits. Sulfur Bank Mine is a Federal Superfund site.

Downstream of Clear Lake and Indian Valley Reservoir and in the Bear Creek drainage, there are numerous inactive mercury mines that have localized impacts on adjacent waterways and cumulatively contribute to downstream problems. Fish from lower Cache Creek have elevated mercury levels. During periods of high runoff, large loads of mercury come down Cache Creek and enter the Yolo Bypass. Smaller amounts of mercury are also released into the Yolo Bypass during low summer flows. Mercury from the Cache Creek Watershed appears to be a major source of mercury entering the Delta.

Gravel mining operations in Cache Creek between the foothills and Yolo Bypass have caused concern to local citizens. They are concerned that the operations will enhance the transport of pollutants to drinking water wells that are adjacent to Cache Creek. They also believe that the operations have reduced infiltration rates. There are erosion problems downstream from gravel extraction operations. Erosion problems are experienced throughout the watershed and have resulted in substantial property damage, including at a Yolo County park, loss of productive farm land, damage to roads and bridges, and increased risk of flooding at private homes. Gravel removal may remobilize mercury previously deposited with sediment.

Gravel mining within the active channel of Cache Creek has been eliminated. Gravel extraction for flood control purposes is still permitted. Mining has been relocated to adjoining terraces and is being monitored. Yolo County reports that no significant water quality problems to

Cache Creek have been detected. There is still some concern expressed by private citizens about potential problems in the off-site pits that are created during mining operations and potential threats to groundwater.

Elevated boron levels downstream from the confluence of Bear Creek can impact agricultural production and may inhibit efforts at reestablishing riparian vegetation.

Comprehensive monitoring studies have not been completed in the watershed to determine whether pesticides are a problem in the watershed. Tests conducted by Yolo County during the 1997-98 winter season did not detect any pesticides or herbicides; however, further testing is recommended. There is the potential for pesticide problems in portions of the watershed that are dominated by agricultural activities. Yolo County testing did show high total and fecal coliform levels in the lower watershed.

Cache Creek is on the CWA Section 303(d) List (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of mercury and toxicity to aquatic organisms. Causes of the aquatic organism toxicity are unknown. Clear Lake is listed because of mercury and nutrients.

Watershed Description

The San Joaquin River flows northward and drains the portion of the Central Valley south of the Sacramento-San Joaquin Delta and north of the Tulare Lake Basin. The San Joaquin River Basin covers 15,880 square miles and yields an average annual surface runoff of about 1.6 million acre feet. The Basin includes the entire area drained by the San Joaquin River and all watersheds tributary to the River. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include 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 wasteloads 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, dominate flow and quality of discharges from the east side of the Lower San Joaquin River Basin, while 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.

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 in order to develop a workable and comprehensive selenium control program.

The San Joaquin River Basin also includes all or part of 11 major groundwater basins: Kings Basin, Madera Basin, Chowchilla Basin, Merced Basin, Modesto Basin, Eastern San Joaquin County Basin, Tracy Basin, Delta-Mendota Basin, Westside Basin, and Sacramento County Basin. Groundwater is also used in some upland areas and in foothill and mountain valleys.

Water Quality Assessment

SURFACE WATER

The most significant surface water quality problems in the San Joaquin River watershed are selenium, salt, boron, pesticides, and unknown toxicity. All of these problems result primarily from agricultural activities and are exacerbated by altered flow regimes. In addition, the CVRWQCB is concerned with storm water runoff, discharges from inactive or abandoned mines, discharges from dairies, discharges from NPDES facilities, and elevated temperature caused by water management practices.

USGS has recently released a series of reports on results of a five year study on the quality of water in 20 major drainage basins throughout the Nation, including the San Joaquin and Tulare Basins. The report, *Water Quality in the San Joaquin - Tulare Basins, California, 1992-95*, describes some general conclusions regarding surface water quality in the San Joaquin River basin: (1) nitrate and ammonia generally do not adversely impact drinking water and aquatic life uses of the River; (2) the potential exists for toxicity to aquatic organisms from water-borne pesticides because concentrations of seven pesticides have exceeded aquatic life criteria; and (3) the potential exists for adverse effects on aquatic life from pesticides in bed sediment and aquatic tissue samples. The USGS results are consistent with CVRWQCB CWA Section 303(d) listings and water quality assessments. The study did not review selenium, boron, and salt in order to avoid duplicating monitoring and evaluation being conducted by other federal, State, and local agencies.

Selenium

In 1983, high frequencies of waterfowl deaths and deformities were observed in Kesterson National Wildlife Refuge and were attributed to elevated concentrations of selenium in subsurface agricultural drainage that was entering the site. The source of agricultural drainage to Kesterson was lands within the Westlands Water District. The discharge to Kesterson was discontinued by 1985.

A survey of lands adjacent to Westlands Water District showed that agricultural subsurface drainage from a large area in the Grassland Watershed also contained elevated selenium levels. This drainage water was being discharged directly into channels that supplied water to Grassland wetlands and also into the San Joaquin River.

In 1985, staff of the CVRWQCB began a monitoring program to assess selenium concentrations and loads in the lower San Joaquin River and the Grassland Watershed and also to track progress

of a variety of management practices initiated by the agricultural community. Results from the monitoring program indicate that although water quality objectives are now being met in the majority of wetland water supply channels and overall selenium loads to the San Joaquin River are decreasing, water quality objectives continue to be exceeded in the main stem of the River upstream of the Merced River inflow and in Mud Slough (north). The San Joaquin River and several tributaries continue to be included on the CWA Section 303(d) list for selenium.

Salinity

Since the 1940s, mean annual salt concentrations in the San Joaquin River, near Vernalis have doubled. The increases are primarily due to reservoir development on the east side tributaries and upper watershed for agricultural development; the use of poorer quality, higher salinity, Delta water in lieu of San Joaquin River water on west side agricultural lands; and drainage from upslope saline soils on the west side of the San Joaquin Valley. Industrial and municipal discharges also contribute to the salinity problem. In addition, current wetland management practices are contributing significant salt loads to the River. As a result of salt contributions from the various point and nonpoint sources, salinity objectives at Vernalis are periodically exceeded. The salinity objectives were established to protect the beneficial use of water for agriculture. The San Joaquin River and several tributaries are included on the CWA Section 303(d) list for salt.

Boron

For many of the same reasons contributing to salinity concerns, boron concentrations in the San Joaquin River frequently exceed water quality objectives adopted for the protection of irrigation water supply. The majority of the exceedances occur during dry years, with dramatic improvements in water quality during wet years.

Pesticides

Water Column Pesticide Problems: Chemical and bioassay monitoring demonstrate that pesticides in the San Joaquin River can occur at concentrations that are toxic to sensitive aquatic organisms. Two multi-year studies have been conducted. The first found that a 43 mile reach of the River between the confluence of the Merced and Stanislaus River was found to be toxic about half of the time to the invertebrate component of the USEPA three species test. Toxicity appeared to be caused by pesticides in storm and irrigation tailwater runoff from row and orchard crops. Follow-up testing conducted a year later found that River toxicity had decreased to about 6 percent of the time. In these two studies and subsequent follow-up studies, the insecticides, diazinon and chlorpyrifos, have been identified as common causes of toxicity. Additional monitoring by the USGS, DPR, and others have confirmed the widespread occurrence of diazinon, chlorpyrifos, and other pesticides in the San Joaquin River and tributaries. The most significant sources of chlorpyrifos and diazinon appear to be winter storm runoff from orchard and summer irrigation return flows. Urban runoff has also been documented to be a significant source in the vicinity of Stockton and Modesto. Urban runoff has been identified as a significant

source of these two pesticides in the Bay Area and in Sacramento. The San Joaquin River and several tributaries are included on the CWA Section 303(d) list for chlorpyrifos and diazinon.

No water quality objectives exist for diazinon and chlorpyrifos. USEPA has developed a criterion for chlorpyrifos and a draft criterion for diazinon. DFG has developed draft hazard assessment criteria for both pesticides. Both pesticides are frequently detected at levels exceeding the criteria.

Other pesticides have been identified at levels of concern in monitoring studies conducted in the San Joaquin River watershed. In addition, in many toxic samples, the toxicant has not been identified.

Alfalfa: Alfalfa is one of the major agricultural commodities in California. It is a primary food source used by dairies, and presently there are approximately 1.2 million dairy animals in the Central Valley. County Agricultural Commissioners' 1998 data indicates that throughout the State, over one million acres are dedicated to alfalfa. Over 65 percent of that acreage is located in Region 5, with approximately 37,000 acres in the northern mountain counties, 127,000 acres in the Sacramento Valley, 188,000 acres in the San Joaquin Valley, and 347,000 in the Tulare Basin.

Organophosphorous (OP) pesticides are used to control pests such as weevils, army worms, alfalfa caterpillars, and aphids. According to the DPR's 1998 Annual Pesticide Use Report, over 780,000 pounds of OP pesticide active ingredient were applied to alfalfa in 1998. Primary OP pesticides used were chlorpyrifos (282,130 lbs.) and malathion (260,526 lbs.), followed by dimethoate (84,884 lbs.), phosmet (69,864 lbs.), and methamidophos (61,568 lbs.). A host of other OP pesticides were used as well, but in smaller quantities.

OP pesticides used on alfalfa have been identified as the cause of toxicity to aquatic species in watersheds throughout the State. The transport mechanism of the OP pesticides from alfalfa fields to surface water is believed to be primarily due to storm and irrigation water runoff. A bioassay study conducted in the San Joaquin Basin in 1991 and 1992 documented chlorpyrifos detections on 190 occasions between March and June of both years, 43 times at toxic concentrations to *Ceriodaphnia*. Major uses of chlorpyrifos in March in the Central Valley are on alfalfa and sugarbeets for weevil and worm control. USGS, as a part of its National Water-Quality Assessment (NAWQA) Program, in 1993 sampled and analyzed for pesticides along with other parameters in the San Joaquin Basin. Chlorpyrifos was detected in 64 percent of all of the samples collected. Sample concentrations ranged from non-detect to 0.26 micrograms per liter. In 1996 and 1997, sampling on Orestimba Creek was conducted as part of a Dow Agrosciences LLC-sponsored study to characterize chlorpyrifos concentration patterns in an agriculturally dominated tributary to the San Joaquin River. Key crops grown in the watershed included alfalfa, walnuts, almonds, and dry beans. Thirteen chlorpyrifos concentration peak occurrences were associated with specific events determining the most probable transport

process–nine were related to spray drift, four to irrigation tailwater. There were approximately 29 occurrences of chlorpyrifos detections where a transport process could not be identified. Concentrations as high as 2.28 micrograms per liter were found in samples.

In addition to *Ceriodaphnia* toxicity from chlorpyrifos, algal toxicity has been observed in surface waters. The herbicide diuron has been identified as one of the causes. Potential sources are alfalfa runoff, urban storm runoff, and applications to rights of way. Approximately 222,000 lbs. of diuron was applied to alfalfa in the State in 1998 according to DPR's Annual Pesticide Use Reports. Additional causes of algal toxicity are unknown at this time.

Fish Tissue Problems: The SWRCB TSMP has found elevated levels of Group A Pesticides in fish from the Tuolumne, Merced, and Stanislaus Rivers and the mainstream San Joaquin River. Group A Pesticides include chlordane, toxaphene, endosulfan, and a few other pesticides. The chemicals are thought to result primarily from past agricultural use. Agricultural use of chlordane, DDT, and toxaphene is now banned, and endosulfan use is closely regulated and much reduced. However, the materials appear to be tightly bound to sediment and move into the river systems as the sediment moves off site. NAS and U.S. Food and Drug Administration (FDA) criteria are used to evaluate tissue levels of contaminants. The rivers mentioned above are all included on the CWA Section 303(d) list for Group A pesticides and/or DDT.

Drinking Water Quality Concerns

The Sacramento River and San Joaquin River watersheds and the Sacramento-San Joaquin Delta provide drinking water for over two thirds of the people in California (more than 20 million people). Most of southern California, a major portion of the San Francisco Bay area, and many Central Valley communities rely on these watersheds for their drinking water. Most water supply agencies rely on the multiple barrier approach to water treatment. This approach includes watershed management and waste water treatment to control contaminants at the source, along with water treatment and distribution system water quality management, to provide high quality drinking water to customers. The USEPA and DHS encourage water suppliers to include watershed management as an element of providing high quality drinking water.

The major tributaries of the San Joaquin River provide drinking water to residents of the East Bay area, San Francisco, and communities in the San Joaquin Valley. The main stem of the San Joaquin River is not a source of drinking water for any large communities, although potential domestic supply is a designated use.

The Sierra tributaries to the San Joaquin River provide high quality drinking water sources that have low levels of most drinking water contaminants of concern. As the water flows out of the foothills and into the valley, contaminants from a variety of urban, industrial, and agricultural sources degrade the quality of the San Joaquin River. The key drinking water contaminants in the San Joaquin River are discussed below.

Organic Carbon: Sources of organic carbon in the San Joaquin watershed include natural organic matter from soils and vegetation and wastewater, urban, and agricultural discharges.

MTBE

MTBE has been mixed with gasoline in the Central Valley Region since the mid-1970s. Initially at a low percentage, the content of MTBE has increased to as much as 15 percent by the late 1990s. Leaks and spills from service stations in combination with the high solubility of MTBE, allow MTBE to move quickly into groundwater. Except for dilution, MTBE is very resistant to natural attenuation in either surface or groundwater. Commonly used systems for the treatment of contamination from gasoline leaks or spills, such as vapor extraction, are ineffective for treating MTBE. Due to increasing concerns over MTBE impacts on the beneficial uses of groundwater and the difficulty of cleanup, Governor Davis signed Order No. D-5-99 in spring 1999. This Order requires the phase out of MTBE in gasoline and CVRWQCB actions to expedite MTBE cleanup.

DHS has designated MTBE as a potential carcinogen with the primary MCL established at 14 ug/l and the secondary taste and odor threshold, at 5 ug/l. Using these numbers and SWRCB Order No. 92-49, the CVRWQCB is working to prevent any impact on either existing beneficial uses of groundwater, or foreseeable future uses of groundwater.

Currently, the CVRWQCB has recorded over 900 sites with MTBE releases with 24 drinking water wells impacted. MTBE also has been shown to cause high mortality to aquatic microorganisms (food for fish). The sources of MTBE include above and UST systems, pipelines, landfills, and wastewater treatment plants.

Temperature

There are concerns about elevated temperature in the Stanislaus, Tuolumne, and Merced Rivers downstream from the major dams. The storage and diversion of water for hydroelectric and other purposes impacts downstream beneficial uses.

PCBs

The San Francisco Regional Monitoring Program demonstrated in 1993 and 1994 that total PCB concentrations were above USEPA recommended criteria to protect human health at all sites surveyed in San Francisco Bay, including at the confluence of the Sacramento and San Joaquin Rivers in the Delta. Furthermore, clam transplant studies demonstrated that some of the highest tissue concentrations were obtained from animals located in the Sacramento and San Joaquin Rivers. The data were interpreted to mean that the Rivers were a source of PCBs.

Confined Animal Facilities

Currently, there are more than 900 dairies operating in the watershed with over 600,000 milk cows. Wasteloads from these facilities are equivalent to the wasteload from 14 million people. The majority of these facilities are not regulated by waste discharge requirements. Based on information obtained during complaint investigations and aerial surveillance flights, it is apparent that many of the facilities are following practices that may adversely impact water quality.

Water that is high in organic carbon is pumped from the Delta at the Clifton Court Forebay into the California aqueduct for delivery south as drinking water. Water is also pumped into the Delta-Mendota Canal and used to irrigate cropland along the westside of the San Joaquin Valley. This water is then recirculated in the San Joaquin River. Based on fairly limited data, Mud Slough (north) and Salt Slough were found to contribute about 30 percent of the organic carbon load to the San Joaquin River. This relative contribution has not been re-evaluated since subsurface agricultural drainage was diverted around the Grassland wetland supply channels in 1996. The source of most of the load to the San Joaquin River was unidentified.

CALFED did not establish a water quality target level for organic carbon in the San Joaquin River. The target range established for the Delta is 2 to 4 mg/L. Dissolved organic carbon concentrations in the San Joaquin River at Vernalis range from 2.2 to 11.4 mg/L with a median concentration of 3.4 mg/L. There are no data on the concentrations of organic carbon in the tributaries to the San Joaquin River.

Bromide: The sources of bromide in the San Joaquin River include the drainage from areas of ancient marine deposits in the San Joaquin Valley and the Delta water that is diverted for irrigation and recirculated through the San Joaquin River system.

CALFED did not establish a water quality target level for bromide in the San Joaquin River. The target range for the Delta is 50 to 150 ug/L. Bromide concentrations in the San Joaquin River at Vernalis range from 40 to 650 ug/L with a median concentration of 370 ug/L.

Total Dissolved Solids (TDS): The sources of TDS in the San Joaquin River are agricultural drainage, urban runoff, municipal and industrial wastewater discharges, discharges from dairies and confined animal facilities, and Delta water that is diverted for irrigation and recirculated through the San Joaquin River system. The CVRWQCB is conducting studies on the loadings of TDS to the San Joaquin River. TDS concentrations in the San Joaquin River range from 143 to 768 mg/L. DHS recommended secondary Maximum Contaminant Level for TDS is 500 mg/L, with an upper level of 1,000 mg/L and short-term level of 1,500 mg/L.

Pathogens: Potential sources of pathogens in the San Joaquin watershed include urban runoff, wastewater discharges, dairies, and other confined animal facilities. The DWR MWQI Program is currently monitoring pathogens in the San Joaquin River at Vernalis and downstream of the Stockton wastewater treatment plant discharge. The results of that study are not yet available.

Turbidity: Turbidity concentrations fluctuate in the San Joaquin River with the highest concentrations occurring during and immediately after major storm events. CALFED established a water quality target of 50 NTU for the Delta but did not establish a target level for the San Joaquin River. The DWR MWQI Program has measured turbidity in the San Joaquin River at Vernalis ranging from 8 to 68 NTU. DHS secondary Maximum Contaminant Level for turbidity is 5 NTU.

Several drains on the eastside of the San Joaquin River have documented seasonal water quality degradation due to discharges from dairies. Lone Tree Creek and Temple Creek are both included on the CWA Section 303(d) list for low dissolved oxygen and elevated levels of ammonia.

Urban Storm Runoff

Studies in Stockton and Sacramento have documented toxic conditions in urban runoff. Studies in other urban areas around the State and throughout the nation show similar results. Problems are anticipated where urban runoff enters water bodies with limited dilution.

NPDES

In the San Joaquin River watershed, there are about 18 major NPDES permits and 57 minor permits. There are localized water quality problems associated with some of the discharges, especially where facilities discharge to water bodies that provide little dilution. Water quality problems associated with the City of Stockton Discharge are discussed in the Delta section.

Forestry Activities

Forestry activities have the potential to cause water quality impairments. Principle concerns are temperature, sediment and siltation, and herbicides. Activities that cause problems include road construction, water crossings, harvest activities, and applications of herbicides.

Effluent Dominated Water Bodies

Over 1,700 water bodies (and over 5,000 miles of channel) in the watershed are dominated by discharges from agriculture, urban areas, and NPDES facilities. Some of these water bodies support valuable aquatic resources and provide terrestrial habitat for many species. Other effluent dominated water bodies are barren and support few beneficial uses. As discussed in previous sections, excess levels of toxic chemicals may seriously limit a water body's beneficial uses.

Metals

Penn Mine: There are localized water quality problems associated with inactive mines. The most significant site and the one staff has and will continue to spend the most resources on is Penn Mine. The CVRWQCB has been working on Penn Mine for more than 20 years. The Mokelumne River is on the CWA Section 303(d) list for copper and zinc. The site has been under litigation, and there are detailed reports on file that describe all the activities that have taken place over the years.

GROUNDWATER

As was previously discussed, the USGS has recently released a series of reports on results of a five year study on the quality of water in 20 major drainage basins throughout the nation, including the San Joaquin and Tulare Basins. The report, "Water Quality in the San Joaquin - Tulare Basins, California, 1992-95," describes one general finding regarding groundwater quality in the San Joaquin Basin: drinking water sources from groundwater have been degraded by fertilizers and pesticides.

Nitrates

There are nearly 200 square miles of groundwater in the watershed with elevated nitrate levels. Shallow groundwater west of the San Joaquin River in Merced and Stanislaus County has elevated nitrate levels, which affect the Cities of Firebaugh, Newman, Gustine, Los Banos, and Dos Palos. Also, water supplies are impacted over a wide area extending along the Highway 99 corridor between Fresno and Stockton and across the southern Delta to Brentwood. The principle sources of nitrates in the watershed are believed to be from crop production and dairies.

Salinity

More than 1,000 square miles of groundwater are impacted by elevated levels of salinity. Areas affected include the entire valley trough between Fresno and Modesto, the vicinity of Stockton, the southern Delta, and the entire area on the west side of the valley between Mendota and Los Banos. The sources of salinity include irrigated agriculture, dairies, and other industrial and municipal discharges, as well as areas with naturally high salt concentrations, such as the Grassland Basin. The problems have been exacerbated by water management practices in the watershed.

Pesticides

More than 500 square miles of groundwater are affected by elevated levels of pesticides, mostly Dibromochloropropane (DBCP). Most of the problems occur over a wide area extending along the Highway 99 corridor between Stockton and Fresno. The sources are past applications of DBCP, a product that is no longer in use. The sources of other pesticides in groundwater are believed to be primarily from routine agricultural uses of the pesticides.

Selenium

More than 200 square miles of groundwater are affected by elevated levels of selenium. The main area affected is between Mendota and Los Banos on the west side of the valley. The source of selenium is natural. Agricultural practices cause the selenium to be discharged to surface waters.

USTs

USTs containing hazardous petroleum products have impacted groundwater resources through leaks and spills. Impacts are at scattered sites in the watershed and are typically associated with service stations for fueling motor vehicles. Contaminants include benzene, toluene, ethylene, xylene, and MTBE. Over 320 active cases had groundwater contamination at the beginning of FY 1999-00. MTBE has impacted groundwater at over 190 of these sites.

Other

More than 50 square miles are affected by petroleum products, solvents, and other synthetic organics. The impacts are mostly in the vicinity of the urban areas. The sources include underground and above ground tanks, industrial facilities, commercial facilities, military facilities, landfills, waste management units, and spills and leaks. MTBE from a variety of sources has been detected in groundwater basins.

STATE OF THE WATERSHED REPORT
DELTA SUB-WATERSHED

Watershed Description

The legal boundary of the Sacramento-San Joaquin Delta Estuary is defined in Section 12220 of the Water Code. The area comprises over 700 miles of interconnected waterways and encompasses 1,153 square miles (State Land Commission, 1991). Most of the Delta is included in the San Joaquin watershed (See watershed description of the State of the Watershed Report for the San Joaquin River Watershed). However, for simplicity, the Delta is discussed here as a separate unit. The Delta, together with San Francisco Bay, is the largest Estuary on the west coast of North America. It is fed by three rivers, the Sacramento, the San Joaquin, and the Mokelumne, with a combined average unimpaired flow of about 22 million acre-feet per year. Major beneficial uses of Delta water are municipal and domestic water supply, irrigation water, water contact recreation, and freshwater aquatic habitat. Two statistics are presented below to help illustrate the environmental significance of the Estuary to the people of California. First, over 280 species of birds and over 50 species of fish inhabit the freshwater portion of the Estuary. This is considerably more than for any other water body in the State of California. Second, over half of all the drinking water for the State of California is pumped from the Delta. Protecting the beneficial uses of Delta water is one of the CVRWQCB's most important jobs.

Water quality impairments in the Delta can result from either contamination being carried into the Estuary on the main rivers or from *in situ* land and water management practices within the system. Reductions in upstream loads should improve water quality conditions in the Delta for many contaminants. Emphasized in this report are activities that must occur within the Delta to ensure the protection of the Estuary's water quality.

Water Quality Assessment

SURFACE WATER

There are many reports that describe water quality conditions in the Delta. This report is not intended to be a compilation of all of these, but instead is presented to summarize what is known about the most important problems. The most significant surface water quality problems in the Delta are mercury, pesticides, salinity, dissolved oxygen, urban storm runoff, PCBs, and metals. There is concern that sediment may be toxic in some areas and that dredging activities may result in toxic conditions at disposal sites and in the vicinity of the dredging operations.

The entire Delta is on the CWA Section 303(d) list (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of elevated fish tissue levels of mercury, Group A Pesticides, and DDT. Also, the entire Delta is listed for water column toxicity and chlorpyrifos and diazinon. A small area, in the

vicinity of Stockton, is listed because of periodic depressed levels of dissolved oxygen. Stockton urban creeks are listed for chlorpyrifos and diazinon. The southern Delta is listed for salt. Marsh Creek is listed for mercury.

Mercury

There is a human health advisory in effect in the Delta and in San Francisco Bay because of elevated mercury levels in striped bass and other long lived fish. The Bay and Delta are both on the CWA Section 303(d) for mercury in fish tissue. Water column mercury levels in the Sacramento River, in Cache Creek, and in parts of the Delta exceed USEPA criteria for total mercury during periods of high storm water runoff. CALFED has identified mercury as a pollutant of concern in the Delta and is evaluating various actions to reduce mercury levels. The main sources of mercury to the Delta are streams tributary to the Sacramento River from both the Sierras and Coast Range including Cache Creek (see Sacramento River Initial State of Watershed the Report). Discharges from Mt. Diablo Mine to Marsh Creek are another obvious source.

In California, mercury was historically mined in the Coast Range both north and south of San Francisco Bay and transported across the Valley for use in placer gold mining in the Sierra Nevada Mountains. Both operations caused widespread mercury sediment contamination in the water courses. The limited mercury work undertaken so far in the Central Valley has concentrated on estimating loads to the Estuary and on determining *in situ* mercury bioavailability in valley waterways.

A loading study conducted by Larry Walker Associates in 1997 estimated that 640 kg of mercury were exported by the Sacramento watershed to the Estuary between October 1994 and September 1995. Most of the material was contributed during winter high flow periods. The Feather River and American River watersheds, sites of intensive historical placer gold mining activity, accounted for only about 25 percent of the total load. The majority of mercury appeared to originate from the Sacramento River watershed above the confluence of the Feather River. Between 1993 and 1995 the CVRWQCB conducted a bulk mercury loading study to the Estuary from the Sacramento River watershed. This study differed from that of Larry Walker Associates in that it included an assessment of loads from the Yolo Bypass during high flows. The CVRWQCB estimated that the Sacramento River watershed exported 800 kg of mercury to the Estuary between May 1994 and April 1995. Staff found, like Larry Walker Associates, that most of the mercury was transported into the Estuary during high flow periods. High mercury concentrations in the Yolo Bypass suggested possible local inputs. Follow-up studies demonstrated that Cache Creek was exporting about 1,000 kg of mercury during wet years. Half of the load was trapped in the Cache Creek Settling Basin while the remainder was exported to the Bypass.

Additional monitoring conducted in Cache Creek in 1997 and 1998 confirmed that the watershed was a major source of mercury to the Estuary. Sulfur Creek and Harley Gulch were identified as significant mercury sources during the wet season while Clear Lake was the major input in the dry irrigation season. Not yet known is the bioavailability of coastal range mercury once transported into the Estuary. However, Cache Creek serves as the major water source for the

recently created Yolo Wildlife Refuge Area. In addition, the CALFED Bay/Delta Program has purchased several large tidal islands downstream in the Yolo Bypass for conversion to shallow water wildlife habitat. These areas are being built upon fill derived, at least in part, from erosion of the Cache Creek watershed.

A study on mercury bioaccumulation in aquatic invertebrate communities in the Sierra Nevada mountains and Coast Range identified local hot spots of elevated concentrations of bioavailable mercury. All were associated with past intensive gold and mercury mining. The studies also suggest that some sites with large bulk mercury loads, such as Cache Creek drainage, might not be as vulnerable to methyl mercury production as their loads would suggest at least while in the parent watershed. Still unknown is the fate of the material from the various watersheds once transported into the Estuary.

Pesticides

Water Column Pesticide Problems: Aquatic resources in the Delta are in decline. Many factors have been advanced to explain the collapse including water diversions, loss of habitat, and toxic chemicals. The role of toxic chemicals in this collapse has been the subject of three recent review papers. All three concluded that pesticide concentrations in the Delta are periodically at concentrations which should be toxic to sensitive local organisms. However, the significance of pesticides on the decrease in abundance and distribution of local organisms is not known.

The BPTCP began in 1992 to identify locations in the Estuary where contaminant levels in water or sediment were sufficiently elevated to kill aquatic organisms (including bioassays) and where chemicals were identified at concentrations explaining the toxicity. BPTCP funds were used in the Delta to evaluate water column toxicity employing the USEPA three species bioassay procedure. Toxicity has been observed to all three species (fish, invertebrate, and algae). However, the chemical responsible for toxicity has only been routinely evaluated for the invertebrate species. This was because limited funds existed and acute toxicity was frequently observed with this species. In each case insecticides (primarily diazinon, chlorpyrifos, and carbofuran) were identified through a combination of chemical analysis and Toxicity Identification Evaluations (TIEs) as the cause of toxicity. On some occasions the chemicals were transported into the Estuary on the major rivers, and in other cases they were discharged into back sloughs from use within the Delta. An example of a riverine input is the movement of the dormant orchard spray diazinon into the Estuary in storm runoff from both the Sacramento and San Joaquin basins. An example of input within the Delta is the presence in March and April of carbofuran and chlorpyrifos at toxic concentrations in back sloughs from applications to control alfalfa weevils. Another example is the toxicity in back sloughs associated with urban runoff from Stockton. A combination of bioassay, chemical, and toxicity work has demonstrated that diazinon and chlorpyrifos are present in urban runoff discharged to back sloughs around Stockton at concentrations toxic to sensitive invertebrate species. Toxicity to the algal bioassay organism

has also been measured in the Delta, and diuron has been implicated as the cause of some of the toxicity. However, in most cases the chemical cause is not known although Phase I TIEs suggest nonpolar organics. Finally, fish toxicity has been detected in Sacramento River water at its confluence with the Delta and at various points in the Estuary. The cause of the fish toxicity is not known.

The entire Delta and Stockton area urban creeks are on the CWA Section 303(d) list for diazinon and chlorpyrifos. CALFED has identified diazinon, chlorpyrifos, and carbofuran as pollutants of concern in the Delta and is evaluating various actions to reduce levels of these pesticides.

Fish Tissue Pesticide Problems: The TSMP has found elevated levels of Group A Pesticides and DDT in fish tissue collected from Hood on the Sacramento River and from Vernalis on the San Joaquin River. The sources of the chemicals are believed to be from past agricultural use, and, in the case of chlordane, from urban use. The use of chlordane, DDT, and toxaphene is now banned, and endosulfan use is closely regulated and much reduced. The DDT and Group A Pesticide fish tissue concentrations exceed the NAS-recommended criteria to protect predators and/or the recommended FDA concentrations to protect public health.

NPDES

In the Delta, there are about 30 NPDES permits. There are localized water quality problems associated with some of the discharges, especially where facilities discharge to small water bodies that provide little dilution.

Dissolved oxygen levels in the San Joaquin River (within the Delta) off Rough and Ready Island in the vicinity of the City of Stockton do not meet Basin Plan water quality objectives during late summer and early fall. A model developed for the City of Stockton confirmed that discharge from the City's publicly owned sewage treatment plant was a major cause of the high BOD loads in the San Joaquin River. See discussion below on dissolved oxygen.

Dissolved Oxygen

Low dissolved oxygen concentrations impair beneficial uses in the San Joaquin River in the vicinity of the City of Stockton, in the Turning Basin, and in sloughs that receive urban runoff from Stockton. The urban runoff problem was described in the previous section. Low dissolved oxygen levels in the San Joaquin River occur from spring to early fall with worst conditions being present in late summer to early fall. Concentrations in the main stem River have been measured as low as 2.5 mg/l. The Basin Plan objective is 5.0 and 6.0 mg/l, depending on the location. Low dissolved oxygen levels appear to result from discharges from the Stockton Wastewater Treatment Plant and other sources that create a high oxygen demand. Low flows in the San Joaquin River exacerbate the problem. The Turning Basin has little circulation, and the water has a long residence time, which promotes algal blooms that further reduce oxygen levels, especially near the bottom. Low dissolved oxygen is responsible for fish kills and can cause physiological stress to fish and block upstream migration of salmon, including the Fall Run Chinook salmon, which has been identified as a "species of concern" by the USFWS. The City

of Stockton completed a river model assessing the impact of the Stockton Wastewater Treatment Plant on receiving water quality. The model suggested that the wastewater treatment plant contributed to as much as 40 percent of the problem, but that even if the entire discharge from the treatment plant were removed from the River, dissolved oxygen objectives would not be met.

Urban Storm Water Runoff

The CVRWQCB received a USEPA CWA Section 104(b)(3) grant to identify the pollutants causing toxicity in wet weather urban runoff from back sloughs around the City of Stockton. Testing in 1994 identified toxicity to each of the three species. Diazinon and chlorpyrifos were implicated by both TIE and chemical analysis as the primary cause of invertebrate bioassay mortality. Studies in subsequent years, as part of the BPTCP, confirmed the presence of these pesticides in urban runoff and back sloughs at concentrations that are toxic to sensitive invertebrates. Diuron was identified as a cause of algal toxicity. There were many instances where toxic conditions were measured but no specific toxicant was identified.

Fish kills are reported each year in channels around Stockton after the first large storm of the year. In 1994 University of California, Davis (UCD) observed high BODs in water collected from Smith Canal, Calaveras River, Mosher Slough, and 5 Mile Slough. Ambient dissolved oxygen levels were less than 1 mg/l (the Basin Plan objective is 5 mg/l or 6 mg/l depending on the location) in all the waterways after the first major storm of the year. Experiments in the lab suggested that the cause of the fish kills was asphyxiation. In 1995 staff observed low dissolved oxygen associated with fish kills after the first storm of the year. In 1996 and again in 1997, DeltaKeeper reported low dissolved oxygen levels in all four waterways. Little suppression in dissolved oxygen has ever been noted in any storm runoff event after the first flush.

Potential problems exist in the vicinity of other urban areas in the Delta (e.g., near Antioch). Also, of concern is the residential growth in both the southern and eastern portions of the Delta, (San Joaquin County and Contra Costa County).

Salinity

The seasonal pattern of salinity is important to the Delta ecosystem. Elevated salinity also impairs agricultural water uses. The main sources of salt to the Delta are from the San Joaquin River and from oceanic intrusion of saltwater. In the past conditions have not been optimum for protection of agricultural and aquatic life beneficial uses. The SWRCB adopted a Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary in May 1995 prescribing salinity standards within the Delta and is currently developing an implementation plan to achieve compliance with the standards. Staff needs to develop a program to reduce levels of salt entering the Delta from the San Joaquin River and assure continued low salinity in the Sacramento River (see San Joaquin River State of Watershed the Report).

Ballast Water Discharge

Ocean going vessels discharge ballast water in the Delta as they navigate through the waterways on their way to unload cargo. The ballast water may contain salt, oil and grease, heavy metals, pathogens from on-board sewage, and foreign aquatic species which could adversely compete with native species. The Bay/Delta system is recognized as the most invaded aquatic ecosystem in North America, with more than 200 introduced invertebrates, fish, plants and microorganisms. The introduction of nonindigenous species has been identified as a critical factor affecting the aquatic life beneficial uses of the Bay/Delta system. Ballast discharges are uncontrolled, and the CVRWQCB has little direct authority over the discharges.

Vessel Sewage Discharges

There are thousands of boats in the Delta used both recreationally and for permanent residences. Raw and partially treated sewage is dumped into Delta waterways from many of these boats. Sewage pumpout facilities are available at several locations, but are not used by all boaters. Many vessels used for permanent residences cannot move, therefore, they cannot use pumpout facilities.

Abandoned Vessels

There are many derelict and abandoned vessels in the Delta, many abandoned by owners no longer wanting the boats. The boats contain fuels and other chemicals that can contaminate surface waters. They are a navigation hazard. Abandoned boats are often used as shelter for the homeless, but no sewage facilities are available, so sewage is discharged to the waterways. Abandoned vessels have also been used for drug labs, with toxic chemicals being left on the boats or dumped overboard.

Drinking Water Issues

The Sacramento River and San Joaquin River watersheds and the Sacramento-San Joaquin Delta provide drinking water for over two thirds of the people in California (more than 20 million people). Most of southern California, a major portion of the San Francisco Bay Area, and many Central Valley communities rely on these watersheds for their drinking waters. Most water supply agencies rely on the multiple barrier approach to water treatment. This approach includes watershed management to control contaminants at the source, along with water treatment and distribution system water quality management, to provide high quality drinking water to customers. USEPA and DHS encourage water suppliers to include watershed management as an element of providing high quality drinking water.

Delta water quality is significantly degraded compared to Sacramento River water quality. Current water quality conditions in the Delta will make it exceedingly difficult to meet future drinking water regulations for disinfection by-products and pathogens without extensive and expensive changes in water treatment processes. Even if water suppliers treating Delta water

switch to ozone as the primary disinfectant, bromide levels in Delta water will prevent them from meeting the anticipated future bromate standard.

Organic Carbon: Sources of organic carbon to the Delta include the Sacramento and San Joaquin Rivers, Delta agricultural drainage, and Delta vegetation and soils. About half of the load at the south Delta pumping plants comes from the rivers and about half is generated within the Delta. The peat soils of the Central Delta are more significant contributors of organic carbon than are mineral soils. Decaying crop material, becoming humus, is also a source of organic carbon. Delta agricultural drainage has been shown to contribute about 50 percent of the in-Delta load of organic carbon. The Sacramento River contributes approximately 85 percent and the San Joaquin River contributes about 15 percent of the riverine load to the Delta.

CALFED established a water quality target range of 2 to 4 mg/L for Delta raw water supplies. Many of the urban water agencies have recommended a target of 3 mg/L. This will allow water suppliers to meet anticipated future drinking water regulations without installing costly advanced water treatment processes. Total organic carbon concentrations at the Banks Pumping Plant range from 2.5 to 9.6 mg/L with a median concentration of 4 mg/L.

Bromide: In the Delta, the major source of bromide is ocean water. Open ocean water contains about 65 mg/L of bromide. Seawater intrudes into the western Delta, particularly during dry years when Sacramento River flows are reduced. Upwelling connate groundwater may also be a minor in-Delta source of bromide.

CALFED established a water quality target range of 50 to 150 ug/L for bromide in the Delta. Many of the urban water agencies have recommended a target of 50 ug/L. This is based on controlling the formation of bromate when ozone is used as the primary disinfectant in water treatment plants. Bromide concentrations at the Banks Pumping Plant range from 50 to 650 ug/L. The highest concentrations occur during dry years.

TDS: Major TDS sources to the Delta include seawater, connate groundwater, runoff containing dissolved minerals, and agricultural drainage bearing soluble salts from irrigation water and leachate from the fields. Open ocean water is about 35,000 mg/L. Agricultural drainage from Delta islands and tracts has TDS concentrations of several hundred mg/L to a few thousand mg/L.

CALFED established a water quality target for TDS of <220 mg/L as a ten year average and <440 mg/L as a monthly average. TDS concentrations at the Banks Pumping Plant range from 94 to 466 mg/L with a median concentration of 286 mg/L.

Pathogens: The DWR MWQI Program is currently conducting a pathogen monitoring program throughout the SWP system. The results of that study are not yet available. Metropolitan Water District conducted a study in 1992 and 1993 that included the Banks Pumping Plant. Neither Giardia nor Cryptosporidium was detected.

Turbidity: CALFED established a water quality target of 50 NTU for the Delta. Turbidity concentrations fluctuate at the Banks Pumping Plant with the highest concentrations occurring during and immediately after major storm events. The DWR MWQI Program has measured turbidity at the Banks Pumping Plant ranging from 3 to 60 NTU.

Drinking water for over 365,000 people living on Travis AFB and in the Cities of American Canyon, Fairfield, Vacaville, Benicia, Vallejo, and Napa is pumped from Barker Slough into the North Bay Aqueduct (NBA), which is part of the SWP. The 15 square mile Barker Slough watershed is located in Solano County within the Sacramento River watershed.

The NBA water periodically contains very high concentrations of organic carbon, bromide, coliform bacteria, metals, and turbidity and low levels of alkalinity and pH. The State Water Contractors conducted the first sanitary survey of the SWP watershed in 1990 and updated the sanitary survey in 1996. The initial survey identified the NBA as having the poorest water quality in the entire SWP system. The follow-up survey included a more focused evaluation of the Barker Slough watershed and recommended that a study be conducted to evaluate the source of water quality contaminants in the NBA system.

A water quality monitoring program, conducted by DWR's MWQI Program, has shown that runoff from the local Barker Slough watershed greatly degrades the quality of raw water at the NBA Barker Slough Pumping Plant. Organic carbon concentrations average 8 mg/L and reach 25 mg/L during storm events. The average concentration of organic carbon is almost triple the 3 mg/L target level recommended by urban water agencies for the CALFED program. The average turbidity of 54 NTU exceeds the CALFED goal of 50 NTU, and storm season turbidities (200-800 NTU) greatly exceed the goal.

MTBE

MTBE has been mixed with gasoline in the Central Valley Region since the mid-1970s as a small percentage to as much as 15 percent in the late 1990s. MTBE is soluble in water at 42,000 mg/l allowing it to move in groundwater at the same velocity. Except for dilution, the compound is very resistant to natural attenuation in either surface or groundwater. Commonly used treatment systems used for gasoline, such as vapor extraction, are ineffective for treating MTBE.

DHS has designated MTBE as a potential carcinogen with the primary MCL established at 14 ug/l and the secondary taste and odor threshold at 5 ug/l.

Currently, CVRWQCB has recorded over 900 sites with MTBE releases with 24 drinking water wells impacted. MTBE also has been shown to cause high mortality to aquatic microorganisms (food for fish). The sources of MTBE include above and UST systems, pipelines, landfills, and wastewater treatment plants.

PCBs

The San Francisco Regional Monitoring program demonstrated in 1993 and 1994 that total PCB concentrations were above USEPA recommended criteria to protect human health at all sites surveyed in San Francisco Bay including the confluence of the Sacramento and San Joaquin Rivers in the Delta. Furthermore, clam transplant studies demonstrated that some of the highest total PCB tissue concentrations were obtained from animals located in both Rivers. The data was interpreted to mean that the Rivers were a major source of PCBs to the Delta. Not known is the impact of elevated PCB levels on aquatic biota in the Estuary.

Metals

San Francisco Bay exceeds Basin Plan water quality objectives for copper. Estuarine loading estimates suggest that more than half of all the copper load to the Bay is from river inputs. Most of the copper in the Central Valley is thought to originate from mine runoff. An additional metal concern is that metal loads entering the Delta may accumulate to toxic levels in the sediment.

Sediment

Various areas of the Delta contain sediments that may be toxic to aquatic life. These areas appear to be associated with industrial dischargers and spills. In addition, dredging and dredge material disposal activities in the Delta have the potential to cause water quality problems. These activities, however, must take place to maintain two deep water ship channels and over 1,000 miles of levees. Dredging activities are also performed to improve water conveyance systems and intake structures. Water quality impacts can occur at the dredge site and at the site of disposal or reuse. Contaminates and chemical changes in the material can threaten both groundwater and surface water quality. The reuse of dredge material for construction of wetlands, enhancement of channel islands, and the rehabilitation of levees is being considered. To a smaller degree, dredging has been used to mitigate potential toxic hot spots. Sediment quality criteria for the various types of reuses and disposal environments are required to ensure that water quality and beneficial uses are protected.

Effluent Dominated Water Bodies

There are many bodies of water in the watershed that are dominated by discharges from agriculture, urban areas, and NPDES facilities. Some of these water bodies support valuable aquatic resources and provide terrestrial habitat for many species. Other effluent dominated water bodies are barren and support few beneficial uses. As discussed in previous sections, excess levels of toxic chemicals may seriously limit a water body's beneficial uses. However, there can be other reasons (e.g., erratic or fluctuating flow, stream morphology and hydrology, temperature fluctuations, seasonal elimination of flow, and unstable substrate).

GROUNDWATER

Various areas of the Delta contain groundwater that does not meet drinking water standards. The exceedances appear to result from natural causes and from inputs of pollutants from a variety of point and nonpoint sources, including agricultural operations, underground and above ground tanks, industrial facilities, commercial facilities, military facilities, landfills, waste management units, and other spills and leaks. As in the other watershed in the Region, MTBE in groundwater is a concern in the Delta.

STATE OF WATERSHED REPORT
TULARE LAKE HYDROLOGIC BASIN

Watershed Description

The Tulare Lake Hydrologic Basin comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. The Tulare Lake Hydrologic Basin is essentially a closed basin since surface water drains north into the San Joaquin River only in years of extreme rainfall. The Basin includes six groundwater basins: Kern County Basin, Tulare Lake Basin, Tule Basin, Kaweah Basin, Kings Basin, and Westside Basin.

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 lake bed. 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.

Water Quality Assessment

SURFACE WATER

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.

Tulare Lake Basin Management Area

The Lower Kings River contains electrical conductivity and TDS higher than Basin Plan objectives. 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 Kings River is on the CWA Section 303(d) list because of salt, pesticides, molybdenum, copper, and arsenic.

Kaweah Basin Management Area

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

Tule Basin Management Area

Sedimentation has been noted in Lake Success. Also, the potential exists for high bacteria levels in 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 which also cause high levels of mercury in Panoche Creek. The source of the mercury is the New Idria Mine.

Kern County Basin Management Area

Some sedimentation problems are noted in Isabella Lake.

NPDES

The Tulare Lake Basin watershed currently has about 49 NPDES permits. Most domestic discharges occur seasonally when there is dilution and little opportunity for direct reclamation.

MTBE

MTBE has been mixed with gasoline in the Central Valley Region since the mid-1970s as a small percentage to as much as 15 percent in the late 1990s. MTBE is soluble in water at 42,000 mg/l allowing it to move in groundwater at the same velocity. Except for dilution, the compound is very resistant to natural attenuation in either surface or groundwater. Commonly used treatment systems used for gasoline, such as vapor extraction, are ineffective for treating MTBE.

DHS has designated MTBE as a potential carcinogen with the primary MCL established at 14 ug/l and the secondary taste and odor threshold at 5 ug/l.

EROSION

In addition to the sedimentation problems noted above, with each rainfall, the surface waters of the Basin run brown implying that there is a large quantity of sediments in the water. No review of potential sediment sources has been done. Improperly graded subdivisions are believed to

contribute large quantities of sediment as do eroding roads, grazing, and other activities. These sediments may be impairing the municipal, recreational, and habitat beneficial uses of affected water bodies.

GROUNDWATER

Nitrates

There are nearly 400 square miles of groundwater in the Basin with elevated nitrate levels. Water supplies are impacted in Delano, McFarland, Wasco-Shafter, Bakersfield, Maricopa, Taft, the Hanford-Lemoore area, the west side of Kettlemen City, the Fresno-Clovis area around Kingsburg, and the Reedley-Orange Cove area. Some control of nitrates has been achieved through the controlled use of septic systems in larger subdivisions and agriculture's efforts in recent years to apply fertilizer at agronomical rates. The principle sources of nitrates are believed to be from agricultural operations and from dairies.

Salinity

The Basin is arid and closed. To become and continue as a highly productive agricultural area, vast quantities of supply water are imported. While the imported water is of excellent quality, sheer magnitude equates to millions of tons of salt that remain in the Basin. Historically, large quantities of salts have come from oil field production. Regulation of these discharges has reduced the salt discharge. Evaporation basins collect and dispose of hundreds of thousands of salt. Evaporation basins are an interim solution to disposing of salts until determined environmentally benign. In addition, agriculturally based industries concentrate salts in their processes. Several industries (i.e., olive processors) and municipalities have created local plumes where salt concentrations have caused groundwater pollution. Fertilizers, soil amendments, and leachate from affected soils are additional sources of salt.

More than 1,800 square miles of valley floor groundwater aquifers are impacted by elevated levels of salinity. Impacted areas include the valley floor in the western portion of Kern County, Kings County, Tulare County, and Fresno County."

Pesticides

More than 1000 square miles of groundwater are affected by elevated levels of pesticides, including DBCP and Ethylene Dibromide (EDB). Most of the problem occurs in the Kings Basin (in the vicinity of Fresno). The source of DBCP is past applications.

Selenium

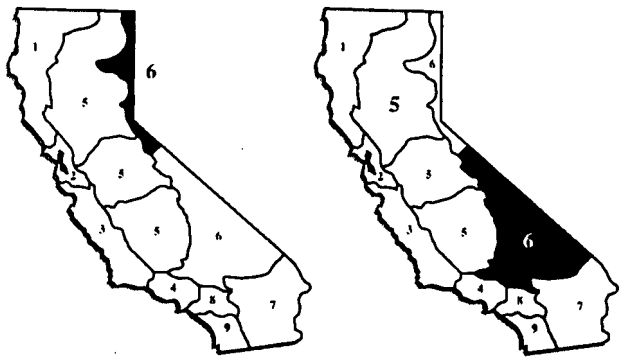
More than 100 square miles of groundwater are affected by elevated levels of selenium. Areas affected are near Kettlemen City and south of the Tulare Lake Bed. The source of selenium is natural, but agricultural practices compound the problems.

Shallow groundwater that is drained to allow agricultural production contains salts and selenium. This water is discharged to evaporation basins where the salt and selenium concentrate and have cause avian problems.

Other

There are hundreds of confirmed groundwater contamination sites associated with discharges from underground and above ground tanks, industrial facilities, commercial facilities, military facilities, landfills, waste management units, and other unknown sources.

Lahontan Region (Region 6)



The Lahontan Region (Figures 1.1 and 1.2) is larger than the State of Maine, and geographically and ecologically diverse. It includes 42 recognized major watersheds or "hydrologic units", and water bodies of statewide, nationwide, and international importance (e.g., Lake Tahoe and Mono Lake). The southern part of the Region includes some of the fastest growing cities in California, and many of the "rural" areas of the Region are affected by heavy recreational use, resource management, or military activities. With such a large number of water bodies in such a big geographic area, Lahontan Regional Water Quality Control Board (LRWQCB) staff must address a wide variety of water quality problems with very limited funds.

Because of finite resources, the watershed management approach can only initially focus on certain watersheds within the Region, switching its focus on other watersheds in the future. During two public meetings in February and March 1996, the LRWQCB members concurred with staff's proposal to focus initial WMI implementation in five watersheds. The selected watersheds were Lake Tahoe Basin, Truckee River below Lake Tahoe outlet, Carson River, upper Owens River, and Mojave River. The five focus watersheds were selected based on their resource value, the significance of known water quality problems, and opportunities for implementing current and future LRWQCB programs within a true "watershed planning" context.

Three of these five watersheds are currently designated the LRWQCB's highest priority watersheds for development of TMDLs, and a watershed planning approach is expected to facilitate TMDL development and implementation. Within the larger Lake Tahoe and Owens River watersheds, smaller subwatersheds are being selected for initial planning and implementation emphasis.

Figure 1.1 North Lahontan Basin

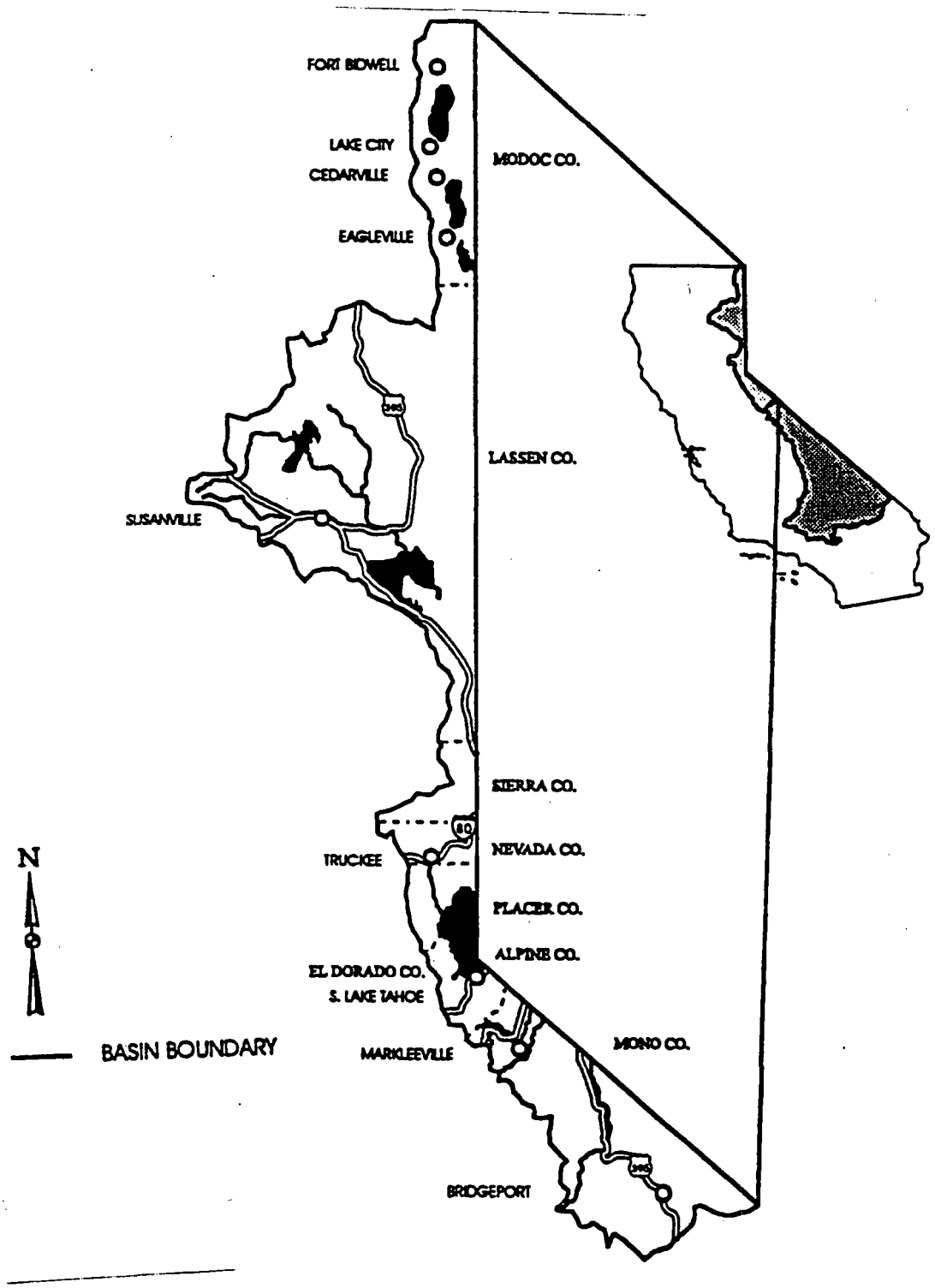
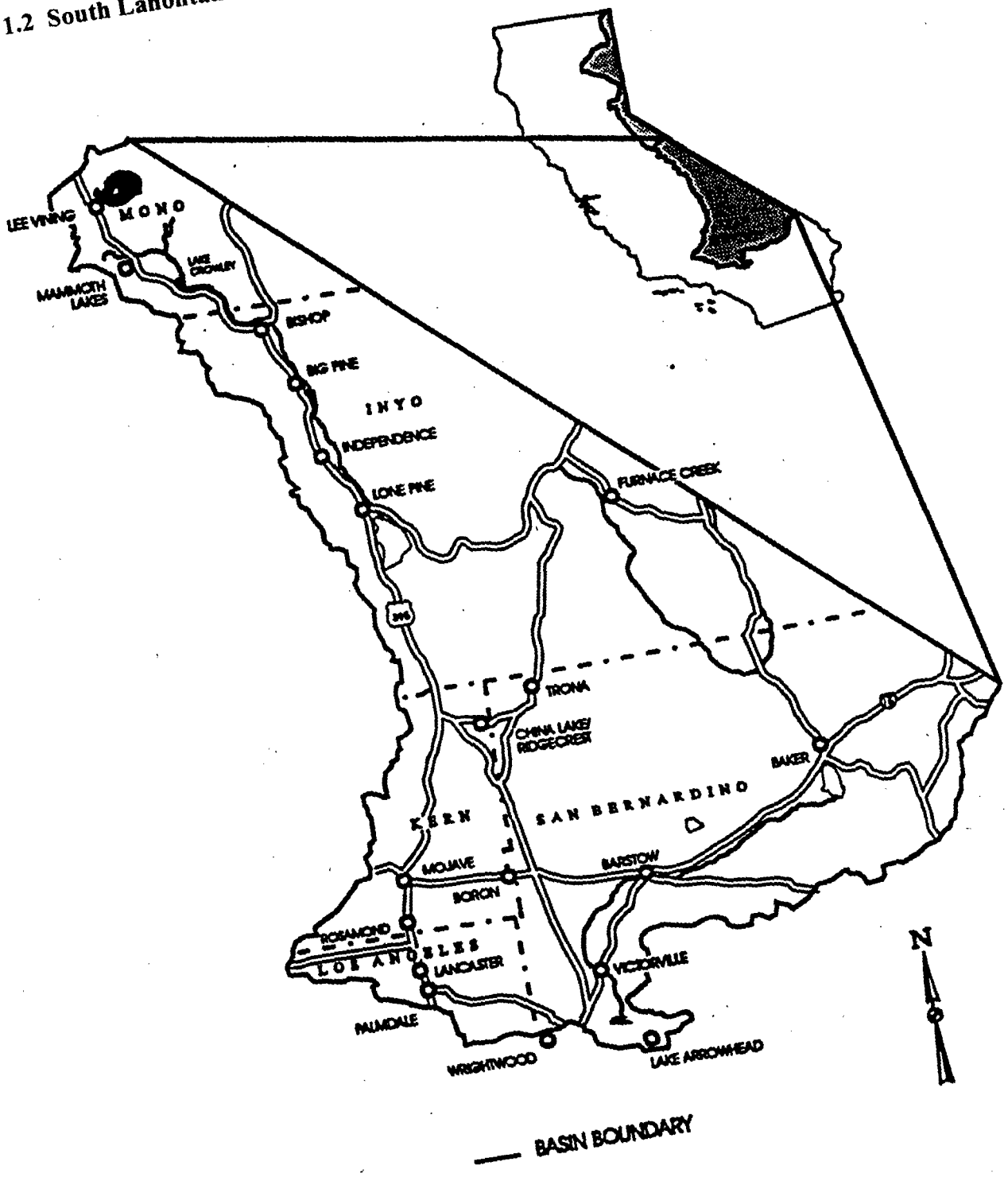


Figure 1.2 South Lahontan Basin



Section 2.1 Lower Truckee River Watershed (1 of 5 Focus Watersheds)

2.1a Watershed Overview

The Truckee River has been selected as a priority or 'focus' watershed because of the high resource value of its waters, the threats to water quality from current and potential human activities in the watershed, and the LRWQCB staff's ongoing monitoring and planning programs which target this area. Other considerations include the existence of bi-state, interagency cooperative efforts, which could facilitate watershed planning and implementation, and the interest of homeowners near Donner Lake in a voluntary monitoring effort.

The Truckee River watershed in California (Figure 2.1) encompasses approximately 273,920 acres in portions of Placer, Nevada, and Sierra Counties. The Truckee River, which emerges from the northwest periphery of Lake Tahoe, is considered a separate steam from the Upper Truckee River, which is Lake Tahoe's largest tributary. The Little Truckee River watershed, although mapped as a separate hydrologic unit, must be considered in hydrologic, sediment, and nutrient budgeting for the main river. Both of these watersheds have high resource values, including heavy summer and winter outdoor recreational use, and support of threatened/endangered species in both California and Nevada. Donner Memorial State Park is located in the watershed. Part of the River is managed as a wild trout stream by DFG. DFG considers Martis Creek, a tributary to the Truckee River, to be a 'Significant Natural Area' (SNA) as the most typical habitat of the threatened Lahontan cutthroat trout. Vernal pool wetlands in Martis Valley provide habitat for the Plumas ivesia, a plant species under consideration for federal threatened/endangered species listing. Sagehen Creek, a tributary to the Truckee River, is an SNA for three species, including riparian habitat-dependent willow flycatcher. A segment of the Truckee River and several of its tributaries are under consideration for inclusion in the federal Wild and Scenic Rivers system. The Truckee River provides about 75 percent of the municipal water supply for the Reno-Sparks, Nevada area. The Sierra Pacific Power Company, Reno's downstream water purveyors, operated hydropower facilities on the River. Releases from Lake Tahoe and other reservoirs are managed to maintain fishery flows in the River and to provide critical water supplies for maintenance of the threatened Lahontan cutthroat trout and endangered cui-ui populations in Pyramid Lake, Nevada. The Truckee River watershed in California includes the communities of Tahoe City, Alpine Meadows, Squaw Valley, Truckee, Hirschdale, and Floriston. Much of the watershed is within the Tahoe and Toiyabe National Forests. Land use in the portion of the Truckee River watershed from the Lake Tahoe Dam to Alpine Meadows Road is under the jurisdiction of the Tahoe Regional Planning Agency (TRPA). The recently incorporated Town of Truckee (with a current population of about 11,300) and surrounding portions of the Martis Valley have the greatest potential for new growth in the northern part of the Lahontan Region.

2.1b Water Quality Problems and Issues

The water quality of the Truckee River system has been impacted by a variety of sources. The watershed was extensively logged in the nineteenth century, and there was a short-lived mining rush in the 1860s. Management of modern timber harvest practices in the watershed is an issue

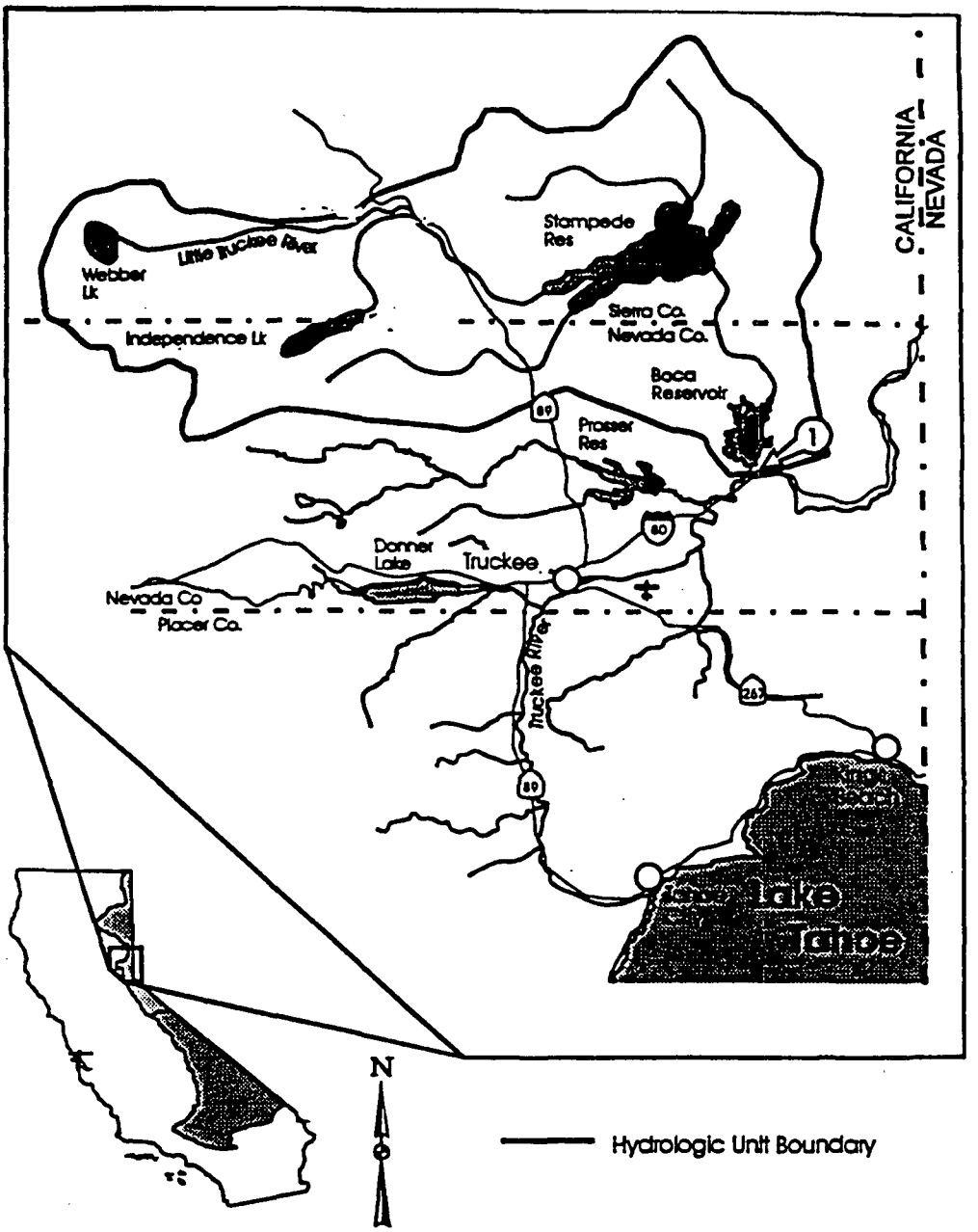
of increasing focus and concern for the LRWQCB. Increasingly, more timber harvesting is occurring, due to increased lumber prices, decreased timber harvesting on public lands, and recent wildland fires. Approximately 67,040 total acres have been harvested on both private and federal lands since about 1989 (CH2Mhill 1996). Hydrologic modification, including alteration of wetlands and fisheries habitat, has occurred in connection with dam and reservoir construction, ski resort development, and sand and gravel mining. The River once supported a superior trout fishery, but as a result of flow and habitat modification, the fishery resource has been severely diminished (Snider/DFG 1995).

CWA Section 304(l) and 303(d) lists/TMDLs -- The Truckee River is on the federal CWA Section 303(d) list for siltation. Several tributaries (including Squaw Creek, Martis Creek, Bronco Creek, Bear Creek, Gray Creek, Donner Lake, and Stampede Reservoir) are also on the Section 303(d) list for siltation, priority organics, or pesticides. Limited monitoring shows radioactive elements in Sagehen Creek, presumably from natural weathering of Sierra Nevada granite. Localized high uranium in groundwater has affected municipal supplies in the Lake Tahoe Basin, and additional monitoring may be desirable to determine whether a similar problem occurs in the Truckee River watershed. The Truckee River and Squaw Creek are one of the LRWQCB's highest priority water bodies for the development of TMDLs. The LRWQCB's ongoing and proposed short-term activities in the watershed include the development and implementation of TMDLs for sediment.

Erosion -- Portions of the watershed are highly erosive. Turbidity increases after intense storms. Storm events have increased suspended sediment to the extent that Nevada water purveyors have been unable to filter municipal supplies, and water rationing has been necessary. Significant concerns about water system reliability were generated after one such turbidity event in July 1992 that lasted 20 days. During this event, Sierra Pacific Power Company's treatment plants were shut down for several days. Within two days, water storage was near depletion and the Nevada Health Department was notified that, without mandatory water use restrictions, partially disinfected water would enter the distribution system (Sierra Pacific Power Company 1994). Concern about erosion has increased due to extensive watershed damage by several catastrophic forest fires in 1994.

Point and Nonpoint Source Impacts -- Urban development, several highways, and a railroad are located adjacent to surface waters; hazardous substance spill and storm water discharges are significant concerns. A Highway 267 bypass around the Town of Truckee is being proposed. Railroad traffic could increase by 50-70 percent due to the merger of the Southern Pacific and Union Pacific railroads. Significant vehicular traffic increases in and near Truckee are projected in relation to growth under the Town's new General Plan. Increases in railroad and highway traffic, and in the associated risks of spills, could affect the quality of storm water discharges. The Eastern Regional Landfill, an unlined Class III landfill located close to the River, is now undergoing final closure. Elevated levels of sediment and heavy metals have recently been detected in a drainage emerging from the landfill. Other current or potential sources of pollutant loading to surface waters include past and present disposal of treated wastewater, septic systems, reservoir releases, construction activities, highway and railroad maintenance, livestock grazing, and golf courses.

Figure 2.1- Truckee River Watershed



Concerns about point and nonpoint source water quality impacts in the Truckee River watershed arose at the same time that comprehensive watershed planning began for Lake Tahoe. Consideration was once given to designation of a bi-state CWA Section 208 planning area for the watershed, as was done for Lake Tahoe under TRPA. Nonpoint source problem inventories of the Truckee River watershed and recommendations for implementation were made in the 1980s by the Placer and Nevada County Resource Conservation Districts using CWA Section 208 grant funds. A Best Management Practices' (BMP) handbook was developed for the eastern portions of Placer and Nevada Counties, and revisions were made to local grading ordinances. However, due to lack of funds, little progress was made on organized implementation of the CWA Section 208 Study's recommendations.

Threat of Nutrient Loading -- Although the Truckee River is not currently impaired by nutrient loading, nutrients are considered a significant threat. Due to concern about nutrient loading to the River from domestic wastewater, the LRWQCB has prohibited, within a portion of the watershed, new septic system discharges (with limited exemptions), and discharges from formerly used secondary wastewater treatment plants. (Past wastewater discharges are probably still affecting the quality of springs entering the Truckee River from a former disposal area near Tahoe City, and the quality of the Squaw Valley drinking water aquifer.) Any new wastewater discharges in the LRWQCB's prohibition area are required to provide the same level of nitrogen removal as the tertiary Tahoe-Truckee Sanitation Agency (TTSA) treatment plant. TTSA is a regional facility which treats wastewater from five member districts in the North Lake Tahoe and Truckee areas. It discharges treated effluent indirectly to the River through groundwater leachfield discharge and experimental sprayfield irrigation. Although TTSA provides advanced treatment, nutrient loading to the Truckee River and Martis Creek is still a concern, and increased nitrate loading has been documented downstream of the TTSA plant. The phosphorus absorption capability of TTSA's leachfield may soon be reached. Present disposal areas are proposed for expansion and to be supplemented by development of new land disposal areas. TTSA currently has unused treatment capacity, but the planned new growth in and near its service area will eventually make expansion of the plant or construction of other treatment facilities necessary. Some existing subdivisions which are now permitted to use septic systems may also eventually need to be sewered to protect groundwater and reduce total nutrient loading to the River. The water quality impacts of increased wastewater discharges in the Truckee River watershed will need careful evaluation and mitigation. The LRWQCB's ongoing and proposed monitoring and assessment activities for the watershed include formulation of a nutrient budget for the Truckee River.

Water Quality and Water Quantity Issues -- Water quality and water quantity are significantly interrelated in the Truckee River watershed. During the recent drought, portions of the River were dry for long periods, and dissolved constituent concentrations increased greatly in reaches with low flows. Reservoir releases for downstream uses were controversial because of their impacts on the reservoirs' own aquatic life and recreational uses. During normal to high water conditions, reservoir management is of concern in relation to shoreline erosion. New reservoirs have been conceptually proposed for two tributary watersheds near the California-Nevada State line.

Consumptive use of all surface and some groundwater of the Truckee River watershed is regulated by an interstate compact which has been approved by Congress as PL 101-618; flows are managed by a federal watermaster under a court decree. Revisions in operating criteria for the river/reservoir system are currently being proposed. The draft Truckee River Operating Agreement Joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) Study has identified instream flow for fisheries and water quality of the Truckee River as the key concerns for flow management. Regulated flows from Donner, Martis, and Prosser Creeks, the Little Truckee River (Stampede/Boca Reservoirs), and the dam at Lake Tahoe all influence base flows and the water quality of the main stem of the Truckee River. The Operating Agreement will propose flow amendments for the River that may affect the assimilative capacity of the River for wasteloads (e.g., discharges from the TTSA leachfield).

Donner Lake -- Donner Lake is historically and recreationally important. Municipal supplies are diverted from the lake for use at surrounding development, and the lake is also managed as a reservoir for municipal use in Nevada. Donner Lake's watershed is the most highly urbanized watershed of any lake the Truckee River watershed. It is affected by forest management activities and storm water from Interstate 80, the railroad, subdivisions and commercial development. Development of new private piers has increased; local concerns about the impacts of boating have led to recent adoption of restrictions on fueling. Sampling of fish tissue and sediment from Donner Lake under the SWRCB's TSMP shows elevated levels of PCBs, chlordane, silver, and zinc. The sources of these pollutants are unknown. Property owners around the lake have recently become concerned about the potential for eutrophication of the Lake and have funded monitoring by the University of Nevada. A 1998 study by the UCD Tahoe Research Group showed MTBE in the lake during the summer (the season of heavy boating use).

Squaw Creek -- Because of significant sediment loading into the Creek, a TMDL is planned for Squaw Creek. The LRWQCB has received numerous complaints regarding siltation from new and existing construction.

Groundwater -- There are a number of groundwater-related issues in the Truckee River watershed. In certain areas, groundwater contains naturally high levels of arsenic and other minerals. Groundwater contamination is a concern because of the unsuitability of some soils in the region for septic systems. Toxic substances contamination of groundwater has occurred near the railroad station in Truckee and from a number of underground tank sites in the Truckee area. Groundwater quantity is of concern because the interstate water compact places limits on total diversions for consumptive use from all sources in the Truckee River watershed, including some groundwater. Local groundwater supplies may not be adequate to serve all existing needs plus planned growth.

Stakeholder Participation/Public Participation -- Stakeholder and other public participation in LRWQCB activities to protect and enhance water quality and beneficial uses in the Truckee River watershed are expected to occur in cooperation mainly with the Truckee River Coordinated Resources Management Plan (CRMP) and the Truckee River Habitat Restoration Group.

Identification of Priority Problems

1. Water quality in the Truckee River is adversely affected by nonpoint source pollutants, particularly suspended sediment. Although silt-laden flows are routinely observed in the Truckee River, Squaw Creek (key tributary), and several other tributaries, in most cases, the source or sources of the pollutants are unknown and largely uncontrolled. Nonpoint sources are inadequately characterized as to their origin and relative contribution to cumulatively effecting water quality degradation.

2. Nonpoint source pollution is considered to be increasing in the Truckee River watershed. The basis for this assertion is increased pressure to harvest timber, increasing urbanization, and commercial development in the Town of Truckee, proposed highway and railroad development, and increased recreation development.

3. Increases in nonpoint source pollutant loading of the Truckee River from all new sources, in combination with existing nonpoint source pollutant loading of the River, will result in additional water quality degradation and impairment of beneficial uses. The individual effects from existing nonpoint sources is cumulative.

4. Historical loss and/or modification of aquatic habitat associated with water development, urban development, and recreational development, combined with future potential losses, will likely result in additional water quality degradation and impairment of beneficial uses.

Section 2.2 Upper Truckee River Watershed -- Lake Tahoe Basin (2 of 5 Focus Watersheds)

The Upper Truckee River and the tributaries which make up the Upper Truckee River Watershed comprise the largest contribution to the waters of Lake Tahoe. Lake Tahoe (see Figure 2.2) is an "Outstanding National Resource Water" under federal antidegradation regulations and is losing clarity at the rate of one and one half feet per year. Many agencies, local jurisdictions, and concerned groups have been and continue to work toward reversing this trend. In the summer of 1995, the LRWQCB and TRPA selected this watershed in which to focus programs, projects, studies, and resources in an attempt to create measurable improvements in water quality. Additionally, the watershed contains a variety of types of watershed disturbance and includes many of the water quality problems affecting the Lake Tahoe Basin as a whole. The watershed contains sites of numerous past, current, and proposed remedial watershed restoration efforts.

In summer 1997, Lake Tahoe was the focus of an unprecedented Presidential forum which resulted in $27.5 million in federal funds being allocated to address the continued decline of the quality of Lake Tahoe's pristine waters. One result of this forum is the commitment from the USFS to complete a watershed assessment study of the entire Lake Tahoe Basin. In addition, proposed State funding for work at Lake Tahoe totaling $80 million was decided by voters in June 1998. The LRWQCB has embarked on an effort to bring State, Regional, and federal

efforts to bear on the problems of the Upper Truckee River watershed in hopes of developing a prototypical environmental and economic strategy. The lessons learned from this focused watershed exercise could then be transferred to all of the other watersheds within the Lake Tahoe Basin.

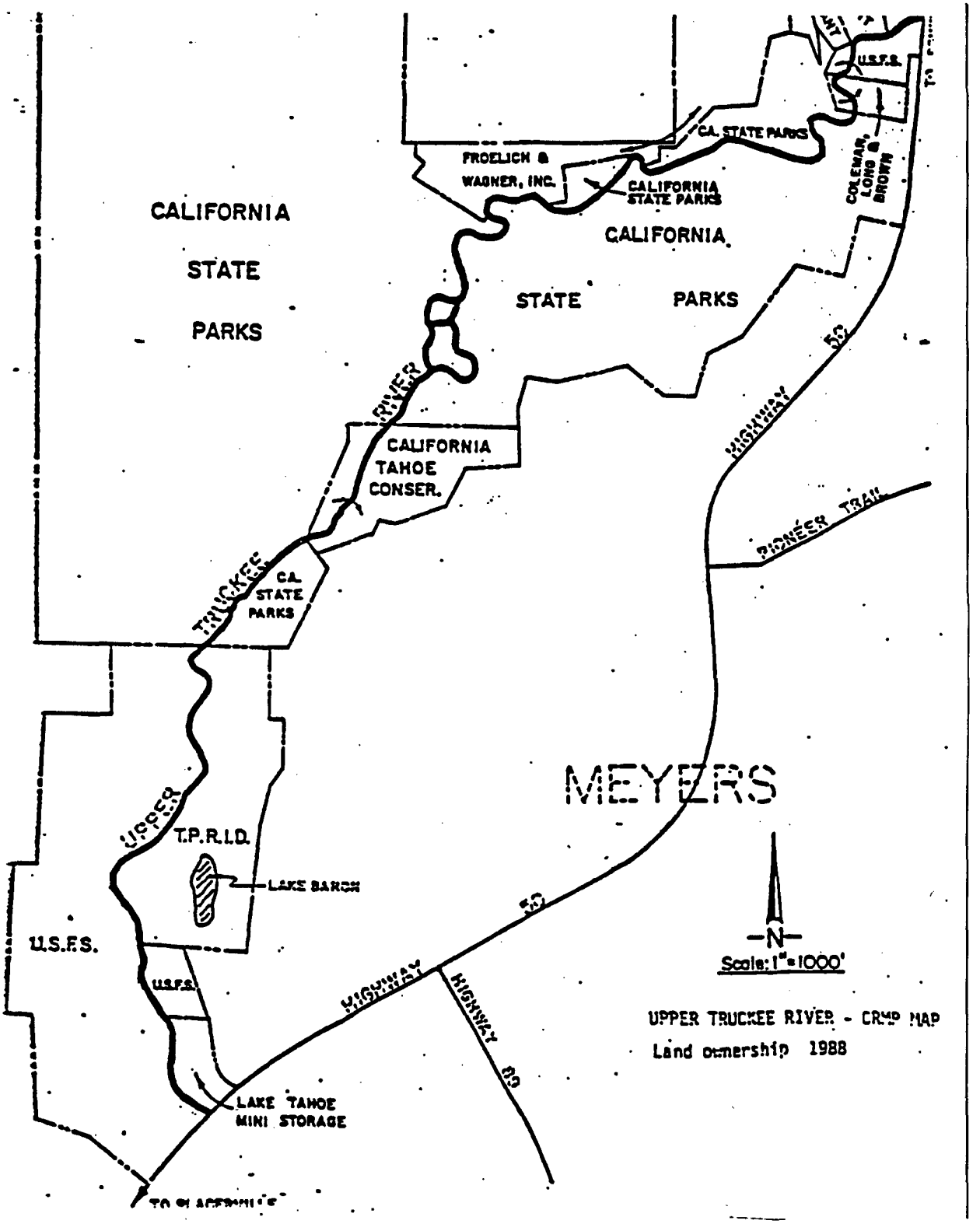
2.2a Watershed Overview

The Lake Tahoe Basin is recognized as a national priority because of its high resource value and its sensitivity to water quality impacts. Increased development and watershed disturbance in the Basin continue to degrade the Lake and its tributaries in spite of a comprehensive point and nonpoint source control program. Efforts to protect Lake Tahoe since the 1960s have been pioneer examples of Watershed Planning and nonpoint source control, but much work remains to be done.

Lake Tahoe is a designated "Outstanding National Resource Water" under federal antidegradation regulations and is one of only two lakes with such a designation in California. The Lake Tahoe Basin receives over 20 million visitor days per year, about five times the visitation to Yosemite National Park. Five million of these visitor days are directly related to outdoor recreation. Lake Tahoe is operated as a reservoir, and together with other reservoirs in the lower Truckee River system, provides about 85 percent of the municipal water supply of the Reno-Sparks, Nevada area.

Lake Tahoe is the tenth deepest lake in the world, rivaled only by Crater Lake and Lake Baikal in Russia, for its combination of size, scenic beauty, and unique ecological qualities. Lake Tahoe has a mean depth of 1,027 feet (313 meters) and a maximum depth of 1,645 feet (501 meters). Much of the beauty of the Lake comes from its extraordinary transparency and related deep blue color. Secchi depths of over 131 feet (40 meters) were measured in the 1960s, and the Lake historically transmitted enough light to support beds of attached mosses and other plants at depths of up to 400 feet (122 meters). Saturated oxygen concentrations have been recorded throughout the Lake. Concentrations of nutrients are so low that special analytical methods are necessary to measure them. The Lake once supported the Lahontan cutthroat trout; rare species currently present include a unique wingless benthic stonefly, and the shorezone plant, Tahoe yellow cress.

Figure 2.2 Upper Truckee River Watershed



2.2b Water Quality Problems and Issues

Lake Tahoe -- Lake Tahoe and its tributaries have been monitored by UCD researchers since the early 1960s. This long-term monitoring has shown statistically significant trends of increased phytoplankton productivity and decreased transparency in Lake Tahoe. Phytoplankton productivity has nearly tripled since 1968, and average clarity has been lost at a rate of about one and half feet per year. The growth of attached algae (periphyton) in the littoral zone of the Lake has increased dramatically, particularly offshore of developed areas. Recently, the first statistically significant decrease in oxygen in the hypolimnion was measured. Although Lake Tahoe is still considered oligotrophic, it is not meeting California's water quality standards for clarity and productivity, based on levels measured in 1968-1971. These measured trends of degradation led to classification of the Lake as a "Water Quality Limited Segment" under CWA Section 303(d); it is listed for siltation. The Lake Tahoe Basin is currently one of the Lahontan LRWQCB's highest priorities for the development of TMDLs. Although the Upper Truckee River, tributary to Lake Tahoe, is not listed on the 303(d) list, restoration within its watershed is necessary in order to improve clarity with Lake Tahoe.

Lake Tahoe's naturally high quality is due to the relatively small size of its watershed in relation to the volume of the Lake, which led to very low nutrient inputs under natural conditions. Human activities, including watershed and wetland disturbance, and activities which have increased wet and dry atmospheric nutrient deposition, have greatly increased nutrient loading to the Lake since the 1960s. Phytoplankton bioassays show that the Lake, which was initially nitrogen limited, has changed to phosphorus limitation due to increased nitrogen loading. Sediment loading from watershed disturbance has also increased due to human activities, and control of sediment has become increasingly important because most phosphorus input is in the particulate form.

Implementation of water pollution controls has been complicated by the politically fragmented nature of the Lake Tahoe watershed. One third of the watershed is within the State of Nevada. In California, land use controls are divided among entities including the USFS, El Dorado, Placer, and Alpine Counties, and the City of South Lake Tahoe. A bi-state TRPA was formed by Act of Congress in 1969. There has been controversy between local economic interests and efforts to protect Lake Tahoe as a "national treasure". Recent national attention focusing on the efforts of these seemingly divergent interests to cooperate and coordinate has brought millions of dollars to the Basin.

The initial concern about impacts of human activities on Lake Tahoe led to mandates for the export of wastewater from the Basin in the 1960s. The emphasis turned to nonpoint source planning, using Section 208 grant funds, in the 1970s. Comprehensive land use and water quality controls were adopted in the 1980s. Current controls include limits on all types of new development (including single family homes in existing subdivisions), waste discharge prohibitions related to specific types of watershed disturbance, limits on impervious surface coverage, requirements for retrofit of BMPs for erosion and storm water control to existing development, public acquisition of lands too environmentally sensitive to be developed, municipal storm water NPDES permits, waste discharge requirements for a variety of nonpoint

sources, and publicly funded programs to restore wetlands (Stream Environment Zones or SEZs), and implement erosion and storm water control projects. New residential and commercial development is phased based on the accomplishment of remedial control measures. Because of the sensitivity of Lake Tahoe, these nonpoint source controls are mandatory, not voluntary, as is the case for most current watershed plans in California.

Over $400 million in federal, State and local funds have been spent on wastewater treatment and export, acquisition of sensitive lands, and implementation of remedial projects. However, the quality of Lake Tahoe continues to deteriorate. Funding for remedial projects and for baseline/trend monitoring is becoming increasingly scarce. Some of the projected remedial work is behind schedule.

Upper Truckee River -- The Upper Truckee River watershed is located in Alpine and El Dorado Counties. Tributaries include Angora, Echo, Grass Lake, and Big Meadow Creeks, and Upper and Lower Echo, Round, and Dardanelles Lakes. Two large sphagnum bogs, Grass Lake and Osgood Swamp, are located in the watershed and both are considered to be Significant Natural Areas by DFG. Grass Lake has been designated a USFS Research Natural Area. The headwaters are in Desolation Wilderness and in roadless areas managed for quasi-wilderness uses by USFS. Both areas receive heavy recreational use. The reach of the Upper Truckee River above Christmas Valley is under study for inclusion in the federal Wild and Scenic Rivers system. Threatened Lahontan cutthroat trout have been reintroduced into the River in the Meiss Meadows area, and the endangered shorezone plant Tahoe yellow cress is found near the mouth of the River on the shores of Lake Tahoe. The lower reach of the River flows through the unincorporated community of Meyers and the City of South Lake Tahoe.

The Upper Truckee River watershed has been heavily impacted by human activities. Historically, the watershed was affected by nineteenth century logging and livestock grazing. Today, overnight camping in Desolation Wilderness is limited, but the water quality impacts of human waste disposal in the back country are still of concern. Summer cabins in the Echo Lakes sub-watershed are allowed to dispose gray water to leachfields, which may affect lake quality. The watershed has been disturbed by off-road vehicle use, residential, commercial, and industrial development, highway construction and maintenance, and wetlands disturbance. The watershed includes two golf courses, and recreational and commercial facilities with expansive turf areas. Highway 50 crosses the Upper Truckee River at three locations. Discharges of abrasives and salt are inadequately treated prior to reaching surface waters within the watershed. The lower reach of the Upper Truckee River was channelized and much of the marsh near its mouth was filled to create the Tahoe Keys subdivision. Further hydrologic modification occurred for construction of the South Lake Tahoe airport. Spills of treated wastewater from the South Tahoe Public Utility District's (STPUD) export facilities in this watershed are an ongoing concern. Municipal water supplies from groundwater sources heighten concern about compliance with regional limits on water diversions from all sources.

Potential future disturbance in the Upper Truckee River watershed includes expansion of the airport, expansion of Heavenly Ski Area, replacement of portions of the STPUD's wastewater export system, a new USFS off-road vehicle trail, expansion of Lake Tahoe Community College,

additional public and private timber harvest/forest management activities, new commercial and residential development, temporal disturbances from area-wide storm water treatment and erosion control projects, and large-scale stream and restoration projects. El Dorado County includes the largest number of high erosion hazard residential lots on the California side of the Lake Tahoe Basin.

The Trout Creek watershed is a major subwatershed of the Upper Truckee River. Trout Creek enters the River just before it drains into Lake Tahoe. Named tributaries of Trout Creek include Saxon, Cold, and Heavenly Valley Creeks. The upper watershed provides habitat for the spotted owl, pine marten, and Tahoe draba (a rare plant). Heavenly Valley Creek supports a population of the threatened Lahontan cutthroat trout.

The upper watershed of Trout Creek has been disturbed by ski resort development, timber harvest, range cattle grazing, and off-road vehicle use. A former municipal landfill, which has been remediated by the USFS, is located in the Saxon Creek watershed. Until 1968, secondary wastewater effluent from the STPUD was discharged to land in the Heavenly Valley Creek watershed. Impacts of that discharge were still measurable in the Creek in the 1980s. The lower watershed of Trout Creek has been affected by residential, commercial, and highway construction, livestock grazing, and wetlands disturbance. Proposed new development in the Trout Creek watershed includes Heavenly Valley Creek is listed as a Water Quality Limited Segment under CWA Section 303(d) for the pollutant 'siltation'.

Section 2.3 Carson River (3 of 5 Focus Watersheds)

The Carson River watershed has been selected as a priority watershed because of the high resource value of its waters, the problems associated with the Leviathan Mine and other inactive mines, and the ongoing Upper Carson River watershed management planning effort organized by the Nevada Department of Environmental Protection which provides greater potential for coordinated watershed management and improvement.

2.3a Watershed Overview

The East and West Forks of the Carson River are located in Alpine County, south of Lake Tahoe (see Figure 2.3). The forks join to form the Carson River near Genoa, Nevada. Several tributaries, including Indian Creek and Bryant Creek, cross the California-Nevada State line separately from the main forks. Both the East and West Forks originate in the upper reaches of the eastern side of the Sierra Nevada in or near federal wilderness areas. The watershed is popular for sport fishing, rafting, and other outdoor recreation activities which depend on high water quality. The West Fork flows through scenic Hope Valley, where public funds have recently been spent to acquire important wetland/riparian habitat. A segment of the East Fork between Hangman's Bridge and the Nevada State line is designated as a State Wild and Scenic River and is a popular river rafting area. USFS is studying some reaches of the East Fork in California for possible inclusion in the federal Wild and Scenic River system.

The watershed supports two subspecies of threatened trout, the Lahontan and Paiute cutthroat trout. Heenan Lake, which contains a population of Lahontan cutthroat trout, was recently named as one of six waters statewide in DFG's "Heritage Trout Program." As a result of the Sierra Nevada Ecosystem Project (SNEP), the East Fork Carson River has been recognized as a potential "Aquatic Diversity Management Area", and its tributaries, Silver King Creek above Llewelyn Falls, and Whitecliff Lake, as "Significant Natural Areas (Aquatic)". The East Fork was given an "Index of Biological Integrity" (IBI) score, based on the diversity of aquatic communities, in the "good" range (only seven of 100 Sierra Nevada streams scored "excellent"). The upper reach of the West Fork was also rated "good" (UCD, 1996). See the SNEP report (UCD, 1996) for more information on the East Fork.

The Pacific Rivers Council (1998) identified the East Fork Carson River as an Aquatic Diversity Area due to the presence of eight native fish species and a native amphibian, the mountain yellow-legged frog. The East Fork above Carson Falls, Murray Canyon, and Poison Flat Creeks were identified as "Critical Refuges" for the Lahontan Cutthroat trout, and Silver King, Corral Valley, and Coyote Valley Creeks were identified as Critical Refuges for the Paiute cutthroat trout. The "Aquatic Diversity Area" and "Critical Refuge" designations relate to the degree of intactness of natural ecosystem processes and the probability that protection of these areas will promote ecosystem recovery in the long term (The Pacific Rivers Council, 1998).

Most of the California portion of the Carson River watershed is in public ownership, and the local economy depends heavily on tourism. (The watershed also includes lands of the Washoe Tribe of California and Nevada.) Cattle ranching is important in the lower sections of the East and West Fork watersheds, and grazing on rangeland extends to the upper watersheds. Water diversions are limited by the California-Nevada Interstate Water Compact and a court decree. Water is released from several small California reservoirs for use in Nevada (DWR, 1991). Recently, DFG has been acquiring private water rights to maintain lake levels and support instream flows for aquatic life uses. Treated wastewater exported from the South Lake Tahoe area is stored in the STPUD's Harvey Place Reservoir and released for use in pasture irrigation. The permanent population of Alpine County is about 1,100; about half of these people live in the Carson River watershed, mostly in and near the communities of Markleeville, Woodfords, and Paynesville, and in the Woodfords Indian Community.

2.3b Water Quality Problems and Issues

Acid mine drainage and sedimentation problems associated with the inactive Leviathan Mine have impaired water quality and instream uses in downstream waters. (As shown in Figure 2.3, the Bryant Creek watershed is tributary to the East Fork Carson River in Nevada.) Bryant Creek has been on the CWA Section 303(d) list of impaired water bodies since the adoption of the 1975 North Lahontan Basin Plan (California Regional Water Quality Control Board, 1975). The segments of its tributaries Leviathan and Aspen Creeks affected by mine drainage were added to the list during the 1980s. The listings are for metals, but low pH and high levels of sulfate in the acid mine drainage are also of concern.

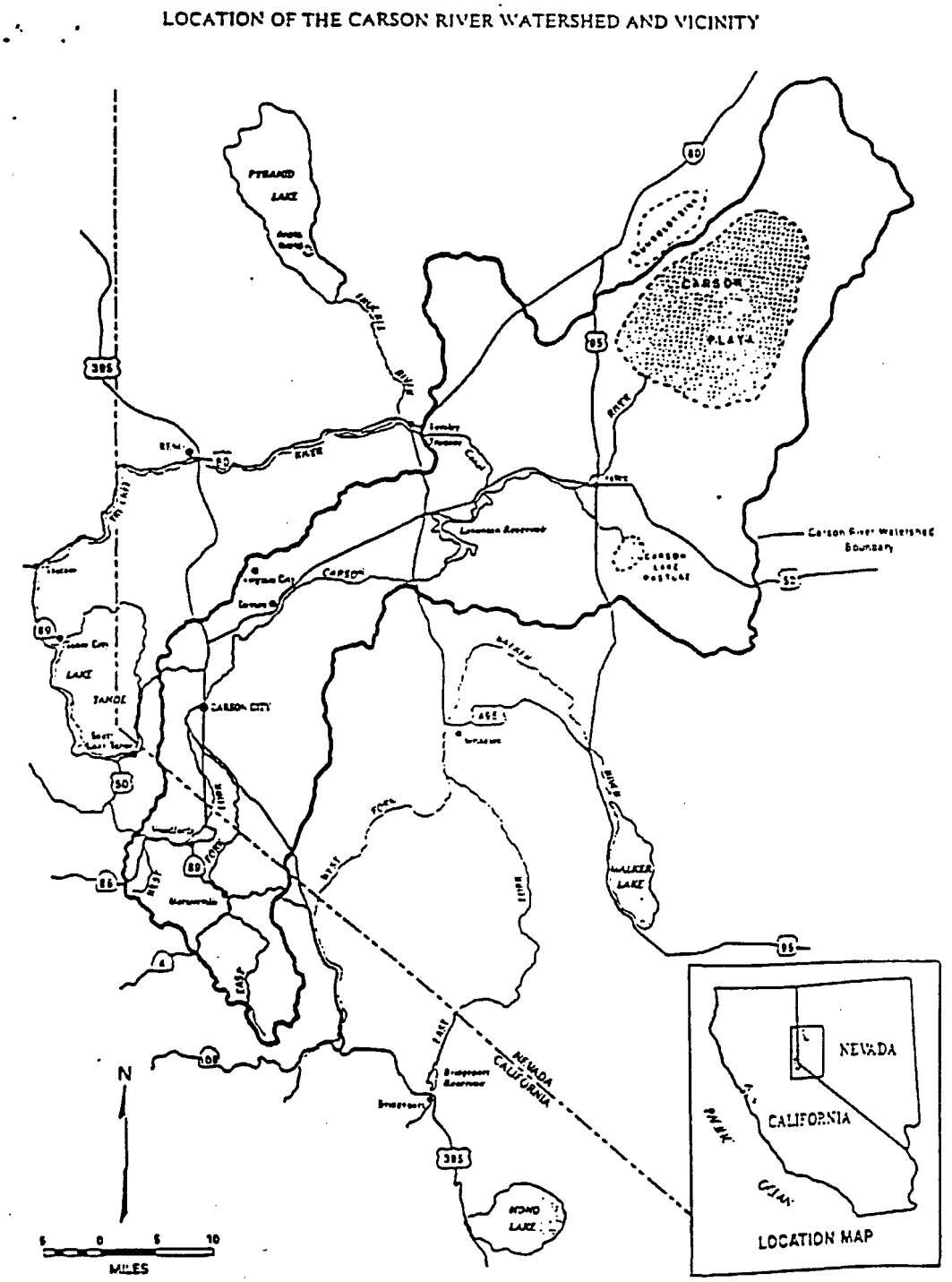
About 40 other inactive mines are located throughout the watershed. USFS, Toiyabe National Forest, (1998) surveyed inactive mines in the Carson and Walker River watersheds during the summer of 1997, and noted the presence of acid mine drainage, unstabilized tailings, etc. Earlier biomonitoring also indicates problems possibly related to acid mine drainage in certain stream segments. An LRWQCB-sponsored study (Vinyard and Watts, 1992) showed degradation of aquatic communities in Monitor Creek. Elevated levels of metals in fish tissue have been found in fish tissue samples collected from the East and West Forks, Monitor Creek, Silver Creek, and Indian Creek Reservoir and from several tributaries under the SWRCB's TSMP (e.g., California SWRCB, 1997). (For the purposes of the TSMP, "elevated" means levels at or above the 85th percentile of all samples collected statewide since 1978.) Additional study of the water quality impacts of inactive mines in the Carson River watershed is proposed as part of the WMI effort.

The East Fork Carson River is Section 303(d)-listed due to pH criteria violations near the state line, which may have been the result of 1980's drought conditions. The West Fork also has historic boron, mercury, and coliform criteria violations near the State line. Indian Creek Reservoir is CWA Section 303(d) listed due to eutrophication and Indian Creek due to aquatic habitat degradation. STPUD's monitoring of surface waters in the lower watershed shows very high levels of coliform bacteria which cannot be attributed to reclaimed wastewater discharges. This may indicate a need for better manure management on pasture lands. Livestock grazing has damaged stream geomorphology and riparian vegetation in Hope Valley. A federal General Accounting Office report identified watershed problems related to grazing on National Forest lands in the upper East Fork watershed. The SNEP report (University of California, Davis, 1996) identified human impacts on aquatic and riparian habitat in the East Fork watershed including grazing of meadows, camping, and fishing including heavy fishing pressure near highways, mine tailings, wastewater effluent, and introduced trout which compete with native species. Grazing impacts are a special concern with respect to the potential for recovery of the threatened Paiute cutthroat trout and the SNEP report concludes (Vol. II, page 958) that "full recovery will require the exclusion of grazing from the riparian areas and meadows".

Flooding in January 1997 caused additional watershed damage. In the summer of 1997, LRWQCB staff observed turbidity problems in the East Fork possibly related to recreational dredge mining. Other issues in these watersheds include highway and urban runoff, septic systems, forest management activities, potential impacts of the Markleeville Public Utility District's wastewater disposal system, and the relationship between water quantity and water quality.

The spread of exotic weeds, such as tall whitetop (*Lepidium latifolium*) into riparian and wetland areas of the Carson and Truckee River watersheds has recently become an important issue. Such weeds can have significant impacts on natural ecosystems by outcompeting native plants and affecting the quality of food and habitat available to animals. However, the impacts of potential control measures such as herbicides on water quality and beneficial uses are also of concern. The Lahontan Basin includes a regionwide water quality objective that provides that there shall be no detectable pesticides in waters of the Region. All waters of the Carson River watershed in California are designated for the Municipal and Domestic supply (MUN) beneficial use and are considered sources of drinking water under Proposition 65.

Figure 2.3 Carson River Watershed



The Carson River watershed efforts of the LRWQCB involve both continued cooperation with the California-Nevada "Upper Carson River CRMP group" and outreach to previously uninvolved stakeholders in the California portions of the watershed. LRWQCB activities to protect and enhance water quality and beneficial uses in the Carson River watershed are expected to occur in cooperation with activities of a number of other public entities including but not limited to the following: USEPA, USFS, U.S. Bureau of Land Management, NRCS, USCOE, DFG, CDF, California Department of Transportation, California Department of Parks and Recreation, Alpine County, Alpine Resource Conservation District, Woodfords Indian Community, and STPUD. Potential private stakeholder groups include the High Sierra Fly Casters, the Friends of Hope Valley, the Sierra Club Toiyabe Chapter, and other environmental and recreational user groups As the result of the first "Carson River Conference" held in April 1998, stakeholders for the Upper Carson River Watershed (in Alpine County California and Douglas County Nevada) closer coordination with three other stakeholder groups in the lower reaches of the River in Nevada. The Carson Water Subconservancy District, which has authority only in Nevada, has been designated to coordinate watershed group activities for the entire Nevada portion of the watershed. Its role with respect to California watershed activities has not yet been determined. The Upper Carson River group has hired a full-time coordinator for implementation of the bi-state voluntary management plan in Nevada.

Communication and cooperation among public agencies and the private sector is expected to be an important aspect of the development of BMPs and watershed restoration programs on private and public lands in the Carson River watershed. Public outreach in the form of watershed education and stakeholder meetings will be used to generate and encourage of public participation in the watershed approach. Other opportunities for public participation will occur in connection with consideration of permits, enforcement actions, status reports, and Basin Plan amendments at LRWQCB meetings.

Section 2.4 Long Hydrologic Area, Owens River (4 of 5 Focus Watersheds)

2.4a Watershed Overview

The Owens River has been selected as a priority watershed because of the high resource value of its waters. The entire Owens River watershed is designated as a 'Category 1' Priority under the California Unified Watershed Assessment prepared in accordance with the federal Clean Water Action Plan. For purposes of the WMI, the upper reaches of the Owens River system (Figure 2.4(a)[1]), known as the Long Hydrologic Area (Figure 2.4(b)[2]), has been selected as a target subwatershed. The LRWQCB intends to modify and apply any watershed management strategy developed for Long Valley to the entire Owens/Mono watershed in the future. The Long Hydrologic Area overlies the geographic area where the two LRWQCB offices (Victorville and South Lake Tahoe) generally divide responsibility; thus, effective communication between the two offices is very important to the successful implementation of WMI within the watershed.

[1] Figure 2.4(a) is modified from the "Draft Environmental Impact Report for the Review of the Mono Basin Water Rights of the City of Los Angeles, May 1993" prepared by Jones, Stokes and Associates.

[2] Figure 2.4(b) is modified from the Geographic Information System maintained by the Inyo National Forest.

The Long Hydrologic Area is located in Mono County and encompasses approximately 380 square miles. It includes the upper reaches of the Owens River above Crowley Reservoir. Within the watershed are numerous alpine lakes at the higher elevations of the eastern Sierra Mountains. A few peaks in this watershed are at elevations of over 12,000 feet above mean sea level. Within the watershed, numerous streams flow eastward to the Owens River, the principal of which are Mammoth, Deadman, Glass, Hot, McGee, Convict, and Hilton Creeks. The headwaters of the Owens River is considered the "Big Springs". An ancient volcano, known as the Long Valley Caldera forms the topographical shape of the Long Hydrologic Unit into an elongated oval. Volcanic activity in the area is recent. The low point in the watershed is formed by Crowley Reservoir constructed in 1941 which has a spillway elevation of 8,781 feet above mean sea level. The following major land owners within the watershed manage over 90 percent of the land area:

USFS, Inyo National Forest;
U.S. Bureau of Land Management (BLM), Bishop Resources Area; and
City of Los Angeles, Department of Water and Power (LADWP).

The Inyo National Forest includes the John Muir trail and several federal wilderness areas. The LADWP owns several reservoirs, which also receive heavy recreational use. A variety of unique species and subspecies of fish, wildlife, and aquatic invertebrates exist in the Owens River watershed, including the endangered Owens tui chub. DFG has identified a number of "Significant Natural Areas" with unique biological attributes in the watershed. The University of California operates the Sierra Nevada Aquatic Research Laboratory near Convict Lake.

The Town of Mammoth Lakes is the only incorporated community in the Long Hydrologic Area, which also includes a number of small unincorporated communities. The Town of Mammoth Lakes, with a permanent population of about 5,000, accounts for 3.7 million visitor-days annually and serves as a gateway for increasing recreational use of federal lands in the area. The Town of Mammoth Lakes has been growing rapidly with new residential, commercial, industrial (e.g., geothermal energy) and recreational (e.g., golf course and ski area) developments proposed.

Hot Creek Hatchery, operated by the DFG, supports a large regional recreational fishery by providing fish stock for planting in other rivers and lakes. Crowley Lake is one of the largest and most used trout fisheries in California. Livestock grazing occurs on both public and private lands. After construction of the Los Angeles Aqueduct in 1913, the waters of the Owens River

Mono-Owens Watersheds

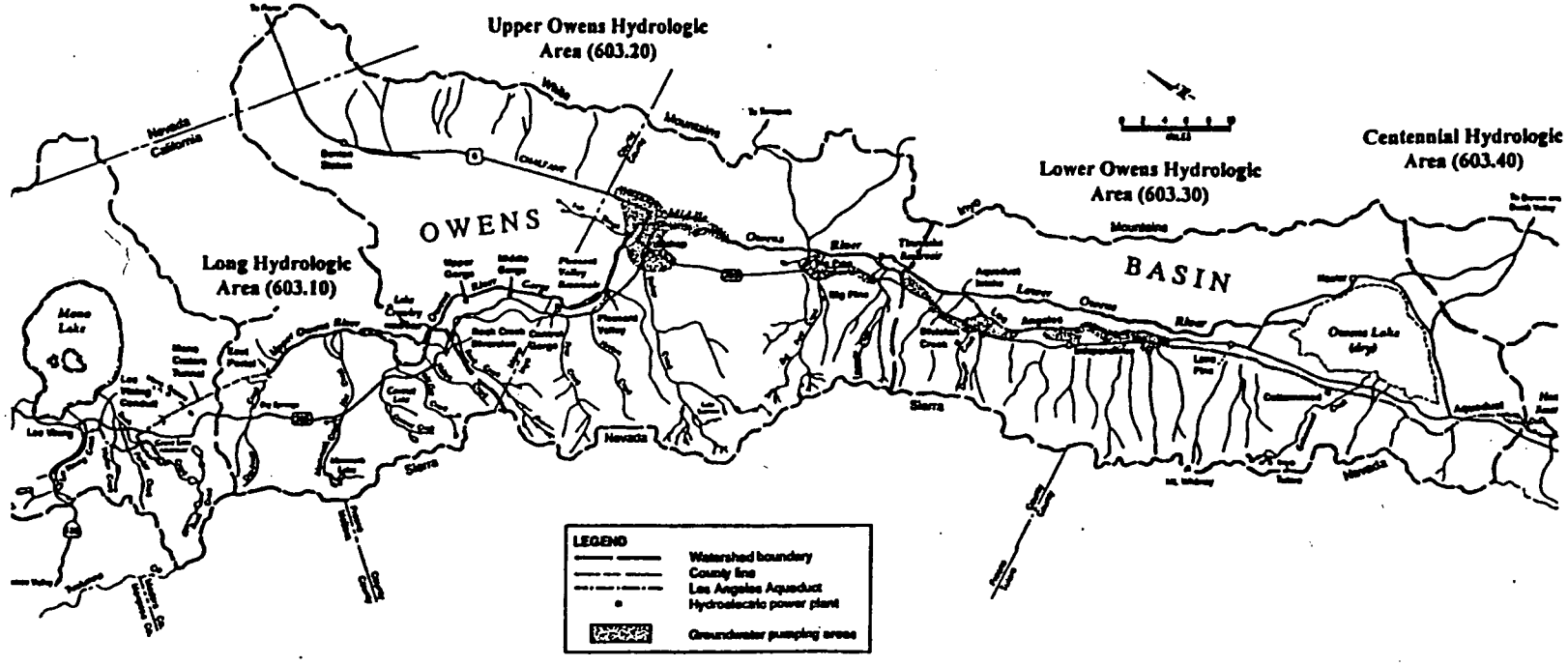
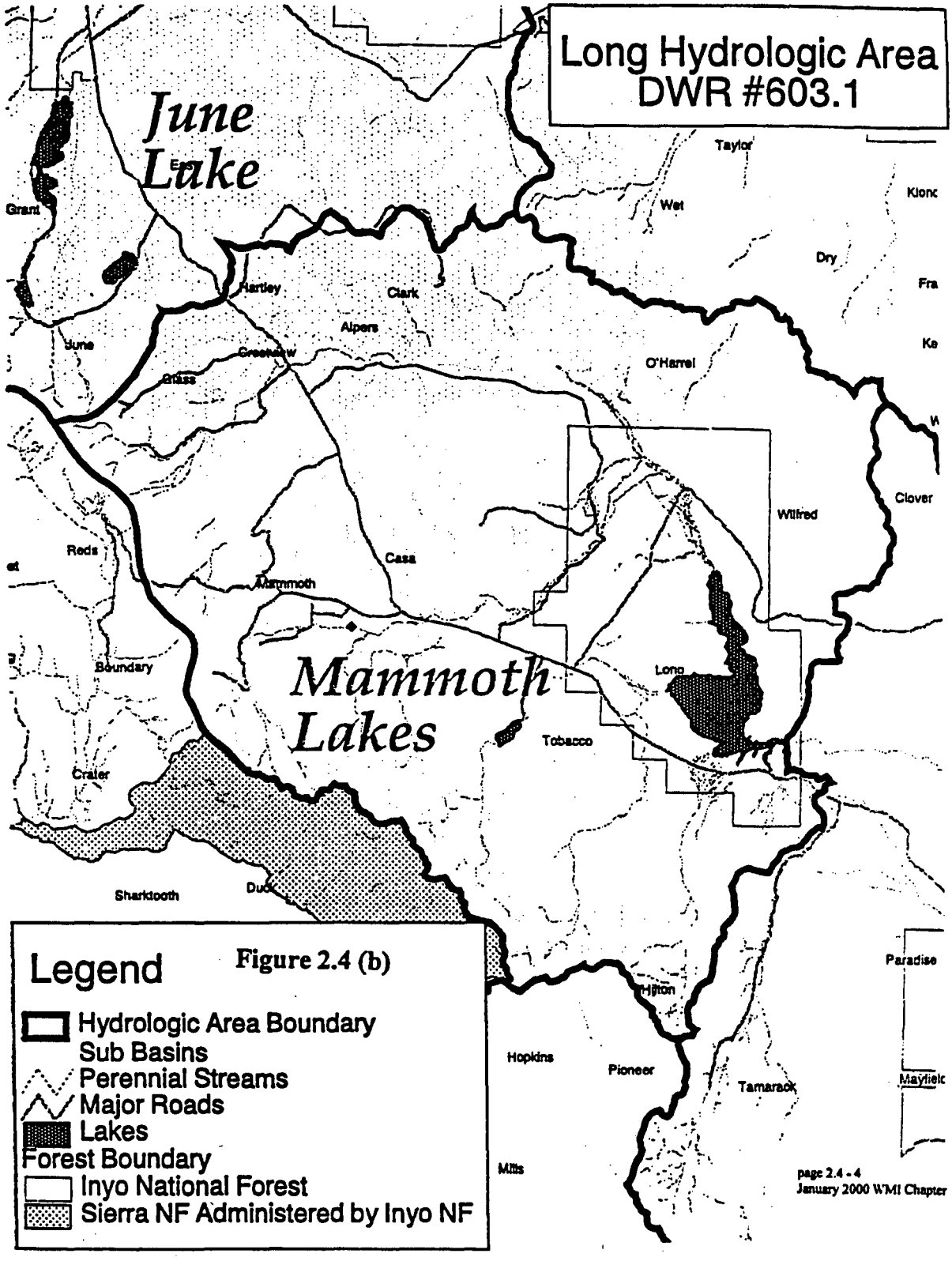


Figure 2.4(a) -- Mono Owens Watersheds

Figure 2.4(b) --Long Hydrologic Area



have been transported out of the Owens River watershed further downstream. From 1941 to 1989, streams from the Mono Lake Basin have been diverted by the LADWP from Grant Reservoir through a tunnel into the Owens River. Limited diversion still occur and may increase as Mono Lake reaches levels established by the SWRCB. Together with the tributaries to Mono Lake, the entire Owens River watershed provides significant domestic water supplies to the Los Angeles metropolitan area. Both the Mono and Owens Hydrologic Units are interior draining, closed hydrologic basins with no natural outlet of surface waters.

2.4b Water Quality Problems and Issues

The water quality of the snowmelt runoff from the higher elevations of the eastern Sierra mountains is excellent. This water recharges groundwater and contributes to surface waters of the basin. At lower elevations, there are areas with naturally occurring poorer water quality, primarily due to geothermal altered waters from volcanic activity. The great demand for the high quality waters and for the recreational opportunities in the eastern Sierra region have allowed human caused influences that have degraded or threaten to degrade these high quality waters. Some water bodies in the watershed are listed as Water Quality Limited Segments under the federal CWA.

The LRWQCB conducted numerous stakeholder meetings from 1997 on into 1999. Based upon stakeholder input received during those meetings and LRWQCB's own review of watershed issues in the Long Hydrologic Unit, the following watershed issues were identified:

(A) Cooperative Relationships with Stakeholders - Maintaining a cooperative relationship with stakeholders to effectively implement the WMI and to demonstrate a long-term commitment for improving water quality.

(B) Water Quality and Quantity Relationships - Long-term water quality of Crowley Reservoir from all upstream effects (point and nonpoint sources) and development of an appropriate monitoring plan to quantify these loading.

(C) Wetlands and Riparian Habitat - Impacts to wetlands and riparian habitat losses and establishing regional wetlands restoration projects or wetlands mitigation banks.

(D) Surface Water Discharges - Development of environmentally acceptable plans and subsequent permit actions for the use of reclaimed treated wastewater, storm water runoff, and other direct discharges into surface waters.

(E) Development of TMDLs for Water Quality Limited Segments - Adoption of TMDLs and establishment of a long term management strategy to minimize future impacts where appropriate.

(F) Continued LRWQCB Oversight of Other Water Quality Issues - Continued LRWQCB oversight of the other water quality issues in the Long Hydrologic Area.

The following are expanded discussions of these issues:

(A) Cooperative Relationships with Stakeholders

Because so much of the land in the Owens River watershed, and specifically Long Hydrologic Area, is publicly owned, the LRWQCB activities to protect and enhance water quality and beneficial uses are expected to occur in cooperation with the following public entities:

- U.S. Forest Service, Inyo National Forest;
- U.S. Bureau of Land Management, Bishop Resources Area;
- U.S. Natural Resource Conservation Service;
- U.S. Army Corps of Engineers;
- U.S. Fish and Wildlife Service;
- U.S. Environmental Protection Agency;
- California Department of Fish and Game;
- California Department of Forestry and Fire Protection;
- California Department of Transportation;
- California State Water Resources Control Board, Division of Water Rights;
- Mono County;
- Town of Mammoth Lakes;
- Mammoth County Water District;
- Los Angeles Department of Water and Power; and
- University of California, Sierra Nevada Aquatic Research Laboratory, and White Mountain Research Station.

Cooperation with the private sector in voluntary implementation of BMPs and watershed protection and restoration programs on private lands is also expected to be important. Opportunities for public participation will be provided on an ongoing basis through consideration of permits, enforcement actions, status reports, and Basin Plan amendments at LRWQCB meetings, through technical and/or policy advisory committees for grant-funded projects, and through periodic watershed stakeholder meetings.

The LRWQCB has indicated in the stakeholder meetings that it will intend to use the following approach to keep stakeholders informed and aware of WMI issues and to allow for public input in the process.

- Use the Mono County Collaborative Planning Team as one forum for discussion of policy related issues,
- Use the Long Valley Hydrologic Advisory Committee (LVHAC) and Owens Valley Interagency Committee meetings as one forum for discussion of technical related issues,
- Use periodic LRWQCB Workshops for an expanded forum with the public and LRWQCB members,
- Hold periodic stakeholder meetings for additional public input,

- Continue periodic mailings to interested stakeholders, and
- Use specific stakeholder groups or subgroups to address general or specific issues that arise (e.g., LVHAC's Cold Water Subgroup for issues relating to Mammoth Creek).

(B) Water Quality and Quantity Relationships

Due to a generally arid climate, the large quantity of water diversions (both surface and groundwater) and an increasing demand on the resource, the relationship between water quality and quantity are significantly interrelated in the entire Owens River watershed. *The long-term water quality of Crowley Reservoir from all upstream effects is identified as a high Watershed Management Initiative priority.*

LADWP Diversions

The entire LADWP Aqueduct system delivers an average of 470,000 acre feet per year of water. From 1941 until 1989, streams in the Mono Basin were diverted to the Owens River from Grant Lake through the Mono Craters Tunnel. From 1974 to 1989 the average yearly diversion was 83,000 acre feet. From 1990 to 1994, the Superior Court ordered that no diversions were allowed between 1990 to 1994 until the SWRCB Water Rights hearings were complete. The SWRCB's Mono Basin Water Rights Decision No. 1631 allowed diversions to continue in a "step-up" fashion under certain conditions. The two primary factors that govern the export of Mono Basin water into the Owens Basin are that (1) the fisheries in streams that feed Mono Lake be maintained and that (2) the Mono Lake elevation is stabilized at 6,377 feet above mean sea level.

The historical diversions (of Grant Lake water into the River) resulted in channel morphology changes and served to lower alkalinity in the natural Owens River system. After the Mono Lake level stabilizes at 6,377 feet above mean sea level, diversions of Mono Basin water into the Owens River are expected to increase to as much as 30,000 acre feet per year. The LRWQCB adopted water quality objectives in the 1975 Basin Plan and incorporated into the revised 1995 Basin Plan that were based on Owens River water quality which included water diverted from Grant Reservoir through the Mono Craters Tunnel. The reduced diversions into the Owens River have an unknown effect on maintaining water quality. The Basin Plan water quality objectives should be reviewed as part of establishing TMDLs discussed later.

Crowley Reservoir

Crowley Reservoir is the natural low point for the entire Long Hydrologic Area. Most of the water from this reservoir is transported to hydroelectric power plants downstream; some is used to support a recently reestablished fishery the downstream Owens River Gorge. On numerous occasions, most recently in fall 1996, releases of water containing low dissolved oxygen levels from Crowley Reservoir resulted in severe fish kills downstream in Pleasant Valley Reservoir. LADWP has made modifications to the Gorge power plants for air injection during conditions of low dissolved oxygen. The cause of the fish kill is believed to be due to elevated phosphorus and

low inorganic nitrogen levels in Crowley Reservoir that combined with ideal weather conditions to allow a massive blue-green algae bloom to form. The oxygen in the reservoir was consumed by the biological decay of the algae as it died, depressing dissolved oxygen levels. The sources of nutrients to Crowley Reservoir may be combinations of both natural and human caused sources. The LRWQCB requested LADWP to modify the power generation and reservoir management activities to address this issue. A gradual long term decline in Crowley Reservoir angling successes, beginning in 1987 and persisting through many seasons, aroused public concern. A "Committee To Save Crowley Lake" was formed and requested the DFG to take action. As a result, the DFG adopted a Fisheries Management Plan for Crowley Lake in 1997. The LADWP has implemented a number of management strategies intended to address Crowley Lake issues. These strategies include riparian set-back fencing projects along the Owens River and other creeks upstream of Crowley Reservoir and the installation of equipment to increase dissolved oxygen levels in the Owens River Gorge hydroelectric power plants that release water from Crowley Reservoir into Pleasant Valley Reservoir.

Groundwater Pumping

There are a number of current and proposed groundwater extraction projects that may lower the water table or affect the supply spring water temperature for Hot Creek Hatchery. The DFG is very concerned that the Hot Creek Hatchery water supply be protected. There are existing and proposed geothermal power generation projects near Casa Diablo to the northwest of the hatchery. The zone of pumping and reinjection from these geothermal projects may affect the flow or temperature to the springs. These power plants have constructed spill retention basins to capture fluids should a well blowout or spill occur. Additionally, the Mammoth Community Water District supply wells and proposed commercial development projects near the Town of Mammoth Lakes Airport may lower Mammoth Creek and groundwater levels thereby affecting the springs that feed the hatchery. The LVHAC was formed as a Condition of Approval for the geothermal power plants. The LVHAC meets quarterly to make specific recommendations to the various member agencies based upon data collected from a maintained sampling network; examples include recommendations that better pre-project is collected, and encouraging that GIS capabilities are used to analyze historical data.

(C) Wetlands and Riparian Habitat

Riparian habitat has been degraded from loss of vegetation, stream bank trampling, and loading of nutrients and coliform bacteria to surface waters from livestock wastes, recreational uses, and urban and commercial development. *Impacts to wetlands and riparian habitat loss is identified as a high WMI priority.*

Wetlands

Construction for residential, commercial, and recreational development has disturbed steep slopes and wetlands. The LRWQCB has utilized approximately $300,000 to define and map

wetland areas within parts of Mono County. Wetlands mapping has been completed for parts of the Long Hydrologic Area. The maps and a related report are available in the Mono County Planning office or from the LRWQCB.

The LRWQCB is working with Mono County to identify potential restoration sites within the County, and to plan and pursue the implementation of the restoration sites. The LRWQCB also is coordinating with Mono County Collaborative Planning Team to explore establishing these restoration sites and to establish a better permitting process for projects with wetlands impacts.

Livestock Grazing

Livestock grazing is conducted by individual landowners on private lands or on leases of land from the major land managers in the watershed--the USFS, BLM, and LADWP. Most LADWP land is located in valley bottoms and meadows incorporating streams and riparian areas. DFG has noted that riparian vegetation is essentially absent along the Upper Owens River. The LADWP is implementing specific management plans on various grazing leases designed to protect riparian areas from overgrazing through the fencing projects already mentioned and other BMPs. In the past, the LRWQCB has requested periodic status reports on these projects because specific complaints from the public were received. On LADWP and other non-federal lands, the LRWQCB will rely on the three-tier grazing management approach outlined in the Water Quality Management Plan for Livestock Grazing on Non-Federal Lands adopted by the SWRCB as part of the statewide nonpoint source waste management strategy. The USFS has developed Allotment Management Plans for each of their grazing allotments which prescribe BMPs for grazing and timber harvesting. The LRWQCB relies upon a Management Agency Agreement requiring the USFS to protect water quality on USFS lands through use of BMPs. The BLM used Allotment Management Plans for the grazing allotments in its Bishop Resources Management Area.

(D) Surface Water Discharges

There are a number of existing or proposed discharges that may have a direct impact on surface water quality. A number of these issues may require LRWQCB regulatory actions to be taken. *The development of environmentally acceptable plans and subsequent permit actions for the use of reclaimed treated wastewater and other direct discharges into surface waters are identified as high WMI priorities.*

Reclaimed Wastewater

The Mammoth Community Water District (MCWD) operates the largest wastewater treatment facility in the Long Hydrologic Unit currently disposes wastewater in a natural depression known as Laurel Ponds. The DFG is concerned that the Laurel Ponds are a breeding area for a population of tiger salamanders which are likely an exotic species that pose a threat to the Hot Creek Fish Hatchery and the native Owens Tui chub (endangered species). The MCWD is preparing environmental documents to support an upgrade of treatment facilities which would allow for the delivery of treated reclaimed wastewater to be used on two golf courses located in

the Town of Mammoth Lakes. Currently, the Basin Plan contains a prohibition against discharge of waste above an elevation of 7,650 feet in the Mammoth Creek Watershed. During an LRWQCB Workshop held in July 1997, the following issues were identified:

- Demonstration that the reclaimed wastewater will meet all appropriate water quality criteria
- Resolution of impacts from reduced flows to Laurel Ponds
- Conversion of the existing waste discharge requirements into a federal NPDES permit
- Adoption of a Basin Plan Prohibition Exemption to allow the reclaimed wastewater to be used above 7,650 feet
- Evaluating the wetlands impacted from changes in flow to Laurel Ponds

The LRWQCB is responsible for completing the permit modifications needed to allow the use of reclaimed wastewater.

Fish Hatcheries

There are two fish hatcheries discharging water directly to the surface waters; Hot Creek Hatchery operated by the DFG and Alpers Ranch. In 1999, the LRWQCB is revising the NPDES permit for the Hot Creek Hatchery. The effluent quality from the Alpers Ranch must be evaluated and an NPDES permit may be adopted if appropriate.

Whitmore Pool

The Whitmore Pool is a natural hot springs used for public swimming. Chlorine is added to the influent pool water supply. The pool effluent then naturally flows into a wetlands downstream of the pool. The discharge may affect aquatic invertebrates in the wetlands which is identified as a sensitive biological area in the 1996 USFWS Owens Basin Wetland and Aquatic Species Recovery Plan.

Storm Water

The LRWQCB uses the Storm Water Program element of the federal NPDES permit system to regulate storm water discharges that may cause erosion from industrial sites (e.g., Mammoth Lakes Airport and Mammoth Mountain Ski Area), construction sites (over 5 acres), and municipalities. Storm water from urban runoff in the Town of Mammoth Lakes and other areas contains grease, trace pesticides, herbicides, heavy metals, and elevated total dissolved solids that adversely affect beneficial uses of waters. The Town of Mammoth Lakes continues to implement a 1985 Storm Water Master Plan as funds become available. In 1997, the Town of Mammoth Lakes was awarded a grant under CWA Section 319(h) for construction of a second sedimentation basin on Murphy gulch as part of that plan. To protect Mammoth Creek, the Town of Mammoth Lakes and the LRWQCB have entered into a Memorandum of Understanding to implement Basin Plan guidelines. For new development projects in the Town of Mammoth Lakes, the guidelines require that all runoff from a 20-year, one-hour storm be retained on site and infiltrated. The long-term effectiveness of the Basin Plan guidelines, which

require the retention and infiltration of runoff water on site and changes resulting from construction of storm water control facilities to implement the 1985 storm water plan are unknown and should be further evaluated between the LRWQCB and Town of Mammoth Lakes. Construction activity in the Mammoth Lakes area is expected to increase dramatically in the next few years as more recreational use support-related projects are developed.

(E) Development of TMDLs for Water Quality Limited Segments

The Owens River and some of its tributaries are listed as Water Quality Limited Segments under CWA Section 303(d). The adoption of TMDLs for these Water Quality Limited Segments will include the point/nonpoint source wasteload assessment process and the implementation process for achieving load reductions. Because current federal guidance for TMDLs emphasizes development of watershed management plans which set goals for percentage reductions of pollutant loads over time through implementation of BMPs, watershed restoration plans, or other appropriate controls, the WMI approach is expected to be a very important in the completion of TMDLs for 303(d) listed waters.

In January 1998, the LRWQCB adopted a revised list of Water Quality Limited Segments (303[d] list) which included a time schedule for TMDL development. The schedule for developing and adopting TMDLs for water bodies in the Long Hydrologic Area is dependent on resource allocations, data availability, and guidance from the SWRCB and USEPA.

Water Body Name	Pollutant or Stressor
Hot Creek (2)*	metals
Little Alkali Lake*	salinity
Little Hot Creek*	metals
Big Springs*	arsenic (and phosphorus)
Owens River - Long HA	arsenic
Owens River - Long HA	habitat alteration
Crowley Lake	nutrients
Owens River - Long HA (Phase II)	arsenic
Owens River - Long HA (Phase II)	habitat alteration
Twin Lakes	nutrients

* Because the pollution into these waters is from natural causes (e.g. geothermal, volcanic) , the LRWQCB is planning actions in FY 1999-00 that should make it possible for these waters to be removed from the CWA Section 303(d) list. For more information, please see Section 3.1 of this Chapter.

(F) Continued LRWQCB Oversight of Other Water Quality Issues

There are other waste discharges, such as those described below, that have affected water quality. The LRWQCB will continue to work on these issues. Historically, the LRWQCB has focused regulatory efforts on point source pollution control. More recently nonpoint source pollution control has been emphasized through implementing BMPs. The LRWQCB will continue to support early identification of potential future water quality issues in the early stages of new project development through the environmental review process. The LRWQCB will continue to use staff time for facility inspection, oversight, and updating waste discharge requirements.

The Benton Crossing landfill, operated by Mono County, is the only permitted landfill in the Long Valley watershed. Low levels of volatile organic compounds have been detected in groundwater beneath the landfill. Leaks associated with USTs have impacted groundwaters and are remediated under the direction of Mono County for soil only cases and the LRWQCB for groundwater cases. Direct spills of pollutants may affect both ground and surface water beneficial uses. For example, the LRWQCB took a 1996 enforcement action against an operator of a site that discharged waste oil into the Murphy Gulch drainage. Other than the MCWD, there are three other regulated wastewater treatment plants in the Long Hydrologic Area: Hilton Creek Community Services District, Convict Lake Campground, and Mammoth Mountain Ski Area. (Mammoth Mountain Ski Area currently discharges to unlined ponds which the LRWQCB is working with the discharger to upgrade). On-site septic systems are used throughout the remainder of the Long Hydrologic Area watershed and are permitted by the Mono County Health Department. A Memorandum of Understanding exists between the LRWQCB and Mono County to implement regional septic system criteria.

Nonpoint sources (both natural and human caused) may provide the greatest pollutant loading to surface waters in the Long Hydrologic Area. Some of the contributors, such as storm water runoff, have been addressed above. Limited commercial timber harvesting occurs in the Inyo National Forest primarily of Jeffrey Pine and Red Fir. Water quality problems may result from erosion and riparian vegetation disturbance in connection with limited timber harvesting or other forest management activities, such as recreational uses and access roads. Humans and cattle are potential carriers of *giardia, cryptosporidium* and other microbial pathogens that may become waterborne and cause disease in humans. The impacts of heavy back country recreational use on watershed condition and of back country human waste disposal on water quality may also be locally significant. In 1991, a Health Advisory was issued for Mammoth Creek. Crowley Lake is open to body contact sports, such as water and jet skiing. Boating is allowed if holding tanks are provided; however, there are no pump out facilities provided. Other lakes in the Region, such as Lake Tahoe, have been found to contain MTBE, an oxygenate additive to gasoline that causes odor in drinking water at low concentrations. The presence of MTBE in lakes may be due to releases from marinas during boat refueling or from boat exhaust. No MTBE data is available for Crowley Reservoir. Extended day use or camping in areas with no sanitary or trash disposal facilities results in some human waste and other debris covering the shoreline. Outdoor recreational visitor use of the federal lands in the watershed is

increasing. Water quality impacts of these activities are unknown but may be locally significant. Off road vehicle use in wetland areas is reported to occur near Benton Crossing which caused damage to plant life.

Section 2.5 Mojave River (5 of 5 Focus Watersheds)

2.5a Watershed Overview

The Mojave Watershed encompasses approximately 4,500 square miles and is located entirely within San Bernardino County (see Figure 2.5). The total population in the watershed is approximately 230,000 and is expected to grow to nearly one-half million by the year 2015. Much of the existing and projected future population is concentrated in the Victor Valley, which includes the incorporated cities of Victorville, Hesperia, Apple Valley, and Adelanto.

The primary geographic and hydrologic feature of the watershed is the Mojave River. The headwaters of the Mojave River are in the San Bernardino Mountains, which annually receives greater than 40 inches of precipitation at its highest elevations. Much of the winter precipitation in the San Bernardino Mountains is in the form of snow which provides spring recharge to the Mojave River system. Historically, the annual recharge from the headwaters is approximately 75,000 acre-feet. The Mojave River channel, through both surface and subsurface flow, transects the watershed a linear distance of approximately 120 miles to its terminus at Silver Dry Lake near the Community of Baker. Aside from intense storm events, the Mojave River channel is typically dry downstream of the Mojave Forks Dam except in select locations where groundwater is forced to the surface by geologic structures.

The Mojave River has been selected as a priority or "focus" watershed because of numerous water quality issues. Historically known for its agricultural, industrial and military land uses, the Victor Valley has significantly changed during the last several decades into a satellite of southern California's urbanization. Urban growth has significantly modified the arena of waste discharges which could potentially affect water quality, including storm water and wastewater treatment. There are also numerous water quality issues associated with past and current agricultural, industrial, and military land uses throughout the watershed. Because of water quality degradation associated with past industrial activities, the Mojave River is listed as a water quality limited segment for priority organics on the federal Section 303(d) list of impaired water bodies.

Typical of southwestern arid environments, the Mojave Watershed has limited water resources. Surface water from the headwaters in the San Bernardino Mountains quickly percolates into the porous sands of the young Mojave River alluvium. Thus, groundwater is the primary source of water supply in most of the watershed. In a constant state of overdraft since the 1950s, the groundwater resources of the Mojave Watershed were formally adjudicated in 1996 through a stipulated judgment. The stipulated judgment is currently under appeal.

2.5b Water Quality Issues and Problems

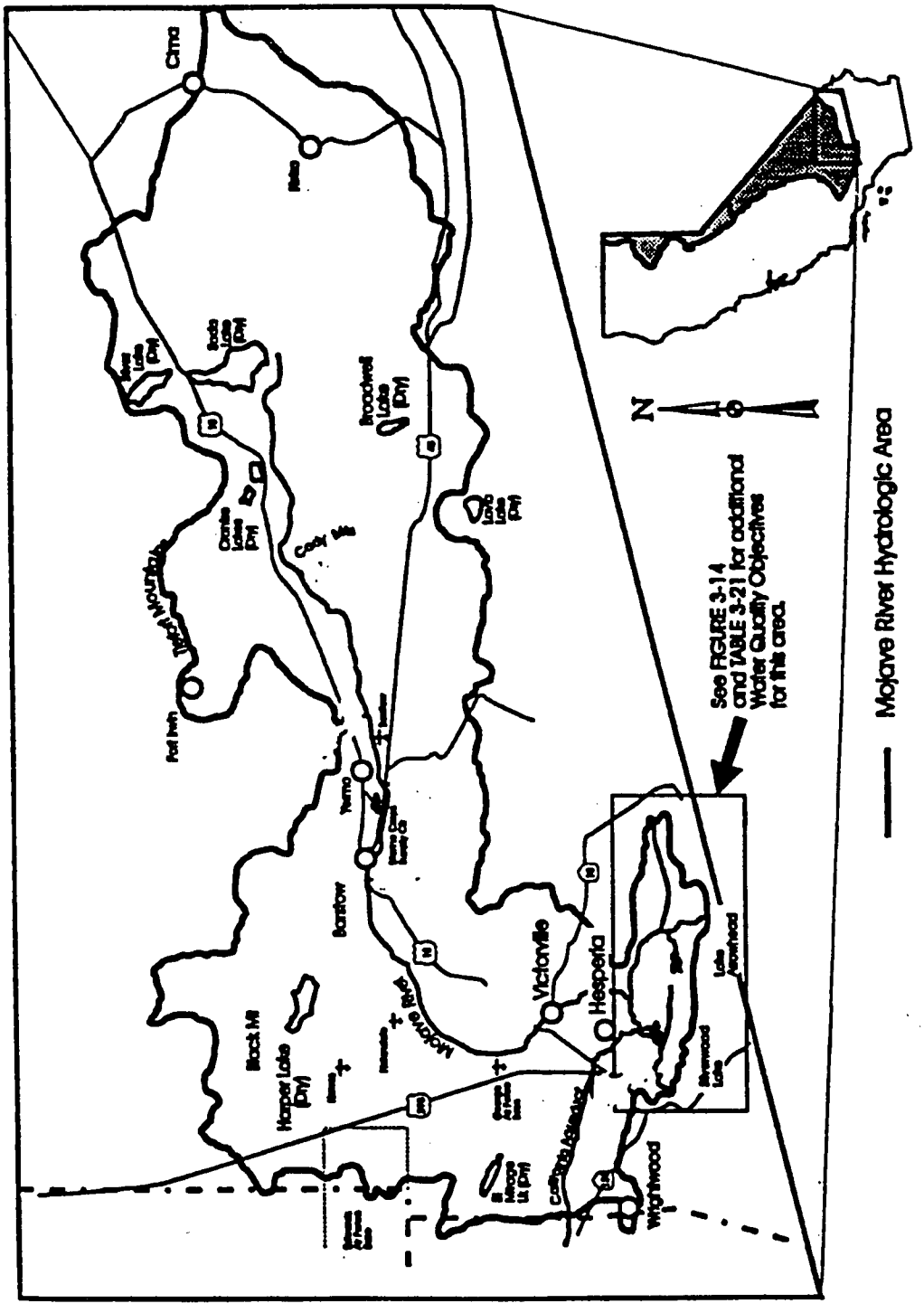
Water Quality Planning

Water Quality Standards -- In the early 1970s the LRWQCB evaluated existing surface water quality data for the Mojave Watershed. The majority of these data had been collected by DWR and USGS and includes data from the turn of the 20th Century. Based on these data, the LRWQCB adopted numerical water quality objectives (WQOs) for inorganic constituents in surface waters of the Mojave River and several of its tributaries in the San Bernardino Mountains. These numerical standards generally represented native or "background" water quality.

In the early 1980s, the LRWQCB adopted numerical WQOs for groundwaters of the Mojave River. These numerical WQOs apply to "reaches of the Mojave River which flow underground in a confined channel" and were developed based upon available groundwater data collected by the DWR and the USGS from wells within approximately one-half mile of the Mojave River. Since adoption of these WQOs, there have been numerous changes in the watershed that can affect water quality. These changes include urbanization, overdraft conditions, improved wastewater treatment technologies, regionalization of wastewater treatment, importation of water from California's aqueduct system, dairy land uses, reduction in crop production, and improved industrial waste handling procedures. Furthermore, the LRWQCB has more current knowledge regarding the hydrogeology and hydrochemistry of the Mojave River system. These numerous changes and projected future changes, such as further urban growth, warrant a careful evaluation of the LRWQCB's WQOs to ensure protection of beneficial uses. The evaluation of these objectives will be a long-term process that will require involvement of numerous stakeholders.

For the purpose of evaluating the WQOs, the LRWQCB has assembled two groups of stakeholders. The first group is focused on surface water upstream of the Mojave Forks Dam, which is located near the City of Hesperia. The second group is focused on the groundwaters of the Mojave River flood plain aquifer downstream of the Mojave Forks Dam, and the few downstream locations where groundwater is forced to the surface of the Mojave River flood plain by geologic structures. The overall goal of the sampling effort is to compare existing surface water quality to the WQOs that were developed in the 1970s. The second group developed a sampling and analysis plan, and recently completed the first set of sampling The goals and objectives of these stakeholder groups are defined in more detail under Section 2.5(c) of this Chapter.

Figure 2.5 Mojave River Watershed



Water Quality Objectives in the Barstow Area -- Historic discharges of industrial, commercial, and domestic wastewater degraded groundwater quality in the Barstow area. Degradation of groundwater quality is from several constituents of concern, including petroleum hydrocarbons, phenols, methylene blue additive substances (MBAS), and TDS. Several domestic wells were impacted, and their use was discontinued. Because of this documented groundwater degradation, the Mojave River has been listed as a water quality limited segment on the federal 303(d) list of impaired water bodies. The location and sampling methods for the Barstow area will be evaluated as part of the overall evaluation of water quality standards.

Because of elevated levels of TDS, a remediation project was planned for Barstow. However, the remediation project has never been implemented.

In the late 1980s a study was conducted on behalf of the LRWQCB to evaluate water quality in the Barstow area. The study showed that the organic portion of the water quality degradation was no longer present. It is unknown if the organic constituents biodegraded and/or diluted. The study did evaluate the potential remaining impacts from some inorganic constituents such as nitrate and chloride, but did not fully evaluate the extent of total dissolved solids in the aquifer.

In 1997, the USGS published a technical report documenting the results of a study which examined the nature of the groundwater in the area of the Marine Corps Logistics Yermo and Nebo Bases. This area is immediately downstream of the City of Barstow. The study documents both historic and existing degradation of groundwater quality associated with total dissolved solids. The report identifies the City of Barstow's wastewater treatment plant discharges as the source of the recent groundwater degradation.

The LRWQCB has worked with the City of Barstow since approximately 1990 to identify and eliminate sources of elevated TDS that enter the City's wastewater treatment plant. Through an aggressive source control program, the City has reduced the concentration of TDS in its effluent from greater than 1,000 mg/L to typically less than 800 mg/L.

Overdraft and Imported Water -- The Mojave Water Agency (Agency) is tasked with implementing a regional water management plan. The water importation involves the construction of the 72-mile Mojave River Pipeline with several spreading basins. The quality of the aqueduct water is expected to be of better quality than native groundwater in some downstream areas and of lesser quality closer to the headwaters.

Overdraft of aquifers in the arid southwest is known to be a significant contributor to degradation of groundwater quality. The LRWQCB and the Agency must work together to implement a water management strategy for the Mojave Watershed that takes into account projected urban growth while protecting water resources for beneficial uses.

Storm Water

The specific water quality concerns associated with storm water in desert communities have yet to be fully identified. The typical surface water concerns associated with storm water may not be fully applicable to the watershed because the Mojave River system is dominated by groundwater rather than surface water. The LRWQCB has assembled a stakeholder group that includes representatives from the communities of Apple Valley, Hesperia, Victorville, and Adelanto. The goal of the stakeholder group is to develop a regional storm water management plan that will be ready for implementation by the year 2001. Constituents such as oil and grease, asbestos, pesticides, and herbicides could potentially be of concern. Identification of critical areas of storm water flow and the full list of constituents of concern will be a primary goal of the stakeholder group.

Solid Waste Management

Because of its sparse population, the communities in the Mojave Watershed have historically disposed of solid waste in small landfills located near each of the communities. Due to increased urban population, competition in the solid waste disposal business, and the cost of environmental compliance, the County of San Bernardino has developed a solid waste management plan that involves closing most of the small landfills and transferring waste to regionalized facilities. The small, closed landfills are waiting closure. The two regionalized facilities in the watershed are located in the communities of Victorville and Barstow.

The County of San Bernardino has developed groundwater and soil gas monitoring programs at many of its solid waste management sites. Groundwater monitoring has indicated releases of Volatile Organic Constituents (VOC). Landfill gas is believed to be the primary source of VOCs detected in the groundwater at some sites. Releases of inorganic constituents have also been documented. The LRWQCB has been working with the County of San Bernardino for several years to define the extent of these constituents in the groundwater. There have been no identified impacts to domestic water supply sources at any of these sites. Pilot groundwater extraction systems are in operation as preliminary methods of corrective action.

Septage Management

Although some of the areas of the watershed are serviced by municipal wastewater treatment plants, a significant number of residences and businesses have septic tanks, leachfields, and/or seepage pits. Based on a survey conducted by the County of San Bernardino, a significant number of the septic tanks in the watershed are located within the incorporated areas of the Victor Valley. The County of San Bernardino continues to work with the Victor Valley Wastewater Reclamation Authority and other agencies to develop a regionalized septage management strategy. This strategy will likely include the construction and operation of a septage receiving facility for treatment and disposal. As part of this strategy, the County closed septage ponds at the Victorville landfill; some of the septage is now disposed at the new facility at Adelanto.

Septic Tanks, Seepage Pits, and Leachfields

Although some of the communities in the watershed are serviced by sewer services, many other areas continue to discharge wastewater to septic tanks, seepage pits, and leachfields. The USGS has conducted a study of the potential effects of leaching septic waste to groundwater quality in the Victor Valley. Based on this study, it appears that the septic waste loads minimal amounts of nitrogen compounds to groundwater in the Victor Valley. It is important to note that the findings of this study can only be directly applied to areas of the watershed that have similar climates and hydrogeologic conditions. Additionally, the water quality effects of leaching septic waste, such as the potential for increasing TDS, has not been fully evaluated.

The LRWQCB prohibits the installation of new septic tanks and leachfields in some areas of the watershed. These areas have one or more conditions that could result in degradation of water quality from leaching of septic waste, such as fractured bedrock, high rainfall, and shallow depth to groundwater. Some exemptions are allowed.

Petroleum USTs

The LRWQCB, the City of Victorville, the City of Hesperia, and the County of San Bernardino's Division of Environmental Health implement California's petroleum UST program in the watershed. There are approximately 150 documented releases of petroleum products from USTs in the watershed that have not been full investigated and/or remediated. Approximately 40 of these releases are known to have impacted groundwater quality. Primary constituents of concern associated with these releases are benzene, toluene, xylenes, ethylbenzene, and MTBE.

U.S. Department of Defense Facilities

The LRWQCB is involved in corrective action activities at George AFB, and the Nebo and Yermo Annexes of the Marine Corps Logistics Base (MCLB). At George AFB, the two major Operational Units (OUs) were developed based on identified sources of groundwater pollution. At the MCLB, all groundwater pollution issues are managed under one OU for the Nebo Annex and one OU for the Yermo Annex. The final cleanup decisions for OUs are ultimately documented in a Record of Decision (ROD), which must be agreed to by each party that is a signatory to the Federal Facilities Agreement (FFA).

George Air Force Base

OU No. 1 at George AFB was developed to address the presence of trichloroethene (TCE) in the groundwater near the northeastern boundary of the base. The main source of the TCE is believed to be an industrial storm drain system which received wash water and storm water from the flight line and surrounding maintenance areas. The Air Force has investigated the lateral and vertical extent of TCE in the aquifer and has determined that the plume has impacted a perched upper aquifer beneath the AFB. The TCE has not effected the regional aquifer beneath the AFB, but

has effected the regional aquifer off the AFB boundary to the northeast where the perched aquifer and the regional aquifer are commingled. The Air Force is currently operating a groundwater extraction and treatment system to contain the plume of polluted groundwater and to effectively remove the TCE from the aquifer.

OU No. 2 at George AFB was developed to address a plume of jet fuel resulting from chronic leakage of the fuel distribution system beneath the flight line. The jet fuel release has only affected the upper perched aquifer. Approximately 450,000 gallons of jet fuel remain floating on the groundwater table surface, and approximately 80,000 gallons have been removed to date by skimming pumps. Studies conducted to date appear to indicate that natural biodegradation of the jet fuel components is occurring on the fringes of the dissolved phase plume. Even with the free product skimming process, the natural attenuation cleanup timeframe would be significantly long because not all of the free product can be recovered by skimming, and the remaining free product would need to first dissolve into the aquifer for biodegradation to take place. The regulatory agencies, including the LRWQCB, have requested the Air Force to evaluate additional active remedial measures, such as vapor extraction, to enhance the recovery of the free product.

Marine Corps Logistics Base (MCLB)

The groundwater OU at the Yermo Annex of the MCLB addresses a plume of VOCs that is approximately 12,000 feet by 4,000 feet in areal extent. The suspected sources of the groundwater pollution are the old sanitary landfill, the old industrial waste treatment plant, and former discharges to a french drain system. The plume of VOCs is traveling in a westerly direction at a rate of approximately 60 to 70 feet per year and has migrated off the MCLB base boundary. Two private drinking water wells have been impacted by the plume, and these wells are fitted with Granular Activated Carbon (GAC) canisters to provide a safe source of drinking water. The extraction system is in operation, currently consisting of eight extraction wells with a combined extraction rate ranging from 600 to 800 gpm.

The groundwater OU at the Nebo Annex of the MCLB addresses two groundwater plumes of VOCs. The North Nebo plume contains tetrachloroethene (PCE) and is associated with former industrial activities at Warehouse Two. The plume is approximately 400 feet by 1,500 feet in areal extent and is isolated in the upper 20 feet of the aquifer. The remedial strategy for the North Nebo plume is an air sparging/soil vapor extraction system in the area of Warehouse Two and natural attenuation of the remaining contaminant mass in the groundwater. A pump and treat system has been installed as a standby in the case whereby plume containment is deemed necessary. The anticipated cleanup timeframe to achieve the drinking water standard of 5 µg/L for PCE is estimated at 15 years.

The South Nebo plume of VOCs contains mostly TCE, which resulted from equipment cleaning at area of concern (AOC) No. 6. The plume is approximately 1,000 feet by 800 feet in areal extent, and is migrating easterly at a rate of approximately 20 feet per year. The plume has migrated off the MCLB base boundary and has effected one private drinking water well. The residence has been piped into the base water system to ensure a safe water supply. A pump and treat system is currently being operated for plume containment. The system consists of five

extraction wells, and the extracted water is being treated by GAC and discharged to percolation ponds. Because of the low transmissivity of the aquifer, the extraction wells can only produce approximately 5 gpm per well. As such, the anticipated cleanup timeframe using a pump and treat remedial strategy is estimated at 105 years. An air sparging/soil vapor extraction system pilot test is being conducted to determine its feasibility for reducing the remedial timeframe.

Abandoned Wells

Because of its rural nature and agricultural/industrial history, the Mojave Watershed contains numerous production wells that have been improperly abandoned. There are also reports of improperly abandoned oil and gas wells in the watershed. These wells may provide a conduit for migration of contaminants to the groundwater and can pose a significant risk to public safety. Proper abandonment of wells is very expensive. The San Bernardino County Division of Environmental Health and the Mojave Water Agency have been working to develop a program for the location of abandoned wells.

Irrigated Agriculture and Confined Animal Facilities

Although the acreage of irrigated agriculture in the Mojave Watershed has diminished in recent years due to urban development, agricultural water use continues to exceed urban use. Confined animal facilities in the watershed have generally consisted of dairies and chicken ranches. There is an estimated thirteen dairies in the watershed, and several chicken ranches continued to be operated in the watershed.

The LRWQCB has established WDRs for four dairies in the watershed based on their close proximity to the Mojave River (within 1/2 mile). These WDRs limit the amount of manure that can be applied to the alfalfa fields at the dairy based on the calculated agronomic rate for nitrate consumption by the crop. In each of these four cases, some manure must be exported from the dairy because more is produced than can be applied to the irrigated land. The manure is typically exported to other irrigated agriculture sites in the watershed. The LRWQCB does not currently have any regulatory involvement with the remaining nine dairies, any of the chicken ranches, or the irrigated sites that receive the exported manure. The LRWQCB will coordinate future regulation with the SWRCB and other appropriate agencies to implement the recently released federal Unified Animal Feeding Operations (AFOs) Strategy.

A study conducted for the LRWQCB by the DWR in 1983 identified the Mojave River floodplain as the key area requiring regulatory involvement in regards to dairy waste management. Thus, the LRWQCB developed a regulatory strategy to develop WDRs only for dairies within one-half mile of the Mojave River Channel. However, LRWQCB staff now recognizes that this strategy does not take into account the manure that is applied to land for agricultural purposes. Thus, a widespread program is necessary to encourage best management practices for all manure management throughout the watershed to protect the beneficial uses of groundwater.

The LRWQCB initiated and participates in a stakeholder group for confined animal facilities and irrigated agriculture sites. The focus of the group is education and outreach of BMPs to ensure protection of beneficial uses. The LRWQCB meets with owners and operators of some dairies that are not currently regulated under WDRs. During this process, the LRWQCB will work with the County of San Bernardino Division of Environmental Health Services which already inspects many of the dairies and chicken ranches regarding public health issues (e.g., vectors and odors). The stakeholder group has completed an initial database with the number of cows and waste treatment abilities at each dairy.

Spills and Leaks

The significant spills, leaks, investigation, and cleanup (SLIC) projects currently ongoing in the Mojave Watershed are discussed in the following paragraphs.

Burlington Northern Sante Fe Barstow Railway Yard

The Burlington-Northern Sante Fe Railway Company (BNSF), formerly the Atchison, Topeka and Sante Fe Railway Company, historically operated and continues to operate railway maintenance facilities in the City of Barstow. Extensive soil and groundwater investigations of the facilities have indicated two separate groundwater plumes within the Mojave River floodplain aquifer. One plume is chlorinated hydrocarbons and the other diesel related constituents. The chlorinated hydrocarbon plume appears to have migrated to the Mojave River channel. The LRWQCB has required BNSF to further investigate the groundwater impacts and to develop a cleanup strategy for restoration of the beneficial uses of the groundwater. BNSF has installed and is currently operating a pilot facility consisting of intrawell air sparing/vapor extraction in the area of the chlorinated hydrocarbon plume to evaluate the technical and economic feasibility of this remedial technology. BNSF is also working to develop a cleanup strategy for the diesel groundwater plume.

In 1989 a pipeline at the BNSF Barstow Yard near "B-Hill" ruptured, releasing diesel fuel into the unsaturated zone. A subsequent investigation indicated diesel fuel floating on the groundwater table surface beneath and downgradient of the release site. BNSF continues to recover free product and has installed a soil vapor extraction/bioventing system to restore the beneficial uses of the groundwater. However, rising groundwater levels caused by recent years of above average recharge has rendered the system inoperative because the air injection/extraction wells are now screened below the water table surface. BNSF has proactively monitored the groundwater during the last several years, and there is no evidence of plume migration. BNSF is currently evaluating options to potentially modify the existing system for operation.

CALNEV Pipeline

In 1992 the CALNEV Pipe Line Company discovered a leak of petroleum fuel at its facility located near the Community of Daggett. A subsequent soil and groundwater investigation has indicated impacts to groundwater quality. The constituents of concern associated with the plume

include benzene and MTBE. CALNEV, which was recently acquired by GATX, has installed and is currently operating a vapor extraction system to remove the volatile components of the release from the unsaturated zone. GATX is currently defining the downgradient extent of the plume and developing a remedial strategy for the groundwater.

Victorville "D" Street Plume

In 1989 the Southwestern Portland Cement Company, a division of Southdown, discovered the presence of PCE and TCE in production supply water at their Victorville River Plant. A subsequent investigation by Southdown indicates that the source(s) of the contaminants are hydrologically upgradient of the cement plant. Southdown continues to extract the groundwater for industrial use, but no longer uses the water for municipal purposes.

The LRWQCB has conducted two investigations of the "D" Street corridor in Victorville. Based on data collected during these two studies, the exact source(s) of the chlorinated hydrocarbons are unknown. Surface water sampling of the Mojave River does not indicate the presence of VOCs, but PCE was detected in a surface water sample from Oro Grande Wash at the outfall into the Mojave River. The LRWQCB continues to work with local agencies to identify any potential past and/or continuing source(s) of the PCE and TCE.

PG&E Chromium Groundwater Plume

Extensive investigation by PG&E Generating Station has identified a plume of groundwater degraded by the hexavalent chromium. The general dimensions of the plume are two miles in length and one-quarter mile in width.

PG&E no longer uses hexavalent chromium in its facility operations. PG&E has implemented an aggressive corrective action program to cleanup and abate the effects of the degraded groundwater. PG&E monitors the soil, groundwater, and alfalfa plant tissue at the irrigation sites for the presence of hexavalent chromium.

Aerochem El Mirage Facility

Former wastewater disposal practices at the Aerochem industrial facility near the Community of El Mirage has resulted in degradation of groundwater quality. The constituents of concern are fluoride and chlorinated hydrocarbons. The LRWQCB required Aerochem to close formerly operated unlined surface impoundments. Sampling of irrigation wells located at nearby agricultural fields has indicated the presence of chlorinated hydrocarbons in one well at low concentrations. Aerochem is developing a final corrective action plan for the chlorinated hydrocarbons in the groundwater.

Wastewater Treatment and Recycling

The LRWQCB provides regulatory oversight for several community wastewater treatment facilities. These facilities provide service for: (1) the San Bernardino Mountains-Lake Arrowhead Community Services District and Crestline Sanitation District; (2) the Victor Valley - the Victor Valley Wastewater Reclamation Authority (VVWRA); (3) the Community of Silver Lakes - San Bernardino County Service Area No. 70; (4) the City of Barstow; (5) the Yermo and Nebo Annexes of the MCLB, and (6) Adelanto Wastewater Treatment Plant. The LRWQCB also provides regulatory oversight for several small package treatment plants that provide service for one or more small residential developments or commercial facilities.

The VVWRA facility is the largest treatment plant in the watershed. The treated wastewater is currently discharged to percolation ponds and to the Mojave River. Implementation of a wastewater recycling plan would involve the construction of pilot wastewater treatment plants upstream of the existing plant to facilitate the availability of high quality effluent for upstream uses. Such uses would include irrigation of parks and golf courses. The City of Victorville has recently received a federal grant of one half million dollars to explore and develop water recycling options.

One of the critical elements of the wastewater recycling plan is the discharge of wastewater to the Mojave River during the winter season when the demand for recycling water may be limited. The LRWQCB's Basin Plan currently prohibits the discharge of wastewater directly to the Mojave River between the Lower Narrows at Victorville and the Mojave Forks Dam. The Basin Plan also contains numerical water quality objectives for the Mojave River that could potentially be exceeded as a result of the wastewater discharges. The LRWQCB has determined that it is appropriate to provide exemption language in the Basin Plan for the direct discharge of recycled wastewater to the Mojave River between the Lower Narrows and the Mojave Forks Dam. As discussed in the Planning section above, additional characterization of the water quality in the Mojave River is necessary before a full evaluation of the numerical water quality objectives can be completed.

Wastewater recycling projects may also be pursued in the San Bernardino Mountains. Direct discharges of high quality effluent to surface water could greatly enhance the beneficial uses of these surface waters, including freshwater habitat, wildlife, and wetlands. These projects would involve careful planning, including possible modifications of numerical water quality objectives.

Wetland Habitat and Flood Control

Today, most of the Mojave River channel is dry downstream of Victorville except during flood events. Historically, some areas contained water surface water throughout most of the year. Former "watering holes" for the Mormon and Spanish Trails were located along the Mojave River, which were primarily located where faults or other geologic structures force groundwater to the surface. Due to years of overdraft conditions, the groundwater table has been lowered to a point where most areas no longer contain surface water. The stipulated judgment for the adjudication of the watershed attempts to address this issue by developing a fund for

evaluation and restoration of these riparian vegetation areas. DFG is responsible for implementation of the fund and is in the process of developing a riparian vegetation and wildlife habitat inventory and evaluation plan. The ultimate goal of the program will be to restore some of the historic areas that provide critical habitat for wildlife.

One of the critical wetlands projects in the watershed is San Bernardino County's Mojave River flood control management plan. The LRWQCB participated in a technical advisory group that coordinated to develop the plan. The plan first identifies critical areas of the Mojave River that require flood control to ensure protection of nearby communities from flood waters. The plan then provides recommendations for flood control activities, including minimization of wetlands impacts.

Additional critical wetlands in the watershed include Afton Canyon, Salt Creek Hills, and Harper Lake. Efforts by the BLM to remove exotic plant species from these wetland areas is discussed below. Salt Creek Hills is the site of a University of California research facility. Natural ponds at the research facility contain Mojave Tui Chub, which is an endangered species of fish. The wetlands at Harper Lake are a primary resting and nesting place for migratory birds.

Abandoned Mines

A portion of the new Mojave National Park is located within the watershed. The National Park Service has completed an inventory of approximately 200 abandoned mines in the Park. Most of the mines are not a likely water quality threat. The LRWQCB is coordinating with the National Park Service to identify those sites which may pose a potential threat. Other abandoned mines are present in the watershed outside the boundaries of the National Park but within the watershed. The LRWQCB will work with the County of San Bernardino in the case whereby a site is identified that may pose a threat to water quality.

Household Hazardous Waste Management

The County of San Bernardino and other local agencies have documented numerous cases of unauthorized disposal of household hazardous waste. The County of San Bernardino is attempting to identify funding sources for construction and operation of household hazardous waste collection centers.

Power Generation Facilities

Power generation facilities typically use large quantities of water for heat exchange. The LRWQCB provides regulatory oversight for these discharges.

The Harper Lake Company operates a solar energy generation facility at Harper Lake. Harper Lake is a 'dry lake' containing wetlands that provide valuable wildlife habitat. The Harper Lake Company currently discharges their high TDS waste to lined ponds, but it is considering the potential benefits of discharging the wastewater to the wetlands. Such a project has a potential to enhance the wetlands habitat, which would be a beneficial use of the water

rather then merely allowing the water to evaporate. LRWQCB staff is working with the Harper Lake Company, BLM, DFG, and the California Energy Commission to evaluate the project.

The High Desert Power Project (at the former Georges Air Force Base) uses groundwater injection of treated SWP water at a higher quality than that of the ambient groundwater.

Eradication of Exotic Plant Species

Several exotic plant species were introduced to the watershed during the 20th century. Two of these species are the Tamarisk and the Salt Cedar. These exotic species use an abundance of water, destroy native vegetation, and do not provide valuable habitat for native animals. Related water quality impacts can result from reduced flows. The BLM has been working for several years to eradicate the watershed of these exotic plant species. Two key eradication sites are at Afton Canyon and Harper Lake. The primary methods used to destroy the plants are cutting, burning, and then subsequent hand applications of herbicides.

The LRWQCB has been coordinating with the BLM, Mojave Water Agency, USFWS, DFG, City of Barstow, and USCOE to develop an Memorandum of Understanding regarding these projects. The BLM is conducting surface water sampling to ensure there is no water quality degradation associated with the herbicides. Sampling data indicate no water quality impacts have resulted from the herbicide applications, and the concentrations of TDS has been greatly reduced in the increased Mojave River surface flows in Afton Canyon. (Surface water flows in Afton Canyon have increased substantially with the removal of the exotic plant species.) Additionally, many native plant and animal species have returned to areas of restored habitat.

Colorado River Basin (Region 7)



The Colorado River Basin Region is approximately 13 million acres (20,000 square miles) in the southeastern corner of California. It includes all of Imperial County and portions of San Bernardino, Riverside, and San Diego Counties. It is bounded on the east by the Colorado River; on the south by the Republic of Mexico; on the west by the Laguna, San Jacinto, and San Bernardino Mountains; and on the north by the New York, Providence, Granite, Old Dad, Bristol, Rodman, and Ord Mountain Ranges. The Region includes 28 recognized major watersheds or "hydrologic units," and contains water bodies of statewide, national, and international significance (the Salton Sea and the Colorado River).

WATERSHED MANAGEMENT AREAS

For the purpose of implementation of the WMI in the Colorado River Basin Region, watershed management areas are defined at three levels: (1) the entire Colorado River Basin Region, (2) sub-regional watersheds, and (3) drainage basins. Defining these three levels provides us with a mechanism to identify problems and then seek remedies at the most effective level.

The first level is the entire area of the Colorado River Basin Region. Regionwide activities, described in the WMI chapter, are implemented at this level of watershed management area.

The second level is sub-regional watersheds which are generally areas defined broadly by geologic boundaries. For the purposes of the WMI, the Region has been divided into three sub-regional watershed management areas, including: (1) the Salton Sea Transboundary Watershed, (2) the Lower Colorado River Watershed, and (3) the Hi-Desert Groundwater Basins. These boundaries are shown in Figure 1. Watershed activities described in the WMI chapter are implemented at this level of watershed management area.

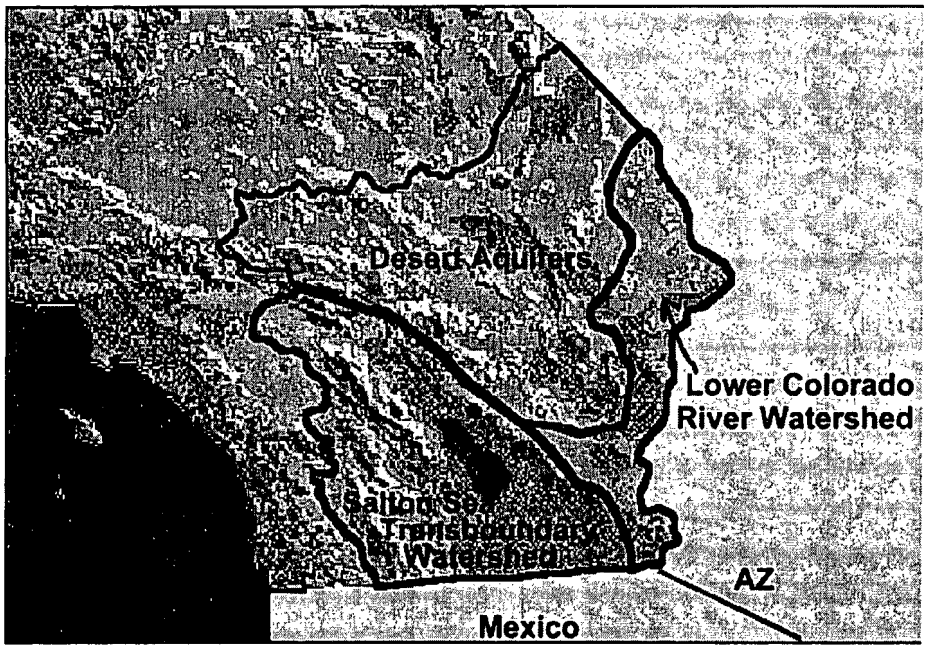


FIGURE 1.

The third level includes physical drainage basins within sub-regional watersheds. For example, the Alamo River watershed, located within the Salton Sea Transboundary Watershed Management Area, is a physical drainage basin. Drainage basins can further be divided into sub-watersheds, such as the South Central drainage or the Rose drainage. This level of management area, in some cases, could lend itself to the development of TMDLs, local stakeholder plans, and focused water quality monitoring activities.

In summary, these three levels have been established to classify problems and focus appropriate control measures at the most appropriate level.

WATERSHED DESCRIPTIONS

Salton Sea Watershed (Priority Watershed)

The Salton Sea Transboundary Watershed is the Region's Priority Watershed for the purposes of the WMI. The watershed is located in the Sonoran desert region in the southeastern corner of California, encompasses one-third of the Colorado River Basin Region (about 8,360 square miles), and contains five (out of a total of six) of the Region's impaired surface water bodies. Most of the watershed is in Imperial County, but it also receives drainage from Coachella Valley in Riverside County and the Mexicali Valley in Mexico (via the New River). The watershed has been identified as a Category I (impaired) Watershed under the 1998 California Unified Watershed Assessment. Water imported from the Colorado River has created an irrigated agricultural ecosystem in the Salton Sea Transboundary Watershed; wildlife and aquatic species are dependant on habitat created and maintained through the discharge of agricultural return flows. Major water bodies in the watershed include the Salton Sea, the Alamo River, the New River, the Imperial Valley Agricultural Drains, the Coachella Valley Stormwater Channel.

Other water bodies of importance include San Felipe Creek and Salt Creek, which provide critical habitat for the endangered desert pupfish. Aquatic and wildlife habitat uses that developed incidental to the importation of water into the desert are designated beneficial uses in the Region's *Water Quality Control Plan* (Basin Plan).

The Salton Sea is a closed basin, saline lake that is about 35 miles long and 9 to 15 miles wide with approximately 360 square miles of water surface area and 105 miles of shoreline. The surface of the Sea lies approximately 227 feet below mean sea level. The Salton Sea is a designated repository for agricultural return flows from the Imperial and Coachella Valleys. In 1924 and 1928, President Coolidge executed Public Water Reserve Order Numbers 90 and 114, respectively, for withdrawal of 123,360 acres of public land lying at an elevation of 220 feet below mean sea level in and surrounding the Salton Sea. These lands were designated as a repository to receive and store agricultural, surface, and subsurface drainage waters. The State of California designated the Sea for this same purpose in 1968. The current inflow into the Salton Sea is about 1.3 million acre-feet per year (AFY), which is approximately equal to the rate of evaporation. Currently, the Sea is 25 percent saltier than the ocean (total dissolved solids concentration of 44,000 milligrams per liter), with salinity increasing at approximately 1 percent per year. It can also be classified as a eutrophic lake. The Sea supports a National Wildlife Refuge and is a critical stop on the Pacific Flyway for migrating birds, including several State and federally-listed endangered and threatened species. The Sonny Bono Salton Sea National Wildlife Refuge was established in 1930 to preserve wintering habitat for millions of waterfowl and other migratory birds. However, catastrophic die-offs of birds and fish between 1992 and 1999 indicate the Sea is in serious trouble, and it may be unable to support these beneficial uses in the future.

Overview of Water Quality Issues in the Salton Sea Watershed

The most significant water quality problems in the Salton Sea Transboundary Watershed are manifested by the severe impairment of the Salton Sea, its two major tributaries (the New and Alamo Rivers), and the Imperial Valley Agricultural Drains (hereafter "Imperial Valley Drains"). The water quality of the Coachella Valley Stormwater Channel is also of concern.

The New River originates in Mexico. It flows approximately 20 miles through the City of Mexicali, Mexico, crosses the International Boundary, continues through the City of Calexico in the United States, and travels northward about 60 miles until it empties into the Salton Sea. Its flow at the International Boundary is about 181 to 362 cubic feet per second (cfs) [118,220 to 264,530 AFY. The New River carries urban runoff, untreated and partially treated municipal wastes, untreated and partially treated industrial wastes, and agricultural runoff from the Mexicali Valley. In addition, the River carries urban runoff, agricultural runoff, treated industrial wastes, and treated, disinfected and non-disinfected domestic wastes from the Imperial Valley. It carries approximately 11 cfs (7,970 AFY) of treated wastewater, as permitted by the Colorado River Basin Regional Water Quality Control Board (CRBRWQCB) under the National Pollutant Discharge Elimination System (NPDES) from point sources in Imperial Valley. The New River flow at the Salton Sea has varied from 553 to 705 cfs (411,770 to 512,350 AFY). Eight NPDES permitted domestic wastewater treatment facilities discharge to the New River. Of

these, three discharge disinfected effluent (~5.7 cfs) and five discharge nondisinfected effluent (~5.3 cfs). It is anticipated that disinfection will be universally required in the watershed soon. Urban runoff and domestic and municipal wastes in the New River carry significant amounts of pathogens, which pose a severe threat to public health, particularly near the International Boundary. Flow at the International Boundary is also high in several VOCs, likely from industrial discharges and petroleum products discharged to the New River.

The Alamo River originates approximately 2 miles south of the International Boundary with Mexico, and flows northward across the border for about 50 miles until it empties into the Salton Sea. The Alamo River is dominated by agricultural return flows from Imperial Valley. Its flow at the International Boundary is 2 to 4 cfs (1450 to 2900 AFY), whereas at its delta with the Salton Sea ranges from 680 to 902 cfs (499,020 to 654,130 AFY). It also carries approximately 15 to 27 cfs (10,867 to 19,200 AFY) of treated wastewater from point sources in Imperial Valley. Mexico has agreed to eliminate dry weather flow contributions to the Alamo River, although that commitment remains unfulfilled to date.

The Imperial Valley Agricultural Drain system comprises over 1,450 miles of constructed surface drains that discharge into the Alamo and New Rivers and the Salton Sea. The Ag Drains primarily carry agricultural runoff from the Imperial Valley. Agricultural discharges in the Imperial Valley range from 830,841 to 1,153,827 AFY, while averaging 994,812 AFY. Of this amount, approximately 44-48 percent is tailwater, 27-31 percent is tilewater, 13 percent is seepage, and 12 percent is operational spill. The resulting mix of tailwater (surface runoff), tilewater (subsurface drainage), and seepage contains pesticides, nutrients, selenium, and silt in amounts that exceed water quality standards.

Over 70 percent of the freshwater inflows to the Sea consists of agricultural drain water from Imperial Valley. Because the Sea has no outlet, salts concentrate in it and nutrients enhance the formation of eutrophic conditions. The Sea's salinity problem cannot be directly addressed from a strictly regulatory standpoint; rather, a coordinated solution involving an engineered solution aimed at stabilization and/or restoration of salinity levels must be developed.

Table 1. Water Quality Issues in the Salton Sea Transboundary Watershed.

Waterbody	Water Quality Issues
Salton Sea	Salinity Eutrophication (nitrogen and phosphorus) Pesticides Selenium Habitat issues (loss of wetlands)
Alamo River	Sediment Selenium Pesticides Nutrients
New River	Pathogens Sediment Selenium VOCs Pesticides Nutrients
Imperial Valley Agricultural Drains	Sediment Selenium Pesticides Nutrients
Coachella Valley Stormwater Channel	Bacteria Nutrients

In addition to existing water quality impairments in the watershed, a pending petition to transfer water rights from the Imperial Irrigation District to San Diego County has serious water quality implications in the Salton Sea Transboundary Watershed. Depending on the methods employed to attain water conservation in the Imperial Valley, water quality of agricultural discharges will be different than it currently is. The concentrations of some pollutants are likely to decrease, while the concentrations of others are likely to increase. Of greatest concern is selenium as it is discharged primarily as tilewater (subsurface drainage). The Imperial Valley Agricultural Drains and the Alamo River are already impaired by selenium. If water conservation practices focus on the reduction of tailwater (surface runoff), the concentration of selenium in drains is likely to greatly increase. Studies conducted by the USFWS and the U.S. Department of Interior's National Irrigation Water Quality Program show that fish and wildlife, including the many species of fish-eating birds and the endangered desert pupfish are currently at reproductive risk from selenium pollution.

Another surface water problem of concern within the watershed is bacterial pollution in the Coachella Valley Stormwater Channel (CVSC). Urban run-off is the likely source of bacteria in the CVSC. Preliminary data from the USBR also indicate that nutrients levels in the CVSC are of concern.

Lower Colorado River Watershed

The Lower Colorado River Watershed is in the extreme southeastern part of California, encompassing the eastern portion of San Bernadino, Riverside, and Imperial Counties. It is bounded on the east by the Colorado River, which forms the Arizona-California state line; on the south by the International Boundary with Mexico, and on the west by (north to south) the New York, Hack Berry, Sacramento, Step Ladder, Turtle, Arica, Granite, Little Maria, McCoy, Mule, Chocolate, and the Cargo Muchacho Mountain Ranges. It should be noted however that portions of the above boundaries are political only. Geographically, the Lower Colorado River Watershed represents only a small portion of the total Colorado River drainage area in the United States and Mexico. Within the U.S., the drainage area of the Colorado River includes portions of the states of Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico, and California. The Lower Colorado River Watershed is designated as that portion of total drainage area of the Colorado River, in the United States that is located below Lee Ferry near Glen Canyon Dam.

The watershed is 200 miles long, with a maximum east-west width of 70 miles. The area is characterized by desert valleys and low mountains that are generally less than 4,000 feet above mean sea level. The highest peak rises 4,860 feet above mean sea level.

Overview of Water Quality Issues in the Lower Colorado River Watershed

Water quality issues within the Lower Colorado River Watershed include:

- Bacterial impairment of the Palo Verde Outfall Drain
- Potential agricultural pollution of the Palo Verde Irrigation District drainage system;

The Colorado River supplies drinking water to millions of Southern Californians. A segment of the Lower Colorado River is impaired by bacteria, perhaps seasonally. The source of the bacteria pollution appears to be from overuse of septic systems by resort parks along the Colorado River. Communities along the Colorado River representing three states and two Indian tribes have formed a coalition to address the problem. Although the CRBRWQCB does not have direct regulatory authority on Indian land to remedy this problem, it will assist this stakeholder group by providing technical assistance and input on regulatory concerns as a solution is developed.

The Palo Verde Valley is located in the Lower Colorado River Watershed (for the purposes of WMI). This Valley is predominantly agricultural. The Palo Verde Outfall Drain is listed on the 1998 updated Section 303(d) List for impairment caused by bacterial pollution of unknown origin.

High Desert Groundwater Basins

Drinking Water Aquifers

In this desert region, groundwater basins of high quality are a precious commodity and must be given the highest protection. As this region grows in population, water quality impacts are occurring. Three groundwater/drinking water quality issues of significant importance: a nitrate plume in the upper desert groundwater basin of Lucerne Valley; a

nitrate plume in the Desert Hot Springs groundwater basin; and nitrate pollution of the Coachella Valley aquifer.

LUCERNE VALLEY

Disposal of domestic wastewater through evaporation/percolation ponds by the Big Bear Area Regional Wastewater Agency (BBARWA), agricultural practices, and septic systems are the suspected sources of the nitrate problem in Lucerne Valley. The full extent of the plume has not been determined, but it spreads several miles and threatens over 15 private supply wells. CRBRWQCB staff lacks the funds to develop a comprehensive groundwater monitoring program to determine the extent of the pollution. However, staff intends to continue working with the BBARWA to address the overall nitrate problem in Lucerne Valley.

DESERT HOT SPRINGS

The cause of the nitrate problem in Desert Hot Springs is a high density of septic tank/leachfield systems. Several domestic wells in Desert Hot Springs show nitrate at concentrations already exceeding the State Maximum Contaminant Level (MCL) for nitrate, but the extent of this plume has not yet been determined either. CRBRWQCB staff lack the resources to develop a comprehensive monitoring program to do so. As resources allow, CRBRWQCB staff intends to assist stakeholders in Desert Hot Springs in addressing these problems.

COACHELLA VALLEY

Nitrate groundwater contamination is present in the Coachella Valley Groundwater Aquifer, which is the sole source of drinking water supply for virtually all of the Coachella Valley. Several municipal wells belonging to the Desert Water Agency in Palm Springs are already restricted in use because the water in those wells shows nitrate concentrations of up to 70 milligrams per liter (mg/l), which are above the State MCL of 45 mg/l. Discharges of wastes from individual domestic septic tanks/leachfield systems, water recycling, widespread application of fertilizers, and discharges of domestic wastes to evaporation/percolation ponds are the likely source of the nitrate contamination.

Leaking Underground Storage Tanks Regionwide

Underground Storage Tank leaks contribute significantly to water quality problems within the Region. The two areas impacted most within the Region are the Coachella Valley (located within the priority watershed) and the City of Blythe. In both areas the underlying soil type is porous, thus allowing a significant amount of pollutants (e.g., petroleum hydrocarbons) to reach groundwater. Also, the gasoline oxygenate known as MTBE has become a major problem. MTBE leaks have caused water districts within the Coachella Valley Groundwater Basin to temporarily shut down and even abandon drinking water wells. This is of serious concern since the groundwater basin is the sole source of drinking water for much of the Coachella Valley.

Because of its location, the City of Blythe has been and still is a fueling station for traffic to and from Los Angeles and Phoenix. As a result, the City of Blythe covers a relatively small area with a large number of UST releases. Most of these contaminant "plumes" are commingled (combined) or in close proximity to one another, rendering independent cleanup nearly impossible. To expedite and streamline cleanup of these plumes, the CRBRWQCB's Executive Officer and the City of Blythe's City Manager entered into a Memorandum of Understanding that allowed the City of Blythe to coordinate its clean-up effort. This approach has become a model for commingled plumes throughout the State and consequently inspired the Legislature to enact commingled plume legislation (SB 562).

Santa Ana Region (Region 8)



WATERSHED MANAGEMENT AREAS

The Santa Ana Region can be viewed as a single, large watershed, but it is far too large and complex to designate as a single WMA. Therefore, it is appropriate to designate smaller, more manageable WMAs as the units of study. These WMAs, sub-watersheds of the larger Santa Ana River watershed, allow watershed planning to happen in a more localized manner. These WMAs are defined based on our understanding of the existing water quality issues and the ability to manage regulatory and planning activities. WMAs in other parts of the State may focus on surface waters, but in the Santa Ana Region, several of the WMAs are defined by groundwater basins.

Eight (8) WMAs have been identified and given a priority for initiating watershed planning and directing resources. Table 1 lists the WMAs, along with the water quality and/or beneficial use problems that have been identified. These WMAs are shown on Figure 1.

Table 1. Watershed Management Areas -- Santa Ana Region

Watershed Management Area (WMA)	Water Quality /Beneficial Use Problem
Chino Basin WMA	High TDS and N levels in groundwater; solvent plumes.
Newport Bay WMA	Excess algal blooms (nutrients); toxic constituents (metals and pesticides); bacterial quality; wetland protection.
Lake Elsinore/San Jacinto River WMA	Summer lake algal blooms and fish kills; bacterial quality; lake water level management; nitrogen and TDS in groundwater; impacts from confined animal feeding operations.
Big Bear Lake WMA	Excess sediments and nutrients; toxic constituents (metals); protection of endangered plant and animal species.
Anaheim Bay Huntington Harbour/ Bolsa Chica WMA	Toxic constituents (metals, pesticides and petroleum products); wetland protection and restoration; bacterial quality.
Middle Santa Ana River WMA	Invasive plant eradication; wastewater reclamation (TDS/N issues); groundwater recharge and water level management; solvent plumes.
Lower Santa Ana River WMA	Bacterial quality; TDS and nitrogen in groundwater; coastal wetlands protection; wastewater reclamation; organic contamination.
Upper Santa Ana River WMA	Wastewater disposal (septic systems) problems.

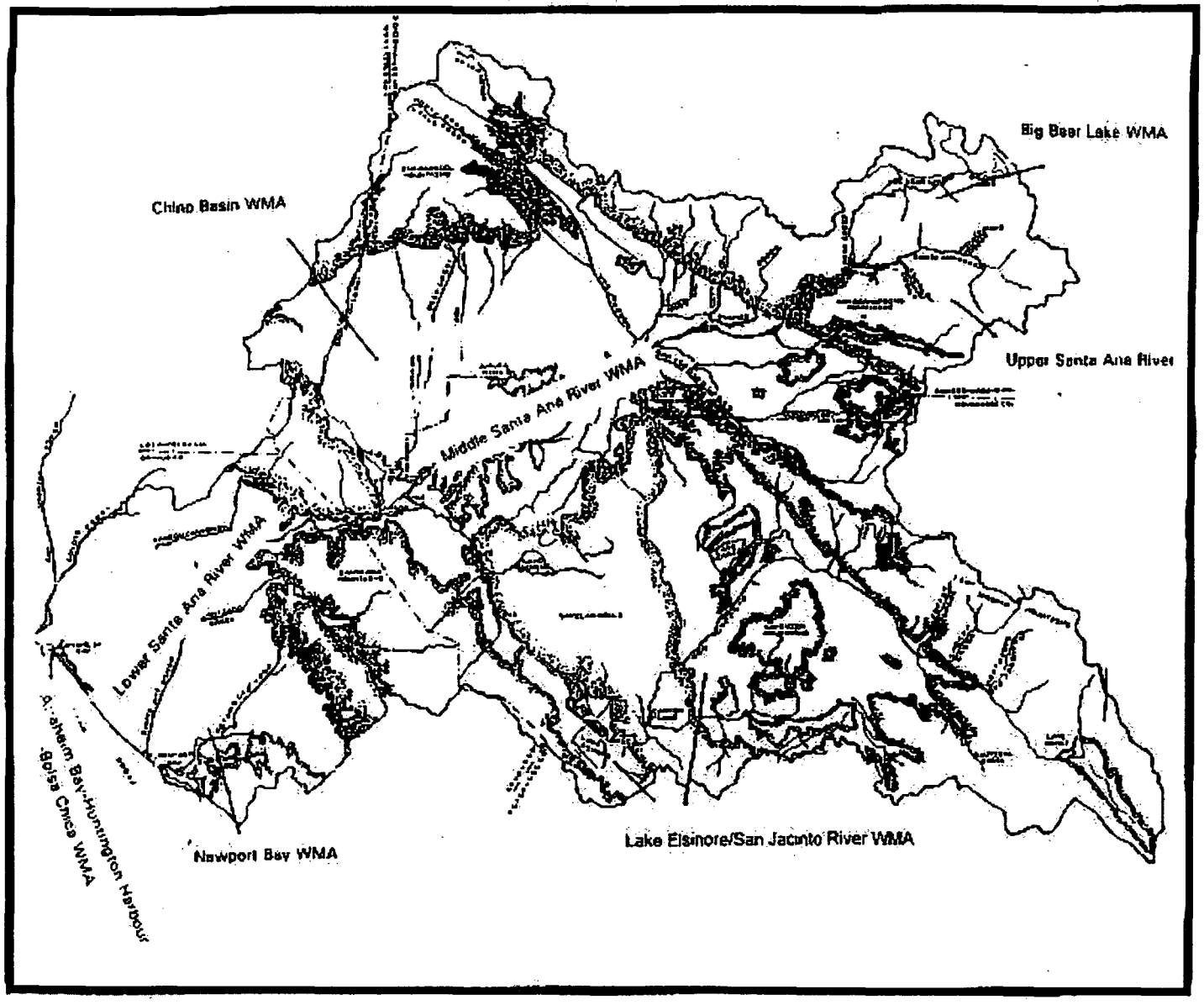


FIGURE 1. WATERSHED MANAGEMENT AREAS

CHINO BASIN WATERSHED

I. Overview

As shown in Figure 2, the Chino Basin Watershed covers about 405 square miles and lies largely in the southwestern corner of San Bernardino County, though a small part of Los Angeles County (Pomona area) and part of western Riverside County are included. Surface drainage is generally southward, from the San Gabriel Mountains toward the Santa Ana River and Prado Flood Control Basin. Major water bodies in the Chino Basin Watershed include:

San Antonio Creek
Chino Creek
Cucamonga Creek
Mill Creek
Santa Ana River, Reach 3 (the lower 3 miles)
Chino I, II, and III groundwater subbasins
Cucamonga groundwater subbasin

Although it was originally developed as an agricultural area, the watershed is being steadily urbanized. Cities in the Chino Basin Watershed include Pomona, La Verne, Upland, Montclair, Claremont, Ontario, Rancho Cucamonga, Fontana, Rialto, Chino, Jurupa, Fontana, and Bloomington. The 1995 population of the watershed was approximately 1.1 million people. The principal remaining agricultural area is the Chino Dairy Preserve. Located in the south-central part of the watershed, the Preserve includes about 340,000 cows, the equivalent of an additional unsewered population of over two million people.

The major water resource in the Chino Basin Watershed is the five to six million acre-feet of groundwater in storage. Groundwater basins and sub-basins also drain generally south toward the River; they include the Claremont Heights, Pomona, and Canyon Basins (plus the Live Oak Basin and part of the Spadra Basin) located mostly in Los Angeles County, the Cucamonga Basin, the Rialto Basin and the main Chino Basin with its three sub-basins (Chino I, II, and III). The Metropolitan Water District of Southern California provides imported water to the area.

The quality and quantity of the area's water supply are major concerns. The Chino groundwater basin has been adjudicated by the court and serves as the major source of water for the basin's cities, industry, and remaining agriculture. Historic and ongoing agricultural operations have severely degraded surface water and groundwater quality in several parts of the watershed. This degradation is a major ongoing concern for the Santa Ana Regional Water Quality Control Board (SARWQCB).

Wastewater reclamation, industrial operations, hazardous materials spills, and other sources of pollution have also affected groundwater quality in more localized areas. Treated wastewater is discharged to tributaries of the Santa Ana River where it joins rising groundwater, NPS

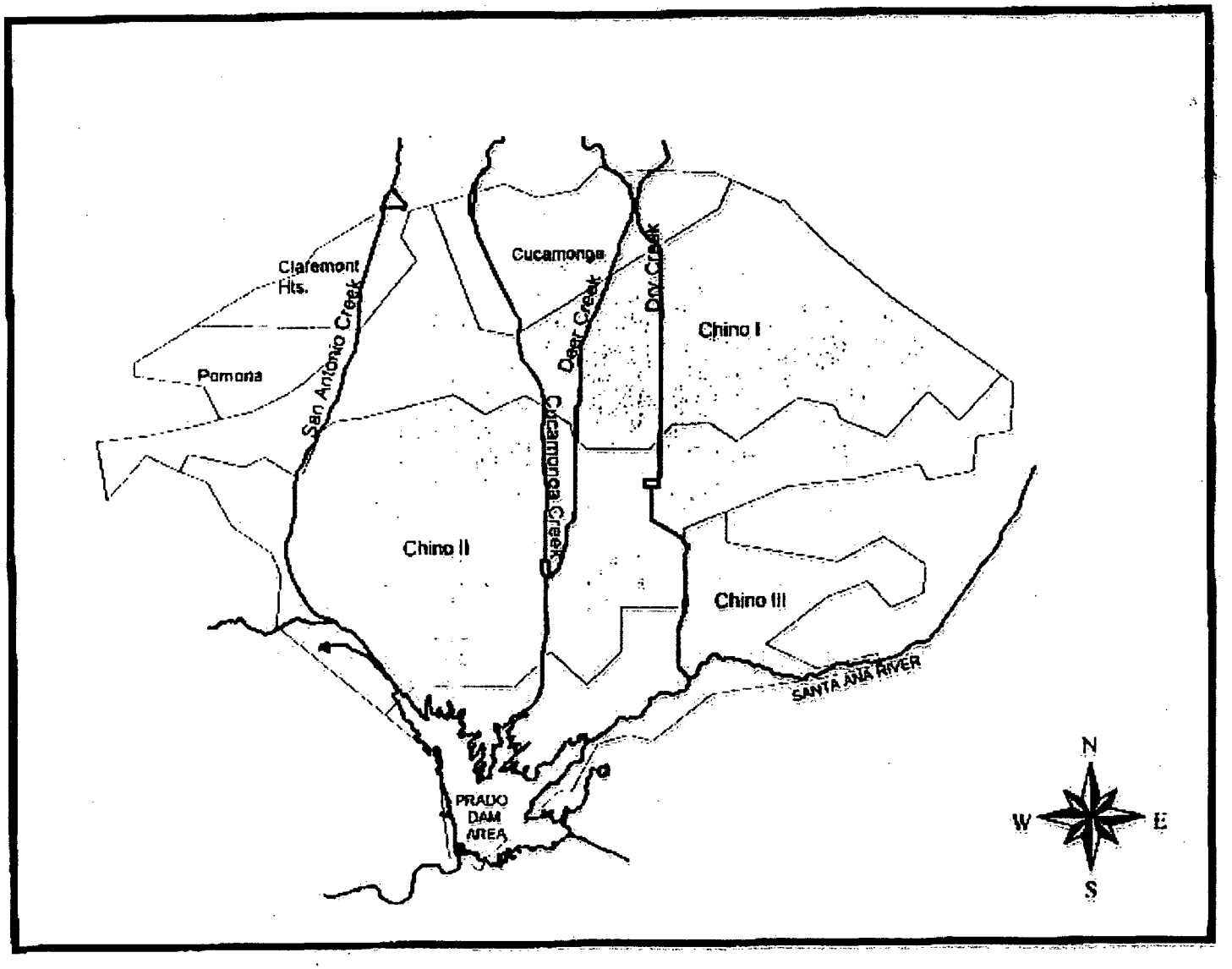


FIGURE 2. CHINO BASIN WMATERSHED

discharges and seasonal rainfall runoff. The River flows into Orange County where it recharges the groundwater basin and is put through another cycle of use. The quality and quantity of flows in the Santa Ana River through Prado Dam are adjudicated in order to maintain a balance of use between the upper (inland) and lower (coastal) basins of the Santa Ana Watershed.

Several significant studies of water quality and water supply in the Chino Basin have been completed in the past few decades. The 1975 Water Quality Control Plan (Basin Plan), produced under contract by the Santa Ana Watershed Project Authority (SAWPA) was based largely on the results of computer simulations using a model called the Basin Planning Procedure (BPP). Serious groundwater degradation was predicted unless major cleanup and management efforts were undertaken promptly. Those recommended actions were not taken. The 1983 Basin Plan basically confirmed the findings of the 1975 plan. The BPP was revised and refined and was used in a large 1989 study which concluded that present and near-future water quality was even worse than previously thought, leading the SARWQCB to impose further restrictions on reclamation and wastewater recharge projects. More recently, a new computer model, the Chino Basin Integrated Ground and Surface Water Model (CIGSM) was developed as part of the Chino Basin Water Resources Management Study. The SARWQCB and SAWPA have been active participants in all these studies.

Water quality issues identified for purposes of this Chino Basin Watershed Management Initiative focus on (1) the quality and quantity of the groundwater supply, (2) storm water runoff and related water quality impacts, (3) the effects of wastewater reclamation, and (4) the impacts of agriculture on water quality, specifically dairies. Making significant water quality improvements in the Chino Basin Watershed will depend on a great many factors, which must be thoroughly assessed and analyzed before efforts are begun.

NEWPORT BAY WATERSHED

I. Overview

As shown in Figure 3, the Newport Bay Watershed encompasses 154 square miles. The San Diego Creek watershed, with an area of 119 square miles, is the largest system draining into Upper Newport Bay. The Santa Ana-Delhi Channel drains 18 square miles and Big Canyon Wash drains two square miles. The remaining 15 square miles are divided among several small watersheds tributary to the lower Bay. Cities in the Newport Bay Watershed include Newport Beach, Irvine, and portions of Costa Mesa, Santa Ana, Orange, Tustin, Lake Forest, and Laguna Hills. The following major water bodies are in the Newport Bay Watershed.

Newport Bay, Lower
Newport Bay, Upper (includes Newport Bay Ecological Reserve)
San Diego Creek, Reaches 1 and 2
Peters Canyon Wash
Santa Ana Delhi Channel
Big Canyon Wash
San Joaquin Freshwater Marsh
Irvine groundwater sub-basins

Newport Bay is divided into upper and lower Bays by the Pacific Coast Highway bridge. The area surrounding Lower Newport Bay is heavily developed, and the local economy is dependent on the housing and tourist industry. Approximately 10,000 small craft are registered in Newport Bay. In contrast to the dense development in the lower Newport Bay, Upper Newport Bay is one of the few remaining undeveloped coastal estuaries in California and is home to several federal- or State-listed rare or endangered species. The DFG owns and manages the upper part of Upper Newport Bay as a State Ecological Reserve.

There are a number of water quality problems that impact the Newport Bay's beneficial uses. These problems can be attributed to both historical in-Bay related uses and NPS inputs from the surrounding watershed. The water quality problems can be divided into the following four categories: sedimentation; bacterial contamination; eutrophication; and toxic contamination. In addition to the water quality related concerns, there are resource-related concerns, particularly for the Upper Newport Bay Ecological Reserve and San Joaquin Freshwater Marsh.

SARWQCB priority activities include watershed management, toxics' TMDL development, nutrient, sediment and pathogen TMDL implementation, and wetlands protection.

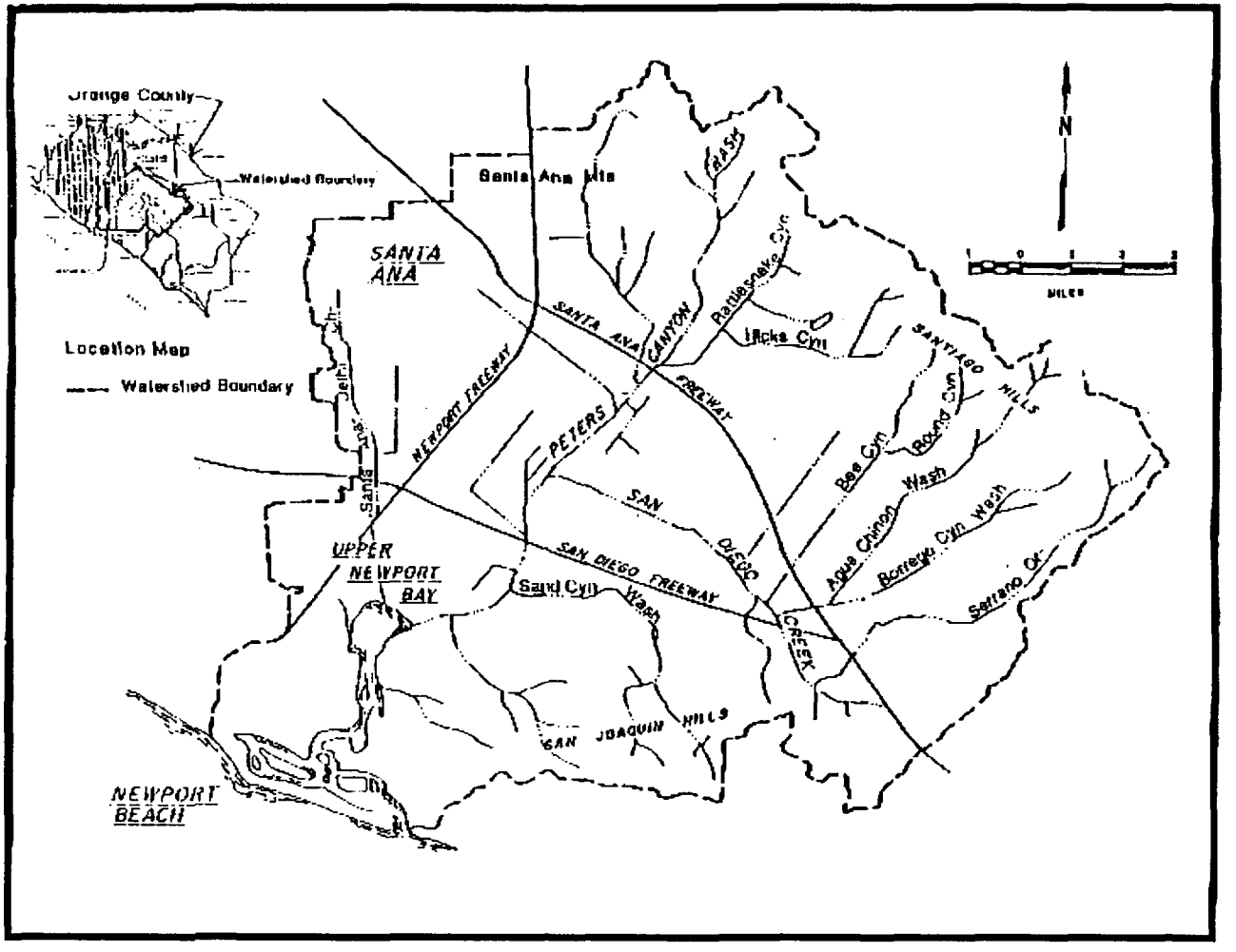


FIGURE 3. NEWPORT BAY WATERSHED

LAKE ELSINORE, LOWER SAN JACINTO WATERSHED

I. Overview

As shown in Figure 4, the Lake Elsinore, Lower San Jacinto River Watershed Management Area is located in Riverside County and includes the following major water bodies:

Lake Elsinore
Canyon Lake
Strawberry Creek
Lake Hemet
San Jacinto River, all reaches
San Jacinto Groundwater Basins

Lake Elsinore is the natural low point of the San Jacinto River watershed. The Lake acts as a sink for the River and overflows only infrequently. Over 90 percent of the Lake Elsinore watershed drains to Canyon Lake, upstream of Lake Elsinore. Almost all of the water that enters Lake Elsinore comes from overflows from Canyon Lake. Cities in the Lake Elsinore/San Jacinto River Watershed include Lake Elsinore, Hemet, Perris, Moreno Valley, San Jacinto, Lakeview, Menifee, Idyllwild, and portions of Beaumont.

The valley surrounding Lake Elsinore is bordered on the south and west by the Santa Ana Mountains and the Cleveland National Forest, and on the north and east by the San Jacinto Mountains. The bottom elevation of Lake Elsinore is 1,223 feet and its natural spill elevation is approximately 1,260 feet. Currently, Lake Elsinore has a surface area of more than 3,600 acres, a maximum depth of 37 feet and a volume greater than 100,000 acre-feet at maximum capacity.

The semi-arid climate in southern California causes the water level of Lake Elsinore to fluctuate significantly as a result of infrequent periods of flooding, followed by prolonged periods of drying out. In turn, this hydrologic pattern causes wide swings in the lake's water quality. During dry periods, the lake levels drop, and evaporative losses cause TDS concentrations to increase well above the Basin Plan Objective. As a result of the lake level fluctuations, the Lake Elsinore Management Project was initiated. The goal of the Project is to develop strategies to achieve a stable lake level by providing make-up water and to develop projects which would minimize flooding during wet years.

Lake Elsinore is currently included on the 303(d) list of impaired water bodies due to excessive levels of nutrients. The nutrients are responsible for algae blooms which cause suppressed dissolved oxygen levels, in turn leading to numerous fish kills. The algae blooms also impair the recreational uses of the lake. The nutrients arise from NPS inputs from the watershed.

Canyon Lake, which is designated MUN (municipal drinking water supply), is also included on the 303(d) list of impaired water bodies due to nutrients and pathogens. The primary source identified at this time is NPSs.

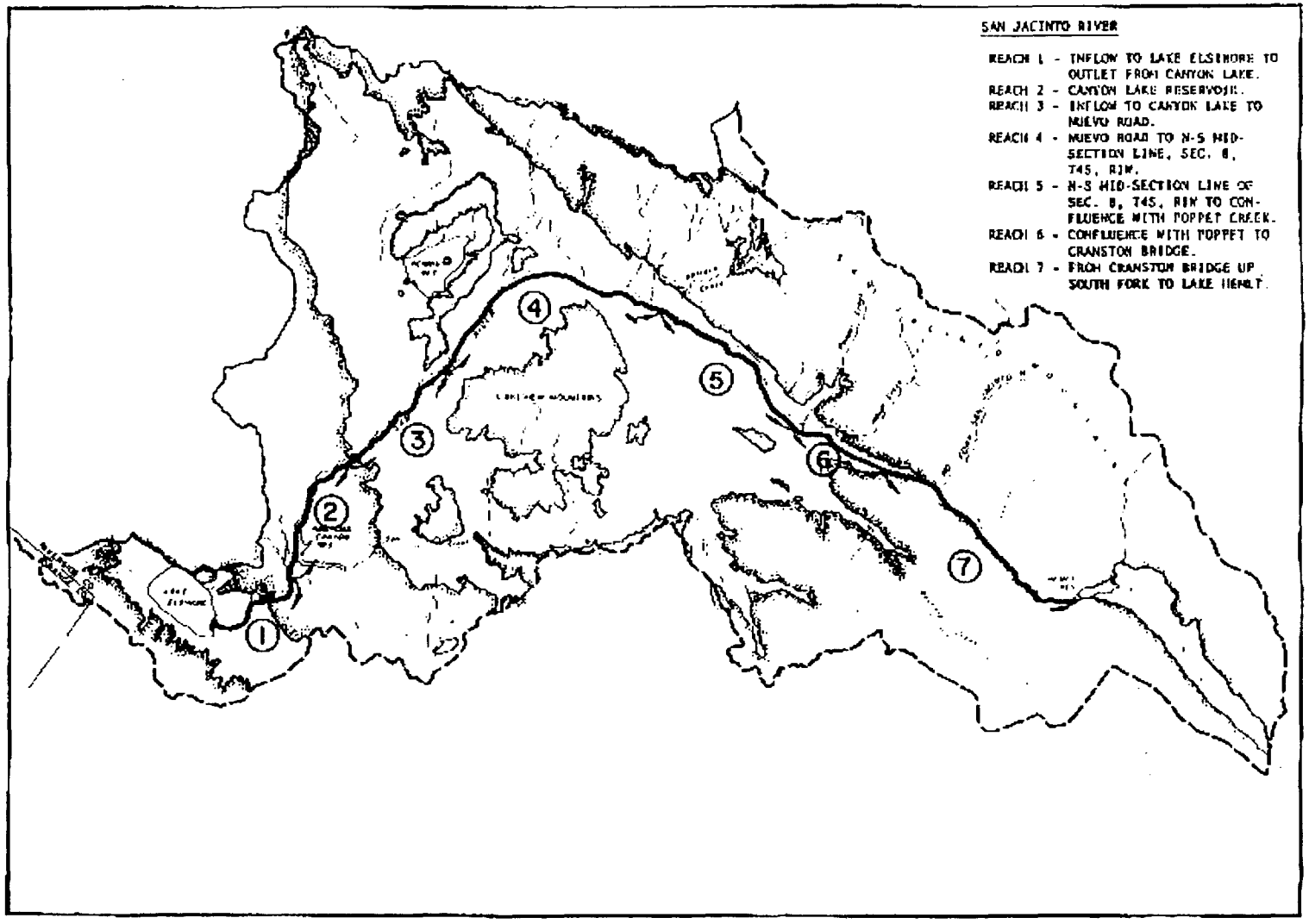


FIGURE 4. LAKE ELSINORE/SAN JACINTO RIVER WMATERSHED

There are approximately 40 confined animal feeding operations (CAFOs) within the San Jacinto River Watershed Management Area. These facilities, along with widespread agricultural operations throughout the watershed above Canyon Lake, are believed to contribute significantly to eutrophication problems in both Canyon Lake and Lake Elsinore. It is believed that failure to implement BMPs at these facilities continues to exacerbate water quality problems in the lower portions of the watershed.

The Hemet/San Jacinto Groundwater Association and Eastern Municipal Water District are in the process of developing a Groundwater Management Plan for the Hemet and San Jacinto sub-basins. The objective of the Management Plan is to optimize use and groundwater resources management in the Hemet and San Jacinto groundwater sub-basins through the cooperative efforts of an association of the major basin pumpers. Eastern Municipal Water District is cooperating with a number of entities to collect water quality and quantity data, land use information, and data on basin hydrogeology, and to develop appropriate planning tools. A Management Plan will be developed and will include plans or programs designed to maximize the groundwater resources and ensure future water supplies. To protect other sub-basins in the San Jacinto watershed, including Perris, Menifee, Lakeview, Winchester, and San Jacinto Lower Pressure, Eastern Municipal Water District has initiated an Assembly Bill (AB) 3030 Groundwater Management Plan. The goal of the program is to develop regional strategies for the protection and management of local groundwater sources. Some of the issues that will be considered include overdraft, prevention of water quality degradation and utilization of available storage capacity to ensure adequate water supplies.

ANAHEIM BAY/HUNTINGTON HARBOUR/BOLSA CHICA WATERSHED

I. Overview

As shown in Figure 5, the Anaheim Bay/Huntington Harbour/Bolsa Chica Watershed Management Area is located in coastal North Orange County. Water bodies in this watershed include the following:

Anaheim Bay
Huntington Harbour
Bolsa Chica Wetlands
Anaheim Bay-Seal Beach National Wildlife Refuge
Bolsa Bay

Cities in the Anaheim Bay, Huntington Harbour, Bolsa Chica Watershed include Westminster, Seal Beach, Garden Grove and portions of Huntington beach, Fountain Valley, Santa Ana, Anaheim, Stanton, Cypress, and Los Alamitos.

The 1998 303(d) List of impaired water bodies includes Anaheim Bay (for metals and pesticides) and Huntington Harbour for metals, pesticides, and pathogens.

Toxics threaten the water quality and beneficial uses of the Anaheim Bay/Huntington Harbour/ Bolsa Chica Watershed Management Area. Two major storm drains, the Bolsa Chica Channel and the East Garden Grove Wintersburg Channel, as well as their tributaries, drain into the Anaheim Bay/Huntington Harbour complex. Inputs of storm water and urban nuisance flows via these channels appear to be significant sources of pollutants. Concentrations of trace metals have decreased over a 13 year period. In studies conducted by the SARWQCB in 1992/93, metal concentrations met established water quality criteria. However, there was an unidentified nonpolar organic compound which was found to be acutely toxic to test species.

Pathogens also threaten water quality in the Anaheim Bay/Huntington Harbour complex. Anaheim Bay (inland of Pacific Coast Highway bridge) and Huntington Harbour are designated as no discharge areas for vessel sanitary wastes. Pump-out facilities are in place throughout the Huntington Harbour to facilitate compliance: however, illegal vessel discharges may still occur.

SARWQCB staff is providing oversight of the cleanup of the Bolsa Chica lowlands, comprised of 880 acres of degraded wetlands, through an interagency agreement with the CA/RA, DFG, the California State Lands Commission, USEPA, NOAA, and USFWS. These wetlands, which had been developed for petroleum production, were deeded to the State Lands Commission in 1997 and are to be restored to provide mitigation for wetlands that are to be taken by the Port of Los Angeles and the Port of Long Beach as part of an expansion of the ports. This project only affects the 880 acre Bolsa Chica lowland wetlands site deeded to the State in 1997. A grant from

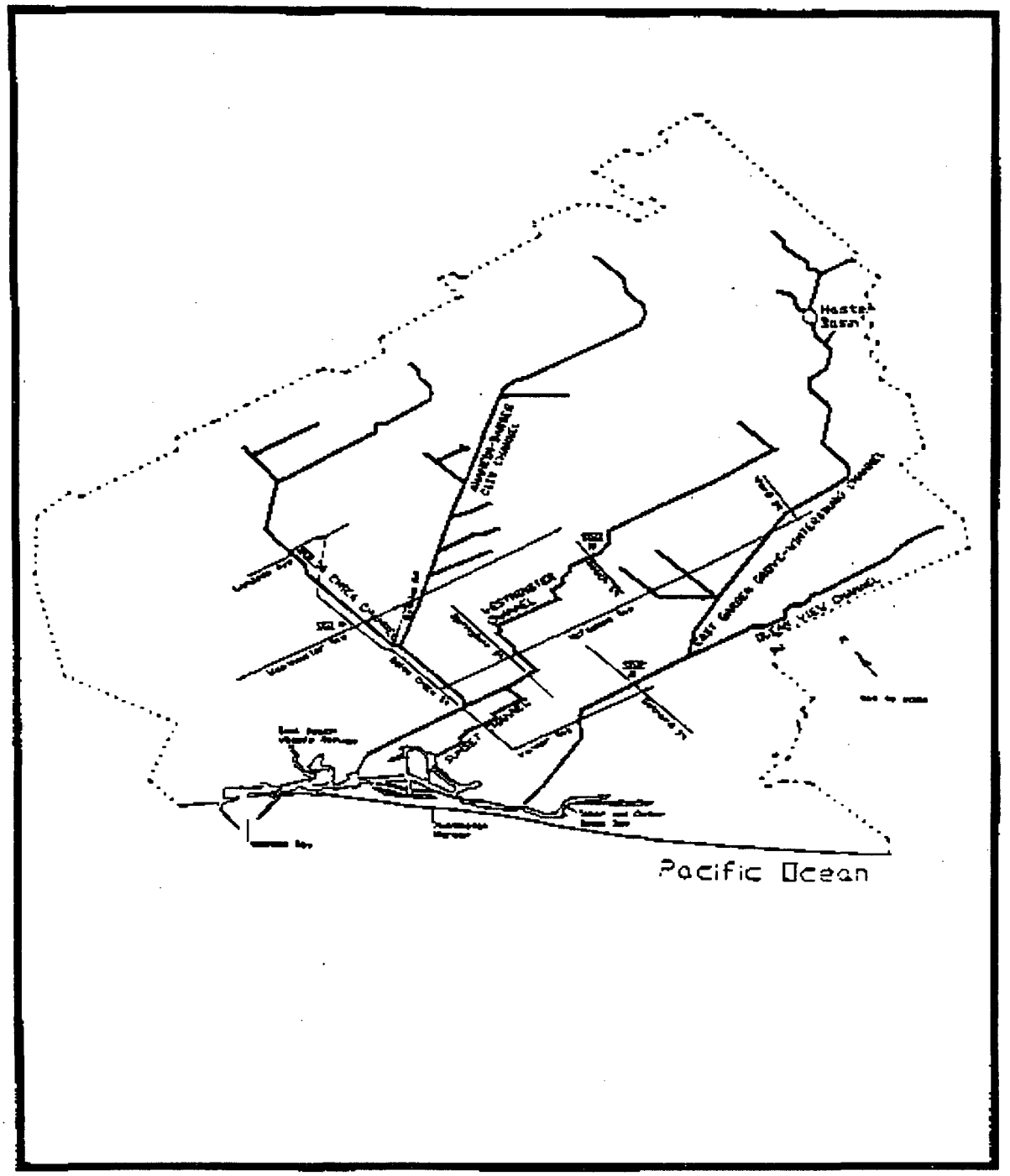


FIGURE 5 ANAHEIM BAY, HUNTINGTON HARBOUR, AND BOLSA CHICA WATERSHED

USEPA will fund the SARWQCB's Bolsa Chica clean-up oversight activities at the rate of 1.1 PY/year, through October 2001. The overall restoration project is expected to take 15 to 20 years to complete, i.e., in the period 2012-2017.

The SARWQCB's current role in the Bolsa Chica wetlands project, as defined in the interagency agreement, includes: serving on the technical advisory committee to the project's Steering Committee, providing clean-up oversight, and considering and deciding clean-up related issues through October 2001.

The Steering Committee will be selecting the preferred wetlands restoration alternative, with a goal of providing high quality tidal and intertidal wildlife habitat. This selection process involves coordination with Orange County and local agencies and authorities to address concerns regarding the quality and quantity of dry weather and wet weather flow entering and potentially entering the restored wetlands from the tributary watershed. The SARWQCB's involvement in this project will assist in the restoration of the wetlands to robust habitat with high environmental value.

BIG BEAR LAKE WATERSHED

I. Overview

As shown in Figure 6, the Big Bear Lake Watershed is located in the San Bernardino Mountains. Major water bodies in this watershed include:

Big Bear Lake
Baldwin Lake
Stanfield Marsh
Shay Meadows
Rathbone (Rathbun) Creek
Summit Creek
Grout Creek

Cities in the Big Bear Lake Watershed include Big Bear Lake and Big Bear City.

Big Bear Lake is a high mountain reservoir occupying a relatively small, east-west oriented basin. The lake was created in 1885 by the construction of a single arch dam across Bear Creek, a tributary to the Santa Ana River. The dam was enlarged to its present size in 1911. The spillway altitude is 6,744 feet, and the lake has a surface area of 3,000 acres, a storage capacity of 73,300 acre-feet and an average depth of 24 feet, with the deepest point of 72.3 feet at the dam.

The lake basin is dominated by yellow pine and white fir, with pinion pine and junipers on the higher slopes. The area supports a variety of sensitive habitat, including wet meadows containing several endangered plant species which are remnants of the glacial episodes of the Region. The lake itself supports habitat for endangered Bald Eagles during the winter season.

The basin supports a large number of recreational activities. Lake recreational activities include fishing, swimming, boating, and water skiing. Areas adjacent to the lake are used for camping, skiing, hiking, equestrian trails, and other outdoor activities.

In addition to the 15,000 permanent residents in Big Bear Valley, over 4 million people visit Big Bear Valley annually. In 1990, a total of 8,681 boat permits were issued to permanent residents and seasonal and daily visitors. Summer sports, as well as the operation of two major ski areas, make Big Bear Valley a highly utilized year-round resort. Every weekend, 120,000 to 180,000 visitors come to this area.

The 1998 303(d) List designated the following water bodies as impaired: Big Bear Lake, due to nutrients, copper, mercury, and siltation; Grout Creek for metals and nutrients; Summit Creek due to nutrients; and Rathbone Creek due to nutrients and siltation. The problem pollutants have been identified as coming from NPSs.

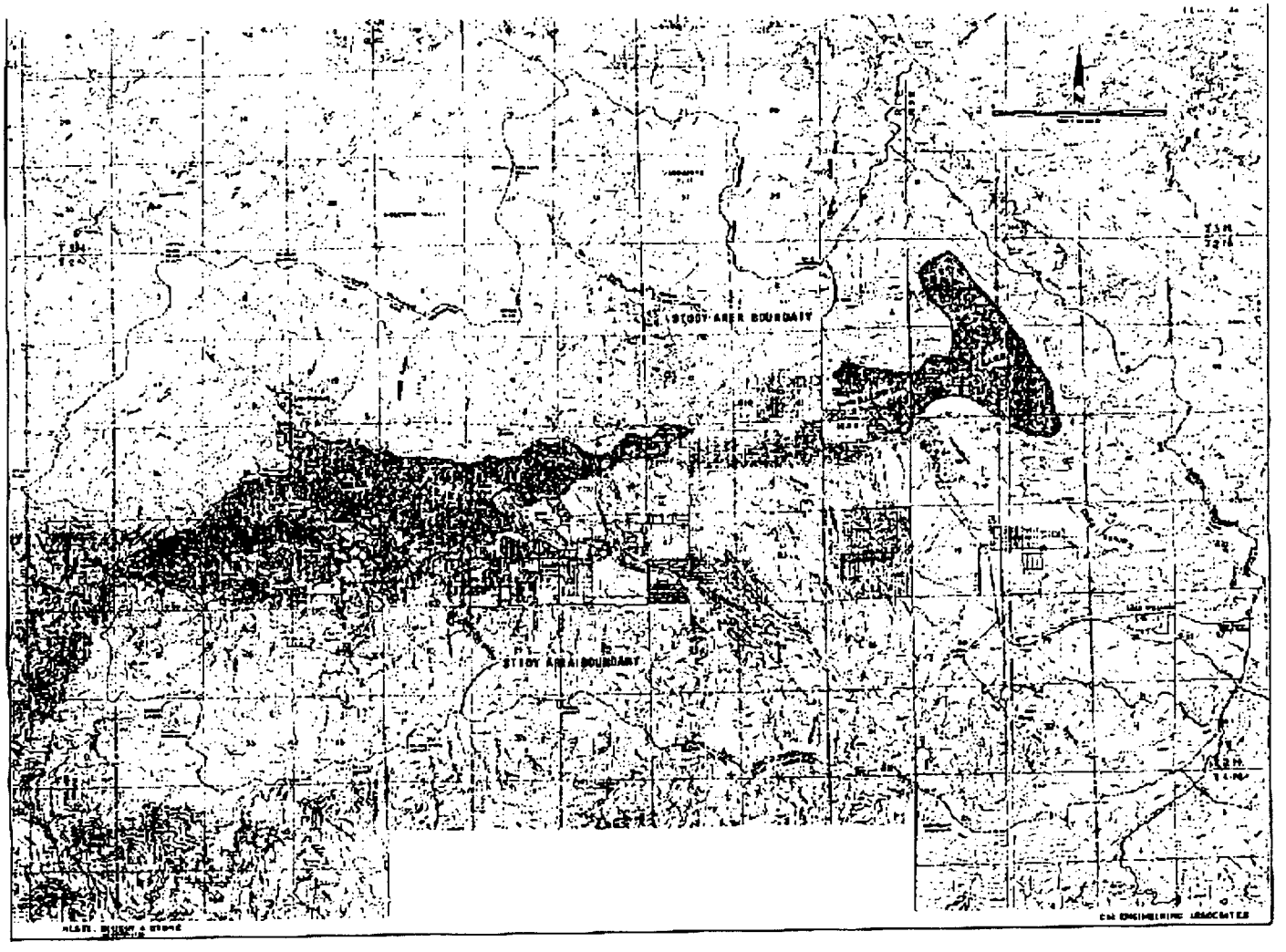


FIGURE 6. BIG BEAR LAKE WATERSHED

During 1992-1993, the SARWQCB conducted a Phase I Clean Lakes study (Section 314 of the CWA) to evaluate the current water quality condition of the lake and its major tributaries. The focus of the study was to identify the tributaries responsible for input of toxics and nutrients.

Big Bear Lake is moderately eutrophic. During the summer months, deeper water may exhibit severe oxygen deficits. Nutrient enrichment has resulted in the growth of rooted aquatic plants, which has impaired the fishing, boating, and swimming uses of the lake. Phosphorus has been identified as the nutrient limiting algae growth. Approximately 80 percent of the phosphorus load emanates from Rathbone Creek. The large amount of precipitation in Southern California during 1993 resulted in more runoff from the Big Bear Lake tributaries and an increased input of nutrients. For instance, the total phosphorus load increased between 1992 to 1993 by a factor of two and the total nitrogen load increased by a factor of 100. To control the vegetation in the lake resulting from excessive nutrient input, mechanical harvesters are used to remove aquatic plants, including the roots. However, given the increasing eutrophic condition of the Lake, harvesting of aquatic vegetation may not be effective much longer. It is therefore appropriate to implement control measures for reducing the input of nutrients from the major tributaries, Rathbone Creek, Summit Creek, and Grout Creek.

Toxics may be entering the Big Bear Lake Watershed and accumulating in aquatic organisms and bottom sediments at concentrations that are of concern, not only for the protection of aquatic organisms but for the protection of human health as well. Past TSMP data have indicated the presence of copper, lindane, mercury, and zinc in fish tissue. Metals are present in the lake and some tributaries. Mercury and copper concentrations measured in the lake and in several of the tributaries (1992-93 Clean Lake study) exceeded water quality criteria. At the same time, however, chronic toxicity bioassays were inconclusive as to whether the presence of metals was causing a toxic response in test organisms. Additional investigations should be done to both pinpoint the source(s) of metals into the lake and determine if metal concentrations are causing toxicity. Once that is accomplished, appropriate source control measures can be implemented.

A cooperative effort to ensure proper management and protection of this resource is in progress. A number of agencies, private organizations, and individuals have joined in the development of the Big Bear Valley CRMP. A GIS will be developed to integrate information on plant and animal habitat, tributaries, and other relevant data. The intent is to use this system as a guide in making land use decisions that are commensurate with water quality protection.

MIDDLE SANTA ANA RIVER WATERSHED

I. Overview

As shown in Figure 7, the Middle Santa Ana River Watershed Management Area extends from Prado Dam to the foothills of the San Bernardino and San Gabriel Mountains and includes the following major water bodies:

Santa Ana River, Reaches 3, 4 and 5
Temescal Creek
San Timoteo Creek
Upper Santa Ana Basin Groundwater Basins
(San Timoteo, Bunker Hill I, II, Pressure, Rialto Colton, Riverside I, II, III, Arlington, Bedford, Lee Lake Coldwater and Temescal)

Cities in the Middle Santa Ana River Watershed include Corona, Norco, Riverside, Colton, San Bernardino, Grand Terrace, Highland, Loma Linda, Redlands, Calimesa, Yucaipa, and portions of Beaumont.

The 1975, 1983, and 1995 Basin Plans reported that the most serious problem in the Santa Ana River Basin is the buildup of dissolved minerals or salts in the ground and surface waters. Sampli and computer modeling of groundwaters showed that the levels of dissolved minerals (TDS) wer exceeding water quality objectives or would do so in the future unless appropriate controls were implemented. Nitrogen levels in the Santa Ana River, largely in the form of nitrate, were likewis projected to exceed objectives. These high levels of TDS and nitrate adversely affect the benefic uses of ground and surface waters. The mineralization problems in the Middle Santa Ana Rive WMA have an impact on potential reclamation activities.

SARWQCB staff is currently involved in a watershed-wide study to evaluate the Total Dissolv Solids (TDS)/Nitrogen Management Plan that is currently specified in the Basin Plan. This includes evaluation of the Basin Plan groundwater objectives. The overall goal of the study is develop a regulatory approach consistent with the Basin Plan and State and federal law that wi allow for increased reclamation opportunities in the watershed. The end product of this effort will be a regulatory guidance document for reclamation in the Santa Ana River watershed.

Giant Reed (*Arundo donax*) (hereafter Arundo) and Saltceder (*Tamarix sp.*) impact the beneficial uses of the Santa Ana River and its tributaries. Throughout the Middle (and Lower and Upper) Santa Ana River watershed, these exotics destroy riparian, endangered species and aquatic habitat. In addition, Arundo is a major consumer of precious water resources. Approximately 8,000 acres of Arundo have been identified along the Santa Ana River watershed. To address the Arundo problem, a number of local, federal and State agencies have formed "Team Arundo", with the intent to develop an Arundo eradication management plan and to initiate the eradication process. Education of local landowners and the nursery and landscape industry is also an important component of the eradication process.

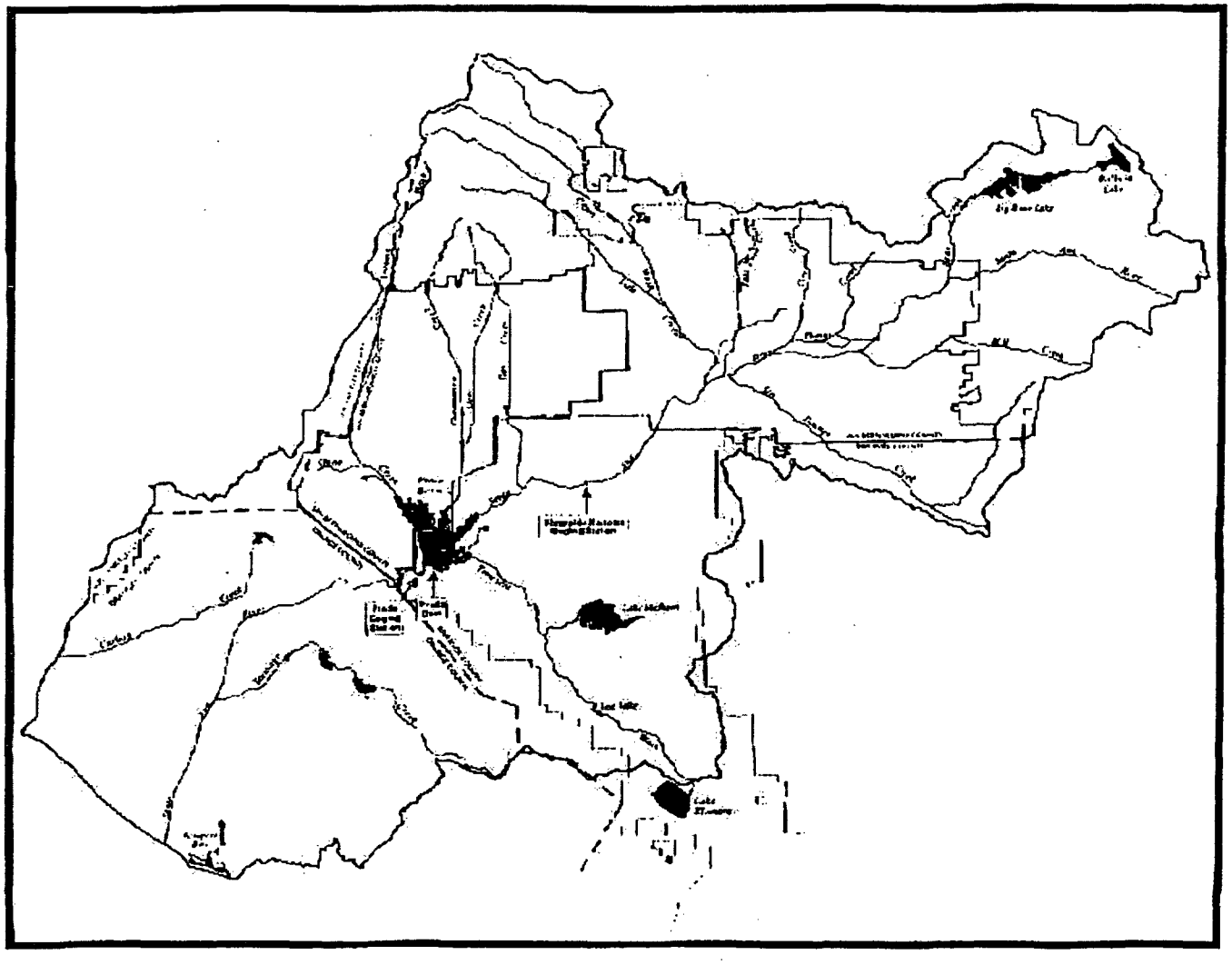


FIGURE 7. MIDDLE SANTA ANA RIVER WMATERSHED

LOWER SANTA ANA RIVER WATERSHED

I. Overview

As shown in Figure 8, the Lower Santa Ana River Watershed Management Area extends from Prado Dam to the Pacific Coast but specifically excludes the Newport Bay Watershed and the Anaheim Bay/Huntington Harbour/Bolsa Chica Watershed which are addressed separately. Major water bodies include:

Santa Ana River, Reaches 1 and 2
Pacific Ocean – coastal waters
Santiago Creek
Carbon Canyon Creek
Santa Ana Forebay groundwater subbasin
Santa Ana Pressure groundwater subbasin
Santa Ana River Mouth Estuary
Talbert Marsh

Cities in the Lower Santa Ana River Watershed include Lorba Linda and Anaheim Hills and portions of Orange, Villa Park, Anaheim, Garden Grove, Santa Ana, Fountain Valley, Huntington Beach, and Costa Mesa.

The Santa Ana River recharges Orange County groundwater subbasins. Rapid percolation basins located in the Santa Ana River streambed are operated and maintained by Orange County Water District (OCWD). OCWD also owns and operates a number of other recharge pits, ponds, and basins in the Santa Ana Forebay area that are supplied with Santa Ana River water via pipelines.

Groundwater makes up approximately 63 percent of the total water supply for the OCWD area. The River and several very small tributaries provide about half of the groundwater recharge. Orange County Water District is currently conducting studies of the Santa Ana River and the receiving groundwater subbasin in order to evaluate the feasibility of recharging high quality recycled water from the Orange County Sanitation District (OCSD).

The Orange County Sanitation District (OCSD) has been conducting an extensive ocean monitoring program in conjunction with the issuance of their 301(h) waiver since 1985. Their program has been structured since its inception to evaluate potential environmental and public health effects from the discharge of about 230 million gallons per day of treated wastewater to the Pacific Ocean approximately 4.5 miles off shore from Huntington Beach at a depth of 198 feet. The District ocean monitoring program was enhanced during FY 97-98 in the re-issuance of their ocean discharge NPDES permit . Requirements were included for the District to conduct strategic process studies and to participate in regional monitoring activities coordinated by the Southern California Coastal Water Research Project (SCCWRP). The intent of these monitoring activities, which go beyond the core program designed to evaluate regulatory compliance, is to determine the potential impacts of the District's discharge in the context of other municipal wastewater discharges and nonpoint source inputs to coastal waters.

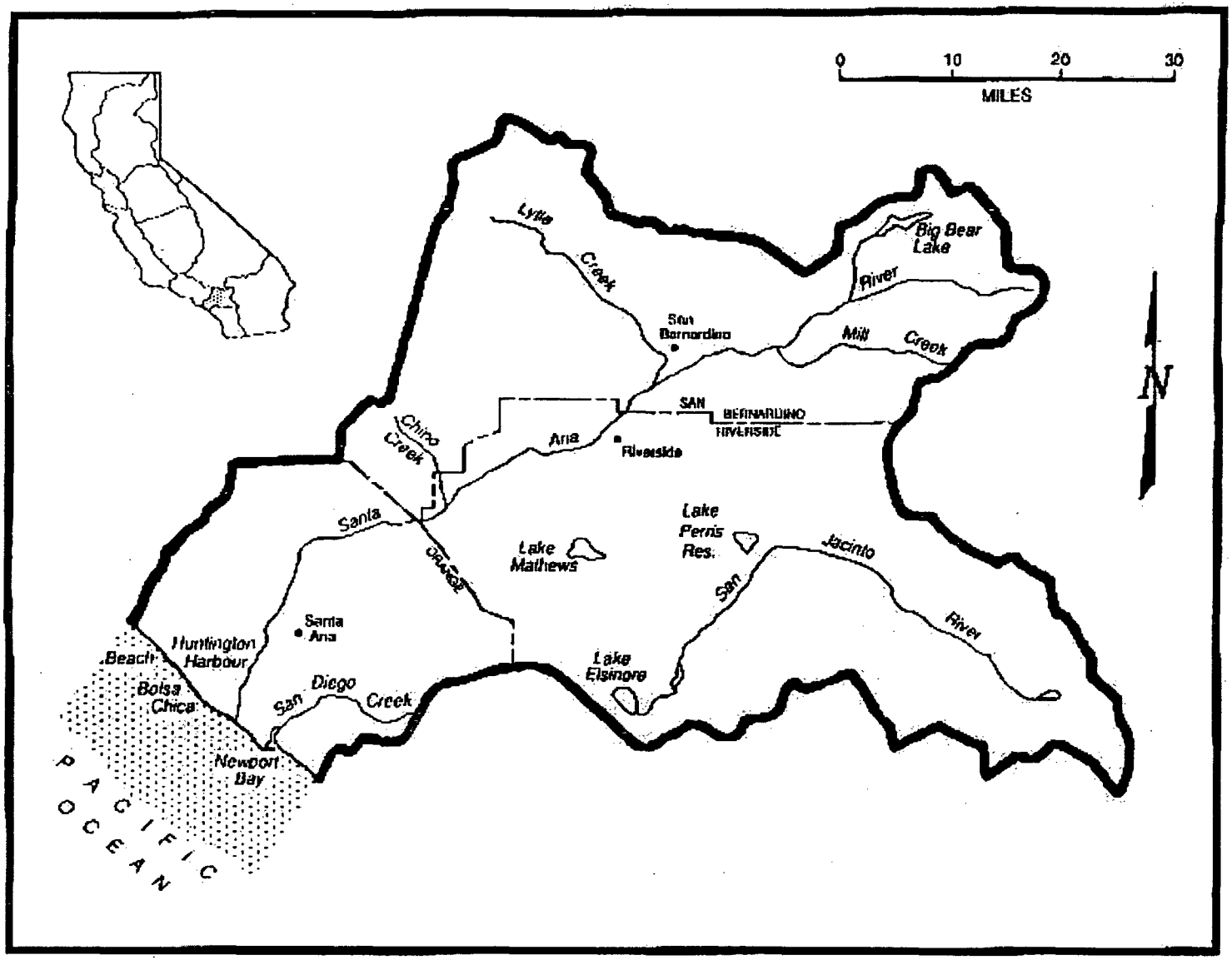


FIGURE 8. LOWER SANTA RIVER WATERSHED

SCCWRP has provided its member agencies and the regulatory community with important scientific information about the sources, fates, and effects of wastewater and storm water discharged into the southern California Bight. In addition to their normal research activities, SCCWRP staff helped coordinate the summer 1998 ocean monitoring program efforts of 41 agencies into the second Bight-wide regional ocean monitoring survey. The goal of this second survey was to add to the data collected in the first survey completed in 1994, as well as to sample other areas of the Bight not investigated in 1994 in order to answer questions about the health of the coastal ocean waters adjacent to Southern California. The planning for this survey required that the ocean dischargers and the regulatory community work closely together to utilize the available monitoring resources in a coordinated fashion. In addition to ocean monitoring, SCCWRP plans to implement an enclosed bays and estuary monitoring program.

UPPER SANTA ANA RIVER WATERSHED

I. Overview

As shown in Figure 9, the Upper Santa Ana River Watershed Management Area extends from the Santa Ana River, Reach 6, to the mountains. In general, the mountain streams are included in the Upper Santa Ana River Watershed. Major water bodies include:

Santa Ana River, Reaches 6 and 7
Lytle Creek, Mountain Reaches
Mill Creek, Mountain Reaches

Communities in the watershed include Angelus Oaks, Arrowbear Lake, Crestline, Forest Falls, and Running Springs.

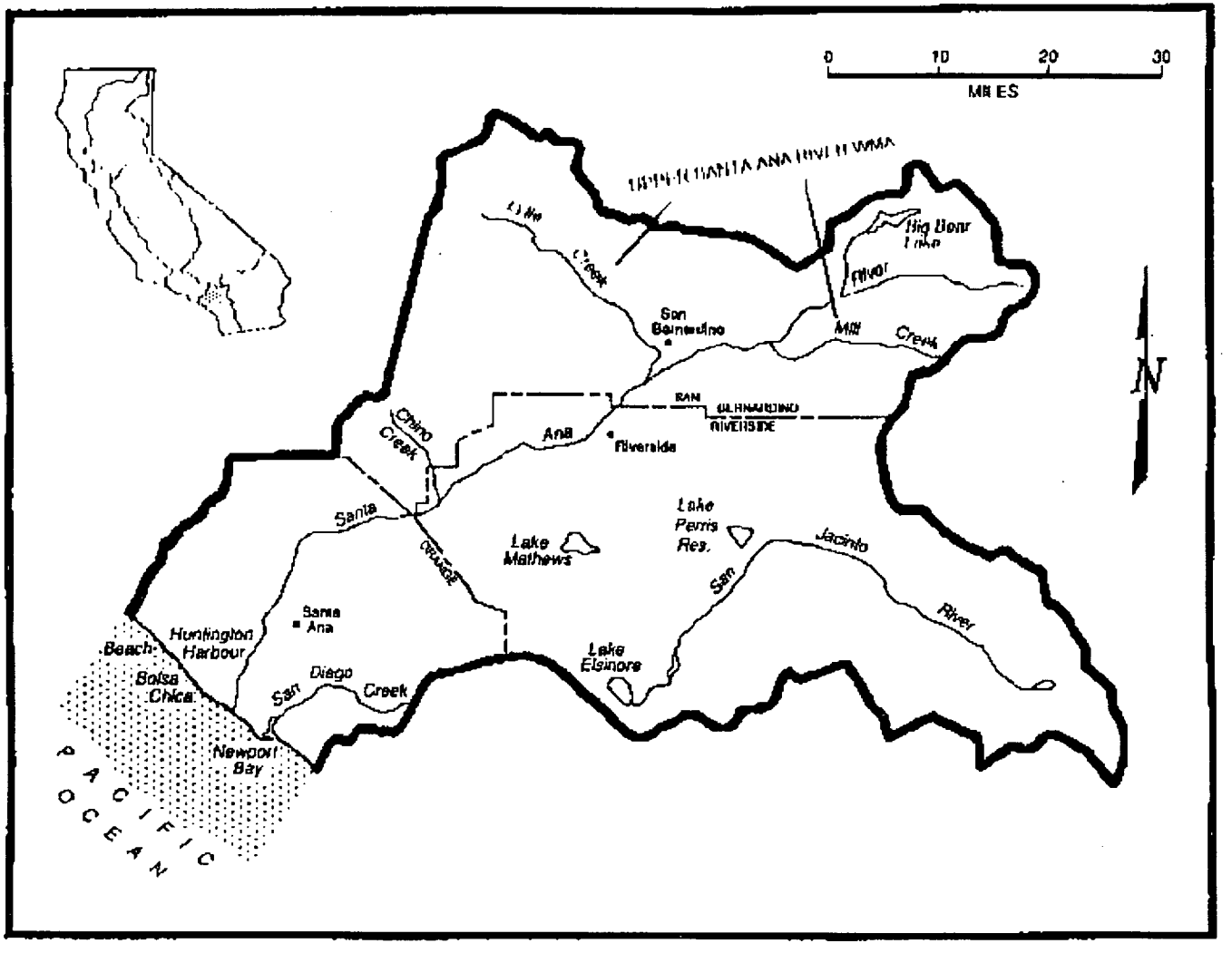


FIGURE 9. UPPER SANTA ANA RIVER WATERSHED

San Diego Region (Region 9)

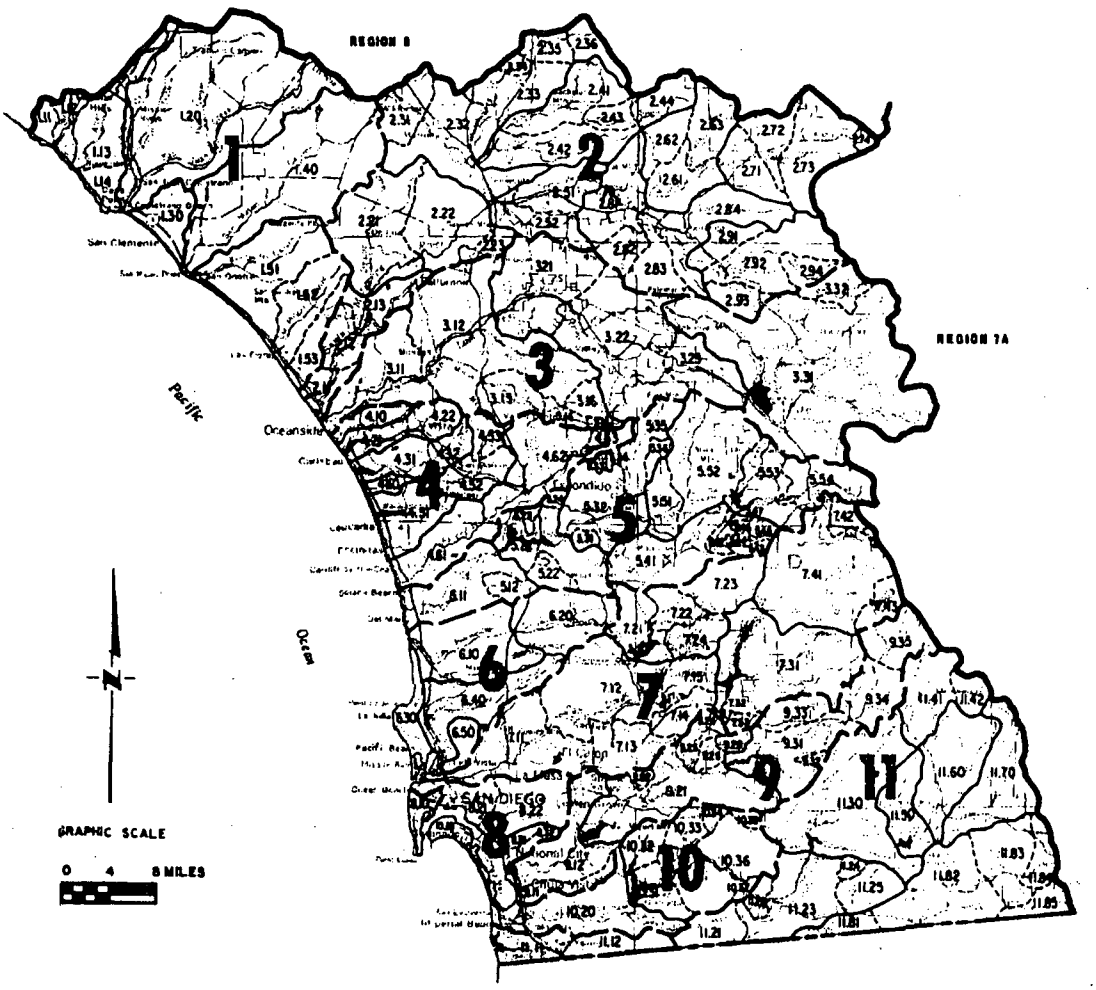


Overview

The San Diego Region, shown in Figure 1, occupies an area of approximately 3,900 square miles in the southwestern corner of California. The northern boundary of the Region is the hydrologic divide starting at the coast near Laguna Beach and extending inland through El Toro and easterly along the ridge of the Elsinore Mountains into the Cleveland National Forest. The eastern boundary of the Region is the hydrologic divide formed by the Laguna Mountains and other lesser known mountains located in the Cleveland National Forest. The southern boundary of the Region is the United States-Mexico international border. The western boundary of the Region parallels the coastline three miles offshore and extends from the international border northerly approximately 85 miles to the northern boundary of the Region. The Region encompasses most of San Diego County and parts of southwestern Riverside County and southern Orange County.

The water resources in the San Diego Region can be classified as coastal waters, inland surface waters, groundwaters, imported waters, and reclaimed water. Some of the freshwater supplied for domestic and municipal uses within the Region is obtained from local surface and ground water, but most is imported. The San Diego Regional Water Quality Control Board (SDRWQCB) *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) identifies the beneficial uses of and water quality objectives for the coastal waters, inland surface waters, and groundwaters of the Region.

Coastal waters in the region include the Pacific Ocean and various bays, harbors, coastal lagoons, estuaries, and river mouths. San Diego Bay (which includes the mouth of the Otay River and Sweetwater Marsh at the mouth of Sweetwater River) is a natural bay that has been dredged to accommodate deep draft vessels. Dana Point Harbor, Del Mar Boat Basin, Oceanside Harbor, and Mission Bay (which includes the Kendall-Frost wildlife reserve) are shallower bays and harbors, all of which have been modified or constructed to accommodate small craft. Important coastal lagoons, estuaries, and river mouths include Aliso Creek mouth, San Juan Creek mouth, San Mateo Creek mouth, San Onofre Creek mouth, Las Flores Lagoon, Santa Margarita Lagoon, San Luis Rey River mouth, Loma Alta Slough, Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, San Elijo Lagoon, San Dieguito Lagoon, Los Penasquitos Lagoon, Famosa Slough, San Diego River mouth, and Tijuana River Estuary.



LEGEND

- DRAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- HYDROLOGIC AREA BOUNDARY
- HYDROLOGIC SUBAREA BOUNDARY

FIGURE 1- SAN DIEGO REGION HYDROLOGIC UNITS AREAS, AND SUBAREAS

The San Diego Region has 13 principal stream systems that originate in the highlands and flow to the coast. From north to south these stream systems are Aliso Creek, San Juan Creek, San Mateo Creek, San Onofre Creek, Santa Margarita River, San Luis Rey River, San Marcos Creek, Escondido Creek, San Dieguito River, San Diego River, Sweetwater River, Otay River, and the Tijuana River. Most of the streams of the San Diego Region are interrupted in character, with both perennial and ephemeral components due to the rainfall pattern and the construction of surface water impoundments. Surface water impoundments capture flow from many of the Region's major surface water streams. Many of the major surface water impoundments (reservoirs) contain a blend of natural runoff and imported water.

All major watersheds in the San Diego Region contain groundwater basins. The basins are relatively small in area and generally shallow. Although these groundwater basins are limited in size, the groundwater yield from the basins has been historically important to the development of the Region, particularly as a local source of supply. A number of the larger groundwater basins could be of future significance in the Region for storage of both imported waters and reclaimed water. Nearly all of the local groundwater of the Region has been intensively developed for municipal and agricultural supply purposes. Because of the movement of groundwater to the surface and the movement of surface water into the ground, pollutants present in groundwater may be transported into surface waters and vice versa.

Land uses in the lower portions of watersheds sometimes differ significantly from those in the upper portions. This difference in land uses can translate to differences in water quality and beneficial use problems, the solutions to such problems, and the composition of the stakeholder groups. However, activities in one part of a watershed can affect other areas in the watershed that are miles away as runoff, sediments, and pollutants flow through the watershed toward its outlet. With the one exception mentioned below, all watersheds in the San Diego Region are contained entirely within the boundaries of the San Diego Region (i.e., all watersheds begin and end within the Region.) This means that activities that could adversely affect the quality and beneficial uses of the waters of the Region generally occur within the SDRWQCB's jurisdiction and are potentially subject to the SDRWQCB's authority and policies.

The Tijuana River Watershed is the one watershed in the San Diego Region that is not entirely within the jurisdiction of the SDRWQCB. The Tijuana River Watershed covers a total of 1,720 square miles in California and Mexico. Approximately 467 square miles or 27 percent of this watershed lies in California; the remainder lies in Mexico. Raw sewage discharges into the Tijuana River from Mexico have adversely affected water quality and posed a public health threat to residents on both sides of the international border. The resolution of water quality problems in the Tijuana River watershed poses unique challenges for the SDRWQCB to work in a cooperative, coordinated manner with governmental agencies at the federal, State, and local level in both Mexico and the United States.

Watershed Management Areas

The San Diego Region consists of 11 hydrologic units (HU), 54 hydrologic areas (HA), and 147 hydrologic subareas (HSA). The names and geographic boundaries of these hydrologic divisions are listed in Table 1 and shown in Figure 1 respectively. An HA is defined as the entire watershed of one or more major streams. Hydrologic areas consist of watersheds of major tributaries and/or major ground water basins within an HU. HSAs are major subdivisions of hydrologic areas including both water-bearing and nonwater-bearing formations.

The term "watershed" can be used interchangeably with any of the terms "hydrologic unit," "hydrologic area," and "hydrologic subarea," all of which are used in the Basin Plan. Watersheds may consist of several smaller tributary watersheds. For example, the Stonewall Creek Watershed is one of several watersheds that are part of the Garnet HSA, which is one of several watersheds that are part of the Upper Sweetwater HA, which is one of several watersheds that are part of Sweetwater HU, which is one of several watersheds that are part of the San Diego Bay Watershed.

For purposes of this document, the San Diego Region has been divided into the following watershed management areas.

1. SAN JUAN CREEK WATERSHED MANAGEMENT AREA

San Juan Hydrologic Unit (1.00)

The San Juan Hydrologic Unit is a generally trapezoid-shaped area of 500 square miles. The cities of Laguna Beach, San Juan Capistrano, Mission Viejo, Laguna Niguel, Lake Forest and Laguna Hills, Dana Point, and San Clemente, and a number of unincorporated communities are located in the Unit.

The three major natural surface water bodies of the San Juan Hydrologic Unit are Aliso Creek, San Juan Creek and San Mateo Creek. San Juan Creek divides the communities of Dana Point and Capistrano Beach and enters the Pacific Ocean at Doheny Beach State Park. The mouth of the creek is normally open to the ocean. The mouth of San Mateo Creek forms a salt water tidal marsh and is entirely within the Camp Pendleton Naval Reservation.

2. ALISO CREEK WATERSHED MANAGEMENT AREA

Aliso Hydrologic Subarea (1.13) of the San Juan Hydrologic Unit

The Aliso Hydrologic Subarea is an area of approximately 36 square miles drained by Aliso Creek. Precipitation ranges from 12 to 14 inches per year. Laguna Niguel Regional Lake is a recreational impoundment on Sulphur Creek, a tributary of Aliso Creek. The

lake contains only local runoff. Aliso and Woods Canyons Wilderness Park is located in the watershed. Aliso Creek flows into the Pacific Ocean in southern Laguna Beach at Aliso Beach Park, a popular recreational area.

3. SANTA MARGARITA RIVER WATERSHED MANAGEMENT AREA

Santa Margarita Hydrologic Unit (2.00)

The Santa Margarita Hydrologic Unit is a rectangular area of about 750 square miles. Included in it are portions of Camp Pendleton, as well as the civilian population centers of Murrieta, Temecula, and part of Fallbrook.

The Santa Margarita Hydrologic Unit is drained largely by the Santa Margarita River and its major tributaries (Murrieta Creek and Temecula Creek). The only coastal lagoon of the Unit is the Santa Margarita Lagoon, which lies entirely within the Marine Corps Base Camp Pendleton. The major surface water reservoirs are Vail Lake and O'Neill Lake. Annual precipitation ranges from less than 12 inches near the coast to more than 45 inches inland near Palomar Mountain.

4. SAN LUIS REY RIVER WATERSHED MANAGEMENT AREA

San Luis Rey Hydrologic Unit (3.00)

San Luis Rey Hydrologic Unit is a rectangular area of about 565 square miles and includes the population centers of Oceanside, Valley Center, and portions of Fallbrook and Camp Pendleton. In addition, there are several Indian reservations in the Unit. The major stream system is the San Luis Rey River. Lake Henshaw, one of the largest water storage reservoirs in the San Diego Region, is located on the River. Annual precipitation is heavier than in other units, ranging from less than 12 inches near the ocean to 45 inches near Palomar Mountain.

The San Luis Rey River estuary is located at the mouth of the San Luis Rey River within the City of Oceanside and adjacent to the City's northern boundary. The mouth of the River is immediately adjacent to Oceanside Harbor, which is managed by the City of Oceanside and Del Mar Boat Basin, which is a military facility. Oceanside Harbor and Del Mar Boat Basin are located side-by-side and are protected from the ocean by the same breakwater.

5. CARLSBAD WATERSHED MANAGEMENT AREA

Carlsbad Hydrologic Unit (4.00)

Carlsbad Hydrologic Unit is a roughly triangular-shaped area of about 210 square miles, extending from Lake Wohlford on the east to the Pacific Ocean on the west and from Vista on the north to Cardiff-by-the-Sea on the south. The Unit includes the Cities of Oceanside, Carlsbad, Leucadia, Encinitas, Cardiff-by-the-Sea, Vista, and Escondido. The area is drained by Buena Vista, Agua Hedionda, San Marcos, and Escondido Creeks.

The Carlsbad Hydrologic Unit contains one small coastal lagoon (Loma Alta Slough) and four major coastal lagoons (Buena Vista, Agua Hedionda, Batiquitos, and San Elijo).

Loma Alta Slough is a small coastal lagoon located entirely within the City of Oceanside at the mouth of Loma Alta Creek. The Slough is normally blocked off from the ocean by a sandbar.

Buena Vista Lagoon at the mouth of Buena Vista Creek lies between the Cities of Carlsbad and Oceanside and is partially within each city. A weir at the mouth of the lagoon maintains the lagoon water level above that of the ocean. The source of water in the lagoon is inflow of rising groundwater and irrigation return water from the area upstream on Vista Creek. A portion of the lagoon has been designated as a bird sanctuary.

Agua Hedionda Lagoon at the mouth of Agua Hedionda Creek is within the City of Carlsbad. The lagoon is routinely dredged to keep it open to the ocean. The lagoon serves as an integral part of a power plant cooling water intake system and also provides a reserve cooling water supply. The easterly portion of the lagoon is used for water oriented recreation.

Batiquitos Lagoon at the mouth of San Marcos Creek enters the Pacific Ocean between the City of Carlsbad and the community of Leucadia. Jetties at the lagoon mouth keep the lagoon open to tidal action.

San Elijo Lagoon is the tidal marsh at the mouth of Escondido Creek. The marsh is normally closed off from the ocean but is subject to tidal fluctuations.

6. SAN DIEGUITO RIVER WATERSHED MANAGEMENT AREA

San Dieguito Hydrologic Unit (5.00)

San Dieguito Hydrologic Unit is a rectangular-shaped area of about 350 square miles. It includes the San Dieguito River and its tributaries, along with Santa Ysabel and Santa Maria Creeks. The Unit contains two major reservoirs, Lake Hodges and Sutherland, and a smaller facility, the San Dieguito Reservoir. The Unit contains one

coastal lagoon, the San Dieguito Lagoon, located at the mouth of the San Dieguito River. The lagoon forms the northerly edge of the City of Del Mar. The lagoon is normally closed off from the ocean by a sandbar.

7. MISSION BAY WATERSHED MANAGEMENT AREA

Penasquitos Hydrologic Unit (6.00)

Penasquitos Hydrologic Unit is a triangular-shaped area of about 170 square miles extending from Poway on the east to La Jolla on the west. There are no major streams in this unit although it is drained by numerous creeks. Miramar Reservoir contains imported Colorado River water.

The Unit contains two coastal embayments, Los Penasquitos (or Sorrento) Lagoon and Mission Bay. Los Penasquitos Lagoon is at the mouth of Penasquitos Creek and empties into the ocean near the northerly boundary of the City of San Diego. Mission Bay has been extensively dredged and filled. Only the University of California Kendall-Frost Reserve in the northeastern part of the bay remains in a somewhat natural state.

Annual precipitation in the Unit ranges from less than eight inches along the ocean to 18 inches inland. Poway and La Jolla are the major population centers.

8. SAN DIEGO RIVER WATERSHED MANAGEMENT AREA

San Diego Hydrologic Unit (7.00)

San Diego Hydrologic Unit is a long, triangular-shaped area of about 440 square miles drained by the San Diego River. El Capitan, San Vicente, Cuyamaca, Jennings, and Murray Reservoirs are the major storage facilities. San Vicente, Jennings, and Murray Reservoirs store mainly Colorado River water whereas El Capitan mainly stores local runoff and some Colorado River water. Cuyamaca Reservoir stores only local runoff.

Much of the impounded water is used to serve major population centers, including a portion of the San Diego metropolitan area and the communities of El Cajon, Santee, Lakeside, Alpine, and Julian. Annual precipitation ranges from less than 11 inches at the coast to about 35 inches around Cuyamaca and El Capitan Reservoir.

The lower reach of the San Diego River, which historically flowed into San Diego Bay and Mission Bay, has been channelized and now flows directly into the Pacific Ocean. The once extensive salt water tidal marsh at the mouth of the River is now confined to a small remnant within the River channel and Famosa Slough, which is connected to but out of the River channel.

9. SAN DIEGO BAY WATERSHED MANAGEMENT AREA

San Diego Bay

San Diego Bay is a natural, crescent-shaped embayment extending approximately 14 miles along a curved axis from where it opens to the Pacific Ocean at Point Loma in the north to its innermost reaches at the mouth of the Otay River in the south. Dredging and filling have extensively modified the Bay. The Bay is narrower and deeper than it was in its undredged, unfilled state. The surface area of the Bay is now approximately 19 square miles. The width of the Bay currently ranges from 0.25 miles to 2.5 miles. The depth of the Bay currently ranges from more than 60 feet in some northern areas to only a few feet in much of the southern portion. Depths average less than 40 feet.

The salinity of the San Diego Bay is generally similar to that of the ocean. In summer and early fall, the salinity of the southern part of the Bay may be somewhat higher than that of the ocean. Immediately following storm events, the salinity of the Bay in the vicinity of the mouths of rivers, creeks, and storm drains may be somewhat lower than that of the ocean. Freshwater inflow to the Bay has been reduced by re-routing of San Diego River so that it no longer enters the Bay and construction of dams for water supply reservoirs on Sweetwater River and Otay River.

San Diego Bay is located within the Cities of San Diego, National City, Chula Vista, and Coronado.

Pueblo San Diego Hydrologic Unit (8.00)

Pueblo San Diego Hydrologic Unit is a triangular-shaped area of about 60 square miles with no major stream system. It is bordered on the north by the watershed of the San Diego River and on the south by San Diego Bay and the watershed of the Sweetwater River. The Pueblo San Diego Hydrologic Unit is located entirely within the City of San Diego. The Unit is relatively dry with an annual precipitation of less than 11 inches to 13 inches.

Sweetwater Hydrologic Unit (9.00)

Sweetwater Hydrologic Unit is an elongated northeasterly trending strip with an area of about 230 square miles. It is traversed along its length by the Sweetwater River on which Sweetwater Reservoir is located. The annual precipitation varies from less than 11 inches at the coast to about 35 inches inland. Sweetwater Marsh is located at the mouth of Sweetwater River where the river flows into San Diego Bay.

Otay Hydrologic Unit (10.00)

Otay Hydrologic Unit is a club-shaped area of about 160 square miles. The major stream system traversing the area is the Otay River on which the Upper and Lower Otay Reservoirs are located. The Lower Otay Reservoir is the terminus of the second San Diego Aqueduct. Major population centers include the communities of Imperial Beach in the coastal area and Dulzura inland. The annual precipitation generally increases inland from the coast and ranges from less than 11 to 19 inches. The Otay River flows into the southernmost end of San Diego Bay. The Coronado Hydrologic Area, which comprises the westernmost portion of the Unit, includes North Island Naval Air Station, the City of Coronado, and the Silver Strand.

10. TIJUANA RIVER WATERSHED MANAGEMENT AREA

Tijuana Hydrologic Unit (11.00)

Tijuana Hydrologic Unit is a triangular-shaped area that is drained by Cottonwood and Campo Creeks, which are tributaries to the Tijuana River. It covers an area of about 470 square miles and lies mainly in the mountain-valley section. Part of the Unit lies in Mexico.

Tijuana Hydrologic Unit's only coastal lagoon is the Tijuana Estuary which occupies approximately 2,000 acres and is generally open to the ocean. Most of the area can be classified as a saltwater marsh with a number of arms of open water.

Tijuana Hydrologic Unit is sparsely populated with the major population centers at San Ysidro and Campo. Annual precipitation varies from less than 11 inches near the coast to more than 25 inches farther inland near Laguna Mountain. Runoff is captured by Morena Reservoir and Barrett Reservoir on Cottonwood Creek.

11. PACIFIC OCEAN WATERSHED MANAGEMENT AREA

The Pacific Ocean WMA includes ocean waters extending up to three miles from the San Diego Region coastline. All other WMAs in the San Diego Region are tributary to the Pacific Ocean WMA.

The following tables describe the water quality concerns in each of the watershed management areas:

SAN JUAN CREEK WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Aliso Creek	Coliform	12/05	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
Aliso Creek, mouth	Coliform	12/05	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
San Juan Creek, Lower	Coliform	12/05	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
San Juan Creek, mouth	Coliform	12/05	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.

NOTE: See page A-C-13 (at end of these tables) for explanation of terms.

SANTA MARGARITA RIVER WATERSHED MANAGEMENT AREA

303(d) Listed Water Body	Stressor(s)	Estimated Completion	Comments
Rainbow Creek	Nutrients	10/00	
Santa Margarita Lagoon	Nutrients	4/11	Water quality standards may be attained through enforcement of NPDES permit for a sewage treatment plant; anticipated delisting 7/04.

SAN LUIS REY RIVER WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Guajome Lake	Nutrients	7/11	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.

CARLSBAD WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Loma Alta Slough	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
Loma Alta Slough	Nutrients	2/10	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
Buena Vista Lagoon	Sediment Nutrients Coliform	1/11	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
Agua Hedionda Lagoon	Sediment	7/11	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
Agua Hedionda Lagoon	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
San Elijo Lagoon	Nutrients, Coliform	2/10	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.
San Elijo Lagoon	Sediment	7/11	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.

MISSION BAY WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Los Penasquitos Lagoon	Sediment	7/11	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.
Mission Bay	Nutrients, Lead	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.
Mission Bay	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.
Tecolote Creek	Storm water (Cadmium Copper, Lead, Zinc, Toxicity)	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.
Tecolote Creek	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.

SAN DIEGO RIVER WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Famosa Slough	Nutrients	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/04.

SAN DIEGO BAY WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
San Diego Bay, near Sub Base	Toxicity	12/05	Assess further 7/01
San Diego Bay, Shelter Island Yacht Basin	Toxicity (copper)	10/01	
San Diego Bay, Lindbergh HSA shoreline	Coliform	2/10	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.
San Diego Bay, near Grape Street	Toxicity	12/05	Water quality standards may be attained through enforcement; delist 7/04.
San Diego Bay, downtown Piers	Toxicity	12/05	Assess further 7/01.
San Diego Bay, near Coronado Bridge	Toxicity	12/05	Assess further 7/01.
Chollas Creek	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.

SAN DIEGO BAY WATERSHED MANAGEMENT AREA (continued)

Water Body	Stressor(s)	Estimated Completion	Comments
Chollas Creek	Diazinon	10/00	
Chollas Creek	Metals	10/01	
San Diego Bay, near Chollas Creek	Toxicity	10/03	
San Diego Bay, San Diego Naval Station	Toxicity	10/03	Water quality standards may be attained through enforcement; anticipated delisting 7/02.
San Diego Bay, Seventh Street Channel	Toxicity	10/03	Water quality standards may be attained through enforcement; anticipated delisting 7/02.
San Diego Bay, near 24th Street Marine Terminal	Toxicity	10/03	Assess further 7/01.
San Diego Bay, Telegraph HSA shoreline	Coliform	2/10	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/06.

Water Body	Stressor(s)	Estimated Completion	Comments
Tijuana River	Coliform	7/11	Major sources are probably in Mexico; approaches other than TMDLs will be needed to attain water quality standards.
Tijuana River	Trace metals, Nutrients, Synthetic Organics, Pesticides Trash	7/11	Major sources are probably in Mexico; approaches other than TMDLs will be needed to attain water quality standards.
Tijuana River Estuary	Coliform	7/11	Major sources are probably in Mexico; approaches other than TMDLs will be needed to attain water quality standards.
Tijuana River Estuary	Trace metals, Nutrients, Synthetic Organics, Pesticides Trash	7/11	Major sources are probably in Mexico; approaches other than TMDLs will be needed to attain water quality standards.

PACIFIC OCEAN WATERSHED MANAGEMENT AREA

Water Body	Stressor(s)	Estimated Completion	Comments
Pacific Ocean, Laguna Beach HSA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Aliso HSA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Dana Point HSA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Lower San Juan HSA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Clemente HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Luis Rey HU shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.

PACIFIC OCEAN WATERSHED MANAGEMENT AREA (continued)

Water Body	Stressor(s)	Estimated Completion	Comments
Pacific Ocean, Loma Alta HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Buena Vista Creek HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Marcos HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Escondido Creek HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Dieguito HU shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Scripps HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.

PACIFIC OCEAN WATERSHED MANAGEMENT AREA (continued)

Water Body	Stressor(s)	Estimated Completion	Comments
Pacific Ocean, Loma Alta HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Buena Vista Creek HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Marcos HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07
Pacific Ocean, Escondido Creek HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, San Dieguito HU shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Scripps HA shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.

Water Body	Stressor(s)	Estimated Completion	Comments
Pacific Ocean, San Diego HU shoreline	Coliform	1/08	Water quality standards may be attained through enforcement of the municipal storm water permit; delist 7/07.
Pacific Ocean, Coronado HA shoreline	Coliform	1/08	Cleanup and abatement order issued to City of Coronado; assess further 4/00.
Pacific Ocean, Tijuana HU shoreline	Coliform	1/08	Major sources are probably in Mexico; approaches other than TMDLs will be needed to attain water quality standards.

FOOTNOTES

Estimated Completion - The date it is anticipated that the TMDL will be incorporated into the SDRWQCB Basin Plan.

Assess further--This indicates that the water body may be further assessed prior to TMDL development. Some water bodies may have some indication of impairment or threat (e.g., few data points are available and one point shows exceedance of a criterion), but require further assessment to conclusively determine whether uses are impaired or threatened.

Delist–This indicates that a water body may be removed from the 303(d) List for the reasons specified in the Comments column. Delisting guidelines are contained in the 303(d) listing guidelines. A water body will remain on Table 1, however, until it is formally delisted through the 303(d) public review process.

III. SURFACE WATER ASSESSMENT

A. Surface Water Ambient Monitoring Program (SWAMP)

SWAMP is proposed as a new program at the SWRCB and RWQCBs. To ensure that the SWAMP is coordinated and integrated, the monitoring efforts shall be overseen centrally by the SWRCB. The RWQCBs shall establish monitoring priorities for the water bodies within their jurisdictions.

SWAMP is intended to meet four goals as follows:

1. Identify specific problems preventing the SWRCB, RWQCBs, and the public from realizing beneficial uses in targeted watersheds.

2. Create an ambient monitoring program that addresses all HUs of the State using consistent and objective monitoring, sampling and analysis methods; consistent data quality assurance protocols; and centralized data management.

3. Document ambient water quality conditions in potentially clean and polluted areas.

4. Provide the data to evaluate the effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.

SWAMP will implement a comprehensive environmental monitoring program focused on providing the information needed by the SWRCB and RWQCBs to effectively manage the State's water resources. The monitoring efforts implemented by SWAMP will be built around the following factors:

Adaptability

California has a huge diversity of natural resources with a variety of surface water resources. The State's water resources include streams, rivers, lakes, estuaries, coastal lagoons, enclosed bays, wetlands, and coastal waters. The State's monitoring approach will allow adaptation to each of these systems because the scale, dimension, and environmental resources vary so greatly.

Cooperative Efforts

Monitoring can be expensive due to the scale of the monitoring efforts and the costs of analysis. The most cost-effective efforts are those that bring together all stakeholders to jointly design and implement the ambient monitoring program. The WMI and SWRCB Strategic Plan emphasize full participation of affected parties. This type of cooperative planning initially helps identify redundant efforts and areas in need of monitoring activity and ultimately reduces costs. Cooperative efforts also help the SWRCB and RWQCBs identify where they can rely on existing information to serve monitoring information needs.

Clear Objectives

Because environmental monitoring can be costly, it is important to clearly define the information most useful to resource agencies and stakeholders to better protect water quality and safeguard resources. Clear monitoring objectives are essential if the ambient monitoring program is to produce meaningful and useful information.

Use of Available Information

Once monitoring objectives are identified, useful information may already be available. All sources of information should be used if it serves the SWRCB's and RWQCBs' intended purpose(s) and is of sufficiently high quality. Sources of available information include: compliance monitoring data, regional monitoring efforts already underway, or other monitoring by federal, State, local agencies, volunteer groups, and University efforts. These types of data should be reviewed before any new monitoring is undertaken. If another organization is performing monitoring that serves the purposes of the RWQCBs, then scarce resources can be directed towards other priorities.

Scientifically Sound Monitoring Design

All monitoring programs shall be based on solid, defensible scientific design. Solid scientific information provides a sound basis for changes in water quality programs, policies, and standards set to protect the environment. This will assist in comparing results among programs. To the extent possible, the RWQCBs shall use statewide templates and protocols in developing and implementing this and other monitoring programs in the Regions. Using the statewide templates and protocols will allow greater use of other high quality monitoring data collected by citizen monitoring groups, academic institutions, private parties, and government agencies.

Meaningful Indicators

The ambient monitoring program shall use the best available condition and response indicators of water quality. These indicators will be scientifically valid and practical, and they will address the needs of the water quality programs. The selected indicators will provide evidence of the quality of biological resources and human uses.

Comparable Methods of Sampling and Analysis

In order for monitoring information to be comparable between monitoring locations and programs, there must be a measure of consistency in the approaches and analytical methods used, as well as stated minimum detection limits, measurement quality requirements, and other strict quality assurance requirements. The data produced will be of definable or equivalent quality so both within and between water body comparisons can be made. All methods will be described, validated, performed competently, and to the extent possible, compared to a reference and be performance-based.

Results Evaluation

Monitoring data must be evaluated in order to make meaningful assessments of the status of water quality. Such evaluations are integral in evaluating the effectiveness of water quality programs and assessing whether they need modification. Results evaluation is

important for CWA Section 305(b) reports, CWA Section 303(d) lists of impaired waters, permitting, enforcement, State and local watershed management programs, voluntary pollution prevention and reduction programs, and preservation and restoration programs.

Continual Refinement

Monitoring efforts that are driven by clear objectives generate useful information that resource managers need to evaluate the success of their water quality protection efforts. Such information is vital in indicating where resources should be directed to address specific problems, and which policies and programs should be fine tuned. Such refinement of programs and policies makes the monitoring process dynamic and meaningful.

Data Management

Data management is a high priority for the State's monitoring programs. Too often, limited funds are spent collecting information that ultimately will be of little use due to lack of standardized data management. SWAMP will include the use of existing data to the extent it can be verified and placed or linked into centralized locations. Any data that are collected as part of the Program shall be made available to all stakeholders centrally along with accompanying metadata.

Regular Reporting

Although monitoring news may not always be good, assessments of water quality and the changes over time provide needed information for decision makers and the public. Monitoring information is essential in setting priorities. Also, monitoring identifies issues and areas that are not a problem. Such information is useful for long-term planning, enabling us to evaluate changing conditions and in gauging future stresses on environmental resources.

Monitoring reports provide the feedback to the SWRCB and RWQCBs on the success of regulatory programs and strategies, as well as the success of prevention and cooperative efforts of stakeholders. Additionally, monitoring results are useful for the public to increase awareness and education on the impacts of their activities on the aquatic environment.

B. CWA Section 303(d)

Federal CWA Section 303(d) requires states to identify waters that do not meet applicable water quality standards with technology-based controls alone. Applicable standards include the designated beneficial use and the adopted water quality objective. States are also required to establish a priority ranking of these waters for purposes of developing TMDLs. Subsequently, each point source and NPS discharging pollutants to the listed water body require a Wasteload Allocation and Load Allocation, respectively, assigned to it. States are then required to submit to the USEPA the list of waters and TMDL priorities for review and approval.

1. Development of the 1998 Section 303(d) List and TMDL Priority Schedule

SWRCB staff prepared guidance for the 1998 water quality assessment update outlining the procedures for each of the nine RWQCBs to conduct its review. This guidance placed emphasis on the assessment of California water bodies for possible Section 303(d) listing. The assessment included reexamining the water bodies listed under CWA Section 303(d) in 1996, reviewing new monitoring information, soliciting information from other State and federal agencies, and inviting the public to participate.

The guidance also included the State's "1998 Clean Water Act (CWA) Section 303(d) Listing Guidelines for California," dated August 11, 1997. These guidelines, developed by a task force of USEPA, RWQCB, and SWRCB staff, were used by RWQCB staff as a basis for listing and delisting water bodies, prioritizing and scheduling TMDLs, and public noticing procedures.

The SWRCB received several petitions and comment letters on the RWQCBs' adoption of their 303(d) lists. Given the significant public interest, the SWRCB held a public workshop to receive comments on the RWQCBs' lists. At a subsequent SWRCB Board Meeting, the statewide Section 303(d) list was modified and then approved by the SWRCB for submittal to USEPA for approval. On May 12, 1999, the USEPA approved this Section 303(d) list after adding additional water bodies and pollutants.

The next update of the Section 303(d) list is scheduled for April 2002.

2. 1998 California 303(d) List and TMDL Priority Schedule

The 1998 California Section 303(d) List and TMDL Priority Schedule (including pollutants or stressors, probable sources, the TMDL priorities, and schedules of completion) is presented in Appendix B. The statewide 1998 California 303(d) List and TMDL Priority Schedule includes all nine RWQCBs' final Section 303(d) lists and SWRCB modifications.

The 1998 California Section 303(d) List and TMDL Priority Schedule identified 509 impaired surface waters with 1,471 pollutants or stressors slated for TMDLs. Four hundred seventy-three of these pollutants or stressors were given highest priority for the development of TMDLs. It should be noted that in addition to the highest priority water bodies, actions are underway for many of the remaining Section 303(d) listed waters.

C. Designated Use Support Summary

In previous 305(b) Reports, overall use support tables were presented for each water body type. These tables are no longer a reporting requirement of CWA Section 305(b) because the presentation of overall use could mask the specific number of uses impaired. The overall use tables have been replaced by the Tables 4A-4J summarizing the extent of impairment in terms of the number of beneficial uses affected.

A determination of degree of use support likely presents a worst-case scenario of the State's water quality because a substantial portion of the State's monitoring data are collected in response to suspected problems (i.e., healthy environments are less likely than troubled ones to be targeted for monitoring).

The two assessment categories "evaluated" and "monitored" used in the following Tables 4A-4J are defined in the Guidelines for Preparation of the 1996 State Water Quality Assessments [305(b) Report] as follows:

> "Evaluated waters" are those water bodies for which the use support decision is based on information other than current site-specific ambient data, such as data on land use, location of sources, predictive modeling using estimated input variables, and some surveys of fish and game biologists. As a general guide, if an assessment is based on older ambient data (e.g., older than five years), it would be considered "evaluated."
>
> "Monitored waters" are those water bodies for which the use support decision is principally based on current site-specific ambient data believed to accurately portray water quality conditions. Waters with data from biosurveys would be included in this category along with waters monitored by fixed-station chemical/physical monitoring. To be considered "monitored" based on fixed-station chemical/physical monitoring, waters should be sampled quarterly or more frequently.

TABLE 4A. SUMMARY OF DESIGNATED USE SUPPORT: BAYS AND HARBORS (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	5,625	10,435	16,060
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	350	0	350
Size Impaired for One or More Uses[1]	7,801	447,218	455,019
TOTAL ASSESSED	13,776	457,653	471,429

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4B. SUMMARY OF DESIGNATED USE SUPPORT: COASTAL SHORELINE (Miles)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	691	84	775
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	0	0	0
Size Impaired for One or More Uses[1]	41	1802 181	121 222
TOTAL ASSESSED	732	265	997

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4C. SUMMARY OF DESIGNATED USE SUPPORT: ESTUARIES (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	6,166	67	6,233
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	0	57	57
Size Impaired for One or More Uses[1]	6,515	816,799	823,314
TOTAL ASSESSED	12,681	816,923	829,604

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4D. SUMMARY OF DESIGNATED USE SUPPORT: GROUNDWATER (Square Miles)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	27,469	9,783	37,252
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	1,830	599	2,429
Size Impaired for One or More Uses[1]	7,232	15,739	22,971
TOTAL ASSESSED	36,531	26,121	62,652

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4E. SUMMARY OF DESIGNATED USE SUPPORT: LAKES / RESERVOIRS (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	116,843	58,439	175,282
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	3,640	60,996	64,636
Size Impaired for One or More Uses[1]	4,194	510,625	514,819
TOTAL ASSESSED	124,677	630,060	754,737

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4F. SUMMARY OF DESIGNATED USE SUPPORT: OCEAN and OPEN BAYS (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	313,006	782	313788
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	3006	0	3006
Size Impaired for One or More Uses[1]	0	0	0
TOTAL ASSESSED	316,012	782	316,794

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4G. SUMMARY OF DESIGNATED USE SUPPORT: RIVERS / STREAMS (Miles)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	1,530	933	2,463
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	1,249	613	1,862
Size Impaired for One or More Uses[1]	1,458	19,491	20,949
TOTAL ASSESSED	4,238	21,037	25,275

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4H. SUMMARY OF DESIGNATED USE SUPPORT: SALINE LAKES (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	0	0	0
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	0	0	0
Size Impaired for One or More Uses[1]	0	410,919	410,919
TOTAL ASSESSED	0	410,919	410,919

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4I. SUMMARY OF DESIGNATED USE SUPPORT: WETLANDS, FRESHWATER (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	5,205	6,835	12,040
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	308	494	802
Size Impaired for One or More Uses[1]	29,879	71,958	101,837
TOTAL ASSESSED	35,392	79,287	114,679

[1] Impaired = Partially or Not Supporting a Designated Use

TABLE 4J. SUMMARY OF DESIGNATED USE SUPPORT: WETLANDS, TIDAL (Acres)

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	0	0	0
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	0	3	3
Size Impaired for One or More Uses[1]	13,920	90,859	104,779
TOTAL ASSESSED	13,920	90,862	104,782

[1] Impaired = Partially or Not Supporting a Designated Use

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B — 455,019 A

C — 121 M

E — 823,314

L — 514,819

R 20,949

S — 410,919

T — 101,837

W — 104,782

Region 8: Upper Newport Bay
Trash

SWRCB Staff Recommendation

After reviewing the available data and information and the RWQCB documentation for this recommendation, SWRCB staff conclude that the water body should be placed on the Monitoring Priority List because the data are inadequate to determine if applicable water quality standards are exceeded.

This conclusion is based on the staff findings that:
1. The data is considered to be of unknown quality.
2. The data exhibited sufficient spatial and unknown temporal coverage.
3. Water quality standard used is applicable.
4. The evaluation guideline used to interpret narrative water quality standards is difficult to interpret.
5. Data are both numerical and not numerical.
7. Cannot tell if standard methods were used.
8. Other water body- or site-specific information including the effects of season, storm events, and age of the data were not considered.

An inadequate amount of the measurements exceeded the water quality standard. The staff confidence that standards were exceeded is low.

D. Individual Use Summary

Use Support Classifications

The USEPA categories of Fully Supporting, Fully Supporting But Threatened, Partially Supporting, and Not Supporting, are described below:

Fully Supporting refers to waters of good quality in the WBS database, excluding the *Fully Supporting But Threatened* category which is treated separately. "Good" waters support and enhance all designated beneficial uses.

Fully Supporting But Threatened refers to those portions of good quality waters in the WBS database which specifically identify at least one beneficial use as threatened.

Partially Supporting refers to all intermediate and less severely impaired waters in the WBS database. "Intermediate" waters support beneficial uses with an occasional degradation of water quality. The term "intermediate" usually indicates suspected impacts to beneficial uses, i.e., a problem is indicated but inadequate data are available. "Impaired" water bodies cannot reasonably be expected to attain or maintain applicable water quality standards, and at least one beneficial use shows some degree of impairment.

Not Supporting refers to those water bodies in which a beneficial use is severely impaired and which staff judges to merit serious attention.

Tables 5A-5J show the level of support for each of the seven USEPA designated beneficial uses in different types of water bodies. These include Fish Consumption, Shellfishing, Aquatic Life Support, Swimming, Secondary Contact, Drinking Water Supply, and Agriculture. California has more beneficial use categories than USEPA's designated use categories. For Tables 5A-5J, California beneficial use designations have been grouped into the seven basic USEPA beneficial use categories as outlined below:

USEPA DESIGNATED USE CATEGORIES	EQUIVALENT CALIFORNIA BENEFICIAL USE CATEGORY*
Fish Consumption	Ocean Commercial and Sport Fishing
Shellfishing	Shellfish Harvesting
Aquatic Life Support	Warm Freshwater Habitat Cold Freshwater Habitat Freshwater Replacement Preservation of Biological Habitats of Special Significance Estuarine Habitat Marine Habitat Fish Spawning Fish Migration Rare and Endangered Species Wildlife Habitat Saline Water Habitat Aquaculture
Swimming	Water Contact Recreation
Secondary Contact	Non-Contact Water Recreation
Drinking Water Supply	Municipal and Domestic Supply
Agriculture	Agricultural Supply

* A description of these California beneficial uses is included in Appendix A.

Beneficial use support status is determined for entire water bodies or portions of water bodies based on the length or areal extent represented by monitoring data or other evaluation criteria. In many cases, different portions of a water body have a different use support status. In certain cases where information is not available to determine the limits of impaired areas, the entire water body is considered impaired.

TABLE 5A. INDIVIDUAL USE SUPPORT SUMMARY: BAYS AND HARBORS (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	16,239	559	298,748	157,691	-	12,666
Protect and Enhance Public	*Fish Consumption*	16,863	12,000	298,346	154,868	-	3,826
	Shellfishing	23,897	12,000	297,276	147,036	-	1,499
	Swimming	170,209		299,026	3,028	-	13,639
	Secondary Contact	323,311	-	146,494	2,458	-	13,640
	Drinking Water Supply	*	*	*	*	*	*
Social and Economic	*Agriculture*	5,000	0	15,800	0	-	10,010
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5B. INDIVIDUAL USE SUPPORT SUMMARY: COASTAL SHORELINE (Miles)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	768	0	41	0	-	148
Protect and Enhance Public	*Fish Consumption*	538	0	44	33	-	113
	Shellfishing	694	0	44	22	-	1
	Swimming	695	0	97	121	-	30
	Secondary Contact	754	0	58	69	-	31
	Drinking Water Supply	*	*	*	*	*	*
Social and Economic	*Agriculture*	0	0	0	0	-	0
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5C. INDIVIDUAL USE SUPPORT SUMMARY: ESTUARIES (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	6,101		813,950	2,251	-	26,301
Protect and Enhance Public	*Fish Consumption*	5,621		808,103	1,683	-	20,008
	Shellfishing	3,501		1,045	653	-	19,644
	Swimming	6,081	1,459	809,359	1,890	-	18,985
	Secondary Contact	7,578	57	809,359	1,890	-	18,985
	Drinking Water Supply	0	0	759,391	0		3,673
Social and Economic	*Agriculture*	0	0	266	0	-	3,447
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5D. INDIVIDUAL USE SUPPORT SUMMARY: GROUNDWATER (Square Miles)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	470	208	1,260	-	-	18,003
Protect and Enhance Public	*Fish Consumption*	-	-	-	-	-	3,811
	Shellfishing	-	-	-	-	-	-
	Swimming	-	-	-	-	-	3,811
	Secondary Contact	-	-	-	-	-	3,811
	Drinking Water Supply	30,387	2,381	16,301	1,515	-	12,515
Social and Economic	*Agriculture*	25,179	842	8,131	799	20	22,907
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable

"-" = Category applicable but no data available

"0" = Category applicable, but size of waters in the category is zero

TABLE 5E. INDIVIDUAL USE SUPPORT SUMMARY: LAKES / RESERVOIRS (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	200,843	63,193	292,490	154,073	-	75,243
Protect and Enhance Public	*Fish Consumption*	104,952	64,678	162,481	152,723	-	246,326
	Shellfishing	*	*	*	*	*	400
	Swimming	202,876	77,465	200,941	152,969	-	144,152
	Secondary Contact	216,080	64,473	268,135	152,752		83,903
	Drinking Water Supply	195,506	30,974	186,617	28,013	-	147,476
Social and Economic	*Agriculture*	193,968	32,281	58,035	153,434		250,258
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5F. INDIVIDUAL USE SUPPORT SUMMARY: OCEAN and OPEN BAYS (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	312,004	0	0	0	-	2,511
Protect and Enhance Public	*Fish Consumption*	312,004	0	0	0	-	2,511
	Shellfishing	312,004	0	0	0	-	2,511
	Swimming	312,004	0	0	0	-	2,511
	Secondary Contact	312,004	0	0	0	-	2,511
	Drinking Water Supply	*	*	*	*	*	*
Social and Economic	*Agriculture*	*	*	*	*	*	*
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable

"-" = Category applicable but no data available

"0" = Category applicable, but size of waters in the category is zero

TABLE 5G. INDIVIDUAL USE SUPPORT SUMMARY: RIVERS / STREAMS (Miles)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	2,228	1,632	19,294	1877	-	10,707
Protect and Enhance Public	*Fish Consumption*	1,638	715	9,352	137	-	22,127
	Shellfishing	3	0	19	12	-	2,117
	Swimming	2,151	1,343	12,415	1,987	-	17,527
	Secondary Contact	2,810	1,096	10,426	1,839		19,400
	Drinking Water Supply	2,356	1,038	8,907	981	-	18,976
Social and Economic	*Agriculture*	3,077	955	8,275	437		20,726
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable

"-" = Category applicable but no data available

"0" = Category applicable, but size of waters in the category is zero

TABLE 5H. INDIVIDUAL USE SUPPORT SUMMARY: SALINE LAKES (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance Ecosystems	*Aquatic Life Support*	0	0	372,484	0	-	38,434
Protect and Enhance Public	*Fish Consumption*	0	0	9,391	0	-	401,528
	Shellfishing	0	0	0	0	-	0
	Swimming	0	0	324,706	0	-	86,213
	Secondary Contact	0	0	410,231	0	-	688
	Drinking Water Supply	0	0	70,989	0	-	106,590
Social and Economic	*Agriculture*	0	0	69,777	0	-	77,592
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5I. INDIVIDUAL USE SUPPORT SUMMARY: WETLANDS, FRESHWATER (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	12,081	494	71,155	0	-	18,106
Protect and Enhance Public	*Fish Consumption*	173	0	62,637	0	-	30,542
	Shellfishing	0	0	0	0	-	495
	Swimming	11,831	494	8,489	0	-	80,697
	Secondary Contact	12,157	494	8,489	0	-	80,697
	Drinking Water Supply	476	1	63,078	0	-	33,389
Social and Economic	*Agriculture*	0	0	8,282	0	-	88,185
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

TABLE 5J. INDIVIDUAL USE SUPPORT SUMMARY: WETLANDS, TIDAL (Acres)

GOALS	USE	SIZE FULLY SUPPORTING	SIZE SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE	SIZE NOT ASSESSED
Protect & Enhance	*Aquatic Life Support*	0	3	26,065	359	-	102,769
Protect and Enhance	*Fish Consumption*	0	-	24,160	13	-	66,370
	Shellfishing	-	-	-	-	-	67,233
	Swimming	0	0	24,160	346	-	67,206
	Secondary Contact	0	0	24,160	346	-	67,206
	Drinking Water Supply	*	*	*	*	*	*
Social and Economic	*Agriculture*	*	*	*	*	*	*
	Cultural or Ceremonial	*	*	*	*	*	*

"*" = Category not applicable
"-" = Category applicable but no data available
"0" = Category applicable, but size of waters in the category is zero

E. Total Sizes of Waters Impaired by Various Cause Categories

The WBS database contains the portion (length or areal extent) of water bodies that are not fully supporting their designated uses (i.e., partially and not supporting uses) because of a specific pollutant or stressor. Causes are pollutants or stressors that contribute to the actual or threatened impairment of designated uses. Stressors are factors or conditions (other than specific pollutants) that cause impairment (e.g., flow and other habitat alterations, presence of exotic species).

Tables 6A-6I present, for each water body type, the length or areal extent of all impaired water bodies that are affected by one or more of 30 specific categories. The measurements in Tables 6A-6I are not additive because a water body may be affected by several pollutants or stressors, and its size is counted in each relevant cause category.

The types of contributions to impairment used in Tables 6A-6I are defined as follows:

A "major" contributor is a pollutant or stressor that is either the only one responsible for nonsupport of any designated use or it predominates over other pollutants or stressors.

A "moderate" contributor is a pollutant or stressor that is the only one responsible for partial support of any use, predominates over other causes of partial support, or is one of multiple causes of nonsupport that have a significant impact on designated use attainment.

A "minor" contributor is a pollutant or stressor that is one of multiple causes responsible for nonsupport or partial support and is judged to contribute relatively little to this nonattainment.

TABLE 6A.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

BAYS AND HARBORS (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		5,000
Toxicity (Unknown toxicant)	250	154,085
Pesticides	342	318,196
Priority organic chemical	63	398,347
Nonpriority organic chemical		1,389
Metals	21,674	335,164
Ammonia		
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients		29,297
PH		
Siltation		29,297
Organic enrichment/low DO		2,237
Salinity/TDS/chlorides		
Thermal modifications		
Flow alterations		161,333
Other habitat alterations	12,000	141,358
Pathogen indicators	785	25,945
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		140,240
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6B.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

COASTAL SHORELINE (Miles)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		
Pesticides	19	0.5
Priority organic chemical	0.4	6
Nonpriority organic chemical		
Metals		16
Ammonia		
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients		
pH		
Siltation		
Organic enrichment/low DO		44
Salinity/TDS/chlorides		
Thermal modifications		
Flow alterations		
Other habitat alterations		
Pathogen indicators	29	163
Radiation		
Oil and grease		44
Taste and odor		
Suspended solids		44
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6C.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

ESTUARIES (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		759,902
Pesticides	5,657	803,471
Priority organic chemical		808,509
Nonpriority organic chemical		
Metals	759,322	48,963
Ammonia		199
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients	269	2,939
pH		
Siltation		10,936
Organic enrichment/low DO	759,392	2,255
Salinity/TDS/chlorides		759,366
Thermal modifications		6,350
Flow alterations		48,252
Other habitat alterations		2,206
Pathogen indicators	157	3,840
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		8
Exotic species		5,977
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6D.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

LAKES / RESERVOIRS (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		1,454
Toxicity (Unknown toxicant)		2,451
Pesticides	449	91,825
Priority organic chemical		819
Nonpriority organic chemical		243
Metals	891	218,048
Ammonia		916
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients	106,435	54,007
pH		480
Siltation	85,471	10,550
Organic enrichment/low DO	932	24,965
Salinity/TDS/chlorides	70,615	613
Thermal modifications		
Flow alterations	69,665	3,775
Other habitat alterations		72
Pathogen indicators	20,708	3,628
Radiation		
Oil and grease		
Taste and odor	18	201
Suspended solids		59
Noxious aquatic plants (macrophytes)	294	90,076
Total toxics		
Turbidity		59
Exotic species		172
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6E.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

OCEAN AND OPEN BAYS (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		
Pesticides		
Priority organic chemical		
Nonpriority organic chemical		
Metals		294
Ammonia		
Cyanide		
Sulfates		
Chlorine		
Other inorganics		294
Nutrients		
pH		
Siltation		
Organic enrichment/low DO		
Salinity/TDS/chlorides		
Thermal modifications		
Flow alterations		
Other habitat alterations		
Pathogen indicators		294
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		294
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6F.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

RIVERS / STREAMS (Miles)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		293
Toxicity (Unknown toxicant)	406	929
Pesticides	602	3,412
Priority organic chemical	11	420
Nonpriority organic chemical		19
Metals	561	2,935
Ammonia	24	629
Cyanide		
Sulfates		
Chlorine	14	34
Other inorganics		145
Nutrients	212	7,638
pH	102	177
Siltation	2,149	15,405
Organic enrichment/low DO	1,637	3,127
Salinity/TDS/chlorides	236	1,275
Thermal modifications	643	9,008
Flow alterations	2,356	4,415
Other habitat alterations	3,662	8,238
Pathogen indicators	254	4,694
Radiation		
Oil and grease		127
Taste and odor		72
Suspended solids		4,278
Noxious aquatic plants (macrophytes)	9	217
Total toxics		
Turbidity	17	959
Exotic species		83
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6G.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

SALINE LAKES (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		
Pesticides		
Priority organic chemical		
Nonpriority organic chemical		
Metals	47,967	291,761
Ammonia		
Cyanide		
Sulfates		
Chlorine		
Other inorganics	105,747	
Nutrients		
pH	96,167	
Siltation		57,756
Organic enrichment/low DO		
Salinity/TDS/chlorides	91,366	319,530
Thermal modifications		
Flow alterations	97,546	665
Other habitat alterations	39,743	1,190
Pathogen indicators		233,340
Radiation		39,743
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6H.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

WETLANDS, FRESHWATER (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		615
Pesticides		441
Priority organic chemical		121
Nonpriority organic chemical		
Metals	7,996	63,602
Ammonia		
Cyanide		
Sulfates		
Chlorine		
Other inorganics		44
Nutrients		790
pH		
Siltation		789
Organic enrichment/low DO		345
Salinity/TDS/chlorides	7,996	90,136
Thermal modifications		
Flow alterations		27,477
Other habitat alterations	3	93,183
Pathogen indicators		
Radiation		
Oil and grease		468
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 6I.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

WETLANDS, TIDAL (Acres)

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		
Toxicity (Unknown toxicant)		13
Pesticides	13	3
Priority organic chemical		
Nonpriority organic chemical		13
Metals	315	90,543
Ammonia		31
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients		66,340
pH		31
Siltation		
Organic enrichment/low DO		66,339
Salinity/TDS/chlorides		66,339
Thermal modifications		
Flow alterations		315
Other habitat alterations		315
Pathogen indicators	31	
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		315
Excessive algal growth		
Inappropriate littoral vegetation		

F. Total Sizes of Waters Impaired by Various Source Categories

The WBS database contains the portion (length or areal extent) of water bodies that are not fully supporting their designated uses (i.e., partially and not supporting uses) that are affected by a specific source. Sources are the facilities or activities that contribute pollutants or stressors resulting in impairment of designated uses in a water body.

Tables 7A-7I present, for each water body type, the total length or areal extent of all impaired water bodies that are affected by each category of source. In Tables 7A-7I the measurements are not additive because a water body may be affected by several different sources of pollution and the appropriate size is counted in each relevant cause category.

The definitions for the types of contributions to impairment used in Tables 7A-7I are as follows:

A "major" contributor is a source that is either the only one responsible for nonsupport of any designated use or it predominates over other sources.

A "moderate" contributor is a source that is the only one responsible for partial support of any use, predominates over other sources of partial support, or is one of multiple sources of nonsupport that have a significant impact on designated use attainment.

A "minor" contributor is a source that is one of multiple sources responsible for nonsupport or partial support and is judged to contribute relatively little to this nonattainment.

TABLE 7A.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

BAYS AND HARBORS (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	140,240	259,500
Municipal Point Sources		425,060
Combined Sewer Overflows		
Agriculture		258,866
Crop-related sources	60	21,215
Grazing-related sources		37,737
Intensive animal feeding operations		
Silviculture		
Construction		
Urban Runoff/Storm Sewers	12,215	276,735
Resource Extraction	221,972	29,237
Land Disposal	2,444	21,082
Hydromodification	140,241	160,340
Habitat Modification (non-hydromod)		
Marinas and Recreational Boating		3,025
Erosion from Derelict Land		
Atmospheric Deposition		368,617
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		154,603
Contaminated Sediments	135	155,958
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		368,876
Recreational Activities		
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other	12,000	
Unknown Source		221,992
Sources Outside State Jurisdiction/Borders		

TABLE 7B.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

COASTAL SHORELINE (Miles)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources		44
Municipal Point Sources		44
Combined Sewer Overflows		
Agriculture		2
Crop-related sources		
Grazing-related sources		
Intensive animal feeding operations		
Silviculture		
Construction		3
Urban Runoff/Storm Sewers	8	91
Resource Extraction		
Land Disposal		26
Hydromodification		
Habitat Modification (non-hydromod)		
Marinas		1
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal		26
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		60
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		16
Recreational Activities		
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other		
Unknown Source		
Sources Outside State Jurisdiction/Borders		

TABLE 7C.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

ESTUARIES (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	41,736	765,473
Municipal Point Sources		806,803
Combined Sewer Overflows		
Agriculture		809,869
Crop-related sources	290	759,491
Grazing-related sources		496
Intensive animal feeding operations		237
Silviculture		320
Construction		2,668
Urban Runoff/Storm Sewers		812,271
Resource Extraction	806,716	
Land Disposal		335
Hydromodification	47,461	760,822
Habitat Modification (non-hydromod)		1,492
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		47,394
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		49
Contaminated Sediments	420	1,685
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		48,547
Recreational Activities		38
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other		
Unknown Source		806,841
Sources Outside State Jurisdiction/Borders		

TABLE 7D.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

LAKES / RESERVOIRS (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	295	
Municipal Point Sources		
Combined Sewer Overflows		
Agriculture	3,000	33,324
Crop-related sources		59
Grazing-related sources	2,614	30,530
Intensive animal feeding operations		90
Silviculture	85,471	1,436
Construction	85,471	24,815
Urban Runoff/Storm Sewers	85,766	8,566
Resource Extraction	35,727	89,665
Land Disposal	85,636	21,654
Hydromodification	917,762	15,768
Habitat Modification (non-hydromod)	87,445	3,543
Marinas	85,471	747
Erosion from Derelict Land		
Atmospheric Deposition	85,471	3,833
Septage Disposal		21,654
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff	85,471	21,024
Spills (Accidental)		20
Contaminated Sediments		154
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources	6,834	40,315
Recreational Activities		6,609
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other	1,702	408
Unknown Source	85,471	128,278
Sources Outside State Jurisdiction/Borders		

TABLE 7E.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

OCEAN AND OPEN BAYS (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources		294
Municipal Point Sources		294
Combined Sewer Overflows		
Agriculture		
Crop-related sources		
Grazing-related sources		
Intensive animal feeding operations		
Silviculture		
Construction		
Urban Runoff/Storm Sewers		
Resource Extraction		
Land Disposal		
Hydromodification		
Habitat Modification (non-hydromod)		
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		
Recreational Activities		
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other		
Unknown Source		
Sources Outside State Jurisdiction/Borders		

TABLE 7F.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

RIVERS / STREAMS (Miles)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	7	1,269
Municipal Point Sources	17	2,459
Combined Sewer Overflows	10	19
Agriculture	1,681	9,972
Crop-related sources	974	3,870
Grazing-related sources	87	5,864
Intensive animal feeding operations	51	331
Silviculture	220	13,211
Construction	173	3,365
Urban Runoff/Storm Sewers	82	2,215
Resource Extraction	3,758	1,505
Land Disposal	19	530
Hydromodification	2,715	6,238
Habitat Modification (non-hydromod)	2,144	10,792
Marinas		1
Erosion from Derelict Land		
Atmospheric Deposition		137
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		434
Spills (Accidental)		268
Contaminated Sediments	226	60
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources	72	1,956
Recreational Activities	9	231
Salt Storage Sites	187	32
Groundwater Loadings		34
Groundwater Withdrawal	144	53
Other		193
Unknown Source		1,149
Sources Outside State Jurisdiction/Borders	979	

TABLE 7G.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

SALINE LAKES (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources		
Municipal Point Sources		
Combined Sewer Overflows		
Agriculture		340,942
Crop-related sources		
Grazing-related sources		1,190
Intensive animal feeding operations		
Silviculture		
Construction		58,421
Urban Runoff/Storm Sewers		
Resource Extraction		
Land Disposal		
Hydromodification	97,499	48,657
Habitat Modification (non-hydromod)		
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources	167,523	10,056
Recreational Activities		
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		97,546
Other		
Unknown Source	30,211	39,743
Sources Outside State Jurisdiction/Borders		

TABLE 7H.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

WETLANDS, FRESHWATER (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources		
Municipal Point Sources		
Combined Sewer Overflows		
Agriculture	7,964	93,643
Crop-related sources	7,962	120
Grazing-related sources	2	30,117
Intensive animal feeding operations		
Silviculture		62,591
Construction	1	967
Urban Runoff/Storm Sewers	1	469
Resource Extraction	1	2
Land Disposal		496
Hydromodification	1	27,477
Habitat Modification (non-hydromod)	451	11
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal		2
Leaking Underground Storage Tanks		1
Highway Maintenance and Runoff		470
Spills (Accidental)		1
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources	33	90,141
Recreational Activities		1
Salt Storage Sites		
Groundwater Loadings		1
Groundwater Withdrawal		
Other		62,591
Unknown Source		3
Sources Outside State Jurisdiction/Borders		

TABLE 7I.

TOTAL SIZES OF WATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

WETLANDS, TIDAL (Acres)

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources		24,191
Municipal Point Sources		24,160
Combined Sewer Overflows		
Agriculture		66,339
Crop-related sources		
Grazing-related sources		
Intensive animal feeding operations		
Silviculture		
Construction		
Urban Runoff/Storm Sewers		90,862
Resource Extraction		24,160
Land Disposal		
Hydromodification		66,655
Habitat Modification (non-hydromod)		315
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		34
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		362
Recreational Activities		315
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other		
Unknown Source		
Sources Outside State Jurisdiction/Borders		

G. Public Health Concerns

1. Sizes of Waters Affected by Toxicants

Toxic substances are a major emphasis of the 1998 water quality assessment. The information assessed includes types of media and pollutants monitored, results of toxic substance monitoring, sediment contamination, toxic constituents in fish and shellfish tissue, fish kills and abnormalities, fishing advisories or bans, and specific sources of toxics for impaired waters. This information is contained in the WBS database as individual water body assessments. The results are reflected in the various cause and source categories used for reporting impairment from toxic substances, the designated use support status determinations, and assessment comments.

Table 8 summarizes the total size of waters monitored for and impacted by toxic substances for each of the water body types. This shows all waters found to be impacted by pesticides, priority organics, nonpriority organics, metals, ammonia, chlorine, other inorganics, or toxicity (toxicant unknown) with either a high or moderate contribution to impairment. It should be noted that this summary includes not only waters which do not support their designated uses, but also waters where uses are currently supported, but are considered threatened by toxic substances.

TABLE 8

TOTAL SIZE AFFECTED BY TOXICANTS

WATER BODY TYPE	SIZE MONITORED FOR TOXICS	SIZE WITH ELEVATED LEVELS OF TOXICANTS
Bays and Harbors (acres)	39,253	280,178
Coastal Shoreline (miles)	69	0
Estuaries (acres)	772,595	767,385
Groundwater (square miles)	29,442	23,827
Lakes/ Reservoirs (acres)	50,378	182,406
Ocean and Open Bays (acres)	0	0
Rivers/Streams (miles)	5,158	3,171
Saline Lakes (acres)	369,938	106,388
Wetlands, Freshwater (acres)	65,800	63,066
Wetlands, Tidal (acres)	25,372	24,519

2. Health Warnings

OEHHA determines whether a public health hazard exists in eating fish or waterfowl from certain locations in California. These risk assessments are based on laboratory testing data and monitoring for toxic substances in fish tissue. Over the past several years, the health advisories listed in Table 9 have been issued by OEHHA and listed in the California Sport Fishing Regulations published by the Fish and Game commission and by the DFG. The percent area of rivers and lakes in California with fish consumption advisories is shown in Table 10.

TABLE 9
FISH CONSUMPTION ADVISORIES FOR CALIFORNIA WATERS

REGION	WATER BODY TYPE	HYDROLOGICAL SUB UNIT AREA	COUNTY	WATER BODY NAME	SIZE OF AREA RESTRICTED	CONTAMINANT	FISH WITH RESTRICTED CONSUMPTION
2	Bay & Estuary	Several	Several	San Francisco Bay and Delta	NA*	Mercury, PCBs and other chemicals	Striped bass, Shark, Sturgeon, Croakers, (Richmond Harbor Channel only:Surfperches, Bullheads, Gobies, and Shellfish)
2	Lake	207.210	Solano	Lake Herman	108 acres	Mercury	Largemouth bass
2	Reservoir	205.400	Santa Clara	Guadalupe Reservoir	63 acres	Mercury	Any type of fish
2	Reservoir	205.400	Santa Clara	Calero Reservoir	334 acres	Mercury	Any type of fish
2	Reservoir	205.400	Santa Clara	Almaden Reservoir	62 acres	Mercury	Any type of fish
2	River	205.400	Santa Clara	Guadlupe River and associated percolation ponds	18 miles	Mercury	Any type of fish
2	Creek	205.400	Santa Clara	Guadlupe Creek and associated percolation ponds	8 miles	Mercury	Any type of fish
2	Creek	205.400	Santa Clara	Alamitos Creek and associated percolation ponds	7 miles	Mercury	Any type of fish
3	Lake	309.820	San Luis Obispo	Lake Nacimiento	5,735 acres	Mercury	Largemouth bass
4	Bay	404.356	Los Angeles	Point Dume, Malibu (Malibu Bay)	NA*	PCBs and DDT	White croaker
4	Bay	404.210	Los Angeles	Malibu Pier (Malibu Bay)	NA*	PCBs and DDT	Queen fish
4	Bay	413.000	Los Angeles	Short Bank (Malibu Bay)	NA*	PCBs and DDT	White croaker
4	Bay	405.120	Los Angeles	Redondo Pier (Malibu Bay)	NA*	PCBs and DDT	Corbina
4	Bay	405.110	Los Angeles	Point Vicente Palos Verde-Northwest (Malibu Bay)	NA*	PCBs and DDT	White croaker
4	Bay	405.110	Los Angeles	White's Point (Malibu Bay)	NA*	PCBs and DDT	White croaker, Sculpin, Rockfishes, Kelp bass
4	Bay	405.120	Los Angeles	Los Angeles/Long Beach Harbor (esp. Cabrillo Pier) (San Pedro Bay)	NA*	PCBs and DDT	White croaker, Queenfish, Black croaker, Surfperches
4	Bay	405.120	Los Angeles	Los Angeles/Long Beach Breakwater (Ocean side) (Long Beach Harbor)	NA*	PCBs and DDT	White croaker, Queenfish, Black croaker, Surfperches
4	Bay	405.120	Los Angeles	Belmont Pier, Pier J (Long Beach Harbor)	NA*	PCBs and DDT	Surfperches
4	Ocean	413.000	Los Angeles	Horseshoe Kelp	NA*	PCBs and DDT	Sculpin
4	Lake	405.120	Los Angeles	Machado Lake (Harbor Park Lake)	45 acres	Chlordane and DDT	Goldfish, Carp
5	Lake	513,520	Lake	Clear Lake	40,070 acres	Mercury	Largemouth bass, White catfish, Channel catfish, Brown bullhead, Blackfish, Crappie, and Hitch
5	Lake	512.210	Napa	Lake Berryessa	19,083	Mercury	Largemouth bass, Smallmouth bass, White catfish, Channel catfish, Rainbow trout
5	Rivers	541.200	Merced	Grasslands Area	NA*	Selenium	Any type of fish
7	Lake	728.000	Imperial and Riverside	Salton Sea	233,340 acres	Selenium	Croaker, Orangemouth corvina, Sargo, and Tilapia
7	River		Imperial	New River	63 miles	Not specified	Any type of fish
8	Bay	801.110	Orange	Newport Pier (Newport Bay)	NA*	PCBs and DDT	White croaker, Corbina

NA = size of restricted area is unclear

TABLE 10.
PERCENT AREA OF LAKES AND RIVERS WITH FISH CONSUMPTION RESTRICTIONS

WATER BODY TYPE	TOTAL AREA IN CALIFORNIA	TOTAL AREA WITH RESTRICTIONS	PERCENT AREA WITH RESTRICTIONS
Lakes	1,672,684 acres	298,840 acres	18
Rivers	211,513 miles	96 miles	0.05

3. Ocean Beaches Affected By Bathing Area Closures

The following discussion was taken from the CALIFORNIA BEACH CLOSURE REPORT—1999, produced by SWRCB:

California Health and Safety Code §115910 requires each local health officer to submit to the SWRCB an annual survey documenting all beach postings and closures due to threats to the public health that occurred during the preceding calendar year. The law also requires the SWRCB to publish a statewide report, on or before September 30 of each year, documenting the beach posting and closure data provided by health officers for the preceding calendar year. This report contains data submitted by local health officers regarding beach postings and closures that occurred in 1999.

California's coastline is one of its most important natural features. It extends over 1,000 miles from the rocky cliffs of the north coast to the sandy, sun-drenched beaches in the south. Approximately 80 percent of California's 33 million residents live within a 30-mile drive of its coastline. Millions of visitors come to see its beauty and play on the shore and in its waters. The coastal areas represent a desirable place to live. As California's coastal population increases, the number and volume of discharges from industrial and municipal facilities into our coastal waters also increase.

The ocean is the final deposition site for most land-based pollutants entering California's coastal watersheds. Near-shore pollution can result from dumping industrial waste, dredge spoils, agricultural and urban runoff, and municipal sewer discharges. Although this pollution has been controlled to a great extent in recent years, the increases in population and development offer a constant challenge to those agencies responsible for pollution control. Increasingly, the public is becoming concerned about beach closures, swimmers' illnesses, and the lack of public confidence due to the up and down nature of posting of warning signs.

One of the SWRCB's primary responsibilities is to protect California's valuable coastal waters by controlling what goes into them. The six RWQCBs bordering the coastline also have primary responsibility for protecting coastal waters. Anyone wishing to discharge

waste to the ocean from a pipe or waste facility (a "point source") must obtain an NPDES permit from the RWQCB. The RWQCBs establish monitoring programs to be conducted by the discharger as a way of measuring compliance with permit provisions.

Another primary source of coastal water pollution comes from the untreated runoff flowing from the land through storm drains and hundreds of natural stream courses. This runoff may come from roof tops, streets, yards, gardens, open spaces, parking lots, animal yards, construction sites, logging roads, and any other surface exposed to rain or snow. It collects animal waste, oil and rubber residue from cars, asbestos and metals from brake linings, pesticides, silt, and various types of vegetable matter. It may have high bacterial counts, contain viruses, be toxic to marine life, and carry tons of garbage and silt that litter the ocean and its beaches and kill or injure marine life.

Since this runoff does not come from a discrete source, such as a pipe, it is regarded as a "nonpoint source discharge." Some of these types of wastes are collected in urban storm drains. The RWQCBs currently issue NPDES permits for discharges from municipal storm sewer systems serving a population of 100,000 or more. The SWRCB has also adopted two statewide general storm water permits for industrial and construction activities, and a statewide permit to address all of Caltrans' road construction activities. These permits require the storm water dischargers to implement programs to reduce and/or eliminate storm water pollution to the maximum extent possible. If NPS waste causes serious pollution, the RWQCBs may work with the dischargers to require the application of measures to control the waste (known as BMPs) and prevent pollution. If those measures are not carried out effectively, the RWQCBs may issue waste discharge permits or take enforcement action.

Causes of Beach Closures

Much attention has been given to the number of beach closures and warnings, especially along the southern California coast. California coastal communities have active monitoring programs conducted primarily by county health agencies and municipal waste treatment facilities. Water samples are collected in the surf zone to determine if recreational waters are contaminated with indicator bacteria (total coliform, fecal coliform, and enteroccus bacteria). Contaminated water may contain bacteria, viruses, and other organisms, which can cause flu-like symptoms, ear infections, or upset stomachs in people who have had contact with the water. Studies have been conducted that correlate the levels of indicator bacteria with incidence of illness. If tests using indicator bacteria show levels above State standards, the beach will be posted with warning signs or closure notices to notify the public of the potential health risk. The beach is reopened when further sampling confirms that bacteria levels meet State standards. The term "beach closure" needs clarification. In most cases, the ocean is closed to swimming and other water contact recreation while the beach area is open for sunbathing, volleyball, and other activities that do not involve water contact.

Beaches, or more precisely the ocean waters adjacent to the beach, are closed when certain kinds of bacteria are found in the water at levels that are considered a problem. These indicator bacteria imply the potential presence of microscopic disease-causing organisms originating from human and animal wastes. Indicator bacteria are carried to coastal waters in a variety of ways. Bacteria typically enter coastal waters from sewage spills, overflows from

sewage-treatment plants and sanitary sewers, and from stormwater runoff from urban, suburban, and rural areas. An ideal indicator would be found only when disease-causing agents were present at densities that could cause problems. The current indicators are not this precise. Rather, these bacteria are produced by many types of animals and represent a range of potential risk of disease. For example, birds using wetland areas can excrete indicator bacteria in densities that would suggest a potential risk to human health. However, birds do not carry the same types of pathogens as people. The risk of illness to people is assumed to be lower when the indicator bacteria come from animals instead of humans.

Beach closures can also be caused by other events such as a leaking sewage pipe or an oil spill. In addition, advisories are often issued when it rains because it is known from past experience that rain water carries pollution to the beach. Rain advisories are issued by radio or newspaper during rainstorms to warn people to avoid areas where rain water flows onto the beach.

Difference Between a Posting, Closure, and Advisory

A beach (ocean) closure occurs as a result of a sewage spill or repeated incidences of exceedances of bacteriological standards from an unknown source. A closure is a notice to the public that the water is unsafe for contact and that there is a high risk of getting ill from swimming in the water. Closure occurs when health risks are considered greater than those associated with posting. As stated earlier, in most beach closure cases the access to ocean water is prohibited, but the beach area is open for activities not involving water contact.

The posting of a warning sign means that at least one bacterial standard has been exceeded, but there is no known source of human sewage. The posting of warning signs alerts the public of a possible risk of illness associated with water contact. The placement of signs may be short-term when a single microbiological indicator standard is exceeded or more permanent where monitoring indicates repeated contamination (e.g., from a storm drain). Warnings may also be posted where sources of contamination are identifiable and can be explained as not of human origin (e.g., storm drain water or resident marine mammals or seabirds). Health and Safety Code Section 115915(a) requires posting for certain public beaches whenever standards for microbiological indicator organisms are exceeded.

Assembly Bill (AB) 411

AB 411 (Wayne, Chapter 765 of Statutes of 1997) requires the DHS to adopt procedures that increase consistency in the way county agencies measure beach water quality, post warnings, and close beaches.

The law requires that, beginning in 1999, the local health officer conduct weekly bacterial testing (total coliform, fecal coliform, and enterococci bacteria) between April 1 and October 31, of waters adjacent to public beaches which have more than 50,000 visitors annually and are near storm drains which flow in the summer. If any one of these indicator organisms exceeds the standard, the County health officer is required to post warning signs at the beach and to make the determination whether to close that beach in the case of extended exceedances. The law also requires the health officer to establish a telephone hotline to

inform the public of all beaches that are closed, posted or otherwise restricted. Ten coastal counties (San Mateo, Sonoma, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Orange, Los Angeles, and San Diego) and one city (Long Beach) have reported that they have beaches that meet the AB 411 criteria, i.e., beaches that are near storm drains and are visited by more than 50,000 people annually.

Before AB 411 became law, County health officers had discretion to post or close any beach that violated total coliform standards. Under the new regulations, health officers are required to post warnings whenever any one of the bacterial standards is violated in areas near storm drains, but have the discretion to close the beach when appropriate. Many beaches near storm drains (which are covered under the AB 411 regulations) frequently violate at least one of the standards established by the DHS. These violations increase the number of postings regardless of whether there have been changes in water quality from previous years. Information collected under the mandate of AB 411 provides a new baseline against which the number of future beach warning postings and closures could be compared.

Beach Mile-Day (BMD)

The BMD is a measure of beach availability for recreation per year. It is a product of the number of miles of coastline and 365 days (the number of days the beach may be available for recreation in California). For instance, if a County has 50 miles of open coast, bay, and harbor beaches, it has 18,250 BMD available (50 X 365). However, if 150 BMD are impaired due to closures or posted warnings, then 0.8 percent (150/18,250 X 100) of the beach availability was impaired. In other words, 99.2 percent of beach usage met standards.

The BMD is a useful measure for comparing the health of beaches from year to year. The comparison is how much of the year's BMDs have been impaired in a particular County. It is a more meaningful measure of comparison than the number of incidences or the number of days of postings or closures.

Beach Closure Data

The data in this report are from SWRCB's Beach Closure/Posted Warning Database which identifies the extent of closures and warning postings in miles (or yards) as well as by beach name. The Beach Water Quality Workgroup (Workgroup), an ad hoc committee composed of groups responsible for the protection and reporting of beach water quality, has approved the design and information requirements of the database. The Workgroup includes staff from County Environmental Health Departments, environmental groups, sewage treatment plants that discharge to coastal waters, the CCC, DHS, SWRCB, RWQCBs, and USEPA, Region 9. This database makes it possible to report beach postings and closures by BMDs.

TABLE 11A. BEACH WARNINGS POSTED IN CALIFORNIA BY COUNTY--1999

County	Number of Incidences	Number of Days	Beach Mile-Day Posted	Primary Cause(s)
Del Norte	N[1/]	N	N	
Humboldt	N	N	N	
Mendocino	N	N	N	
Sonoma	4	14	2.8	Unknown
Marin	N	N	N	
San Francisco	5	8	21.3	Combined sewer overflow
Contra Costa	N	N	N	
Alameda	N	N	N	
San Mateo	6	132	47	Creeks/rivers, storm drains
Santa Cruz	4	45	13.3	Sewer line, wildlife (birds)
Monterey	8	54	26.3	Storm Drains
San Luis Obispo	1	2	0.8	Wildlife
Santa Barbara	109	1,540	87.5	Urban runoff, creeks, wildlife
Ventura	74	399	22.6	No causes given
Los Angeles	109	406	39.8	Unknown
Long Beach	68	104	3	Unknown
Orange	136	865	175	Urban runoff
San Diego	97	617	33.7	Urban runoff, creeks/rivers
TOTAL			473	

N[1/] No reported warning postings.

Table 11A presents the data on beach warnings posted in California in 1999. A total of 473 BMDs had warnings posted in the State. With the exception of San Francisco County, warning postings have not been routinely reported to the SWRCB. Since this information has not been collected in the past, it is not possible to make comparisons with beach warnings posted in previous years. Further, because the AB 411 regulations were not officially adopted until July 1999, the data reported in Table 11A are not for the full time period required by law (from April 1 to October 31), and they will not be comparable with next year's number of postings of warnings.

Figure 1 shows that statewide the source of 68 percent of all BMDs with warnings posted was contamination carried to the beach by urban runoff (53 percent) and creeks and rivers (15 percent). Sewer related problems, wildlife, and rain accounted for 11 percent of warnings. The source for the remaining 21 percent of the BMD warnings posted was unknown.

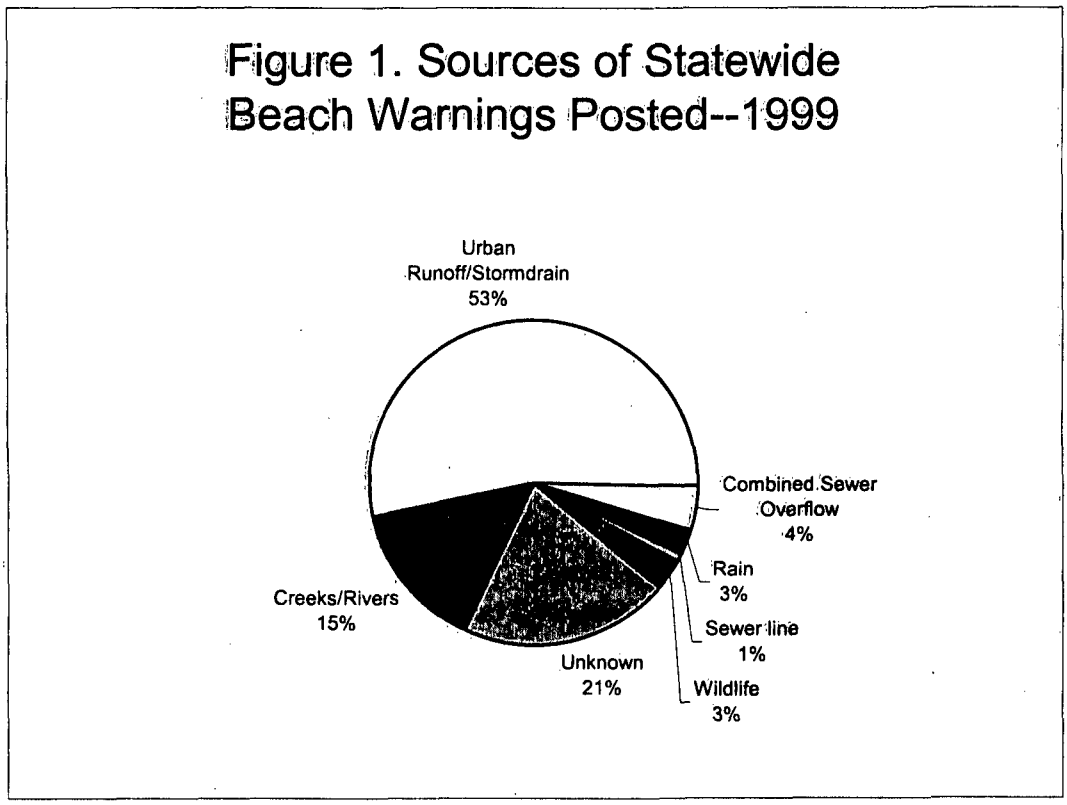


TABLE 11B. BEACH CLOSURES IN CALIFORNIA BY COUNTY- 1999

County	Number of Incidences	Number of Days	Beach Mile-Day Closed	Primary Cause(s)
Del Norte	N[1/]	N	N	
Humboldt	N	N	N	
Mendocino	1	12	2.4	Sewer line
Sonoma	2	13	1.3	Unknown
Marin	N	N	N	
San Francisco	N	N	N	
Contra Costa	N	N	N	
Alameda	N	N	N	
San Mateo	1	6	6	Sewer line
Santa Cruz	N	N	N	
Monterey	3	16	4	Sewer line
San Luis Obispo	1	2	0.6	Sewer line
Santa Barbara	10	222	12.6	Urban runoff, creeks/rivers, rain, wildlife
Ventura	10	35	26.5	Sewer line
Los Angeles	6	12	36.1	Sewer line
City of Long Beach	3	51	1.4	Unknown
Orange	22	209	156.1	Sewer, 105 of 156.1 BMD is Huntington Beach--cause unknown
San Diego	32	116	33.9	Sewer line
TOTAL			280.9	

N[1/] No reported beach closures.

Table 11B presents the data on beach closures in California in 1999. Approximately 281 BMDs were closed in the State. Figure 2 shows that statewide 56 percent of the BMDs of closures were due to problems with sewer lines (such as line breaks, blockages due to grease, roots, or rocks, and pump failures). The sources of 39 percent of the BMDs of closures were unknown. This large percentage of BMDs of closure from unknown sources is due to the large number (105 BMDs) of closures at Huntington Beach in Orange County that was caused by unknown sources. In fact, Huntington Beach accounts for over 97 percent of the 107.9 BMDs of closures caused by unknown sources statewide. Creeks and rivers, urban runoff, rain, and wildlife were the sources listed for 5 percent of BMDs of closures.

Figure 2. Sources of Statewide Beach Closures--1999

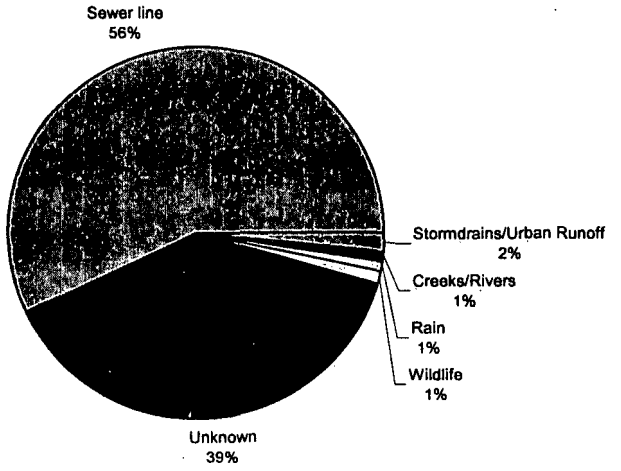
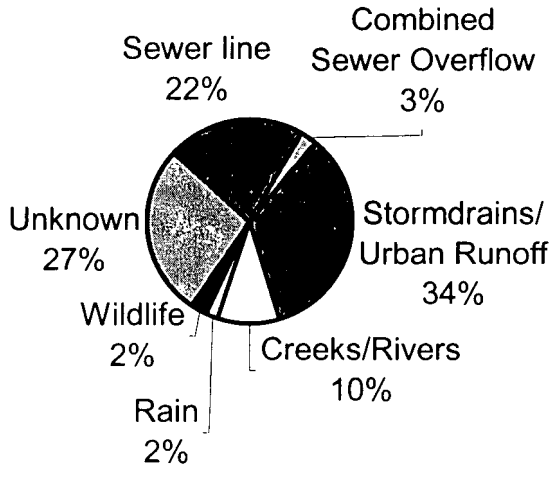


Figure 3 shows the percentages of sources which contributed to both postings and closures in 1999 statewide. Twenty-five percent of the BMDs of closures/warnings posted resulted from releases of sewage either directly (22 percent) or as the result of heavy rains that caused overflows of sewer systems (3 percent). Storm drains/urban runoff and creeks and rivers accounted for 34 and 10 percent, respectively, of the BMDs of closures and warnings posted. The source of contamination for 27 percent of the BMDs of closures/posting was unknown. Contamination due to wildlife accounted for 2 percent of the BMD posted/closed. Rain was listed as the source of the closure/posting for 2 percent of the total BMDs.

Figure 3. Combined Statewide Beach Sources of Warnings Posted and Beach Closures--1999



IV. GROUNDWATER ASSESSMENT

California includes groundwaters in its statewide WBS database. The WBS database provides the major and minor causes and sources affecting the water quality of a particular groundwater basin. The causes and sources of impairment for each groundwater assessed in the WBS database are presented in Appendix C. The causes and sources shown for each groundwater impairment are not necessarily linked. Tables 12A and 12B present the total area of groundwaters in the WBS impaired by various cause and source categories, respectively. Table 12A and 12B were developed in the same manner as Tables 6A-6I and Tables 7A-7I in Section III (Surface Water Assessment).

March 15, 2001

Retraction of Groundwater Assessment Information

State Water Resources Control Board (SWRCB) staff is retracting all groundwater assessment information from the SWRCB's year 2000 federal Clean Water Act (CWA) Section 305(b) report. The reason for this decision is that the data on the size of groundwater impairment (columns 5 and 7 in Appendix C) are not correct. In almost all cases, the total size of the groundwater basin (column 8 in Appendix C) is assumed to be impaired, leading to a gross overestimation of groundwater impairment in California.

The summary information on the size of groundwater impaired by various cause and source categories presented in Tables 12A and 12B, respectively, should be disregarded since it is based on the faulty information of Appendix C.

It should also be noted that the groundwater assessment information in the WBS database has not been updated since 1992. SWRCB staff is in the process of verifying and updating the groundwater assessment information.

Please call Nancy Richard at (916) 341-5546 if you have any questions on this subject.

TABLE 12A.

TOTAL SIZES (Square Miles) OF GROUNDWATERS IMPAIRED BY VARIOUS CAUSE CATEGORIES

CAUSE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown		2,275
Toxicity (Unknown toxicant)		
Pesticides	7,500	3,829
Priority organic chemical	757	22,743
Nonpriority organic chemical	388	15,602
Metals	4,531	6,206
Ammonia		
Cyanide		
Sulfates		145
Chlorine		50
Other inorganics	535	
Nutrients	5,920	10,094
pH	1	
Siltation		
Organic enrichment/low DO		244
Salinity/TDS/chlorides	11,620	14,403
Thermal modifications		
Flow alterations	2,720	3,015
Other habitat alterations		
Pathogen indicators	627	863
Radiation		770
Oil and grease	425.11	5,465
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)		
Total toxics		
Turbidity		
Exotic species		
Excessive algal growth		
Inappropriate littoral vegetation		

TABLE 12B.

TOTAL SIZES (Square Miles) OF GROUNDWATERS IMPAIRED BY VARIOUS SOURCE CATEGORIES

SOURCE CATEGORY	SIZE OF WATERS BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	715	14,503
Municipal Point Sources	388	264
Combined Sewer Overflows		
Agriculture	6,399	11,914
Crop-related sources	385	1,971
Grazing-related sources		
Intensive animal feeding operations	4,460	7,716
Silviculture		
Construction		709
Urban Runoff/Storm Sewers		940
Resource Extraction	1,161	7,136
Land Disposal	5,087	11,315
Hydromodification	2,831	776
Habitat Modification (non-hydromod)		
Marinas		
Erosion from Derelict Land		
Atmospheric Deposition		
Septage Disposal	6,522	8,914
Leaking Underground Storage Tanks	126	19,859
Highway Maintenance and Runoff		115
Spills (Accidental)	625	4,885
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources	6,937	12,002
Recreational Activities		3
Salt Storage Sites		
Groundwater Loadings	20	685
Groundwater Withdrawal	140	437
Other		277
Unknown Source	448	1,730
Sources Outside State Jurisdiction/Borders		490

APPENDIX A

BENEFICIAL USE DESIGNATIONS

BENEFICIAL USE DESIGNATIONS

"Beneficial uses" are the many ways water can be used either directly by people or for their overall benefit. Drinking and bathing are obvious examples, but there are many others, such as uses by industry, agriculture, commerce, and wildlife. The SWRCB recognizes 23 beneficial uses summarized below:

Municipal and Domestic Supply (MUN)--Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

Agricultural Supply (AGR)--Uses of water for farming, horticulture, or ranching including, but not limited to irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PRO)--Uses of water for industrial activities that depend primarily on water quality.

Industrial Service Supply (IND)--Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Groundwater Recharge (GWR)--Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Freshwater Replenishment (FRSH)--Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Navigation (NAV)--Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Hydropower Generation (POW)--Uses of water for hydropower generation.

Water Contact Recreation (REC-1)--Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Noncontact Water Recreation (REC-2)--Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Ocean Commercial and Sport Fishing (COMM)--Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Aquaculture (AQUA)--Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Warm Freshwater Habitat (WARM)--Uses of water that support warmwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Freshwater Habitat (COLD)--Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates.

Inland Saline Water Habitat (SAL)--Uses of water that support inland saline water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates.

Estuarine Habitat (EST)--Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).

Marine Habitat (MAR)--Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD)--Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats of Special Significance (BIOL)--Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Rare, Threatened, or Endangered Species (RARE)--Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or federal law as rare, threatened or endangered.

Migration of Aquatic Organisms (MIGR)--Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN)--Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL)--Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sports purposes.

APPENDIX B

1998 CALIFORNIA SECTION 303(d) LIST
AND
TMDL PRIORITY SCHEDULE

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	E	EEL RIVER DELTA	111.110							
				Sedimentation/Siltation		Low	6350	Acres	0204	1206
					Range Land					
					Silviculture					
					Nonpoint Source					
				Temperature		Low	6350	Acres	0204	1206
					Nonpoint Source					
1	E	ESTERO AMERICANO	115.300							
				Nutrients		Medium	692	Acres	0497	0206
				Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards and objectives, as was done in the Estero de San Antonio / Stemple Creek TMDL Water Quality Attainment Strategy, adopted by the North Coast Regional Water Quality Control Board at the December 11, 1997 meeting.						
					Pasture Land					
					Manure Lagoons					
				Sedimentation/Siltation		Medium	692	Acres	0497	0206
				Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards and objectives, as was done in the Estero de San Antonio / Stemple Creek TMDL Water Quality Attainment Strategy, adopted by the North Coast Regional Water Quality Control Board at the December 11, 1997 meeting.						
					Riparian Grazing					
					Hydromodification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Erosion/Siltation					
					Nonpoint Source					
1	E	NAVARRO RIVER DELTA	113.500							
				Sedimentation/Siltation		Medium	20	Acres	0298	1200
					Erosion/Siltation					
1	L	LAKE PILLSBURY	111.630							
				Mercury		Low	2280	Acres	1209	1211
					Natural Sources					
1	R	ALBION RIVER	113.400							
				Sedimentation/Siltation		Medium	14	Miles	0299	1201
				USEPA is preparing TMDL for Albion River.						
					Silviculture					
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	AMERICANO CREEK	115.300							
				Nutrients		Medium	7	Miles	0497	0206
				(See Estero Americano)						
					Pasture Land					
					Riparian Grazing					
					Upland Grazing					
					Animal Operations					
					Manure Lagoons					
					Dairies					
1	R	BIG RIVER	113.300							
				Sedimentation/Siltation		Medium	40	Miles	0299	1201
					Silviculture					
					Nonpoint Source					
1	R	EEL RIVER, MIDDLE FORK	111.700							
				Sedimentation/Siltation		Low	64	Miles	0201	1203
				USEPA will develop a TMDL for Eel River, Middle Fork.						
					Erosion/Siltation					
				Temperature		Low	64	Miles	0201	1203
				USEPA will develop a TMDL for Eel River, Middle Fork.						
					Nonpoint Source					
1	R	EEL RIVER, MIDDLE MAIN FORK	111.70							
				Sedimentation/Siltation		Low	1075.38	Miles	0203	1205
				USEPA will develop a TMDL for Eel River, Middle Main Fork.						
					Range Land					
					Silviculture					
					Nonpoint Source					
				Temperature		Low	1075.38	Miles	0203	1205
				USEPA will develop a TMDL for Eel River, Middle Main Fork.						
					Nonpoint Source					
1	R	EEL RIVER, NORTH FORK	111.500							
				Sedimentation/Siltation		Low	41	Miles	0200	1202
				USEPA will develop TMDL for Eel River, North Fork						
					Silviculture					
					Logging Road Construction/Maintenance					
					Erosion/Siltation					
					Nonpoint Source					
				Temperature		Low	41	Miles	0200	1202
				USEPA will develop TMDL for Eel River, North Fork.						
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	EEL RIVER, SOUTH FORK	111.300							
				Sedimentation/Siltation		**Low**	**85**	**Miles**	**0297**	**1299**
				USEPA is developing TMDL for Eel River, South Fork. Sediment and temperature TMDLs will be developed for: (1) the area tributary to and including the South Fork of the Eel River above Garberville and (2) the area tributary to and including the South For of the Eel River below Garberville.						
					Range Land					
					Silviculture					
					Logging Road Construction/Maintenance					
					Resource Extraction					
					Hydromodification					
					Flow Regulation/Modification					
					Removal of Riparian Vegetation					
					Erosion/Siltation					
					Nonpoint Source					
				Temperature		**Low**	**85**	**Miles**	**0297**	**1299**
				USEPA is developing TMDL for Eel River, South Fork.						
					Hydromodification					
					Flow Regulation/Modification					
					Removal of Riparian Vegetation					
					Erosion/Siltation					
					Nonpoint Source					
1	R	EEL RIVER, UPPER MAIN FORK	111.60							
				Sedimentation/Siltation		**Low**	**1154.24**	**Miles**	**0202**	**1204**
				USEPA will develop a TMDL for Eel River, Upper Main Fork.						
					Range Land					
					Silviculture					
					Nonpoint Source					
				Temperature		**Low**	**1154.24**	**Miles**	**0202**	**1204**
				USEPA will develop a TMDL for Eel River, Upper Main Fork.						
					Nonpoint Source					
1	R	ELK RIVER	110.000							
				Sedimentation/Siltation		**Medium**	**87.53**	**Miles**	**0207**	**2009**
				Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. Regional Water Board and California Department of Forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules. It is possible that compliance will bring attainment prior to TMDL development.						
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Erosion/Siltation					
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	FRESHWATER CREEK	110.000							
				Sedimentation/Siltation		**Medium**	**72.67**	**Miles**	**0208**	**1210**
				Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. Regional Water Board and California Department of Forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules. It is possible that compliance will bring attainment prior to TMDL development.						
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Erosion/Siltation					
					Nonpoint Source					
1	R	GARCIA RIVER	113.700							
				Sedimentation/Siltation		**High**	**39**	**Miles**	**0997**	**1297**
				The Regional Water Board is involved in extended public hearings to consider the adoption of a TMDL for sediment control on the Garcia River. In January, 1998, USEPA issued public notice for adoption and promulgation of a TMDL for sediment on the Garcia River.						
					Riparian Grazing					
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Channel Erosion					
					Erosion/Siltation					
					Nonpoint Source					
				Temperature		**High**	**39**	**Miles**	**0298**	**2000**
				Elevated temperatures impacting coldwater fisheries in these reaches and sub-areas: Planning Units 113.70010 (Pardaloe Creek), 113.70011, 12, 13, 14, 20, 21, and the entire mainstem Garcia River from Pardaloe Creek to the estuary, which includes that portion of 113.70022, 23, 24, 25, and 26. February 1998 - The Regional Water Board is working to adopt a TMDL for sediment on the Garcia River. It is possible that voluntary compliance with measures in this TMDL will improve conditions related to temperature prior to development of a TMDL for temperature.						
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	GUALALA RIVER	113.800							
				Sedimentation/Siltation		Medium	35	Miles	0499	1201
					Specialty Crop Production					
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Road Construction					
					Land Development					
					Disturbed Sites (Land Develop.)					
					Erosion/Siltation					
					Nonpoint Source					
1	R	KLAMATH RIVER	105.000							
				Nutrients		Medium	190	Miles	0402	0404
				Nutrient TMDLs will be developed for the area tributary to and including:						
				Clear Lake Reservoir Area						
				Lost River/Tule Lake to Oregon border						
				Oregon border to iron Gate dam						
				Iron Gate Dam to Scott River						
				Scott River to Trinity River						
				Trinity River to the Ocean						
					Municipal Point Sources					
					Irrigated Crop Production					
					Agricultural Return Flows					
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	180	Miles	0202	1204
				Dissolved oxygen levels do not meet Basin Plan Objective. Fisheries habitat is impaired due to low dissolved oxygen levels. Dissolved Oxygen TMDL will be developed for the mainstem of the Klamath River.						
					Municipal Point Sources					
					Agricultural Return Flows					
					Flow Regulation/Modification					
				Temperature		Medium	190	Miles	0402	0404
				Temperature TMDLs will be developed for the area tributary to and including:						
				Clear Lake Reservoir Area						
				Lost River/Tule Lake to Oregon border						
				Oregon border to iron Gate dam						
				Iron Gate Dam to Scott River						
				Scott River to Trinity River						
				Trinity River to the Ocean						
					Dam Construction/Operation					
					Flow Regulation/Modification					
					Water Diversions					
					Habitat Modification					
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	MAD RIVER	109.000							
				Sedimentation/Siltation		Low	90	Miles	0205	0207
				USEPA will develop TMDL for the Mad River. Sediment TMDLs will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the Mad River(Upper), and (3) the Mad River (Middle).						
					Silviculture					
					Resource Extraction					
					Nonpoint Source					
				Turbidity		Low	90	Miles	0205	0207
				Turbidity TMDLs will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the Mad River(Upper), and (3) the Mad River (Middle).						
					Silviculture					
					Resource Extraction					
					Nonpoint Source					
1	R	MATTOLE RIVER	112.300							
				Sedimentation/Siltation		Medium	56	Miles	0200	1202
					Specialty Crop Production					
					Range Land					
					Riparian Grazing					
					Silviculture					
					Hydromodification					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Erosion/Siltation					
					Nonpoint Source					
				Temperature		Medium	56	Miles	0200	1202
					Silviculture					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	NAVARRO RIVER	113.500							
				Sedimentation/Siltation		Medium	25	Miles	0298	1200
				Sediment TMDLs will be developed for: (1) the area tributary to and including the Navarro River above Philo and (2) the area tributary to and including the Navarro River below Philo.						
					Agriculture					
					Nonirrigated Crop Production					
					Irrigated Crop Production					
					Specialty Crop Production					
					Range Land					
					Riparian Grazing					
					Upland Grazing					
					Agriculture-grazing					
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Silvicultural Point Sources					
					Construction/Land Development					
					Highway/Road/Bridge Construction					
					Road Construction					
					Land Development					
					Disturbed Sites (Land Develop.)					
					Resource Extraction					
					Flow Regulation/Modification					
					Water Diversions					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Drainage/Filling Of Wetlands					
					Channel Erosion					
					Erosion/Siltation					
					Nonpoint Source					

* Comments presented under each pollutant/stressor are not required under Clean Water Act Section 303(d). In a few cases, they provide necessary information.

1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Temperature		**Medium**	**25**	**Miles**	**0298**	**1200**
				Temperature TMDLs will be developed for: (1) the area tributary to and including the Navarro River above Philo and (2) the area tributary to and including the Navarro River below Philo.						
					Agriculture					
					Agricultural Return Flows					
					Resource Extraction					
					Flow Regulation/Modification					
					Water Diversions					
					Agricultural Water Diversion					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Drainage/Filling Of Wetlands					
					Nonpoint Source					
1	**R**	**NOYO RIVER**	**113.200**							
				Sedimentation/Siltation		**Medium**	**35**	**Miles**	**0698**	**1299**
					Silviculture					
					Nonpoint Source					
1	**R**	**REDWOOD CREEK**	**107.000**							
				Sedimentation/Siltation		**Low**	**63**	**Miles**	**0497**	**1298**
				Sediment TMDLs are being developed for: (1) the area tributary to and including the mainstem upstream of the Redwood National Park boundary and (2) for the area tributary to and including the mainstem within the Park boundary.						
					Range Land					
					Silviculture					
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	RUSSIAN RIVER	114.100							
				Sedimentation/Siltation		Medium	105	Miles	0209	1211
				[Entire watershed, mainly tributaries.] *Sedimentation, threat of sedimentation, siltation, turbidity, bank erosion impaired spawning and rearing habitat, increased rate and depth of flooding due to sediment, property damage, in Russian River and tributaries. Aggradation in the main stem Russian River. Sonoma County Water Agency has begun a comprehensive Endangered Species Act habitat assessment. This project should arrive at assessment and control measures equivalent to TMDL allocation and attainment strategies.*					
					Specialty Crop Production					
					Riparian Grazing					
					Upland Grazing					
					Agriculture-storm runoff					
					Silviculture					
					Harvesting, Restoration, Residue Management					
					Logging Road Construction/Maintenance					
					Construction/Land Development					
					Highway/Road/Bridge Construction					
					Road Construction					
					Land Development					
					Disturbed Sites (Land Develop.)					
					Other Urban Runoff					
					Hydromodification					
					Channelization					
					Flow Regulation/Modification					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Drainage/Filling Of Wetlands					
					Channel Erosion					
					Erosion/Siltation					
					Nonpoint Source					
1	R	SCOTT RIVER	105.400							
				Sedimentation/Siltation		Low	68	Miles	0203	0405
					Irrigated Crop Production					
					Pasture Land					
					Silviculture					
					Resource Extraction					
					Mine Tailings					
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Temperature		Low	68	Miles	0203	0405
					Irrigated Crop Production					
					Pasture Land					
					Agricultural Return Flows					
					Silviculture					
					Water Diversions					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Drainage/Filling Of Wetlands					
					Nonpoint Source					
1	R	SHASTA RIVER	105.500							
				Org. enrichment/Low D.O.		Low	52	Miles	0203	0905
					Riparian Grazing					
					Agricultural Return Flows					
					Flow Regulation/Modification					
				Temperature		Low	52	Miles	0203	0905
					Agriculture-irrigation tailwater					
					Water Diversions					
					Agricultural Water Diversion					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Drainage/Filling Of Wetlands					
					Nonpoint Source					
1	R	STEMPLE CREEK	115.400							
				Nutrients		Low	17	Miles	0496	0498
				This water body/pollutant was relisted by USEPA.						
					Pasture Land					
					Manure Lagoons					
					Nonpoint Source					
1	R	TEN MILE RIVER	113.130							
				Sedimentation/Siltation		Low	10	Miles	0298	1200
				USEPA is developing TMDL for Ten Mile River.						
					Silviculture					
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
1	R	TOMKI CREEK	111.620							
				Sedimentation/Siltation		**Medium**	**18**	**Miles**	**0202**	**1204**
				USEPA will develop TMDL's for Eel River Watershed in the Tomki Creek vicinity. Tomki Creek, tributary to the Eel River, has been listed under Clean Water Act Section 303(d) due to the effects of sedimentation. Restoration effort has targeted the riparian area. Tomki Creek is under consideration for removal from the 303(d) list.					
					Range Land					
					Silviculture					
					Erosion/Siltation					
					Nonpoint Source					
1	R	TRINITY RIVER	106.000							
				Sedimentation/Siltation		**Medium**	**170**	**Miles**	**0199**	**1201**
				USEPA will develop TMDL for Trinity River. Sediment TMDLs will be developed for the area tributary to and including: (1) the Trinity River (Upper), (2) the Trinity River (Middle), and (3) the Trinity River (Lower).						
					Range Land					
					Silviculture					
					Resource Extraction					
					Mine Tailings					
					Nonpoint Source					
1	R	TRINITY RIVER, SOUTH FORK	106.200							
				Sedimentation/Siltation		**Low**	**80**	**Miles**	**0397**	**1298**
				USEPA will be developing TMDL for South Fork Trinity River. Sediment TMDLs will be developed for: (1) areas tributary to and including Hayfork/Corral Creeks and (2) areas tributary to and including the South Fork of the Trinity River except Hayfork/Corral Creeks						
					Riparian Grazing					
					Silviculture					
					Nonpoint Source					
				Temperature		**Low**	**80**	**Miles**	**0206**	**1208**
				Elevated temperatures impact coldwater fisheries. USEPA will be developing TMDL for South Fork Trinity River.						
					Riparian Grazing					
					Water Diversions					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
1	R	VAN DUZEN RIVER	111.200							
				Sedimentation/Siltation		**Low**	**63**	**Miles**	**0297**	**1299**
				USEPA is developing TMDL for Van Duzen River. Sediment TMDLs will be developed for: (1) areas tributary to and including Yager Creek, (2) areas tributary to and including the Van Duzen River above Bridgeville, and (3) areas tributary to and including the Van Duzen River below Bridgeville.						
					Range Land					
					Silviculture					
					Erosion/Siltation					
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	B	CARQUINEZ STRAIT	207.100							
				Chlordane		Low	6560	Acres		
				This listing was made by USEPA.						
					Nonpoint Source					
				Copper		Medium	6560	Acres	2003	2008
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		Low	6560	Acres		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		Medium	6560	Acres	2000	2005
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		Low	6560	Acres		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		High	6560	Acres		
				** The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		High	6560	Acres	1998	2003
				Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.						
					Ballast Water					
				Furan compounds*		High	6560	Acres		
				** The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Mercury		**High**	**6560**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.						
					Industrial Point Sources					
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				Nickel		**Low**	**6560**	**Acres**	**2006**	**2010**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
				PCBs		**Medium**	**6560**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs.						
				Interim health advisory for fish; uncertainty regarding water column concentration data.						
					Unknown Nonpoint Source					
				PCBs (dioxin-like)*		**High**	**6560**	**Acres**		
				** The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*						
				This listing was made by USEPA.						
					Unknown Nonpoint Source					
				Selenium		**Low**	**6560**	**Acres**	**2006**	**2010**
				Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks); low TMDL priority because Individual Control Strategy in place.						
					Industrial Point Sources					
					Agriculture					
2	B	RICHARDSON BAY	203.130							
				Chlordane		**Low**	**2560**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				DDT		**Low**	**2560**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dieldrin		**Low**	**2560**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Dioxin compounds*		**High**	**2560**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**2560**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; endanger food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**2560**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				High Coliform Count		**Medium**	**200**	**Acres**	**2003**	**2008**
				Affected area, Waldo Point Harbor, is less than 10% of embayment; source has been positively identified as substandard sewage systems in some houseboat areas; extensive local control program in place with significant water quality improvements.						
					Urban Runoff/Storm Sewers					
					Septage Disposal					
					Boat Discharges/Vessel Wastes					
				Mercury		**High**	**2560**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.						
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				PCBs		**Medium**	**2560**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs.						
				Interim health advisory for fish; uncertainty regarding water column concentration data.						
					Unknown Nonpoint Source					
				PCBs (dioxin-like)*		**High**	**2560**	**Acres**		
				* *The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*						
				This listing was made by USEPA.						
					Unknown Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	B	SAN FRANCISCO BAY, CENTRAL	203.120							
				Chlordane		**Low**	**67700**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Copper		**Medium**	**67700**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		**Low**	**67700**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		**Medium**	**67700**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		**Low**	**67700**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		**High**	**67700**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**67700**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; endanger food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**67700**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Mercury		**High**	**67700**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.	**Industrial Point Sources**					
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				PCBs		**Medium**	**67700**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs. *Interim health advisory for fish; uncertainty regarding water column concentration data.*	**Unknown Nonpoint Source**					
				PCBs (dioxin-like)*		**High**	**67700**	**Acres**		
				** The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189)*						
				This listing was made by USEPA.	**Unknown Nonpoint Source**					
				Selenium		**Low**	**67700**	**Acres**	**2006**	**2010**
				Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks); low TMDL priority because Individual Control Strategy in place.	**Industrial Point Sources**					
					Agriculture					
					Natural Sources					
					Exotic Species					
2	**B**	**SAN FRANCISCO BAY, LOWER**	**204.100**							
				Chlordane		**Low**	**79900**	**Acres**		
				This listing was made by USEPA.	**Nonpoint Source**					
				Copper		**Medium**	**79900**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.	**Municipal Point Sources**					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		**Low**	**79900**	**Acres**		
				This listing was made by USEPA.	**Nonpoint Source**					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Diazinon		**Medium**	**79900**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		**Low**	**79900**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		**High**	**79900**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**79900**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; endanger food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**79900**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Mercury		**High**	**79900**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources; water objective exceedances. Elevated sediment levels, elevated tissue levels.						
					Industrial Point Sources					
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				Nickel		**Medium**	**79900**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels of nickel.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				PCBs		**Medium**	**79900**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs. *Interim health advisory for fish: uncertainty regarding water column concentration data.*						
					Unknown Nonpoint Source					

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Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs (dioxin-like)*		**High**	**79900**	**Acres**		
				* *The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*						
				This listing was made by USEPA.						
					Unknown Nonpoint Source					
2	B	SAN FRANCISCO BAY, SOUTH	205.100							
				Chlordane		**Low**	**24500**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Copper		**High**	**24500**	**Acres**	**1998**	**2003**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		**Low**	**24500**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		**Medium**	**24500**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		**Low**	**24500**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		**High**	**24500**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**24500**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; endanger food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**24500**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Mercury		**High**	**24500**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources; water objective exceedances. Elevated sediment levels, elevated tissue levels.	**Industrial Point Sources** **Municipal Point Sources** **Resource Extraction** **Atmospheric Deposition** **Natural Sources** **Nonpoint Source**				
				Nickel		**High**	**24500**	**Acres**	**1998**	**2003**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.	**Municipal Point Sources** **Urban Runoff/Storm Sewers** **Other**					
				PCBs		**Medium**	**24500**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs. *Interim health advisory for fish; uncertainty regarding water column concentration data.*	**Unknown Nonpoint Source**					
				PCBs (dioxin-like)*		**High**	**24500**	**Acres**		
				** The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).* *This listing was made by USEPA.*	**Unknown Nonpoint Source**					
				Selenium		**Low**	**24500**	**Acres**	**2006**	**2010**
				A formal health advisory has been issued by OEHHA for benthic-feeding ducks in South San Francisco Bay. This health advisory clearly establishes that water contact recreation beneficial use (REC-1) is not fully supported and standards are not fully met.	**Agriculture** **Domestic Use of Ground Water**					
2	B	SAN PABLO BAY	206.100							
				Chlordane		**Low**	**71300**	**Acres**		
				This listing was made by USEPA.	**Nonpoint Source**					
				Copper		**Medium**	**71300**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.	**Municipal Point Sources** **Urban Runoff/Storm Sewers** **Atmospheric Deposition** **Other**					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				DDT		**Low**	**71300**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		**Medium**	**71300**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		**Low**	**71300**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		**High**	**71300**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**71300**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**71300**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4.7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Mercury		**High**	**71300**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.						
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				Nickel		**Low**	**71300**	**Acres**	**2006**	**2010**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
				PCBs		**Medium**	**71300**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs.						
				Interim health advisory for fish; uncertainty regarding water column concentration data.						
					Unknown Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs (dioxin-like)*		**High**	**71300**	**Acres**		
				** The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*					
				This listing was made by USEPA.						
					Unknown Nonpoint Source					
				Selenium		**Low**	**71300**	**Acres**	**2006**	**2010**
				Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks); low TMDL priority because Individual Control Strategy in place.					
					Industrial Point Sources					
					Agriculture					
					Natural Sources					
					Exotic Species					
2	B	SUISUN BAY	207.100							
				Chlordane		**Low**	**25000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Copper		**Medium**	**25000**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		**Low**	**25000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		**Medium**	**25000**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.					
					Nonpoint Source					
				Dieldrin		**Low**	**25000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Dioxin compounds*		**High**	**25000**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*					
				This listing was made by USEPA.						
					Atmospheric Deposition					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Exotic Species		**High**	**25000**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**25000**	**Acres**		
				** The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Mercury		**High**	**25000**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.						
					Industrial Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Natural Sources					
					Nonpoint Source					
				Nickel		**Low**	**25000**	**Acres**	**2006**	**2010**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
				PCBs		**Medium**	**25000**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs.						
				Interim health advisory for fish; uncertainty regarding water column concentration data.						
					Unknown Nonpoint Source					
				PCBs (dioxin-like)*		**High**	**25000**	**Acres**		
				** The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*						
				This listing was made by USEPA.						
					Unknown Nonpoint Source					
				Selenium		**Low**	**25000**	**Acres**	**2006**	**2010**
				Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks); low TMDL priority because Individual Control Strategy in place.						
					Industrial Point Sources					
					Natural Sources					
					Exotic Species					

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Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	B	TOMALES BAY	201.110							
				Metals		**Medium**	**7820**	**Acres**	**2002**	**2007**
				TMDL will be developed as part of evolving watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring and assessment needed.						
					Mine Tailings					
				Nutrients		**Medium**	**7820**	**Acres**	**2002**	**2007**
				TMDL will be developed as part of evolving watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring and assessment needed.						
					Agriculture					
				Pathogens		**Medium**	**7820**	**Acres**	**2002**	**2007**
				TMDL will be developed as part of evolving watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring and assessment needed.						
					Animal Operations					
					Septage Disposal					
				Sedimentation/Siltation		**Medium**	**7820**	**Acres**	**2002**	**2007**
				TMDL will be developed as part of evolving watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring and assessment needed.						
					Agriculture					
					Upstream Impoundment					
2	E	SACRAMENTO SAN JOAQUIN DELTA	207.100							
				Chlordane		**Low**	**15000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Copper		**Medium**	**15000**	**Acres**	**2003**	**2008**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
					Atmospheric Deposition					
				DDT		**Low**	**15000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Diazinon		**Medium**	**15000**	**Acres**	**2000**	**2005**
				Diazinon levels cause water column toxicity. Two patterns: pulses through riverine systems linked to agricultural application in late winter and pulse from residential land use areas linked to homeowner pesticide use in late spring, early summer. Chlorpyrifos may also be the cause of toxicity; more data needed, however.						
					Nonpoint Source					
				Dieldrin		**Low**	**15000**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Dioxin compounds*		**High**	**15000**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Exotic Species		**High**	**15000**	**Acres**	**1998**	**2003**
				Disrupt natural benthos; change pollutant availability in food chain; endanger food availability to native species.						
					Ballast Water					
				Furan compounds*		**High**	**15000**	**Acres**		
				* *The specific compounds are: 2,3,7,8-TCDF, 1,2,3,7,8-PcCDF 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2',3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF.*						
				This listing was made by USEPA.						
					Atmospheric Deposition					
				Mercury		**High**	**15000**	**Acres**	**1998**	**2003**
				Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.						
					Industrial Point Sources					
					Municipal Point Sources					
					Resource Extraction					
					Atmospheric Deposition					
					Nonpoint Source					
				Nickel		**Low**	**15000**	**Acres**	**2006**	**2010**
				Exceedance of California Toxic Rules dissolved criteria and National Toxic Rules total criteria; elevated water and sediment tissue levels.						
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
					Other					
				PCBs		**Medium**	**15000**	**Acres**	**2003**	**2008**
				This listing covers non dioxin-like PCBs. *Interim health advisory for fish; uncertainty regarding water column concentration data.*						
					Unknown Nonpoint Source					
				PCBs (dioxin-like)*		**High**	**15000**	**Acres**		
				* *The specific dioxin-like PCBs are 3,4,4',5-TCB (81), 3,3',3,3'-TCB (77), 3,3',4,4',5-PeCB (126), 3,3',4,4',4,4'-HxCB (169), 2,3,3',4,4'-PeCB (105), 2,3,4,4',5-PeCB (114), 2,3',4,4',5-PeCB (118), 2',3,4,4',5-PeCB (123), 2,3,3',4,4',5-HxCB (156), 2,3,3',4,4',5'-HxCB (157), 2,3',4,4',5,5'-HxCB (167), 2,3,3',4,4',5,5'-HpCB (189).*						
				This listing was made by USEPA.						
					Unknown Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Selenium		**Low**	**15000**	**Acres**	**2006**	**2010**
				Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks); low TMDL priority because Individual Control Strategy in place.					
					Industrial Point Sources					
					Agriculture					
					Natural Sources					
					Exotic Species					
2	L	CALERO RESERVOIR	205.400							
				Mercury		**High**	**350**	**Acres**	**1998**	**2003**
				TMDL will be developed as part of the Santa Clara Basin Watershed Management Initiative. Additional monitoring and assessment is needed.						
					Surface Mining					
					Mine Tailings					
2	L	GUADALUPE RESERVOIR	205.400							
				Mercury		**High**	**80**	**Acres**	**1998**	**2003**
				TMDL will be developed as part of the Santa Clara Basin Watershed Management Initiative. Additional monitoring and assessment is needed.						
					Surface Mining					
					Mine Tailings					
2	L	LAKE HERMAN	207.210							
				Mercury		**Low**	**110**	**Acres**	**2005**	**2010**
				Additional monitoring and assessment needed. Problem due to historical mining.						
					Surface Mining					
2	L	MERRITT LAKE	204.200							
				Floating Material		**Low**	**160**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
				Org. enrichment/Low D.O.		**Low**	**160**	**Acres**		
				This listing was made by USEPA.						
					Nonpoint Source					
2	R	ALAMEDA CREEK	204.300							
				Diazinon		**Low**	**50.77**	**Miles**		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	ALAMITOS CREEK	205.400							
				Mercury		**High**	**21**	**Miles**	**1998**	**2003**
				TMDL will be developed as part of the Santa Clara Basin Watershed Management Initiative. Additional monitoring and assessment is needed.						
					Mine Tailings					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	R	ARROYO CORTE MADERA DEL PRESIDIO	203.200							
				Diazinon		Low	3.2	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	ARROYO DE LA LAGUNA	204.300							
				Diazinon		Low	7.4	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	ARROYO DEL VALLE	204.300							
				Diazinon		Low	48.7	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	ARROYO HONDO	204.300							
				Diazinon		Low	9.23	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	BUTANO CREEK	202.400							
				Sedimentation/Siltation		Medium	1	Miles	2000	2005
				Impairment to steelhead habitat.						
					Nonpoint Source					
2	R	CALABAZAS CREEK	206.401							
				Diazinon		Low	4.7	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	CORTE MADERA CREEK	203.200							
				Diazinon		Low	4.12	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	COYOTE CREEK (MARIN CO)	203.200							
				Diazinon		Low	2.62	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	COYOTE CREEK (SANTA CLARA CO.)	205.300							
				Diazinon		Low	68.63	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					

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Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	R	GALLINAS CREEK	206.200							
				Diazinon		Low	2.4	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	GUADALUPE CREEK	205.400							
				Mercury		High	6	Miles	1998	2003
				TMDL will be developed as part of the Santa Clara Basin Watershed Management Initiative. Additional monitoring and assessment is needed.						
					Mine Tailings					
2	R	GUADALUPE RIVER	205.400							
				Diazinon		Low	18.21	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
				Mercury		High	30	Miles	1998	2003
				TMDL will be developed as part of the Santa Clara Basin Watershed Management Initiative. Additional monitoring and assessment is needed.						
					Mine Tailings					
2	R	LAGUNITAS CREEK	201.130							
				Nutrients		Medium	22	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
				Pathogens		Medium	22	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Medium	22	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
2	R	LAUREL CREEK	207.230							
				Diazinon		Low	3.02	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	LEDGEWOOD CREEK	207.230							
				Diazinon		Low	12.44	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	R	LOS GATOS CREEK (REG 2)	205.400							
				Diazinon		Low	25.72	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	MATADERO CREEK	205.500							
				Diazinon		Low	7.34	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	MILLER CREEK	206.200							
				Diazinon		Low	9.03	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	MT. DIABLO CREEK	207.310							
				Diazinon		Low	12.63	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	NAPA RIVER	206.500							
				Nutrients		Medium	55	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
				Pathogens		Medium	55	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		High	55	Miles	1998	2003
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
2	R	NOVATO CREEK	206.200							
				Diazinon		Low	18.74	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	PERMANENTE CREEK	205.500							
				Diazinon		Low	13.1	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					

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2	R	PESCADERO CREEK (REG 2)	202.400							
				Sedimentation/Siltation		Medium	21	Miles	2000	2005
				Impairment to steelhead habitat.						
					Nonpoint Source					
2	R	PETALUMA RIVER	206.300							
				Nutrients		Medium	25	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
				Pathogens		Medium	25	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Medium	25	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
2	R	PINE CREEK	207.310							
				Diazinon		Low	12.56	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	PINOLE CREEK	206.600							
				Diazinon		Low	9.17	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	RODEO CREEK	201.300							
				Diazinon		Low	7.96	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN ANTONIO CREEK (REG 2)	206.300							
				Diazinon		Low	17.77	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN FELIPE CREEK	205.300							
				Diazinon		Low	15.47	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	R	SAN FRANCISQUITO CREEK	205.500							
				Diazinon		Low	12.05	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Medium	18	Miles	2000	2005
				Impairment to steelhead habitat.						
					Nonpoint Source					
2	R	SAN GREGORIO CREEK	202.300							
				Sedimentation/Siltation		Medium	16	Miles	2000	2005
				Impairment to steelhead habitat.						
					Nonpoint Source					
2	R	SAN LEANDRO CREEK	204.200							
				Diazinon		Low	14.77	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN LORENZO CREEK (R2)	204.200							
				Diazinon		Low	11.7	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN MATEO CREEK	204.400							
				Diazinon		Low	11.05	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN PABLO CREEK	206.600							
				Diazinon		Low	16.14	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SAN RAFAEL CREEK	203.200							
				Diazinon		Low	2.8	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SARATOGA CREEK	205.500							
				Diazinon		Low	17.86	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					

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2	R	SONOMA CREEK	206.400							
				Nutrients		Medium	23	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
				Pathogens		Medium	23	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Medium	23	Miles	2000	2005
				TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
2	R	STEVENS CREEK	205.500							
				Diazinon		Low	22.26	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	SUISUN SLOUGH	207.23							
				Diazinon		Low	10	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	WALKER CREEK	201.120							
				Metals		Medium	25	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Surface Mining					
					Mine Tailings					
				Nutrients		Medium	25	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					
				Sedimentation/Siltation		Medium	25	Miles	2002	2007
				Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.						
					Agriculture					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
2	R	WALNUT CREEK	207.320							
				Diazinon		Low	9.03	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	R	WILDCAT CREEK	206.600							
				Diazinon		Low	12.07	Miles		
				This listing was made by USEPA.						
					Urban Runoff/Storm Sewers					
2	T	SUISUN MARSH WETLANDS	207.230							
				Metals		Medium	57000	Acres	2003	2008
				Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
					Flow Regulation/Modification					
				Nutrients		Medium	57000	Acres	2003	2008
				Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
					Flow Regulation/Modification					
				Org. enrichment/Low D.O.		Medium	57000	Acres	2003	2008
				Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
					Flow Regulation/Modification					
				Salinity		Medium	57000	Acres	2003	2008
				Additional monitoring and assessment needed.						
					Agriculture					
					Urban Runoff/Storm Sewers					
					Flow Regulation/Modification					
3	B	MONTEREY HARBOR	309.500							
				Metals		Medium	74	Acres	0198	0403
					Railroad Slag Pile					
				Unknown Toxicity		Low	74	Acres	0198	0411
					Source Unknown					
3	B	MORRO BAY	310.220							
				Metals		High	100	Acres	0696	0400
					Surface Mining					
					Nonpoint Source					
					Boat Discharges/Vessel Wastes					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Pathogens		High	50	Acres	0696	0400
					Upland Grazing					
					Urban Runoff/Storm Sewers					
					Septage Disposal					
					Natural Sources					
					Nonpoint Source					
				Sedimentation/Siltation		High	100	Acres	0696	0699
					Agriculture					
					Irrigated Crop Production					
					Construction/Land Development					
					Resource Extraction					
					Channelization					
					Channel Erosion					
3	B	MOSS LANDING HARBOR	306.000							
				Pathogens		Low	40	Acres	0405	0409
					Agriculture					
					Nonpoint Source					
					Boat Discharges/Vessel Wastes					
				Pesticides		Low	160	Acres	0405	0409
					Agriculture					
					Irrigated Crop Production					
					Specialty Crop Production					
				Sedimentation/Siltation		Low	160	Acres	0405	0409
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Hydromodification					
					Dredging (Hydromod.)					
					Channel Erosion					
					Erosion/Siltation					
					Nonpoint Source					
3	C	MONTEREY BAY SOUTH	309.500							
				Metals		Low	10	Miles	0198	0411
					Surface Mining					
				Pesticides		Low	10	Miles	0198	0411
					Agriculture					
3	C	PACIFIC OCEAN AT POINT RINCON	315.340							
				Pathogens		Medium	5	Miles	0406	0411
					Urban Runoff/Storm Sewers					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
3	E	CARPINTERIA MARSH (EL ESTERO MARSH)	315.340							
				Nutrients		Low	80	Acres	0406	0411
					Agriculture					
				Org. enrichment/Low D.O.		Low	80	Acres	0406	0411
					Agriculture					
				Priority Organics		Low	80	Acres	0406	0411
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Low	80	Acres	0406	0411
					Agriculture					
					Construction/Land Development					
					Storm sewers					
3	E	ELKHORN SLOUGH	306.000							
				Pathogens		Low	500	Acres	0405	0409
					Natural Sources					
					Nonpoint Source					
				Pesticides		Low	500	Acres	0405	0409
				Industrial discharge from PG&E may transfer pollutants from Old Salinas river and Moss Landing Harbor to the slough.						
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agricultural Return Flows					
					Contaminated Sediments					
					Erosion/Siltation					
					Nonpoint Source					
				Sedimentation/Siltation		Low	50	Acres	0405	0409
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Channel Erosion					
					Nonpoint Source					
3	E	GOLETA SLOUGH/ESTUARY	315.310							
				Metals		Low	200	Acres	0406	0411
					Industrial Point Sources					
				Pathogens		Low	200	Acres	0406	0411
					Urban Runoff/Storm Sewers					
				Priority Organics		Low	200	Acres	0406	0411
					Nonpoint Source					
				Sedimentation/Siltation		Low	200	Acres	0406	0411
					Construction/Land Development					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
3	E	OLD SALINAS RIVER ESTUARY	309.100							
				Nutrients		Medium	50	Acres	0198	0403
					Agriculture					
					Irrigated Crop Production					
					Agricultural Return Flows					
					Nonpoint Source					
				Pesticides		Medium	50	Acres	0198	0403
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Nonpoint Source					
3	E	SALINAS RIVER LAGOON (NORTH)	309.100							
				Nutrients		Medium	75	Acres	0198	0403
					Nonpoint Source					
				Pesticides		Medium	75	Acres	0198	0403
					Agriculture					
				Sedimentation/Siltation		Medium	75	Acres	0198	0401
					Nonpoint Source					
3	E	SAN LORENZO RIVER ESTUARY	304.120							
				Pathogens		Medium	20	Acres	0499	0401
					Urban Runoff/Storm Sewers					
					Natural Sources					
				Sedimentation/Siltation		High	20	Acres	0198	0400
					Hydromodification					
3	E	WATSONVILLE SLOUGH	305.100							
				Metals		Medium	300	Acres	0199	0403
					Agriculture					
					Urban Runoff/Storm Sewers					
				Oil and grease		Medium	300	Acres	0199	0403
					Urban Runoff/Storm Sewers					
					Nonpoint Source					
				Pathogens		*Medium*	*300*	Acres	0199	0403
					Urban Runoff/Storm Sewers					
					Source Unknown					
					Nonpoint Source					
				Pesticides		Medium	300	Acres	0199	0403
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agricultural Return Flows					
					Nonpoint Source					

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				Sedimentation/Siltation		Medium	300	Acres	0198	0401
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Nonpoint Source					
3	L	HERNANDEZ RESERVOIR	305.500							
				Mercury		Medium	619	Acres	0198	0403
					Subsurface Mining					
3	L	NACIMIENTO RESERVOIR	309.820							
				Metals		High	5370	Acres	0997	0400
					Subsurface Mining					
					Natural Sources					
3	R	APTOS CREEK	304.130							
				Pathogens		Low	4	Miles	0405	0411
					Urban Runoff/Storm Sewers					
				Sedimentation/Siltation		Medium	4	Miles	0101	0401
					Disturbed Sites (Land Develop.)					
					Channel Erosion					
3	R	ARROYO BURRO CREEK	315.320							
				Pathogens		Medium	6	Miles	0406	0411
					Urban Runoff/Storm Sewers					
					Nonpoint Source					
3	R	BLANCO DRAIN	309.100							
				Pesticides		Medium	8	Miles	0198	0405
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Nonpoint Source					
3	R	CARBONERA CREEK	304.120							
				Nutrients		High	10	Miles	0493	0400
					Nonpoint Source					
				Pathogens		Medium	10	Miles	0499	0401
					Urban Runoff/Storm Sewers					
					Nonpoint Source					
				Sedimentation/Siltation		High	10	Miles	0198	0400
					Construction/Land Development					
					Nonpoint Source					

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3	R	CARPINTERIA CREEK	315.340							
				Pathogens		Low	6	Miles	0406	0411
					Agriculture					
					Septage Disposal					
					Nonpoint Source					
3	R	CHORRO CREEK	310.220							
				Metals		High	11	Miles	0696	0400
					Resource Extraction					
					Mine Tailings					
				Nutrients		High	11	Miles	0696	0400
					Municipal Point Sources					
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
				Sedimentation/Siltation		High	11	Miles	0696	0699
					Agriculture					
					Irrigated Crop Production					
					Range Land					
					Upland Grazing					
					Agriculture-storm runoff					
					Construction/Land Development					
					Road Construction					
					Resource Extraction					
					Hydromodification					
					Channelization					
					Streambank Modification/Destabilization					
					Channel Erosion					
					Natural Sources					
					Golf course activities					
					Erosion/Siltation					
					Nonpoint Source					
3	R	CLEAR CREEK (R3)	304.120							
				Mercury		Medium	2	Miles	0198	0403
					Resource Extraction					
3	R	LAS TABLAS CREEK	309.810							
				Metals		High	13	Miles	0997	0400
					Surface Mining					
3	R	LAS TABLAS CREEK, NORTH FORK	309.810							
				Metals		High	5	Miles	0997	0400
					Surface Mining					

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3	R	LAS TABLAS CREEK, SOUTH FORK	309.810							
				Metals		High	4	Miles	0997	0400
					Surface Mining					
3	R	LLAGAS CREEK	305.300							
				Nutrients		High	22	Miles	0198	0401
					Municipal Point Sources					
					Agriculture					
					Irrigated Crop Production					
					Pasture Land					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Urban Runoff/Storm Sewers					
					Habitat Modification					
					Nonpoint Source					
					Point Source					
				Sedimentation/Siltation		Medium	22	Miles	0198	0401
					Agriculture					
					Hydromodification					
					Habitat Modification					
3	R	LOMPICO CREEK	304.120							
				Nutrients		High	5	Miles	0493	0400
					Septage Disposal					
				Pathogens		Medium	5	Miles	0499	0401
					Septage Disposal					
					Natural Sources					
					Nonpoint Source					
				Sedimentation/Siltation		High	5	Miles	0198	0400
					Construction/Land Development					
					Natural Sources					
3	R	LOS OSOS CREEK	310.220							
				Nutrients		High	10	Miles	0696	0400
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agricultural Return Flows					
				Priority Organics		High	10	Miles	0696	0400
					Urban Runoff/Storm Sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sedimentation/Siltation		High	10	Miles	0696	0699
					Agriculture					
					Irrigated Crop Production					
					Range Land					
					Upland Grazing					
					Agriculture-storm runoff					
					Hydromodification					
					Channelization					
					Dredging (Hydromod.)					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Channel Erosion					
					Natural Sources					
					Erosion/Siltation					
					Nonpoint Source					
3	R	MISSION CREEK	315.320							
				Pathogens		Low	9	Miles	0406	0411
					Urban Runoff/Storm Sewers					
					Septage Disposal					
				Unknown Toxicity		Low	9	Miles	0406	0411
					Urban Runoff/Storm Sewers					
3	R	PAJARO RIVER	305.000							
				Nutrients		High	49	Miles	0198	0401
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-subsurface drainage					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Urban Runoff/Storm Sewers					
					Wastewater - land disposal					
					Channelization					
					Removal of Riparian Vegetation					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sedimentation/Siltation		Medium	49	Miles	0198	0401
					Agriculture					
					Irrigated Crop Production					
					Range Land					
					Agriculture-storm runoff					
					Resource Extraction					
					Surface Mining					
					Hydromodification					
					Channelization					
					Habitat Modification					
					Removal of Riparian Vegetation					
					Streambank Modification/Destabilization					
					Channel Erosion					
3	R	RIDER GULCH CREEK	305.100							
				Sedimentation/Siltation		Medium	2	Miles	0198	0401
					Agriculture					
					Silviculture					
					Construction/Land Development					
3	R	SALINAS RECLAMATION CANAL	309.200							
				Pesticides		Medium	20	Miles	0198	0405
					Minor Industrial Point Source					
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Nonpoint Source					
				Priority Organics		Medium	20	Miles	0198	0405
					Minor Industrial Point Source					
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Urban Runoff/Storm Sewers					
					Source Unknown					
					Nonpoint Source					
3	R	SALINAS RIVER	309.100							
				Nutrients		Medium	50	Miles	0198	0403
					Agriculture					

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				Pesticides		Medium	50	Miles	0198	0403
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agriculture-irrigation tailwater					
					Agricultural Return Flows					
					Nonpoint Source					
				Salinity/TDS/Chlorides		Medium	50	Miles	0198	0403
					Agriculture					
				Sedimentation/Siltation		Medium	90	Miles	0198	0401
					Agriculture					
					Irrigated Crop Production					
					Range Land					
					Agriculture-storm runoff					
					Road Construction					
					Land Development					
					Channel Erosion					
					Nonpoint Source					
3	R	SAN ANTONIO CREEK (SANTA BARBARA COUNTY)	315.310							
				Sedimentation/Siltation		Low	6	Miles	0406	0411
					Agriculture					
					Nonpoint Source					
3	R	SAN BENITO RIVER	305.500							
				Sedimentation/Siltation		Medium	86	Miles	0198	0401
					Agriculture					
					Resource Extraction					
					Nonpoint Source					
3	R	SAN LORENZO RIVER	304.120							
				Nutrients		High	25	Miles	0493	0400
					Septage Disposal					
					Nonpoint Source					
				Pathogens		High	25	Miles	1999	2001
					Urban Runoff/Storm Sewers					
					Septage Disposal					
				Sedimentation/Siltation		High	25	Miles	1298	0400
					Silviculture					
					Construction/Land Development					
					Land Development					
					Urban Runoff/Storm Sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
3	R	SAN LUIS OBISPO CRK.(BELOW W.MARSH ST.)	310.240							
				Nutrients		High	9	Miles	0493	0400
					Municipal Point Sources					
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
				Pathogens		High	9	Miles	0493	0400
					Urban Runoff/Storm Sewers					
				Priority Organics		Medium	9	Miles	0498	0401
					Industrial Point Sources					
3	R	SANTA YNEZ RIVER	314.000							
				Nutrients		Low	70	Miles	0403	0407
					Nonpoint Source					
				Salinity/TDS/Chlorides		Low	70	Miles	0403	0407
					Agriculture					
				Sedimentation/Siltation		Low	70	Miles	0403	0407
					Agriculture					
					Urban Runoff/Storm Sewers					
					Resource Extraction					
3	R	SHINGLE MILL CREEK	304.120							
				Nutrients		High	2	Miles	0198	0401
					Septage Disposal					
				Sedimentation/Siltation		High	2	Miles	0198	0401
					Construction/Land Development					
					Nonpoint Source					
3	R	VALENCIA CREEK	304.130							
				Pathogens		Low	7	Miles	0406	0411
					Agriculture					
					Septage Disposal					
				Sedimentation/Siltation		Medium	7	Miles	0401	0405
					Agriculture					
					Construction/Land Development					
3	R	WADDELL CREEK, EAST BRANCH	304.110							
				Nutrients		Medium	3	Miles	0401	0405
					Municipal Point Sources					
3	W	ESPINOSA SLOUGH	309.100							
				Nutrients		Medium	320	Acres	0198	0403
					Agriculture					
					Storm sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Pesticides		Medium	320	Acres	0198	0403
					Agriculture					
					Urban Runoff/Storm Sewers					
				Priority Organics		Medium	320	Acres	0198	0403
					Nonpoint Source					
3	W	MORO COJO SLOUGH	309.100							
				Pesticides		Low	345	Acres	0198	0411
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Agricultural Return Flows					
					Nonpoint Source					
				Sedimentation/Siltation		Low	345	Acres	0198	0411
					Agriculture					
					Irrigated Crop Production					
					Agriculture-storm runoff					
					Construction/Land Development					
					Nonpoint Source					
3	W	SALINAS RIVER REFUGE LAGOON (SOUTH)	309.100							
				Nutrients		Medium	163	Acres	0198	0401
					Agriculture					
				Pesticides		Medium	163	Acres	0198	0403
					Agriculture					
				Salinity/TDS/Chlorides		Medium	163	Acres	0198	0403
					Agriculture					
3	W	SCHWAN LAKE	304.120							
				Nutrients		Low	32	Acres	0406	0411
					Nonpoint Source					
				Pathogens		Low	32	Acres	0406	0411
					Urban Runoff/Storm Sewers					
					Natural Sources					
3	W	SOQUEL LAGOON	304.130							
				Nutrients		Low	2	Acres	0403	0407
					Septage Disposal					
					Nonpoint Source					
				Pathogens		Low	2	Acres	0403	0407
					Urban Runoff/Storm Sewers					
					Natural Sources					
					Nonpoint Source					
				Sedimentation/Siltation		Medium	2	Acres	0401	0405
					Construction/Land Development					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
3	W	TEMBLADERO SLOUGH	309.100							
				Nutrients		Medium	150	Acres	0198	0403
					Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Nonpoint Source					
				Pesticides		Medium	150	Acres	0198	0403
					Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Nonpoint Source					
4	B	CHANNEL ISLANDS HARBOR	403.11							
				Lead *Elevated levels of lead in sediment.*		Low	220	Acres		
					Nonpoint Source					
				Zinc *Elevated levels of zinc in sediment.*		Low	220	Acres		
					Nonpoint Source					
4	B	LA FISH HARBOR	405.12							
				DDT		High	50	Acres		
					Nonpoint/Point Source					
				PAHs		High	50	Acres		
					Nonpoint/Point Source					
				PCBs		High	50	Acres		
					Nonpoint/Point Source					
				Tributyltin		Low	0	Acres		
					Nonpoint/Point Source					
4	B	LA HARBOR CONSOLIDATED SLIP	405.12							
				Benthic Comm. Effects		High	37.13	Acres		
					Nonpoint Source					
				Chlordane *Elevated levels of chlordane in tissue and sediment.*		Medium	37.13	Acres		
					Nonpoint Source					
				Chromium *Elevated levels of chromium in sediment.*		Medium	37.13	Acres		
					Nonpoint Source					
				DDT *Elevated levels of DDT in tissue and sediment. Fish Consumption Advisory for DDT.*		High	37.13	Acres		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Lead		**Low**	**37.13**	**Acres**		
				Elevated levels of lead in sediment.	**Nonpoint Source**					
				PAHs		**High**	**37.13**	**Acres**		
				Elevated levels of PAHs in sediment.	**Nonpoint Source**					
				PCBs		**High**	**37.13**	**Acres**		
				Elevated levels of PCBs in tissue and sediment. Fish Consumption Advisory for PCBs.	**Nonpoint Source**					
				Sediment Toxicity		**High**	**37.13**	**Acres**		
					Nonpoint Source					
				Tributyltin		**Low**	**37.13**	**Acres**		
				Elevated levels of tributyltin in tissue.	**Nonpoint Source**					
				Zinc		**Medium**	**37.13**	**Acres**		
				Elevated levels of zinc in tissue and sediment.	**Nonpoint Source**					
4	B	LA HARBOR INNER BREAKWATER	405.12							
				DDT		**High**	**1.5**	**Acres**		
					Nonpoint/Point Source					
				PAHs		**High**	**1.5**	**Acres**		
					Nonpoint/Point Source					
				PCBs		**High**	**1.5**	**Acres**		
					Nonpoint/Point Source					
				Tributyltin		**Low**	**1.5**	**Acres**		
					Nonpoint/Point Source					
4	B	LA HARBOR MAIN CHANNEL	405.12							
				Beach Closures		**Low**	**3785**	**Acres**		
					Nonpoint/Point Source					
				Copper		**Low**	**3785**	**Acres**		
				Elevated levels of copper in tissue and sediment.	**Nonpoint/Point Source**					
				DDT		**High**	**3785**	**Acres**		
				Elevated levels of DDT in tissue and sediment. Fish Consumption Advisory for DDT.	**Nonpoint/Point Source**					
				PAHs		**High**	**3785**	**Acres**		
				Elevated levels of PAHs in tissue and sediment.	**Nonpoint/Point Source**					
				PCBs		**High**	**3785**	**Acres**		
				Elevated levels of PCBs in tissue and sediment. Fish Consumption Advisory for PCBs.	**Nonpoint/Point Source**					
				Sediment Toxicity		**Low**	**3785**	**Acres**		
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Tributyltin		Low	3785	Acres		
				Elevated levels of tributyltin in sediment.						
					Nonpoint/Point Source					
				Zinc		Low	3785	Acres		
				Elevated levels of zinc in tissue and sediment.						
					Nonpoint/Point Source					
4	B	LA HARBOR SOUTHWEST SLIP	405.12							
				DDT		High	30	Acres		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	30	Acres		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
				Sediment Toxicity		Medium	30	Acres		
					Nonpoint Source					
4	B	LONG BEACH HARBOR MAIN CHANNEL, SE,W BASIN, PIER J, BREAKWTR	405.12							
				Benthic Comm. Effects		Medium	3594	Acres		
					Nonpoint Source					
				DDT		High	3594	Acres		
				Elevated levels of DDT in tissue. Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PAHs		High	3594	Acres		
				Elevated levels of PAHs in sediment.						
					Nonpoint Source					
				PCBs		High	3594	Acres		
				Elevated levels of PCBs in tissue. Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
				Sediment Toxicity		Medium	3594	Acres		
					Nonpoint Source					
4	B	MARINA DEL REY HARBOR-BACK BASINS	405.13							
				Benthic Comm. Effects		Low	413	Acres		
					Nonpoint Source					
				Chlordane		High	413	Acres		
				Elevated levels of chlordane in tissue and sediment.						
					Nonpoint Source					
				Copper		Medium	413	Acres		
				Elevated levels of copper in tissue and sediment.						
					Nonpoint Source					
				DDT		High	413	Acres		
				Elevated levels of DDT in tissue and sediment. Shellfish Harvesting Advisory for DDT.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Dieldrin *Elevated levels of dieldrin in tissue.*	**Nonpoint Source**	**Low**	**413**	**Acres**		
				Fish Consumption Advisory	**Nonpoint Source**	**High**	**413**	**Acres**		
				High Coliform Count	**Nonpoint Source**	**High**	**413**	**Acres**		
				Lead *Elevated levels of lead in tissue and sediment.*	**Nonpoint Source**	**Low**	**413**	**Acres**		
				PCBs *Elevated levels of PCBs in tissue. Shellfish Harvesting Advisory for PCBs.*	**Nonpoint Source**	**High**	**413**	**Acres**		
				Sediment Toxicity	**Nonpoint Source**	**Medium**	**413**	**Acres**		
				Tributyltin *Elevated levels of tributyltin in tissue.*	**Nonpoint Source**	**Low**	**413**	**Acres**		
				Zinc *Elevated levels of zinc in tissue and sediment.*	**Nonpoint Source**	**Medium**	**413**	**Acres**		
4	B	**PORT HUENEME HARBOR (BACK BASINS)**	**403.11**							
				DDT *Elevated levels of DDT in tissue.*	**Nonpoint Source**	**High**	**50**	**Acres**		
				PAHs *Elevated levels of PAHs in sediment.*	**Nonpoint Source**	**High**	**59**	**Acres**		
				PCBs *Elevated levels of PCBs in tissue.*	**Nonpoint Source**	**High**	**50**	**Acres**		
				Tributyltin *Elevated levels of tributyltin in tissue.*	**Nonpoint Source**	**Low**	**50**	**Acres**		
				Zinc *Elevated levels of zinc in tissue.*	**Nonpoint Source**	**Low**	**50**	**Acres**		
4	B	**SAN PEDRO BAY NEARS/OFF SHORE ZONES- CABRILLO PIER AREA**	**405.12**							
				Chromium *Elevated levels of chromium in sediment.*	**Nonpoint/Point Source**	**Low**	**10700**	**Acres**		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Copper		Low	10700	Acres		
				Elevated levels of copper in sediment.	Nonpoint/Point Source					
				DDT		High	10700	Acres		
				Elevated levels of DDT in tissue and sediment. Fish Consumption Advisory for DDT.	Nonpoint/Point Source					
				PAHs		High	10700	Acres		
				Elevated levels of PAHs in sediment.	Nonpoint/Point Source					
				PCBs		High	10700	Acres		
				Fish Consumption Advisory for PCBs.	Nonpoint/Point Source					
				Sediment Toxicity		Medium	10700	Acres		
					Nonpoint/Point Source					
				Zinc		Low	10700	Acres		
				Elevated levels of zinc in sediment.	Nonpoint/Point Source					
4	B	SANTA MONICA BAY OFFSHORE AND NEARSHORE	413.00							
				Cadmium		Low	16640	Acres		
				Elevated levels of cadmium in sediment.	Nonpoint/Point Source					
				Chlordane		Low	16640	Acres		
				Elevated levels of chlordane in sediment.	Nonpoint/Point Source					
				Copper		Low	16640	Acres		
				Elevated levels of copper in sediment.	Nonpoint/Point Source					
				DDT		High	16640	Acres		
				Elevated levels of DDT in tissue and sediment.	Nonpoint/Point Source					
				Debris		Low	16640	Acres		
					Nonpoint/Point Source					
				Fish Consumption Advisory		High	16640	Acres		
					Nonpoint/Point Source					
				Lead		Low	16640	Acres		
				Elevated levels of lead in tissue and sediment.	Nonpoint/Point Source					
				Mercury		Medium	16640	Acres		
				Elevated levels of mercury in sediment.	Nonpoint/Point Source					
				Nickel		Low	16640	Acres		
				Elevated levels of nickel in sediment.	Nonpoint/Point Source					

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				PAHs		High	16640	Acres		
				Elevated levels of PAHs in sediment.						
					Nonpoint/Point Source					
				PCBs		High	16640	Acres		
				Elevated levels of PCBs in tissue and sediment.						
					Nonpoint/Point Source					
				Sediment Toxicity		Medium	16640	Acres		
					Nonpoint/Point Source					
				Silver		Low	16640	Acres		
				Elevated levels of silver in tissue.						
					Nonpoint/Point Source					
				Zinc		Low	16640	Acres		
				Elevated levels of zinc in sediment.						
					Nonpoint/Point Source					
4	B	VENTURA HARBOR: VENTURA KEYES	403.11							
				High Coliform Count		High	40	Acres		
					Nonpoint Source					
4	C	ABALONE COVE BEACH	405.11							
				Beach Closures		Medium	0.94	Miles		
					Nonpoint Source					
				DDT		High	0.94	Miles		
				Elevated levels of DDT in sediment.						
					Nonpoint Source					
				PCBs		High	0.94	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	AMARILLO BEACH	404.21							
				DDT		High	0.3	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.3	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	BIG ROCK BEACH	404.16							
				Beach Closures		Medium	1.09	Miles		
					Nonpoint Source					
				DDT		High	1.09	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	1.09	Miles		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs		High	1.09	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	BLUFF COVE BEACH	405.11							
				Beach Closures		Medium	0.61	Miles		
					Nonpoint Source					
				DDT		High	0.61	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.61	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	CABRILLO BEACH (INNER) LA HARBOR AREA	405.12							
				Beach Closures (Coliform)		Low	0.79	Miles		
					Nonpoint Source					
				DDT		High	0.79	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.79	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	CABRILLO BEACH OUTER	405.12							
				Beach Closures		Medium	0.51	Miles		
					Nonpoint Source					
				DDT		High	0.51	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	0.51	Miles		
					Nonpoint Source					
				PCBs		High	0.51	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	CARBON BEACH	404.16							
				Beach Closures		Medium	1.48	Miles		
					Nonpoint Source					
				DDT		High	1.48	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.48	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	C	CASTLEROCK BEACH	405.13							
				Beach Closures		Medium	0.81	Miles		
					Nonpoint Source					
				DDT		High	0.81	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.81	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	DAN BLOCKER MEMORIAL (CORAL) BEACH	404.31							
				High Coliform Count		High	1.04	Miles		
					Nonpoint Source					
4	C	DOCKWEILER BEACH	405.12							
				Beach Closures		Medium	5.4	Miles		
					Nonpoint Source					
				High Coliform Count		High	5.4	Miles		
					Nonpoint Source					
4	C	ESCONDIDO BEACH	404.34							
				Beach Closures		Medium	2.05	Miles		
					Nonpoint Source					
				DDT		High	2.05	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	2.05	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	FLAT ROCK POINT BEACH AREA	405.11							
				Beach Closures		Medium	0.3	Miles		
					Nonpoint Source					
				DDT		High	0.3	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.3	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	HERMOSA BEACH	405.12							
				Beach Closures		Medium	1.88	Miles		
					Nonpoint Source					
4	C	INSPIRATION POINT BEACH	405.11							
				Beach Closures		Medium	0.3	Miles		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				DDT		High	0.3	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.3	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	LA COSTA BEACH	404.16							
				Beach Closures		Medium	0.74	Miles		
					Nonpoint Source					
				DDT		High	0.74	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.74	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	LAS FLORES BEACH	404.15							
				DDT		High	0.76	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	0.76	Miles		
					Nonpoint Source					
				PCBs		High	0.76	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	LAS TUNAS BEACH	404.12							
				Beach Closures		Medium	1.25	Miles		
					Nonpoint Source					
				DDT		High	1.25	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.25	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	LEO CARILLO BEACH (SOUTH OF COUNTY LINE)	404.44							
				Beach Closures		Medium	1.15	Miles		
					Nonpoint Source					
				High Coliform Count		High	1.15	Miles		
					Nonpoint Source					
4	C	LONG POINT BEACH	405.11							
				DDT		High	0.45	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				High Coliform Count		High	0.45	Miles		
					Nonpoint Source					
				PCBs		High	0.45	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	LUNADA BAY BEACH	405.11							
				Beach Closures		Medium	0.35	Miles		
					Nonpoint Source					
4	C	MALAGA COVE BEACH	405.11							
				Beach Closures		Medium	1.13	Miles		
					Nonpoint Source					
				DDT		High	1.13	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.13	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	MALIBU BEACH	404.21							
				Beach Closures		Medium	0.53	Miles		
					Nonpoint Source					
				DDT		High	0.53	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
4	C	MALIBU LAGOON BEACH (SURFRIDER)	404.21							
				Beach Closures		Medium	0.66	Miles		
					Nonpoint Source					
				DDT		High	0.66	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	0.66	Miles		
					Nonpoint Source					
				PCBs		High	0.66	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	MANDALAY BEACH	403.11							
				Beach Closures		Low	1.55	Miles		
					Nonpoint Source					
4	C	MANHATTAN BEACH	405.12							
				Beach Closures		Medium	2.08	Miles		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	C	MARINA DEL REY HARBOR BEACH	405.13							
				Beach Closures		Medium	0.65	Miles		
					Nonpoint Source					
				High Coliform Count		High	0.65	Miles		
					Nonpoint Source					
4	C	MCGRATH BEACH	403.11							
				Beach Closures		Low	1.35	Miles		
					Nonpoint Source					
				High Coliform Count		Medium	1.35	Miles		
					Nonpoint Source					
4	C	NICHOLAS CANYON BEACH	404.43							
				Beach Closures		Medium	1.94	Miles		
					Nonpoint Source					
				DDT		High	1.94	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.94	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	PALO VERDE SHORELINE PARK BEACH	413.057							
				Pathogens		Low	0.12	Miles		
					Source Unknown					
				Pesticides		Low	0.12	Miles		
					Source Unknown					
4	C	PARADISE COVE BEACH	404.35							
				Beach Closures		Medium	1.33	Miles		
					Nonpoint Source					
				DDT		High	1.33	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	1.33	Miles		
					Nonpoint Source					
				PCBs		High	1.33	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	POINT DUME BEACH	404.36							
				Beach Closures		Medium	0.95	Miles		
					Nonpoint Source					
				DDT		High	0.95	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs		High	0.95	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	POINT FERMIN PARK BEACH	405.11							
				Beach Closures		Medium	1.5	Miles		
					Nonpoint Source					
				DDT		High	1.5	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.5	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	POINT VICENTE BEACH	405.11							
				Beach Closures		Medium	2.13	Miles		
					Nonpoint Source					
4	C	PORTUGESE BEND BEACH	405.11							
				Beach Closures		Medium	2.2	Miles		
					Nonpoint Source					
				DDT		High	2.2	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	2.2	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	PUERCO BEACH	404.31							
				Beach Closures		Medium	1.68	Miles		
					Nonpoint Source					
				DDT		High	1.68	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.68	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	REDONDO BEACH	405.12							
				Beach Closures		Medium	1.37	Miles		
					Nonpoint Source					
				DDT		High	1.37	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	1.37	Miles		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs		High	1.37	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	RESORT POINT BEACH	405.11							
				Beach Closures		Medium	0.49	Miles		
					Nonpoint Source					
4	C	ROBERT H MEYER MEMORIAL BEACH	404.42							
				Beach Closures		Medium	1.23	Miles		
					Nonpoint Source					
				DDT		High	1.23	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.23	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	ROCKY POINT BEACH	405.11							
				Beach Closures		Medium	0.52	Miles		
					Nonpoint Source					
4	C	ROYAL PALMS BEACH	405.11							
				Beach Closures		Medium	1.06	Miles		
					Nonpoint Source					
				DDT		High	1.06	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.06	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	SANTA CLARA RIVER ESTUARY BEACH/SURFERS KNOLL	403.11							
				High Coliform Count		Low	0.56	Miles		
					Nonpoint Source					
4	C	SANTA MONICA BEACH	405.13							
				Beach Closures		Medium	2.95	Miles		
					Nonpoint Source					
				High Coliform Count		High	2.95	Miles		
					Nonpoint Source					
4	C	SEA LEVEL BEACH	404.41							
				Beach Closures		Medium	0.67	Miles		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				DDT		High	0.67	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.67	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	TOPANGA BEACH	404.11							
				Beach Closures		Medium	1.01	Miles		
					Nonpoint Source					
				DDT		High	1.01	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	1.01	Miles		
					Nonpoint Source					
				PCBs		High	1.01	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	TORRANCE BEACH	405.12							
				Beach Closures		Medium	0.58	Miles		
					Nonpoint Source					
				High Coliform Count		High	0.58	Miles		
					Nonpoint Source					
4	C	TRANCAS BEACH (BROAD BEACH)	404.37							
				Beach Closures		Medium	2.02	Miles		
					Nonpoint Source					
				DDT		High	2.02	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				High Coliform Count		High	2.02	Miles		
					Nonpoint Source					
				PCBs		High	2.02	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	VENICE BEACH	405.13							
				Beach Closures		Medium	1.5	Miles		
					Nonpoint Source					
				High Coliform Count		High	1.5	Miles		
					Nonpoint Source					
4	C	WHITES POINT BEACH	405.11							
				Beach Closures		Medium	0.7	Miles		
					Nonpoint Source					

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				DDT		High	0.7	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	0.7	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	C	WILL ROGERS BEACH	405.13							
				Beach Closures		Medium	2.2	Miles		
					Nonpoint Source					
				High Coliform Count		High	2.2	Miles		
					Nonpoint Source					
4	C	ZUMA (WESTWARD BEACH)	404.36							
				Beach Closures		Medium	1.65	Miles		
					Nonpoint Source					
				DDT		High	1.65	Miles		
				Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				PCBs		High	1.65	Miles		
				Fish Consumption Advisory for PCBs.						
					Nonpoint Source					
4	E	MALIBU LAGOON	404.21							
				Benthic Comm. Effects		Medium	32.5	Acres		
					Nonpoint/Point Source					
				Enteric Viruses		High	32.5	Acres		
					Nonpoint/Point Source					
				Eutrophic		Medium	32.5	Acres	0193	1202
					Nonpoint/Point Source					
				High Coliform Count		High	32.5	Acres		
					Nonpoint/Point Source					
				Shellfish Harvesting Adv.		Medium	32.5	Acres		
					Nonpoint/Point Source					
				Swimming Restrictions		High	32.5	Acres		
					Nonpoint/Point Source					
4	E	MUGU LAGOON	403.11							
				Chlordane		High	2000	Acres	1298	
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				Copper		Medium	2000	Acres		
					Nonpoint/Point Source					
				Dacthal		High	2000	Acres	1298	
				Elevated levels of dacthal in tissue.						
					Nonpoint Source					

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				DDT		High	2000	Acres	1298	
				Elevated levels of DDT in tissue and sediment. Effects on bird reproductivity from DDT.						
					Nonpoint Source					
				Endosulfan		High	2000	Acres	1298	
				Elevated levels of endosulfan in tissue.						
					Nonpoint Source					
				Mercury		High	2000	Acres		
					Nonpoint/Point Source					
				Nickel		Medium	2000	Acres		
					Nonpoint/Point Source					
				Nitrogen		Low	2000	Acres	1298	
					Nonpoint/Point Source					
				PCBs		High	2000	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint/Point Source					
				Sediment Toxicity		High	2000	Acres		
					Nonpoint/Point Source					
				Sedimentation/Siltation		High	2000	Acres		
					Nonpoint/Point Source					
				Zinc		Medium	2000	Acres		
					Nonpoint/Point Source					
4	L	CRYSTAL LAKE	405.43							
				Org. enrichment/Low D.O.		Low	5.8	Acres		
					Nonpoint Source					
4	L	ECHO PARK LAKE	405.15							
				Algae		Low	23	Acres		
					Nonpoint Source					
				Ammonia		Low	23	Acres	0194	1299
					Nonpoint Source					
				Copper		Low	23	Acres		
					Nonpoint Source					
				Eutrophic		Low	23	Acres		
					Nonpoint Source					
				Lead		Low	23	Acres		
					Nonpoint Source					
				Odors		Low	23	Acres		
					Nonpoint Source					
				PCBs		Medium	23	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
				pH		Medium	23	Acres		
					Nonpoint Source					
				Trash		High	23	Acres		
					Nonpoint Source					

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4	L	EL DORADO LAKES	405.15							
				Algae		Low	220	Acres		
					Nonpoint Source					
				Ammonia		Low	220	Acres	0194	1299
					Nonpoint Source					
				Copper		Low	220	Acres		
					Nonpoint Source					
				Eutrophic		Low	220	Acres		
					Nonpoint Source					
				Lead		Low	220	Acres		
					Nonpoint Source					
				Mercury		Medium	220	Acres		
				Elevated levels of mercury in tissue.						
					Nonpoint Source					
				pH		Medium	220	Acres		
					Nonpoint Source					
4	L	ELIZABETH LAKE	403.51							
				Eutrophic		Low	194	Acres		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	194	Acres		
					Nonpoint Source					
				pH		Medium	194	Acres		
					Nonpoint Source					
				Trash		Low	194	Acres		
					Nonpoint Source					
4	L	LAKE CALABASAS	405.21							
				Ammonia		Low	28	Acres		
					Nonpoint Source					
				Copper		Medium	28	Acres		
				Elevated levels of copper in tissue.						
					Nonpoint Source					
				DDT		High	28	Acres		
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Eutrophic		Medium	28	Acres		
					Nonpoint Source					
				Odors		Low	28	Acres		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	28	Acres		
					Nonpoint Source					
				pH		Medium	28	Acres		
					Nonpoint Source					

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				Zinc		Low	28	Acres		
				Elevated levels of zinc in tissue.						
					Nonpoint Source					
4	L	LAKE HUGHES	403.51							
				Algae		Low	34	Acres		
					Nonpoint Source					
				Eutrophic		Medium	34	Acres		
					Nonpoint Source					
				Fish Kills		Medium	34	Acres		
					Nonpoint Source					
				Odors		Low	34	Acres		
					Nonpoint Source					
				Trash		Low	34	Acres		
					Nonpoint Source					
4	L	LAKE LINDERO	404.23							
				Algae		Medium	13.56	Acres		
					Nonpoint Source					
				Chloride		Low	13.56	Acres		
					Nonpoint Source					
				Eutrophic		Medium	13.56	Acres	0193	1202
					Nonpoint Source					
				Odors		Low	13.56	Acres		
					Nonpoint Source					
				Selenium		Low	13.56	Acres		
				Elevated levels of selenium in tissue.						
					Nonpoint Source					
				Specific conductivity		Low	13.56	Acres		
					Nonpoint Source					
				Trash		Low	13.56	Acres		
					Nonpoint Source					
4	L	LAKE SHERWOOD	404.26							
				Algae		Medium	213	Acres		
					Nonpoint Source					
				Ammonia		Low	213	Acres		
					Nonpoint Source					
				Eutrophic		Medium	213	Acres	0193	1202
					Nonpoint Source					
				Mercury		Medium	213	Acres		
				Elevated levels of mercury in tissue.						
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	213	Acres		
					Nonpoint Source					

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4	L	LEGG LAKE	405.41							
				Ammonia		Low	70	Acres		
					Nonpoint Source					
				Copper		Low	70	Acres		
					Nonpoint Source					
				Lead		Low	70	Acres		
					Nonpoint Source					
				Odors		Low	70	Acres		
					Nonpoint Source					
				pH		Medium	70	Acres		
					Nonpoint Source					
				Trash		High	70	Acres		
					Nonpoint Source					
4	L	LINCOLN PARK LAKE	405.15							
				Ammonia		Low	7	Acres	0194	1299
					Nonpoint Source					
				Eutrophic		Medium	7	Acres		
					Nonpoint Source					
				Lead		Low	7	Acres		
					Nonpoint Source					
				Odors		Low	7	Acres		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	7	Acres		
					Nonpoint Source					
				Trash		High	7	Acres		
					Nonpoint Source					
4	L	MACHADO LAKE (HARBOR PARK LAKE)	405.12							
				Algae		Low	45.2	Acres		
					Nonpoint Source					
				Ammonia		Low	45.2	Acres		
					Nonpoint Source					
				ChemA		High	45.2	Acres		
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chlordane		High	45.2	Acres		
				Elevated levels of chlordane in tissue. Fish Consumption Advisory for chlordane.						
					Nonpoint Source					
				DDT		High	45.2	Acres		
				Elevated levels of DDT in tissue. Fish Consumption Advisory for DDT.						
					Nonpoint Source					
				Dieldrin		High	45.2	Acres		
				Elevated levels of dieldrin in tissue.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Eutrophic		Low	45.2	Acres		
					Nonpoint Source					
				Odors		Low	45.2	Acres		
					Nonpoint Source					
				PCBs		High	45.2	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
				Trash		Low	45.2	Acres		
					Nonpoint Source					
4	L	MALIBOU LAKE	404.24							
				Algae		Medium	69	Acres		
					Nonpoint Source					
				Chlordane		Low	69	Acres		
				Elevated levels of chlordane in tissue.						
					Nonpoint/Point Source					
				Copper		Medium	69	Acres		
				Elevated levels of copper in tissue.						
					Nonpoint Source					
				Eutrophic		Medium	69	Acres	0193	1202
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	69	Acres		
					Nonpoint Source					
				PCBs		Low	69	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
4	L	MATILIJA RESERVOIR	402.20							
				Fish barriers		Low	198	Acres		
					Dam Construction/Operation					
4	L	MCGRATH LAKE (ESTUARY)	403.11							
				Chlordane		High	1.35	Acres		
				Elevated levels of chlordane in sediment.						
					Nonpoint Source					
				DDT		High	1.35	Acres		
				Elevated levels of DDT in sediment.						
					Nonpoint Source					
				Pesticides		High	1.35	Acres		
				Elevated levels of pesticides (total) in sediment.						
					Nonpoint Source					
				Sediment Toxicity		Medium	1.35	Acres		
					Nonpoint Source					
4	L	MUNZ LAKE	403.51							
				Eutrophic		Low	15	Acres		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Trash		Low	15	Acres		
					Nonpoint Source					
4	L	PECK ROAD PARK LAKE	405.41							
				Chlordane		Medium	166	Acres		
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				DDT		Medium	166	Acres		
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Lead		Low	166	Acres		
					Nonpoint Source					
				Odors		Low	166	Acres		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	166	Acres		
					Nonpoint Source					
				Trash		High	166	Acres		
					Nonpoint Source					
4	L	PUDDINGSTONE RESERVOIR	405.52							
				Chlordane		Medium	382	Acres		
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				DDT		Medium	382	Acres		
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Mercury		Medium	382	Acres		
				Elevated levels of mercury in tissue.						
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	382	Acres		
					Nonpoint Source					
				PCBs		Medium	382	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
4	L	SANTA FE DAM PARK LAKE	405.41							
				Copper		Low	70	Acres		
					Nonpoint Source					
				Lead		Low	70	Acres		
					Nonpoint Source					
				pH		Low	70	Acres		
					Nonpoint Source					
4	L	WESTLAKE LAKE	404.25							
				Algae		Medium	186	Acres		
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Ammonia		Low	186	Acres		
					Nonpoint Source					
				Chlordane		Low	186	Acres		
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				Copper		Medium	186	Acres		
				Elevated levels of copper in tissue.						
					Nonpoint Source					
				Eutrophic		Medium	186	Acres	0193	1202
					Nonpoint Source					
				Lead		Low	186	Acres		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	186	Acres		
					Nonpoint Source					
4	R	ALISO CANYON WASH	405.21							
				Selenium		Low	10.13	Miles		
					Nonpoint Source					
4	R	ARROYO LAS POSAS REACH 1 (LEWIS SOMIS RD TO FOX BARRANCA)	403.12							
				Ammonia		High	1.99	Miles	1298	
					Nonpoint/Point Source					
				Chloride		Medium	1.99	Miles	0197	1200
					Nonpoint/Point Source					
				DDT		High	1.99	Miles	1298	
				Elevated levels of DDT in sediment.						
					Nonpoint Source					
				Nitrate and Nitrite		Medium	1.99	Miles	1298	
					Nonpoint/Point Source					
				Sulfates		Medium	1.99	Miles		
					Nonpoint/Point Source					
				Total Dissolved Solids		Medium	1.99	Miles	1298	
					Nonpoint/Point Source					
4	R	ARROYO LAS POSAS REACH 2 (FOX BARRANCA TO MOORPARK FWY (23))	403.62							
				Ammonia		High	9.62	Miles	1298	
					Nonpoint/Point Source					
				Chloride		Medium	9.62	Miles	0197	1200
					Nonpoint/Point Source					
				DDT		High	9.62	Miles	1298	
				Elevated levels of DDT in sediment.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Nitrate and Nitrite	Nonpoint/Point Source	Medium	9.62	Miles	1298	
				Sulfates	Nonpoint/Point Source	Medium	9.62	Miles		
				Total Dissolved Solids	Nonpoint/Point Source	Medium	9.62	Miles		
4	R	ARROYO SECO REACH 1 (LA RIVER TO WEST HOLLY AVE)	405.15							
				Algae	Nonpoint Source	Low	7.02	Miles		
				High Coliform Count	Nonpoint Source	Medium	7.02	Miles		
				Trash	Nonpoint Source	High	7.02	Miles		
4	R	ARROYO SECO REACH 2 (WEST HOLLY AVE. TO DEVILS GATE DAM)	405.31							
				Algae	Nonpoint Source	Low	2.53	Miles		
				High Coliform Count	Nonpoint Source	Medium	2.53	Miles		
				Trash	Nonpoint Source	High	2.53	Miles		
4	R	ARROYO SIMI REACH 1 (MOORPARK FRWY (23) TO BREA CYN)	403.62							
				Ammonia	Nonpoint/Point Source	High	7.58	Miles	1298	
				Boron	Nonpoint Source	Medium	7.58	Miles		
				Chloride	Nonpoint Source	Medium	7.58	Miles	0197	1200
				Chromium *Elevated levels of chromium in tissue.*	Nonpoint/Point Source	Low	7.58	Miles		
				Nickel *Elevated levels of nickel in tissue.*	Nonpoint/Point Source	Low	7.58	Miles		
				Selenium *Elevated levels of selenium in tissue.*	Nonpoint/Point Source	Low	7.58	Miles		
				Silver *Elevated levels of silver in tissue.*	Nonpoint/Point Source	Low	7.58	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sulfates		Medium	7.58	Miles		
					Nonpoint Source					
				Total Dissolved Solids		Medium	7.58	Miles		
					Nonpoint Source					
				Zinc		Low	7.58	Miles		
				Elevated levels of zinc in tissue.						
					Nonpoint/Point Source					
4	R	ARROYO SIMI REACH 2 (ABOVE BREA CANYON)	403.67							
				Boron		Medium	11.12	Miles		
					Nonpoint Source					
				Sulfates		Medium	11.12	Miles		
					Nonpoint Source					
				Total Dissolved Solids		Medium	11.12	Miles		
					Nonpoint Source					
4	R	ASHLAND AVENUE DRAIN	405.13							
				High Coliform Count		High	0.57	Miles		
					Nonpoint Source					
				Org. enrichment/Low D.O.		Low	0.57	Miles		
					Nonpoint Source					
				Toxicity		Low	0.57	Miles		
					Nonpoint Source					
4	R	BALLONA CREEK	405.13							
				Arsenic		Medium	4.3	Miles		
				Elevated levels of arsenic in tissue.						
					Nonpoint/Point Source					
				Cadmium		Medium	4.3	Miles		
				Elevated levels of cadmium in sediment.						
					Nonpoint/Point Source					
				ChemA		High	4.3	Miles		
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint/Point Source					
				Chlordane		High	4.3	Miles		
				Elevated levels of chlordane in tissue.						
					Nonpoint/Point Source					
				Copper		Medium	4.3	Miles		
				Elevated levels of copper in tissue and sediment.						
					Nonpoint/Point Source					
				DDT		High	4.3	Miles		
				Elevated levels of DDT in tissue.						
					Nonpoint/Point Source					
				Dieldrin		High	4.3	Miles		
				Elevated levels of dieldrin in tissue.						
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Enteric Viruses	Nonpoint/Point Source	High	4.3	Miles		
				High Coliform Count	Nonpoint/Point Source	High	4.3	Miles		
				Lead *Elevated levels of lead in tissue and sediment.*	Nonpoint/Point Source	Low	4.3	Miles		
				PCBs *Elevated levels of PCBs in tissue.*	Nonpoint/Point Source	High	4.3	Miles		
				Sediment Toxicity	Nonpoint/Point Source	Medium	4.3	Miles		
				Silver *Elevated levels of silver in tissue and sediment.*	Nonpoint/Point Source	Low	4.3	Miles		
				Toxicity	Nonpoint/Point Source	Medium	4.3	Miles		
				Trash	Nonpoint/Point Source	High	4.3	Miles		
				Tributyltin *Elevated levels of tributyltin in sediment.*	Nonpoint/Point Source	Low	4.3	Miles		
4	R	BALLONA CREEK ESTUARY	405.13							
				Arochlor *Elevated levels of arochlor in sediment.*	Nonpoint/Point Source	High	2.5	Miles		
				Chlordane *Elevated levels of chlordane in tissue and sediment.*	Nonpoint/Point Source	High	2.5	Miles		
				DDT *Elevated levels of DDT in sediment.*	Nonpoint/Point Source	High	2.5	Miles		
				High Coliform Count	Nonpoint/Point Source	High	2.5	Miles		
				Lead *Elevated levels of lead in sediment.*	Nonpoint/Point Source	Low	2.5	Miles		
				PAHs *Elevated levels of PAHs in sediment.*	Nonpoint/Point Source	High	2.5	Miles		
				PCBs *Elevated levels of PCBs in tissue and sediment.*	Nonpoint/Point Source	High	2.5	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sediment Toxicity	Nonpoint/Point Source	Medium	2.5	Miles		
				Shellfish Harvesting Adv.	Nonpoint/Point Source	Medium	2.5	Miles		
				Zinc *Elevated levels of zinc in sediment.*	Nonpoint/Point Source	Low	2.5	Miles		
4	R	BEARDSLEY CHANNEL (ABOVE CENTRAL AVENUE)	403.61							
				Algae	Nonpoint Source	Low	6.16	Miles	1298	
				ChemA *Elevated levels of chemA pesticides in tissue.*	Nonpoint Source	High	6.16	Miles	1298	
				Chlordane *Elevated levels of chlordane in tissue and sediment.*	Nonpoint Source	High	6.16	Miles	1298	
				Chlorpyrifos *Elevated levels of chlorpyrifos in tissue.*	Nonpoint Source	High	6.16	Miles	1298	
				Dacthal *Elevated levels of dacthal in sediment.*	Nonpoint Source	High	6.16	Miles	1298	
				DDT *Elevated levels of DDT in tissue and sediment.*	Nonpoint Source	High	6.16	Miles	1298	
				Dieldrin *Elevated levels of dieldrin in tissue.*	Nonpoint Source	High	6.16	Miles	1298	
				Endosulfan *Elevated levels of endosulfan in tissue and sediment.*	Nonpoint Source	High	6.16	Miles	1298	
				Nitrogen	Nonpoint Source	Medium	6.16	Miles	1298	
				PCBs *Elevated levels of PCBs in tissue.*	Nonpoint Source	High	6.16	Miles		
				Toxaphene *Elevated levels of toxaphene in tissue and sediment.*	Nonpoint Source	High	6.16	Miles	1298	
				Toxicity	Nonpoint Source	High	6.16	Miles		
				Trash	Nonpoint Source	Low	6.16	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	R	BELL CREEK	405.21							
				High Coliform Count	Nonpoint/Point Source	Low	9.81	Miles		
4	R	BROWN BARRANCA / LONG CANYON	403.11							
				Nitrate and Nitrite	Nonpoint Source	Medium	3.79	Miles		
4	R	BURBANK WESTERN CHANNEL	405.21							
				Algae	Nonpoint/Point Source	Low	6.35	Miles		
				Ammonia	Nonpoint/Point Source	High	6.35	Miles	0194	1299
				Cadmium	Nonpoint/Point Source	Low	6.35	Miles		
				Odors	Nonpoint/Point Source	Low	6.35	Miles		
				Scum/Foam-unnatural	Nonpoint/Point Source	Low	6.35	Miles		
				Trash	Nonpoint/Point Source	High	6.35	Miles		
4	R	CALLEGUAS CREEK REACH 1 (ESTUARY TO 0.5MI S OF BROOME RD)	403.11							
				Ammonia	Nonpoint/Point Source	High	2.2	Miles	1298	
				ChemA *Elevated levels of chemA in tissue.*	Nonpoint Source	High	2.2	Miles	1298	
				Chlordane *Elevated levels of chlordane in tissue.*	Nonpoint Source	High	2.2	Miles	1298	
				DDT *Elevated levels of DDT in tissue and sediment.*	Nonpoint Source	High	2.2	Miles	1298	
				Endosulfan *Elevated levels of endosulfan in tissue.*	Nonpoint Source	High	2.2	Miles	1298	
				Nitrogen	Nonpoint/Point Source	Medium	2.2	Miles	1298	
				PCBs *Elevated levels of PCBs in tissue.*	Nonpoint/Point Source	High	2.2	Miles		
				Sediment Toxicity	Nonpoint/Point Source	Medium	2.2	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Toxaphene *Elevated levels of toxaphene in tissue and sediment.*	Nonpoint Source	High	2.2	Miles	1298	
				Toxicity	Nonpoint/Point Source	High	2.2	Miles		
4	R	CALLEGUAS CREEK REACH 2 (0.5 MI S OF BROOME RD TO POTRERO RD	403.12							
				Ammonia	Nonpoint/Point Source	High	2.3	Miles	1298	
				ChemA *Elevated levels of chemA pesticides in tissue.*	Nonpoint Source	High	2.3	Miles	1298	
				Chlordane *Elevated level of chlordane in tissue.*	Nonpoint Source	High	2.3	Miles	1298	
				Dacthal *Elevated level of dacthal in tissue.*	Nonpoint Source	High	2.3	Miles	1298	
				DDT *Elevated level of DDT in tissue and sediment.*	Nonpoint Source	High	2.3	Miles	1298	
				Endosulfan *Elevated level of endosulfan in tissue.*	Nonpoint Source	High	2.3	Miles	1298	
				Nitrogen	Nonpoint/Point Source	Medium	2.3	Miles	1298	
				PCBs *Elevated level of PCBs in tissue.*	Nonpoint/Point Source	High	2.3	Miles		
				Sediment Toxicity	Nonpoint/Point Source	Medium	2.3	Miles		
				Toxaphene *Elevated level of toxaphene in tissue and sediment.*	Nonpoint Source	High	2.3	Miles	1298	
				Toxicity	Nonpoint/Point Source	High	2.3	Miles		
4	R	CALLEGUAS CREEK REACH 3 (POTRERO TO SOMIS RD)	403.12							
				Chloride	Nonpoint/Point Source	Medium	7.7	Miles	0197	1200
				Nitrate and Nitrite	Nonpoint/Point Source	Medium	7.7	Miles	1298	

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Total Dissolved Solids		Medium	7.7	Miles		
					Nonpoint/Point Source					
4	R	COMPTON CREEK	405.15							
				Copper		Low	8.52	Miles		
					Nonpoint/Point Source					
				High Coliform Count		Medium	8.52	Miles		
					Nonpoint/Point Source					
				Lead		Low	8.52	Miles		
					Nonpoint/Point Source					
				pH		Medium	8.52	Miles		
					Nonpoint/Point Source					
4	R	CONEJO CREEK / ARROYO CONEJO NORTH FORK	403.64							
				Ammonia		High	6.51	Miles	1298	
					Nonpoint/Point Source					
				Chlordane		Medium	6.51	Miles	1298	
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				DDT		Medium	6.51	Miles	1298	
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Sulfates		Medium	6.51	Miles		
					Nonpoint/Point Source					
				Total Dissolved Solids		Medium	6.51	Miles		
					Nonpoint/Point Source					
4	R	CONEJO CREEK REACH 1 (CONFL CALL TO SANTA ROSA RD)	403.12							
				Algae		Low	5.8	Miles	1298	
					Nonpoint/Point Source					
				Ammonia		High	5.8	Miles	1298	
					Nonpoint/Point Source					
				Cadmium		Medium	5.8	Miles		
				Elevated levels of cadmium in tissue.						
					Nonpoint/Point Source					
				ChemA		High	5.8	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chromium		Medium	5.8	Miles		
				Elevated levels of chromium in tissue.						
					Nonpoint/Point Source					
				Dacthal		High	5.8	Miles	1298	
				Elevated levels of dacthal in tissue.						
					Nonpoint Source					

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				DDT		High	5.8	Miles	1298	
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Endosulfan		High	5.8	Miles	1298	
				Elevated levels of endosulfan in tissue.						
					Nonpoint Source					
				Nickel		Medium	5.8	Miles		
				Elevated levels of nickel in tissue.						
					Nonpoint/Point Source					
				Org. enrichment/Low D.O.		Medium	5.8	Miles		
					Nonpoint/Point Source					
				Silver		Medium	5.8	Miles		
				Elevated levels of silver in tissue.						
					Nonpoint/Point Source					
				Sulfates		Medium	5.8	Miles		
					Nonpoint/Point Source					
				Total Dissolved Solids		Medium	5.8	Miles		
					Nonpoint/Point Source					
				Toxaphene		High	5.8	Miles	1298	
				Elevated levels of toxaphene in tissue and sediment.						
					Nonpoint Source					
				Toxicity		High	5.8	Miles		
					Nonpoint/Point Source					
4	R	CONEJO CREEK REACH 2 (SANTA ROSA RD TO THO. OAKS CITY LIMIT)	403.63							
				Algae		Low	2.67	Miles	1298	
					Nonpoint/Point Source					
				Ammonia		High	2.67	Miles	1298	
					Nonpoint/Point Source					
				Cadmium		Medium	2.67	Miles		
				Elevated levels of cadmium in tissue.						
					Nonpoint/Point Source					
				ChemA		High	2.67	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chloride		Medium	2.67	Miles	0197	1200
					Nonpoint/Point Source					
				Chromium		Medium	2.67	Miles		
				Elevated levels of chromium in tissue.						
					Nonpoint/Point Source					
				Dacthal		High	2.67	Miles	1298	
				Elevated levels of dacthal in tissue.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				DDT		High	2.67	Miles	1298	
				Elevated levels of DDT in tissue.	Nonpoint Source					
				Endosulfan		High	2.67	Miles	1298	
				Elevated levels of endosulfan in tissue.	Nonpoint Source					
				Nickel		Medium	2.67	Miles		
				Elevated levels of nickel in tissue.	Nonpoint/Point Source					
				Org. enrichment/Low D.O.	Nonpoint/Point Source	Medium	2.67	Miles		
				Silver		Medium	2.67	Miles		
				Elevated levels of silver in tissue.	Nonpoint/Point Source					
				Sulfates	Nonpoint/Point Source	Medium	2.67	Miles		
				Total Dissolved Solids	Nonpoint/Point Source	Medium	2.67	Miles		
				Toxaphene		High	2.67	Miles	1298	
				Elevated levels of toxaphene in tissue and sediment.	Nonpoint Source					
				Toxicity	Nonpoint/Point Source	High	2.67	Miles		
4	R	CONEJO CREEK REACH 3 (THOUSAND OAKS CITY LIMIT TO LYNN RD.)	403.64							
				Algae	Nonpoint/Point Source	Low	5.6	Miles	1298	
				Ammonia	Nonpoint/Point Source	High	5.6	Miles	1298	
				Cadmium		Medium	5.6	Miles		
				Elevated levels of cadmium in tissue.	Nonpoint/Point Source					
				ChemA		High	5.6	Miles	1298	
				Elevated levels of chemA pesticides in tissue.	Nonpoint Source					
				Chromium		Medium	5.6	Miles		
				Elevated levels of chromium in tissue.	Nonpoint/Point Source					
				Dacthal		High	5.6	Miles	1298	
				Elevated levels of dacthal in tissue.	Nonpoint Source					
				DDT		High	5.6	Miles	1298	
				Elevated levels of DDT in tissue.	Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Endosulfan		High	5.6	Miles	1298	
				Elevated levels of endosulfan in tissue.						
					Nonpoint Source					
				Nickel		Medium	5.6	Miles		
				Elevated levels of nickel in tissue.						
					Nonpoint/Point Source					
				Org. enrichment/Low D.O.		Medium	5.6	Miles		
					Nonpoint/Point Source					
				Silver		Medium	5.6	Miles		
				Elevated levels of silver in tissue.						
					Nonpoint/Point Source					
				Sulfates		Medium	5.6	Miles		
					Nonpoint/Point Source					
				Total Dissolved Solids		Medium	5.6	Miles		
					Nonpoint/Point Source					
				Toxaphene		High	5.6	Miles	1298	
				Elevated levels of toxaphene in tissue and sediment.						
					Nonpoint Source					
				Toxicity		High	5.6	Miles		
					Nonpoint/Point Source					
4	R	**CONEJO CREEK REACH 4 (ABOVE LYNN RD.)**	403.68							
				Algae		Low	4.98	Miles		
					Nonpoint/Point Source					
				Ammonia		High	4.98	Miles	1298	
					Nonpoint/Point Source					
				ChemA		High	4.98	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chloride		Medium	4.98	Miles	0197	1200
					Nonpoint/Point Source					
				Dacthal		High	4.98	Miles	1298	
				Elevated levels of dacthal in tissue.						
					Nonpoint Source					
				DDT		High	4.98	Miles	1298	
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Endosulfan		High	4.98	Miles	1298	
				Elevated levels of endosulfan in tissue.						
					Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	4.98	Miles		
					Nonpoint/Point Source					
				Sulfates		Medium	4.98	Miles		
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Total Dissolved Solids	Nonpoint/Point Source	Medium	4.98	Miles		
				Toxaphene *Elevated levels of toxaphene in tissue and sediment.*	Nonpoint Source	High	4.98	Miles	1298	
				Toxicity	Nonpoint/Point Source	High	4.98	Miles		
4	R	COYOTE CREEK	405.15							
				Abnormal Fish Histology	Nonpoint/Point Source	Medium	13.45	Miles		
				Algae	Nonpoint/Point Source	Medium	13.45	Miles		
				Ammonia	Nonpoint/Point Source	High	13.45	Miles		
				High Coliform Count	Nonpoint/Point Source	Medium	13.45	Miles		
				Silver *Elevated levels of silver in tissue.*	Nonpoint/Point Source	Medium	13.45	Miles		
4	R	DOMINGUEZ CHANNEL (ABOVE VERMONT)	405.12							
				Aldrin *Elevated levels of aldrin in tissue.*	Nonpoint/Point Source	Medium	9	Miles		
				Ammonia	Nonpoint/Point Source	Low	9	Miles		
				ChemA. *Elevated levels of chemA pesticides in tissue.*	Nonpoint/Point Source	High	9	Miles		
				Chlordane *Elevated levels of chlordane in tissue.*	Nonpoint/Point Source	High	9	Miles		
				Chromium *Elevated levels of chromium in sediment.*	Nonpoint/Point Source	Medium	9	Miles		
				Copper	Nonpoint/Point Source	Low	9	Miles		
				DDT *Elevated levels of DDT in tissue and sediment.*	Nonpoint/Point Source	High	9	Miles		
				Dieldrin *Elevated levels of dieldrin in tissue.*	Nonpoint/Point Source	Medium	9	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				High Coliform Count	**Nonpoint/Point Source**	**Low**	**9**	**Miles**		
				Lead *Elevated levels of lead in tissue.*	**Nonpoint/Point Source**	**Low**	**9**	**Miles**		
				PAHs *Elevated levels of PAHs in sediment.*	**Nonpoint/Point Source**	**High**	**9**	**Miles**		
				PCBs *Elevated levels of PCBs in tissue.*	**Nonpoint/Point Source**	**High**	**9**	**Miles**		
				Zinc *Elevated levels of zinc in sediment.*	**Nonpoint/Point Source**	**High**	**9**	**Miles**		
4	**R**	**DOMINGUEZ CHANNEL ESTUARY (TO VERMONT)**	**405.12**							
				Aldrin *Elevated levels of aldrin in tissue.*	**Nonpoint/Point Source**	**Medium**	**8.4**	**Miles**		
				Ammonia	**Nonpoint/Point Source**	**Low**	**8.4**	**Miles**		
				Benthic Comm. Effects	**Nonpoint/Point Source**	**High**	**8.4**	**Miles**		
				ChemA *Elevated levels of chemA pesticides in tissue.*	**Nonpoint/Point Source**	**High**	**8.4**	**Miles**		
				Chlordane *Elevated levels of chlordane in tissue.*	**Nonpoint/Point Source**	**High**	**8.4**	**Miles**		
				Chromium *Elevated levels of chromium in sediment.*	**Nonpoint/Point Source**	**Medium**	**8.4**	**Miles**		
				Copper	**Nonpoint/Point Source**	**Low**	**8.4**	**Miles**		
				DDT *Elevated levels of DDT in tissue and sediment.*	**Nonpoint/Point Source**	**High**	**8.4**	**Miles**		
				Dieldrin *Elevated levels of dieldrin in tissue.*	**Nonpoint/Point Source**	**Medium**	**8.4**	**Miles**		
				High Coliform Count	**Nonpoint/Point Source**	**Low**	**8.4**	**Miles**		
				Lead *Elevated levels of lead in tissue.*	**Nonpoint/Point Source**	**Low**	**8.4**	**Miles**		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PAHs		High	8.4	Miles		
				Elevated levels of PAHs in sediment.						
					Nonpoint/Point Source					
				PCBs		High	8.4	Miles		
				Elevated levels of PCBs in tissue.						
					Nonpoint/Point Source					
				Zinc		High	8.4	Miles		
				Elevated levels of zinc in sediment.						
					Nonpoint/Point Source					
4	R	DUCK POND AGRICULTURAL DRAIN/MUGU DRAIN/OXNARD DR #2	403.11							
				ChemA		High	13.5	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chlordane		High	13.5	Miles	1298	
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				DDT		High	13.5	Miles	1298	
				Elevated levels of DDT in tissue and sediment.						
					Nonpoint Source					
				Nitrogen		Medium	13.5	Miles	1298	
					Nonpoint Source					
				Sediment Toxicity		Medium	13.5	Miles		
					Nonpoint Source					
				Toxaphene		High	13.5	Miles	1298	
				Elevated levels of toxaphene in tissue.						
					Nonpoint Source					
				Toxicity		High	13.5	Miles		
					Nonpoint Source					
4	R	FOX BARRANCA	403.62							
				Boron		Medium	3.03	Miles		
					Nonpoint Source					
				Nitrate and Nitrite		Medium	3.03	Miles	1298	
					Nonpoint Source					
				Sulfates		Medium	3.03	Miles		
					Nonpoint Source					
				Total Dissolved Solids		Medium	3.03	Miles		
					Nonpoint Source					
4	R	LAS VIRGENES CREEK	404.22							
				High Coliform Count		High	11.47	Miles		
					Nonpoint Source					
				Nutrients (Algae)		Medium	11.47	Miles	0193	1202
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Org. enrichment/Low D.O.	Nonpoint Source	Medium	11.47	Miles		
				Scum/Foam-unnatural	Nonpoint Source	Low	11.47	Miles		
				Selenium	Nonpoint Source	Low	11.47	Miles		
				Trash	Nonpoint Source	Low	11.47	Miles		
4	R	LINDERO CREEK REACH 1	404.23							
				Algae	Nonpoint Source	Medium	2.2	Miles		
				High Coliform Count	Nonpoint Source	High	2.2	Miles		
				Scum/Foam-unnatural	Nonpoint Source	Low	2.2	Miles		
				Selenium	Nonpoint Source	Low	2.2	Miles		
				Trash	Nonpoint Source	Low	2.2	Miles		
4	R	LINDERO CREEK REACH 2 (ABOVE LAKE)	404.23							
				Algae	Nonpoint Source	Medium	4.8	Miles		
				High Coliform Count	Nonpoint Source	High	4.8	Miles		
				Scum/Foam-unnatural	Nonpoint Source	Low	4.8	Miles		
				Selenium	Nonpoint Source	Low	4.8	Miles		
				Trash	Nonpoint Source	Low	4.8	Miles		
4	R	LOS ANGELES RIVER REACH 1 (ESTUARY TO CARSON STREET)	405.12							
				Ammonia	Nonpoint/Point Source	High	2.01	Miles	0194	1299
				High Coliform Count	Nonpoint/Point Source	Medium	2.01	Miles		
				Lead	Nonpoint/Point Source	Low	2.01	Miles		
				Nutrients (Algae)	Nonpoint/Point Source	Medium	2.01	Miles	0194	1299

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				pH	Nonpoint/Point Source	Medium	2.01	Miles		
				Scum/Foam-unnatural	Nonpoint/Point Source	Low	2.01	Miles		
				Trash	Nonpoint/Point Source	High	2.01	Miles		
4	R	LOS ANGELES RIVER REACH 2 (CARSON TO FIGUEROA STREET)	405.15							
				Ammonia	Nonpoint/Point Source	High	19.37	Miles	0194	1299
				High Coliform Count	Nonpoint/Point Source	Medium	19.37	Miles		
				Lead	Nonpoint/Point Source	Low	19.37	Miles		
				Nutrients (Algae)	Nonpoint/Point Source	Medium	19.37	Miles	0194	1299
				Odors	Nonpoint/Point Source	Low	19.37	Miles		
				Oil	Nonpoint/Point Source	Medium	19.37	Miles		
				Scum/Foam-unnatural	Nonpoint/Point Source	Low	19.37	Miles		
				Trash	Nonpoint/Point Source	High	19.37	Miles		
4	R	LOS ANGELES RIVER REACH 3 (FIGUEROA ST TO RIVERSIDE DR.)	405.21							
				Ammonia	Nonpoint/Point Source	High	7.24	Miles	0194	1299
				Nutrients (Algae)	Nonpoint/Point Source	Medium	7.24	Miles	0194	1299
				Odors	Nonpoint/Point Source	Low	7.24	Miles		
				Scum/Foam-unnatural	Nonpoint/Point Source	Low	7.24	Miles		
				Trash	Nonpoint/Point Source	High	7.24	Miles		
4	R	LOS ANGELES RIVER REACH 4 (SEPUVEDA DR. TO SEPULVEDA DAM)	405.21							
				Ammonia	Nonpoint/Point Source	High	11.84	Miles	0194	1299
				High Coliform Count	Nonpoint/Point Source	Medium	11.84	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Lead		Low	11.84	Miles		
					Nonpoint/Point Source					
				Nutrients (Algae)		Medium	11.84	Miles	0194	1299
					Nonpoint/Point Source					
				Odors		Low	11.84	Miles		
					Nonpoint/Point Source					
				Scum/Foam-unnatural		Low	11.84	Miles		
					Nonpoint/Point Source					
				Trash		High	11.84	Miles		
					Nonpoint/Point Source					
4	R	LOS ANGELES RIVER REACH 5 (AT SEPULVEDA BASIN)	405.21							
				Ammonia		High	1.93	Miles	0194	1299
					Nonpoint/Point Source					
				ChemA		Medium	1.93	Miles		
					Nonpoint/Point Source					
				Chlorpyrifos		Medium	1.93	Miles		
				Elevated levels of chlorpyrifos in tissue.						
					Nonpoint/Point Source					
				Nutrients (Algae)		Medium	1.93	Miles	0194	1299
					Nonpoint/Point Source					
				Odors		Low	1.93	Miles		
					Nonpoint/Point Source					
				Oil		Low	1.93	Miles		
					Nonpoint/Point Source					
				Scum/Foam-unnatural		Low	1.93	Miles		
					Nonpoint/Point Source					
				Trash		High	1.93	Miles		
					Nonpoint/Point Source					
4	R	LOS ANGELES RIVER REACH 6 (ABOVE SEPULVEDA FLD CNTRL BASIN)	405.21							
				Dichloroethylene/1,1-DCE		Low	6.17	Miles		
					Nonpoint Source					
				High Coliform Count		Low	6.17	Miles		
					Nonpoint Source					
				Tetrachloroethylene/PCE		Low	6.17	Miles		
					Nonpoint Source					
				Trichloroethylene/TCE		Low	6.17	Miles		
					Nonpoint Source					
4	R	MALIBU CREEK	404.21							
				Fish barriers		Low	9.5	Miles		
					Dam Construction/Operation					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				High Coliform Count	Nonpoint/Point Source	High	9.5	Miles		
				Nutrients (Algae)	Nonpoint/Point Source	Medium	9.5	Miles	0193	1202
				Scum/Foam-unnatural	Nonpoint/Point Source	Low	9.5	Miles		
				Trash	Nonpoint Source	Low	9.5	Miles		
4	R	MATILIJA CREEK REACH 1 (JCT. WITH N. FORK TO RESERVOIR)	402.20							
				Fish barriers	Dam Construction/Operation	Low	1.6	Miles		
4	R	MATILIJA CREEK REACH 2 (ABOVE RESERVOIR)	402.20							
				Fish barriers	Dam Construction/Operation	Low	16.8	Miles		
4	R	MEDEA CREEK REACH 1 (LAKE TO CONFL. WITH LINDERO)	404.23							
				Algae	Nonpoint Source	Medium	3.01	Miles		
				High Coliform Count	Nonpoint Source	High	3.01	Miles		
				Selenium	Nonpoint Source	Low	3.01	Miles		
				Trash	Nonpoint Source	Low	3.01	Miles		
4	R	MEDEA CREEK REACH 2 (ABV COFL. WITH LINDERO)	404.24							
				Algae	Nonpoint Source	Medium	5.44	Miles		
				High Coliform Count	Nonpoint Source	High	5.44	Miles		
				Selenium	Nonpoint Source	Low	5.44	Miles		
				Trash	Nonpoint Source	Low	5.44	Miles		
4	R	MINT CANYON CREEK REACH 1 (CONFL TO ROWLER CYN)	403.51							
				Nitrate and Nitrite	Nonpoint Source	Medium	8.16	Miles		
4	R	MONROVIA CANYON CREEK	405.33							
				Lead	Nonpoint Source	Low	2.09	Miles		

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4	R	PALO COMADO CREEK	404.23							
				High Coliform Count		High	7.78	Miles		
					Nonpoint Source					
4	R	PICO KENTER DRAIN	405.13							
				Ammonia		Low	4.77	Miles		
					Nonpoint Source					
				Copper		Medium	4.77	Miles		
					Nonpoint Source					
				Enteric Viruses		High	4.77	Miles		
					Nonpoint Source					
				High Coliform Count		High	4.77	Miles		
					Nonpoint Source					
				Lead		Low	4.77	Miles		
					Nonpoint Source					
				PAHs		High	4.77	Miles		
					Nonpoint Source					
				Toxicity		Medium	4.77	Miles		
					Nonpoint Source					
				Trash		Low	4.77	Miles		
					Nonpoint Source					
4	R	REVOLON SLOUGH MAIN BRANCH (MUGU LAGOON TO CENTRAL AVENUE)	403.11							
				Algae		Low	8.9	Miles	1298	
					Nonpoint Source					
				ChemA		High	8.9	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chlordane		High	8.9	Miles	1298	
				Elevated levels of chlordane in tissue and sediment.						
					Nonpoint Source					
				Chlorpyrifos		High	8.9	Miles	1298	
				Elevated levels of chlorpyrifos in tissue.						
					Nonpoint Source					
				Dacthal		High	8.9	Miles	1298	
				Elevated levels of dacthal in sediment.						
					Nonpoint Source					
				DDT		High	8.9	Miles	1298	
				Elevated levels of DDT in tissue and sediment.						
					Nonpoint Source					
				Dieldrin		High	8.9	Miles	1298	
				Elevated levels of dieldrin in tissue.						
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Endosulfan		High	8.9	Miles	1298	
				Elevated levels of endosulfan in tissue and sediment.						
					Nonpoint Source					
				Nitrogen		Medium	8.9	Miles	1298	
					Nonpoint Source					
				PCBs		High	8.9	Miles		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
				Selenium		Low	8.9	Miles		
					Nonpoint Source					
				Toxaphene		High	8.9	Miles	1298	
				Elevated levels of toxaphene in tissue and sediment.						
					Nonpoint Source					
				Toxicity		High	8.9	Miles		
					Nonpoint Source					
				Trash		Low	8.9	Miles		
					Nonpoint Source					
4	R	RIO DE SANTA CLARA/OXNARD DRAIN #3	403.11							
				ChemA		High	2.48	Miles	1298	
				Elevated levels of chemA pesticides in tissue.						
					Nonpoint Source					
				Chlordane		High	2.48	Miles	1298	
				Elevated levels of chlordane in tissue.						
					Nonpoint Source					
				DDT		High	2.48	Miles	1298	
				Elevated levels of DDT in tissue.						
					Nonpoint Source					
				Nitrogen		Low	2.48	Miles	1298	
					Nonpoint Source					
				PCBs		High	2.48	Miles		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
				Sediment Toxicity		High	2.48	Miles		
					Nonpoint Source					
				Toxaphene		High	2.48	Miles	1298	
				Elevated levels of toxaphene in tissue.						
					Nonpoint Source					
4	R	RIO HONDO REACH 1 (CONFL. LA RIVER TO SNT ANA FWY)	405.15							
				Ammonia		Low	4.19	Miles	0194	1299
					Nonpoint/Point Source					
				Copper		Low	4.19	Miles		
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				High Coliform Count	Nonpoint/Point Source	Low	4.19	Miles		
				Lead	Nonpoint/Point Source	Low	4.19	Miles		
				pH	Nonpoint/Point Source	Low	4.19	Miles		
				Trash	Nonpoint/Point Source	High	4.19	Miles		
				Zinc	Nonpoint/Point Source	Low	4.19	Miles		
4	R	RIO HONDO REACH 2 (AT SPREADING GROUNDS)	405.15							
				Ammonia	Nonpoint/Point Source	Medium	2.71	Miles	0194	1299
				High Coliform Count	Nonpoint/Point Source	Low	2.71	Miles		
4	R	SAN GABRIEL RIVER EAST FORK	405.43							
				Trash	Nonpoint Source	High	12	Miles		
4	R	SAN GABRIEL RIVER ESTUARY	405.15							
				Abnormal Fish Histology	Nonpoint/Point Source	Medium	2.95	Miles		
				Arsenic *Elevated levels of arsenic in tissue.*	Nonpoint/Point Source	Low	2.95	Miles		
4	R	SAN GABRIEL RIVER REACH 1 (ESTUARY TO FIRESTONE)	405.15							
				Abnormal Fish Histology	Nonpoint/Point Source	Medium	8.73	Miles		
				Algae	Nonpoint/Point Source	Medium	8.73	Miles		
				Ammonia	Nonpoint/Point Source	High	8.73	Miles		
				High Coliform Count	Nonpoint/Point Source	Low	8.73	Miles		
				Toxicity	Nonpoint/Point Source	Medium	8.73	Miles		
4	R	SAN GABRIEL RIVER REACH 2 (FIRESTONE TO WHITTIER NARROWS DAM	405.15							
				Ammonia	Nonpoint/Point Source	High	9.99	Miles		

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				High Coliform Count	Nonpoint/Point Source	Low	9.99	Miles		
				Lead	Nonpoint/Point Source	Low	9.99	Miles		
4	R	SAN GABRIEL RIVER REACH 3 (WHITTIER NARROWS TO RAMONA)	405.41							
				Toxicity	Nonpoint/Point Source	Medium	3.52	Miles		
4	R	SAN JOSE CREEK REACH 1 (SG CONFL. TO TEMPLE STREET)	405.41							
				Algae	Nonpoint/Point Source	Medium	13.12	Miles		
				Ammonia	Nonpoint/Point Source	High	13.12	Miles		
				High Coliform Count	Nonpoint/Point Source	Low	13.12	Miles		
4	R	SAN JOSE CREEK REACH 2 (TEMPLE TO I-10 AT WHITE AVE.)	405.51							
				Algae	Nonpoint/Point Source	Medium	4.93	Miles		
				Ammonia	Nonpoint/Point Source	High	4.93	Miles		
				High Coliform Count	Nonpoint/Point Source	Low	4.93	Miles		
4	R	SANTA CLARA RIVER ESTUARY	403.11							
				ChemA	Nonpoint Source	Medium	2.07	Miles		
				High Coliform Count	Nonpoint Source	Low	2.07	Miles		
				Toxaphene	Nonpoint Source	Medium	2.07	Miles		
4	R	SANTA CLARA RIVER REACH 3 (DAM TO ABV SP CRK/BLW TIMBER CYN)	403.21							
				Ammonia	Nonpoint/Point Source	Medium	13.24	Miles		
				Chloride	Nonpoint/Point Source	Medium	13.24	Miles	1297	

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	R	SANTA CLARA RIVER REACH 7 (BLUE CUT TO WEST PIER HWY 99)	403.51							
				Ammonia	Nonpoint/Point Source	Medium	9.21	Miles		
				Chloride *Chloride was relisted by USEPA*	Nonpoint/Point Source	Medium	9.21	Miles	1297	
				High Coliform Count	Nonpoint/Point Source	Low	9.21	Miles		
				Nitrate and Nitrite	Nonpoint/Point Source	Medium	9.21	Miles		
4	R	SANTA CLARA RIVER REACH 8-W PIER HY 99 TO BOUQUET CYN RD BRG	403.51							
				Ammonia	Nonpoint/Point Source	Medium	3.42	Miles		
				Chloride *Chloride was relisted by USEPA.*	Nonpoint/Point Source	Medium	3.42	Miles	1297	
				High Coliform Count	Nonpoint/Point Source	Low	3.42	Miles		
				Nitrate and Nitrite	Nonpoint/Point Source	Medium	3.42	Miles		
				Org. enrichment/Low D.O.	Nonpoint/Point Source	Medium	3.42	Miles		
4	R	SANTA CLARA RIVER REACH 9 (BOUQUET CYN RD.TO ABV LANG GAGNG)	403.51							
				High Coliform Count	Nonpoint/Point Source	Low	12.69	Miles		
4	R	SANTA MONICA CANYON	405.13							
				High Coliform Count	Nonpoint Source	High	2.9	Miles		
				Lead	Nonpoint Source	Low	2.9	Miles		
4	R	SEPULVEDA CANYON	405.13							
				Ammonia	Nonpoint Source	Low	6.8	Miles		
				High Coliform Count	Nonpoint Source	High	6.8	Miles		
				Lead	Nonpoint Source	Low	6.8	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	R	STOKES CREEK	404.22							
				High Coliform Count	Nonpoint Source	High	5.33	Miles		
4	R	TAPO CANYON REACH 1	403.67							
				Boron	Nonpoint/Point Source	Medium	5.23	Miles		
				Chloride	Nonpoint/Point Source	Medium	5.23	Miles	0197	1200
				Sulfates	Nonpoint/Point Source	Medium	5.23	Miles		
				Total Dissolved Solids	Nonpoint/Point Source	Medium	5.23	Miles		
4	R	TOPANGA CANYON CREEK	404.11							
				Lead	Nonpoint Source	Low	8.6	Miles		
4	R	TORRANCE CARSON CHANNEL	405.12							
				Copper	Nonpoint Source	Low	12.6	Miles		
				High Coliform Count	Nonpoint Source	Medium	12.6	Miles		
				Lead	Nonpoint Source	Low	12.6	Miles		
4	R	TORREY CANYON CREEK	403.41							
				Nitrate and Nitrite	Nonpoint Source	Medium	1.7	Miles		
4	R	TRIUNFO CANYON CREEK REACH 1	404.24							
				Lead	Nonpoint Source	Low	4.06	Miles		
				Mercury	Nonpoint Source	Low	4.06	Miles		
4	R	TRIUNFO CANYON CREEK REACH 2	404.25							
				Lead	Nonpoint Source	Low	1.98	Miles		
				Mercury	Nonpoint Source	Low	1.98	Miles		
4	R	TUJUNGA WASH (LA RIVER TO HANSEN DAM)	405.21							
				Ammonia	Nonpoint Source	Medium	9.68	Miles	0194	1299

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Copper	Nonpoint Source	Medium	9.68	Miles		
				High Coliform Count	Nonpoint Source	Low	9.68	Miles		
				Odors	Nonpoint Source	Low	9.68	Miles		
				Scum/Foam-unnatural	Nonpoint Source	Low	9.68	Miles		
				Trash	Nonpoint Source	High	9.68	Miles		
4	R	VENTURA RIVER ESTUARY	402.10							
				Algae	Nonpoint/Point Source	Low	0.35	Miles		
				DDT *Elevated levels of DDT in tissue.*	Nonpoint/Point Source	Medium	0.35	Miles		
				Eutrophic	Nonpoint/Point Source	Low	0.35	Miles		
				Trash	Nonpoint/Point Source	Low	0.35	Miles		
4	R	VENTURA RIVER REACH 1 (ESTUARY TO MAIN STREET)	402.10							
				Algae	Nonpoint/Point Source	Low	0.18	Miles		
				Copper *Elevated levels of copper in tissue.*	Nonpoint/Point Source	Low	0.18	Miles		
				Silver *Elevated levels of silver in tissue.*	Nonpoint/Point Source	Medium	0.18	Miles		
				Zinc *Elevated levels of zinc in tissue.*	Nonpoint/Point Source	Low	0.18	Miles		
4	R	VENTURA RIVER REACH 2 (MAIN ST. TO WELDON CANYON)	402.10							
				Algae	Nonpoint/Point Source	Low	4.64	Miles		
				Copper *Elevated levels of copper in tissue.*	Nonpoint/Point Source	Low	4.64	Miles		
				Selenium *Elevated levels of selenium in tissue.*	Nonpoint/Point Source	Low	4.64	Miles		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Silver		Medium	4.64	Miles		
				Elevated levels of silver in tissue.						
					Nonpoint/Point Source					
				Zinc		Low	4.64	Miles		
				Elevated levels of zinc in tissue.						
					Nonpoint/Point Source					
4	R	VENTURA RIVER REACH 3 (WELDON CANYON TO CONFL. W/ COYOTE CR)	402.10							
				Pumping		Low	0.78	Miles		
					Nonpoint Source					
				Water Diversion		Low	0.78	Miles		
					Nonpoint Source					
4	R	VENTURA RIVER REACH 4 (COYOTE CREEK TO CAMINO CIELO RD.	402.20							
				Pumping		Low	14.94	Miles		
					Nonpoint Source					
				Water Diversion		Low	14.94	Miles		
					Nonpoint Source					
4	R	VERDUGO WASH REACH 1 (LA RIVER TO VERDUGO RD.)	405.21							
				Algae		Low	3.41	Miles		
					Nonpoint Source					
				High Coliform Count		Low	3.41	Miles		
					Nonpoint Source					
				Trash		High	3.41	Miles		
					Nonpoint Source					
4	R	VERDUGO WASH REACH 2 (ABOVE VERDUGO ROAD)	405.24							
				Algae		Low	5.55	Miles		
					Nonpoint Source					
				High Coliform Count		Low	5.55	Miles		
					Nonpoint Source					
				Trash		High	5.55	Miles		
					Nonpoint Source					
4	R	WALNUT CREEK WASH (DRAINS FROM PUDDINGSTONE RESERVOIR	405.41							
				pH		High	13.9	Miles		
					Nonpoint/Point Source					
				Toxicity		Medium	13.9	Miles		
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
4	R	WHEELER CANYON / TODD BARRANCA	403.21							
				Nitrate and Nitrite	Nonpoint Source	Medium	4.17	Miles		
4	R	WILMINGTON DRAIN	405.12							
				Ammonia	Nonpoint Source	Medium	4.9	Miles		
				Copper	Nonpoint Source	Low	4.9	Miles		
				High Coliform Count	Nonpoint Source	Low	4.9	Miles		
				Lead	Nonpoint Source	Low	4.9	Miles		
4	T	BALLONA CREEK WETLANDS	405.13							
				Arsenic *Elevated levels of arsenic in tissue.*	Nonpoint Source	Medium	86	Acres		
				Exotic Vegetation	Nonpoint Source	Low	86	Acres		
				Habitat alterations	Nonpoint Source	Low	86	Acres		
				Hydromodification	Nonpoint Source	Low	86	Acres		
				Reduced Tidal Flushing	Nonpoint Source	Low	86	Acres		
				Trash	Nonpoint Source	High	86	Acres		
4	T	COLORADO LAGOON	405.12							
				Chlordane *Elevated levels of chlordane in tissue and sediment.*	Nonpoint Source	High	13.6	Acres		
				DDT *Elevated levels of DDT in tissue.*	Nonpoint Source	High	13.6	Acres		
				Dieldrin *Elevated levels of dieldrin in tissue.*	Nonpoint Source	Medium	13.6	Acres		
				Lead *Elevated levels of lead in tissue and sediment.*	Nonpoint Source	Medium	13.6	Acres		
				PAHs *Elevated levels of PAHs in sediment.*	Nonpoint Source	High	13.6	Acres		

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				PCBs		High	13.6	Acres		
				Elevated levels of PCBs in tissue.						
					Nonpoint Source					
				Sediment Toxicity		Medium	13.6	Acres		
					Nonpoint Source					
				Zinc		Medium	13.6	Acres		
				Elevated levels of zinc in sediment.						
					Nonpoint Source					
4	T	LOS CERRITOS CHANNEL	405.15							
				Ammonia		Low	16	Acres		
					Nonpoint Source					
				Copper		Low	16	Acres		
					Nonpoint Source					
				High Coliform Count		Low	16	Acres		
					Nonpoint Source					
				Lead		Low	16	Acres		
					Nonpoint Source					
				Zinc		Medium	16	Acres		
					Nonpoint Source					
5	E	DELTA WATERWAYS	544.000							
				Chlorpyrifos		High	480000	Acres	0198	1205
					Agriculture					
					Urban Runoff/Storm Sewers					
				DDT		Low	480000	Acres	0104	1211
					Agriculture					
				Diazinon		High	480000	Acres	0198	1205
					Agriculture					
					Urban Runoff/Storm Sewers					
				Electrical Conductivity		Medium	16000	Acres	0101	1211
					Agriculture					
				Group A Pesticides		Low	480000	Acres	0104	1211
					Agriculture					
				Mercury		High	480000	Acres	0198	1205
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Org. enrichment/Low D.O.		High	75	Acres	0101	1211
					Municipal Point Sources					
					Urban Runoff/Storm Sewers					
				Unknown Toxicity		Medium	480000	Acres	0101	1211
					Source Unknown					
5	L	BERRYESSA LAKE	512.210							
				Mercury		High	20700	Acres	0198	1205
					Resource Extraction					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
5	L	CLEAR LAKE	513.520							
				Mercury		High	43000	Acres	0198	1205
					Resource Extraction					
				Nutrients		Low	43000	Acres	0104	1211
					Source Unknown					
5	L	DAVIS CREEK RES	513.320							
				Mercury		Medium	290	Acres	0198	1211
					Resource Extraction					
5	L	KESWICK RES	524.400							
				Cadmium		Medium	200	Acres	0198	1211
					Resource Extraction					
				Copper		Medium	200	Acres	0198	1211
					Resource Extraction					
				Zinc		Medium	200	Acres	0198	1211
					Resource Extraction					
5	L	MARSH CREEK RES	543.000							
				Mercury		Medium	375	Acres	0198	1211
					Resource Extraction					
5	L	SHASTA LAKE	506.100							
				Cadmium		Low	20	Acres	0104	1211
					Resource Extraction					
				Copper		Low	20	Acres	0104	1211
					Resource Extraction					
				Zinc		Low	20	Acres	0104	1211
					Resource Extraction					
5	L	WHISKEYTOWN RES	524.610							
				High Coliform Count		Low	100	Acres	0104	1211
					Septage Disposal					
5	R	AMERICAN RIVER, LOWER	519.210							
				Group A Pesticides		Low	23	Miles	0104	1211
					Urban Runoff/Storm Sewers					
				Mercury		Medium	23	Miles	0101	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Unknown Toxicity		Low	23	Miles	0104	1211
					Source Unknown					
5	R	ARCADE CREEK	519.210							
				Chlorpyrifos		Medium	10	Miles	0198	1211
					Urban Runoff/Storm Sewers					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Diazinon		Medium	10	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	CACHE CREEK	511.300							
				Mercury		High	35	Miles	0196	1205
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Unknown Toxicity		Medium	35	Miles	0101	1211
					Source Unknown					
5	R	CHICKEN RANCH SLOUGH	519.210							
				Chlorpyrifos		Medium	5	Miles	0198	1211
					Urban Runoff/Storm Sewers					
				Diazinon		Medium	5	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	COLUSA DRAIN	520.210							
				Carbofuran/Furadan		Medium	70	Miles	0101	1211
					Agriculture					
				Group A Pesticides		Medium	70	Miles	0101	1211
					Agriculture					
				Malathion		Medium	70	Miles	0101	1211
					Agriculture					
				Methyl Parathion		Medium	70	Miles	0101	1211
					Agriculture					
				Unknown Toxicity		Medium	70	Miles	0101	1211
					Agriculture					
5	R	DOLLY CREEK	518.540							
				Copper		Medium	1	Miles	0101	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Medium	1	Miles	0101	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	DUNN CREEK	543.000							
				Mercury		Low	9	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Metals		Low	9	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
5	R	ELDER CREEK	519.120							
				Chlorpyrifos		Medium	10	Miles	0198	1211
					Urban Runoff/Storm Sewers					
				Diazinon		Medium	10	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	ELK GROVE CREEK	519.110							
				Diazinon		Medium	5	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	FALL RIVER (PIT)	526.400							
				Sedimentation/Siltation		Medium	25	Miles	0104	1211
					Agriculture-grazing					
					Silviculture					
					Highway/Road/Bridge Construction					
5	R	FEATHER RIVER, LOWER	519.220							
				Diazinon		High	60	Miles	0198	1205
					Agriculture					
					Urban Runoff/Storm Sewers					
				Group A Pesticides		Low	60	Miles	0104	1211
					Agriculture					
				Mercury		Medium	60	Miles	0101	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Unknown Toxicity		Medium	60	Miles	0101	1211
					Source Unknown					
5	R	FIVE MILE SLOUGH	544.000							
				Chlorpyrifos		Medium	1	Miles	0198	1211
					Urban Runoff/Storm Sewers					
				Diazinon		Medium	1	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	FRENCH RAVINE	516.320							
				Bacteria		Low	1	Miles	0104	1211
					Land Disposal					

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5	R	HARDING DRAIN (TURLOCK IRR DIST LATERAL #5)	535.500							
				Ammonia		Low	7	Miles	0104	1211
					Municipal Point Sources					
					Agriculture					
				Chlorpyrifos		Medium	7	Miles	0198	1211
					Agriculture					
				Diazinon		Medium	7	Miles	0198	1211
					Agriculture					
				Unknown Toxicity		Medium	7	Miles	0198	1211
					Agriculture					
5	R	HARLEY GULCH	513.510							
				Mercury		Medium	8	Miles	0101	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	HORSE CREEK	526.200							
				Cadmium		Low	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		Low	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Lead		Low	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Low	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	HUMBUG CREEK	517.320							
				Copper		Low	9	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Mercury		Low	9	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Sedimentation/Siltation		Low	9	Miles	0104	1211
					Resource Extraction					
				Zinc		Low	9	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					

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5	R	JAMES CREEK	512.240							
				Mercury		Low	6	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
				Nickel		Low	6	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
5	R	KANAKA CREEK	517.420							
				Arsenic		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
5	R	KINGS RIVER (LOWER)	551.900							
				Electrical Conductivity		Low	30	Miles	0104	1211
					Agriculture					
				Molybdenum		Low	30	Miles	0104	1211
					Agriculture					
				Toxaphene		Low	30	Miles	0104	1211
					Agriculture					
5	R	LITTLE BACKBONE CREEK	506.200							
				Acid Mine Drainage		Medium	1	Miles	0104	1211
					Resource Extraction					
				Cadmium		Medium	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
				Copper		Medium	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
				Zinc		Medium	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
5	R	LITTLE COW CREEK	507.330							
				Cadmium		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
				Copper		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
				Zinc		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.	Resource Extraction					
5	R	LITTLE GRIZZLY CREEK	518.540							
				Copper		Medium	10	Miles	0101	1202
					Mine Tailings					

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				Zinc		Medium	10	Miles	0101	1202
					Mine Tailings					
5	R	LONE TREE CREEK	531.400							
				Ammonia		Low	15	Miles	0104	1211
					Dairies					
				Biological Oxygen Demand		Low	15	Miles	0104	1211
					Dairies					
				Electrical Conductivity		Low	15	Miles	0104	1211
					Dairies					
5	R	MARSH CREEK	543.000							
				Mercury		Low	24	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Metals		Low	24	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	MERCED RIVER, LOWER	535.000							
				Chlorpyrifos		High	60	Miles	0198	1205
					Agriculture					
				Diazinon		High	60	Miles	0198	1205
					Agriculture					
				Group A Pesticides		Low	60	Miles	0104	1211
					Agriculture					
5	R	MOKELUMNE RIVER, LOWER	531.200							
				Copper		Low	28	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Low	28	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	MORRISON CREEK	519.120							
				Diazinon		Medium	20	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	MOSHER SLOUGH	544.000							
				Chlorpyrifos		Medium	2	Miles	0198	1211
					Urban Runoff/Storm Sewers					
				Diazinon		Medium	2	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
5	R	MUD SLOUGH	541.200							
				Boron		Low	16	Miles	0101	1211
					Agriculture					
				Electrical Conductivity		Low	16	Miles	0101	1211
					Agriculture					
				Pesticides		Low	16	Miles	0101	1211
					Agriculture					
				Selenium		High	16	Miles	0592	1200
					Agriculture					
				Unknown Toxicity		Low	16	Miles	0101	1211
					Agriculture					
5	R	NATOMAS EAST MAIN DRAIN	519.220							
				Diazinon		Medium	5	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
				PCBs		Low	12	Miles	0104	1211
					Industrial Point Sources					
					Urban Runoff/Storm Sewers					
5	R	ORESTIMBA CREEK	541.100							
				Chlorpyrifos		Medium	10	Miles	0198	1211
					Agriculture					
				Diazinon		Medium	10	Miles	0198	1211
					Agriculture					
				Unknown Toxicity		Medium	3	Miles	0101	1211
					Agriculture					
5	R	PANOCHE CREEK	542.400							
				Mercury		Low	25	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Sedimentation/Siltation		Low	40	Miles	0104	1211
					Agriculture					
					Agriculture-grazing					
					Road Construction					
				Selenium		Low	40	Miles	0104	1211
					Agriculture					
					Agriculture-grazing					
					Road Construction					
5	R	PIT RIVER	506.000							
				Nutrients		Low	100	Miles	0104	1211
					Agriculture					
					Agriculture-grazing					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Org. enrichment/Low D.O.		Low	100	Miles	0104	1211
					Agriculture					
					Agriculture-grazing					
				Temperature		Low	100	Miles	0104	1211
					Agriculture					
					Agriculture-grazing					
5	R	SACRAMENTO RIVER (RED BLUFF TO DELTA)	500.000							
				Diazinon		High	30	Miles	0198	1205
					Agriculture					
				Mercury		High	30	Miles	0198	1205
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Unknown Toxicity		Medium	185	Miles	0101	1211
					Source Unknown					
5	R	SACRAMENTO RIVER (SHASTA DAM TO RED BLUFF)	508.100							
				Cadmium		High	40	Miles	0196	1201
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		High	40	Miles	0196	1201
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Unknown Toxicity		Medium	50	Miles	0101	1211
					Source Unknown					
				Zinc		High	40	Miles	0196	1201
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	SACRAMENTO SLOUGH	520.100							
				Diazinon		Medium	1	Miles	0198	1211
					Agriculture					
					Urban Runoff/Storm Sewers					
				Mercury		Medium	1	Miles	0198	1211
					Source Unknown					
5	R	SALT SLOUGH	541.200							
				Boron		Low	15	Miles	0198	1211
					Agriculture					
				Chlorpyrifos		Low	15	Miles	0198	1211
					Agriculture					
				Diazinon		Low	15	Miles	0198	1211
					Agriculture					
				Electrical Conductivity		Low	15	Miles	0198	1211
					Agriculture					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Selenium		High	15	Miles	0592	1298
					Agriculture					
				Unknown Toxicity		Low	15	Miles	0198	1211
					Agriculture					
5	R	SAN CARLOS CREEK	542.200							
				Mercury		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	SAN JOAQUIN RIVER	544.000							
				Boron		High	130	Miles	0697	1299
					Agriculture					
				Chlorpyrifos		High	130	Miles	0198	1205
					Agriculture					
				DDT		Low	130	Miles	0104	1211
					Agriculture					
				Diazinon		High	130	Miles	0198	1205
					Agriculture					
				Electrical Conductivity		High	130	Miles	0697	1299
					Agriculture					
				Group A Pesticides		Low	130	Miles	0104	1211
					Agriculture					
				Selenium		High	50	Miles	0592	1200
					Agriculture					
				Unknown Toxicity		Medium	130	Miles	0198	1211
					Source Unknown					
5	R	SPRING CREEK	524.400							
				Acid Mine Drainage		High	5	Miles	0198	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Cadmium		High	5	Miles	0198	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		High	5	Miles	0198	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		High	5	Miles	0198	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	STANISLAUS RIVER (LOWER)	535.300							
				Diazinon		High	48	Miles	0198	1205
					Agriculture					
				Group A Pesticides		Low	48	Miles	0104	1211
					Agriculture					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Unknown Toxicity		Medium	48	Miles	0101	1211
					Source Unknown					
5	R	STOCKTON DEEP WATER CHANNEL	544.000							
				Dioxin		Medium	2	Miles		
				This listing was made by USEPA.						
					Point Source					
				Furans		Medium	2	Miles		
				This listing was made by USEPA.						
					Point Source					
				PCBs		Medium	2	Miles		
				This listing was made by USEPA.						
					Point Source					
5	R	STRONG RANCH SLOUGH	519.210							
				Chlorpyrifos		Medium	5	Miles	0198	1211
					Urban Runoff/Storm Sewers					
				Diazinon		Medium	5	Miles	0198	1211
				The agricultural source of diazinon for these waterbodies is from aerial deposition.						
					Agriculture					
					Urban Runoff/Storm Sewers					
5	R	SULFUR CREEK	513.510							
				Mercury		High	7	Miles	0198	1205
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	TEMPLE CREEK	531.400							
				Ammonia		Low	10	Miles	0104	1211
					Dairies					
				Electrical Conductivity		Low	10	Miles	0104	1211
					Dairies					
5	R	TOWN CREEK	526.200							
				Cadmium		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Lead		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Low	1	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
5	R	TUOLUMNE RIVER (LOWER)	535.500							
				Diazinon		High	32	Miles	0198	1205
					Agriculture					
				Group A Pesticides		Low	32	Miles	0104	1211
					Agriculture					
				Unknown Toxicity		Medium	32	Miles	0101	1211
					Source Unknown					
5	R	WEST SQUAW CREEK	505.100							
				Cadmium		Medium	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		Medium	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Lead		Medium	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Medium	2	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	R	WILLOW CREEK (WHISKEYTOWN)	524.630							
				Acid Mine Drainage		Low	3	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Copper		Low	3	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
				Zinc		Low	3	Miles	0104	1211
				Resource extraction sources are abandoned mines.						
					Resource Extraction					
5	W	GRASSLANDS MARSHES	541.200							
				Electrical Conductivity		Medium	8224	Acres	0101	1211
					Agriculture					
				Selenium		High	8224	Acres	0592	1298
					Agriculture					
6	L	BRIDGEPORT RES	630.300							
				Nutrients		High	3000	Acres		
				Livestock grazing in wetlands upgradient of reservoir. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Agriculture					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sedimentation/Siltation		**High**	**3000**	**Acres**		
				Watershed disturbance including livestock grazing. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development processs, resources permitting.						
					Source Unknown					
6	L	CROWLEY LAKE	603.100							
				Arsenic		**High**	**5280**	**Acres**		
				To be addressed as part of Watershed Management Initiative (WMI) for upper watershed, beginning with Years 3-5 of WMI program, if resources permit.						
					Natural Sources					
				Nutrients		**High**	**5280**	**Acres**		
					Source Unknown					
6	L	DONNER LAKE	635.200							
				Priority Organics		**Low**	**960**	**Acres**		
				PCBs in fish and sediment exceed Maximum Tissue Residue Level criteria; unknown nonpoint sources. Phase I Truckee River sediment TMDL projected for completion in 1999. Additional monitoring/study necessary to determine sources/cleanup potential for priority organics. TMDLs for organics to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Source Unknown					
6	L	EAGLE LAKE (2)	637.300							
				Org. enrichment/Low D.O.		**High**	**25000**	**Acres**		
				Nutrients from wastewater disposal to land, livestock grazing, other watershed disturbance. Problems being addressed through sewering of septic system development and RWQCB's ongoing nonpoint source program. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
					Land Development					
					Septage Disposal					
					Nonpoint Source					
6	L	GRANT LAKE	601.000							
				Arsenic		**High**	**1095**	**Acres**	**0198**	**0199**
				Targeted for "easy" (already funded) TMDL documentation that arsenic from natural sources.						
					Natural Sources					
6	L	HAIWEE RES	603.300							
				Copper		**Low**	**1800**	**Acres**		
				Copper problems related to algicide use to prevent taste/odor problems in drinking water supplies. Further biological monitoring being required. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Habitat Modification					
					Nonpoint Source					
6	L	HORSESHOE LAKE (2)	628.000							
				Sedimentation/Siltation		**Low**	**1**	**Acres**		
				Further monitoring may permit delisting. TMDLs, if needed to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Construction/Land Development					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	L	INDIAN CREEK RES	632.200							
				Nutrients		**High**	**160**	**Acres**	**0198**	**0199**
				Reservoir formerly received tertiary-treated domestic wastewater from South Tahoe Public Utility District; unreliability of treatment process led to eutrophication. District is now restoring reservoir through flushing with fresh water.						
					Wastewater					
6	L	LAKE TAHOE	634.000							
				Nutrients		**High**	**120000**	**Acres**		
				Watershed disturbance, urban stormwater, atmospheric deposition. Lake is targeted for sediment and nutrient TMDLs but ability to complete them depends on availability of reliable watershed model. Model calibration, and additional watershed assessment, were funded as a result of 1997 presidential forum; TMDLs for entire watershed to be coordinated with Tahoe Regional Planning Agency's 2001 evaluation of attainment of environmental threshold standards.						
					Silviculture					
					Construction/Land Development					
					Urban Runoff/Storm Sewers					
					Other Urban Runoff					
					Wastewater					
					Hydromodification					
					Drainage/Filling Of Wetlands					
					Marinas					
					Atmospheric Deposition					
					Highway Maintenance And Runoff					
					Nonpoint Source					
				Sedimentation/Siltation		**High**	**120000**	**Acres**		
				Watershed disturbance including logging, construction, urban and highway runoff. Development of TMDLs depends on availability of reliable watershed model. Funding for final calibration of U.C. Davis Tahoe Research group model, and for additional watershed assessment, was provided as a result of 1997 presidential forum. TMDLs to be coordinated with Tahoe Regional Planning Agency's 2001 evaluation of attainment of environmental threshold standards.						
					Source Unknown					
6	L	PLEASANT VALLEY RES	603.200							
				Org. enrichment/Low D.O.		**High**	**115**	**Acres**		
				Problems related to watershed disturbance/reservoir management to be addressed together with problems in Crowley Lake as part of the Watershed Management Initiative; TMDLs to be addressed during years 3-5 of the next 13 years of the TMDL development process, if resources permit.						
					Flow Regulation/Modification					
					Nonpoint Source					
6	L	STAMPEDE RES	636.000							
				Pesticides		**Low**	**3444**	**Acres**		
				Sources unknown; no significant agriculture or residential development in watershed; feasibility of reducing loading probably low. Recalculation of Maximum Tissue Residue Level criteria makes delisting possible in next cycle. TMDLs, if needed, will be addressed during years 6-13 of the next 13 years of the TMDL development process.						
					Source Unknown					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	L	TINEMAHA RES	603.200							
				Arsenic		Low	180	Acres		
				TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Natural Sources					
					Upstream Impoundment					
					Nonpoint Source					
				Metals		Low	180	Acres		
				Watershed disturbance, upstream geothermal sources of arsenic. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Source Unknown					
6	L	TOPAZ LAKE	631.100							
				Sedimentation/Siltation		High	2300	Acres		
				Agriculture, river channel damage during January 1997 flood. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Agriculture					
					Nonpoint Source					
6	L	TWIN LAKES	603.100							
				Nutrients		Low	3	Acres		
				Watershed disturbance, urban runoff; to be addressed during years 6-13 of the next 13 years of the TMDL development process, if resources permit.						
					Land Development					
					Other Urban Runoff					
					Nonpoint Source					
6	R	AMARGOSA RIVER	609.000							
				Salinity/TDS/Chlorides		Medium	198	Miles	0198	0199
				Internally drained river with natural high salinity; targeted for "easy" (already funded) TMDL using 1998 Section 104/106 grant funds						
					Natural Sources					
6	R	ASPEN CREEK	632.100							
				Metals		High	4	Miles	0198	0199
				Acid drainage from Leviathan Mine; Lahontan RWQCB mine workplan to be documented as Phase I TMDL using 1998 Section 104/106 grant funds.						
					Acid Mine Drainage					
					Natural Sources					
					Nonpoint Source					
6	R	AURORA CANYON CREEK	630.300							
				Habitat alterations		Low	13	Miles		
				Livestock grazing. Listed on basis of limited data; further monitoring may permit delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	BEAR CREEK (R6)	635.200							
				Sedimentation/Siltation		**High**	**4**	**Miles**	**1195**	**0199**
				Creek affected by hydrologic modification for ski resort/snow making pond-affected by sediment from pond dam break. Phase I sediment TMDL for Truckee River and tributaries projected to be completed for Basin Plan amendments in 1999, using 1998 Section 104/106 grant funds; Phase II work has received Section 205(j) funding and will begin in 1998.					
					Hydromodification					
					Nonpoint Source					
6	R	BLACKWOOD CREEK	634.200							
				Sedimentation/Siltation		**High**	**8**	**Miles**	**0198**	**0199**
				Creek affected by past gravel quarry operations and other watershed disturbance. Existing USFS restoration program to be documented as phase I "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.					
					Silviculture					
					Construction/Land Development					
					Resource Extraction					
					Hydromodification					
					Nonpoint Source					
6	R	BODIE CREEK	630.200							
				Metals		**High**	**6**	**Miles**		
				Affected by drainage from inactive mines, mine tailings in creek. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.					
					Resource Extraction					
					Mine Tailings					
					Nonpoint Source					
6	R	BRONCO CREEK	635.200							
				Sedimentation/Siltation		**High**	**1**	**Miles**	**1195**	**0199**
				Watershed disturbance in naturally highly erosive watershed; targeted for sediment TMDL as part of larger Truckee River watershed effort. Phase I TMDL to be completed in 1999 using 1998 Section 104/106 grant funds; Phase II, using Section 205j funds, to begin in 1998.					
					Natural Sources					
					Nonpoint Source					
6	R	BRYANT CREEK	632.100							
				Metals		**High**	**10**	**Miles**	**0198**	**0199**
				Affected by acid mine drainage from Leviathan Mine. Problem being addressed by RWQCB through Leviathan Mine workplan; workplan will be documented as Phase I "easy" (already funded) TMDL in 1998 using Section 104/106 grant funds.					
					Acid Mine Drainage					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	CARSON RIVER, E FK	632.100							
				Nutrients		**High**	**1**	**Miles**		
				Probably livestock grazing. River was listed due to data collected by State of NV near state line in 1980s, probably reflecting drought conditions. NV has since delisted the river for these pollutants. Further monitoring may support delisting in CA. TMDLs, if needed, to be addressed during years 3-5 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
					Nonpoint Source					
6	R	CLARK CANYON CREEK	630.300							
				Habitat alterations		**Medium**	**5**	**Miles**		
				Livestock grazing. Listed on basis of very limited information. CRMP has been implemented since 1980s; further monitoring may support delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	CLEARWATER CREEK	630.400							
				Sedimentation/Siltation		**Medium**	**7**	**Miles**		
				Livestock grazing. Listed on basis of limited data; additional monitoring may support delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	COTTONWOOD CREEK (1)	603.300							
				Water/Flow Variability		**High**	**7**	**Miles**		
				Lower reach of creek affected by diversions for LADWP system; TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Flow Regulation/Modification					
6	R	EAST WALKER RIVER	630.000							
				Metals		**Medium**	**8**	**Miles**		
				Inactive mines and other watershed disturbance; highway runoff. Listed initially due to elevated fish tissue levels; needs further monitoring for metals impacts and may be considered for delisting for metals in next cycle. TMDLs, if needed, will be addressed during years 6-13 of the next 13 years of the TMDL development process.						
					Range Land					
					Other Urban Runoff					
					Resource Extraction					
					Natural Sources					
					Nonpoint Source					
				Sedimentation/Siltation		**High**	**8**	**Miles**		
				River affected by turbid releases from Bridgeport Reservoir; major sediment discharge resulted litigation by State Department of Fish and Game. Further monitoring of beneficial use recovery may support delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Hydromodification					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	GOODALE CREEK	603.300							
				Sedimentation/Siltation		**Low**	**9**	**Miles**		
				Potential for delisting following further monitoring. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	GRAY CREEK (R6)	635.000							
				Sedimentation/Siltation		**High**	**4**	**Miles**	**1195**	**0199**
				Disturbance of naturally highly erosive watershed; Phase I of the TMDL in progress, to be completed as Basin Plan amendment using 1998 Section 104/106 grant funds. Section 205(j) funding has been obtained for monitoring to begin in 1998 for use in Phase II of the TMDL.						
					Natural Sources					
					Nonpoint Source					
6	R	GREEN CREEK	630.400							
				Habitat alterations		**Medium**	**1**	**Miles**		
				Creek affected by hydroelectric dam construction, livestock grazing. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process.						
					Range Land					
					Hydromodification					
6	R	GREEN VALLEY LAKE CREEK	628.200							
				Priority Organics		**Low**	**5**	**Miles**		
				Priority organics (source unknown) were detected in stream in 1980's; no monitoring since. Stream needs reevaluation to determine need for listing. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Source Unknown					
6	R	HEAVENLY VALLEY CREEK	634.100							
				Sedimentation/Siltation		**High**	**4**	**Miles**	**0198**	**0199**
				Creek affected by ski resort construction and maintenance activities. Recently adopted resort master plan will phase future development based on accomplishment of watershed restoration projects. Master Plan currently scheduled to be documented as Phase I "easy" (already funded) TMDL using 1998 Section 104/106 grant funds. (Needs further discussion with USFS staff; recent monitoring data indicate possible need for additional sediment modeling.)						
					Construction/Land Development					
					Land Development					
					Hydromodification					
					Habitat Modification					
					Recreational Activities					
					Nonpoint Source					
6	R	HOT CREEK (1)	631.400							
				Metals		**Medium**	**5**	**Miles**	**0198**	**0199**
				Natural geothermal drainage; targeted for "easy" (already funded) TMDL using 1998 Section 104/106 grant funds						
					Natural Sources					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	HOT CREEK (2)	603.100							
				Metals		**High**	**10**	**Miles**	**0198**	**0199**
				Natural geothermal springs. Targeted for "easy" (already funded) TMDL using Section 104/106 grant funds.						
					Natural Sources					
6	R	HOT SPRINGS CANYON CREEK	630.300							
				Sedimentation/Siltation		**Medium**	**1**	**Miles**		
				Listed on basis of limited data; further monitoring may support delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process.						
					Range Land					
6	R	INDIAN CREEK (1)	632.200							
				Habitat alterations		**High**	**7**	**Miles**		
				Watershed disturbance from livestock grazing. TMDLs to be addressed as part of Carson River WMI implementation.						
					Pasture Land					
6	R	LASSEN CREEK	637.000							
				Flow alterations		**Medium**	**6**	**Miles**		
				Agricultural diversions. TMDL to be addressed during years 6-13 of the next 13 years of the TMDL development process, as resources permit.						
					Flow Regulation/Modification					
6	R	LEE VINING CREEK	601.000							
				Flow alterations		**High**	**11**	**Miles**		
				Affected by diversions by Los Angeles Dept. of Water and Power. Court ordered restoration project is underway; will probably be documented as Phase I "easy" (already funded) TMDL during years 3-5 of the 13 years of TMDL implementation, resources permitting.						
					Flow Regulation/Modification					
6	R	LEVIATHAN CREEK	632.100							
				Metals		**High**	**2**	**Miles**	**0198**	**0199**
				Lower reach of creek affected by acid drainage from Leviathan Mine; reach has been diverted around tailings as part of ongoing pollution abatement project. Lahontan RWQCB workplan to be documented as Phase I "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Acid Mine Drainage					
6	R	LITTLE HOT CREEK	603.100							
				Arsenic		**Medium**	**1**	**Miles**	**0198**	**1299**
				Natural (geothermal?) sources: targeted for "easy" (already funded) TMDL using 1998 Section 104-106 grant funds.						
					Natural Sources					
6	R	MAMMOTH CREEK	603.100							
				Metals		**High**	**22**	**Miles**		
				Mammoth Creek is the headwaters of Hot Creek (2); However, it is affected by urban runoff from the Town of Mammoth Lakes as well as natural sources of metals. Urban runoff problems at Mammoth are being addressed through the RWQCB's ongoing regulation and enforcement problems and the WMI.						
					Natural Sources					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	MILL CREEK (1)	601.000							
				Flow alterations		**High**	**7**	**Miles**		
				Creek affected by water diversions. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Water Diversions					
6	R	MILL CREEK (3)	641.300							
				Sedimentation/Siltation		**Medium**	**6**	**Miles**		
				Livestock grazing. TMDL to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	MOJAVE RIVER	628.200							
				Priority Organics		**High**	**10**	**Miles**		
				River was 303(d) listed in 1980's due to subsurface "Barstow slug" of toxic pollutants from various urban/industrial sources; later monitoring shows main "slug" has dissipated but some areas of pollution remain. River is currently a WMI priority watershed with emphasis on revision of TDS/salinity objectives. TMDLs for "mini-slug" pollutants to be addressed, if necessary, during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Land Disposal					
					Hazardous Waste					
6	R	MONITOR CREEK	632.100							
				Metals		**High**	**4**	**Miles**		
				Drainage from inactive mines; other watershed disturbance. Problems to be addressed as part of Carson River WMI effort during years 3-5 of the next 13 years of TMDL development.						
					Resource Extraction					
					Natural Sources					
					Nonpoint Source					
6	R	OWENS RIVER	603.300							
				Arsenic		**High**	**120**	**Miles**		
				Arsenic from natural geothermal sources; amounts affected by reservoir management. TMDLs for Long HA (603.10) to be addressed during years 3-5 of the next 13 years of the TMDL development process, as part of WMI, if resources permit. TMDLs for Upper and Middle Owens HAs (603.20 and 603.30) to be addressed during years 6-13 if resources permit.						
					Natural Sources					
				Habitat alterations		**High**	**120**	**Miles**		
				TMDLs for Long HA (630.10) to be addressed in years 3-5 of the next 13 years of the TMDL development process as part of the WMI, resources permitting. TMDLs for Upper and Middle Owens HA's to be addressed during years 6-13 of the next 13 years of TMDL development, resources permitting.						
					Flow Regulation/Modification					
6	R	PINE CREEK (2)	637.300							
				Sedimentation/Siltation		**High**	**24**	**Miles**	**0198**	**0199**
				Livestock grazing; other watershed disturbance. Watershed/fisheries restoration by existing CRMP group to be documented as "easy"(already funded) TMDL, or as basis for delisting, using 1998 Section 104/106 grant funds.						
					Range Land					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	ROUGH CREEK	630.000							
				Habitat alterations		**Medium**	**8**	**Miles**		
				Livestock grazing impacts. Additional monitoring may provide grounds for delisting. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	SKEDADDLE CREEK	637.100							
				High Coliform Count		**Low**	**5**	**Miles**		
				Livestock grazing on BLM land led to reports of high coliform levels several years ago; current status unknown. Further monitoring may support delisting. TMDLs, if needed, will be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	SNOW CREEK	634.200							
				Habitat alterations		**High**	**1**	**Miles**		
					Land Development					
					Drainage/Filling Of Wetlands					
					Nonpoint Source					
6	R	SQUAW CREEK	635.200							
				Sedimentation/Siltation		**High**	**8**	**Miles**	**1195**	**0199**
				Watershed heavily disturbed by ski resort construction and construction of other facilities for 1960 Winter Olympics; part of creek was channelized. Lower creek has very high bedload sediment transport. Severe watershed damage occurred from January 1997 flooding. Phase I sediment TMDL to be completed using 1998 Section 104/106 grant funds; Phase II to begin in 1998 using Section 205(j) funds.						
					Construction/Land Development					
					Other Urban Runoff					
					Hydromodification					
					Drainage/Filling Of Wetlands					
					Highway Maintenance And Runoff					
					Natural Sources					
					Recreational Activities					
					Nonpoint Source					
6	R	SUSAN RIVER	637.200							
				Unknown Toxicity		**High**	**59**	**Miles**		
				River affected by natural and man-made geothermal discharges and by agricultural drainage. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Agriculture					
					Other Urban Runoff					
					Highway Maintenance And Runoff					
					Natural Sources					
					Source Unknown					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	R	TRUCKEE RIVER	635.200							
				Sedimentation/Siltation		**High**	**106**	**Miles**	**1195**	**0199**
				Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersheds. Phase I sediment TMDL to be completed using 1998 Section 104/106 grant funds; Phase II work, using Section 205(j) funds to begin in 1998.						
					Source Unknown					
6	R	TUTTLE CREEK	603.300							
				Habitat alterations		**Low**	**10**	**Miles**		
				Livestock grazing problems. Potential for delisting following further monitoring. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	R	WARD CREEK	634.200							
				Sedimentation/Siltation		**High**	**7**	**Miles**		
				Watershed disturbance. TMDLs to be developed as part of those for Lake Tahoe during years 6-13 of the next 13 years of the TMDL development process, as resources permit.						
					Land Development					
					Nonpoint Source					
6	R	WEST WALKER RIVER	631.000							
				Sedimentation/Siltation		**High**	**1**	**Miles**		
				Agriculture, flooding, highway construction. (Watershed severely impacted by January 1997 flood; 8 miles of highway washed out and reconstructed under emergency regulations with no CEQA analysis.) *TMDLs to be addressed through WMI process (once priority watersheds are rotated), probably during years 6-13 of the next 13 years of the TMDL development process, as resources permit.*						
					Agriculture					
					Nonpoint Source					
6	R	WOLF CREEK (1)	632.100							
				Sedimentation/Siltation		**High**	**14**	**Miles**		
				Livestock grazing. Problems to be addressed as part of Carson River WMI effort during years 3-5 of the next 13 years of the TMDL development process, resources permitting.						
					Range Land					
6	S	ALKALI LAKE, LOWER	641.000							
				Salinity/TDS/Chlorides		**Medium**	**10855**	**Acres**	**0198**	**0199**
				Natural internally drained lake; affected by agricultural diversions from tributaries. Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Flow Regulation/Modification					
					Natural Sources					
					Nonpoint Source					
6	S	ALKALI LAKE, MIDDLE	641.000							
				Salinity/TDS/Chlorides		**Medium**	**39475**	**Acres**	**0198**	**0199**
				Natural internally drained lake affected by agricultural diversions from tributaries. Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Flow Regulation/Modification					
					Natural Sources					
					Nonpoint Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	S	ALKALI LAKE, UPPER	641.000							
				Salinity/TDS/Chlorides		**Medium**	**24250**	**Acres**	**0198**	**0199**
				Natural internally drained lake affected by agricultural diversions from tributaries. Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Flow Regulation/Modification					
					Natural Sources					
					Nonpoint Source					
6	S	DEEP SPRINGS LAKE	605.000							
				Salinity/TDS/Chlorides		**Medium**	**1400**	**Acres**	**0198**	**0199**
				Natural internally drained lake; "natural impairment" to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Nonpoint Source					
6	S	HONEY LAKE	637.200							
				Arsenic		**Medium**	**55327**	**Acres**		
				Arsenic is from ultimately from natural sources, but amounts are affected by agricultural/geothermal drainage. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, probably in connection with TMDLs for Susan River system.						
					Flow Regulation/Modification					
					Natural Sources					
					Nonpoint Source					
				Salinity/TDS/Chlorides		**Medium**	**55327**	**Acres**		
				Natural internally directed lake affected by agricultural and geothermal drainage. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, as resources permit (probably in connection with TMDLs for the Susan River.)						
					Agriculture					
					Natural Sources					
					Nonpoint Source					
6	S	HONEY LAKE WILDFOWL MGMT. PONDS	637.200							
				Flow alterations		**Medium**	**500**	**Acres**		
				Ponds were affected by 1980s drought. Further monitoring may support delisting for this parameter. TMDLs, if needed, to be addressed during years 6-13 of the next 13 years of the TMDL development process.						
					Agricultural Water Diversion					
				Metals		**Medium**	**500**	**Acres**		
				Ponds were affected by 1980s drought; further monitoring may support delisting for this parameter. TMDLs, if needed, to be addressed during years 6-10 of the next 13 years of the TMDL development process, as resources permit.						
					Agriculture					
					Geothermal Development					
					Natural Sources					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Salinity/TDS/Chlorides		**Medium**	**500**	**Acres**		
				Ponds affected by agricultural, geothermal drainage. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Agriculture					
					Geothermal Development					
					Natural Sources					
				Trace Elements		**Medium**	**500**	**Acres**		
				Geothermal and agricultural drainage. Further monitoring might support delisting. TMDLs, if needed, to be addressedduring years 6-13 of the next 13 years of the TMDL development process, resources permitting.						
					Geothermal Development					
					Natural Sources					
6	**S**	**LITTLE ALKALI LAKE**	**603.100**							
				Arsenic		**Medium**	**1**	**Acres**	**0198**	**0199**
				Naturally impaired (by geologic/geothermal sources); natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					
6	**S**	**MONO LAKE**	**601.000**							
				Salinity/TDS/Chlorides		**High**	**35000**	**Acres**	**0198**	**0199**
				Naturally saline, internally drained lake with increased TDS due to diversions of tributaries by Los Angeles Dept. of Water and Power. Natural high levels of toxic elements to be addressed through "easy" (already funded) TMDL using Section 104/106 grant funds.						
					Flow Regulation/Modification					
					Natural Sources					
					Source Unknown					
6	**S**	**OWENS LAKE**	**603.300**							
				Salinity/TDS/Chlorides		**Low**	**20000**	**Acres**		
				Natural internally drained saline lake with lake level decreased, salinity increased due to diversions of tributaries by Los Angeles Department of Water and Power. Pending project by Great Basin Unified Air Pollution Control District may restore some beneficial uses to part of lakebed. TMDLs to be addressed during years 6-13 of the next 13 years of the TMDL development process, as resources permit. [20,000 acre area figure reflects past Corps of Engineers delineation of brine pool; natural lake bed is much larger.]						
					Flow Regulation/Modification					
					Natural Sources					
6	**S**	**SEARLES LAKE**	**621.000**							
				Salinity/TDS/Chlorides		**Medium**	**26100**	**Acres**	**0198**	**0199**
				Naturally saline, internally drained desert playa lake. Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Source Unknown					
6	**W**	**AMEDEE HOT SPRINGS**	**637.200**							
				Metals		**Medium**	**1**	**Acres**	**0198**	**0199**
				Natural geothermal springs developed for energy production; natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
6	W	BIG SPRINGS	603.100							
				Arsenic		Medium	1	Acres	0198	0199
				Natural geothermal source of arsenic at headwaters of Owens River. Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					
6	W	CINDER CONE SPRINGS	635.000							
				Nutrients		**Medium**	**1**	**Acres**		
				Springs tributary to Truckee River, affected by subsurface drainage from former wastewater disposal area (disposal discontinued 1978).						
					Source Unknown					
				Salinity/TDS/Chlorides		**Medium**	**1**	**Acres**		
				Subsurface drainage from former wastewater disposal area. Has not been monitored routinely in recent years; further monitoring may support delisting. TMDLs, if needed, to be addressed during years 3-5 of the next 13 years of the TMDL development process, as resources permit.						
					Wastewater					
6	W	FALES HOT SPRINGS	631.000							
				Metals		**Medium**	**1**	**Acres**	**0198**	**0199**
				Natural geothermal springs; natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					
6	W	HONEY LAKE AREA WETLANDS	637.200							
				Metals		**Medium**	**12000**	**Acres**		
				Geothermal drainage;effects of saline Honey Lake water. To be addressed during years 6-13 of the next 13 years of the TMDL development process, probably as part of TMDLs for Honey Lake and Susan River.						
					Agriculture					
					Geothermal Development					
					Natural Sources					
					Nonpoint Source					
6	W	KEOUGH HOT SPRINGS	603.000							
				Metals		**Medium**	**1**	**Acres**	**0198**	**0199**
				Natural geothermal springs developed for recreation. Natural impairment to be documented as "easy" (already funding) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					
6	W	TOP SPRING	637.200							
				Radiation		**Medium**	**1**	**Acres**	**0198**	**0199**
				Natural source (spring was developed as domestic water source for USFS ranger station and abandoned after testing showed MCL exceedance.) Natural impairment to be documented as "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					
6	W	WENDEL HOT SPRINGS	637.200							
				Metals		**Medium**	**1**	**Acres**	**0198**	**0199**
				Natural geothermal spring developed for energy. Metals source to be documented as natural for "easy" (already funded) TMDL using 1998 Section 104/106 grant funds.						
					Natural Sources					

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7	R	ALAMO RIVER	723.100							
				Pesticides		High	52	Miles	2002	2011
				Pesticides may be contained in agricultural return flows. Elevated fish tissue levels. Toxic bioassay results.						
					Agricultural Return Flows					
				Sedimentation/Siltation		High	52	Miles	1998	2000
					Agricultural Return Flows					
				Selenium		High	52	Miles	2000	2010
				Selenium originates from Upper Basin Portion of Colorado River. Elevated fish tissue levels.						
					Agricultural Return Flows					
7	R	COACHELLA VALLEY STORM CHANNEL	719.470							
				Bacteria		Low	20	Miles	2004	2009
				Bacteria objectives violated, threat of toxic bioassay results.						
					Source Unknown					
7	R	IMPERIAL VALLEY DRAINS	723.100							
				Pesticides		High	1305	Miles	2005	2011
				Elevated fish tissue levels and toxic bioassay results.						
					Agricultural Return Flows					
				Sedimentation/Siltation		High	1305	Miles	2000	2010
				Agricultural return flows.						
					Agricultural Return Flows					
				Selenium		High	1305	Miles	2000	2010
				Selenium originates from Upper Basin Portion of Colorado River. Elevated fish tissue levels.						
					Agricultural Return Flows					
7	R	NEW RIVER (R7)	723.100							
				Bacteria		High	60	Miles	1998	2005
				Regional Board proposes to establish TMDL in cooperation with U.S.EPA/Mexico.						
					Agricultural Return Flows					
				Nutrients		High	60	Miles	2002	2010
				Regional Board proposes to establish TMDL in cooperation with U.S.EPA/Mexico.						
					Agricultural Return Flows					
				Pesticides		High	60	Miles	2002	2013
					Agricultural Return Flows					
				Sedimentation/Siltation		High	60	Miles	1998	2002
				Agricultural Drainage from Imperial Valley and Mexicalli Valley.						
					Agricultural Return Flows					
				Volatile Organics/VOCs		High	60	Miles	2007	2013
					Agricultural Return Flows					
7	R	PALO VERDE OUTFALL DRAIN	715.400							
				Bacteria		Medium	16	Miles	2005	2011
					Source Unknown					

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7	S	SALTON SEA	728.000							
				Nutrients		Medium	220000	Acres	2002	2010
					Agricultural Return Flows					
				Salinity		Medium	220000	Acres	1998	2001
					Agricultural Return Flows					
				Selenium		Medium	220000	Acres	2000	2007
				Selenium originates from Upper Basin Portion of Colorado River.						
					Agricultural Return Flows					
8	B	ANAHEIM BAY	801.110							
				Metals		Medium	180	Acres	0108	0111
					Urban Runoff/Storm Sewers					
					Unknown Nonpoint Source					
				Pesticides		Medium	180	Acres	0108	0111
					Unknown Nonpoint Source					
8	B	HUNTINGTON HARBOUR	801.110							
				Metals		Medium	150	Acres	0108	0111
					Urban Runoff/Storm Sewers					
					Boatyards					
				Pathogens		Medium	150	Acres	0108	0111
					Urban Runoff/Storm Sewers					
				Pesticides		Medium	150	Acres	0108	0111
					Unknown Nonpoint Source					
8	B	NEWPORT BAY, LOWER	801.110							
				Metals		High	700	Acres	0196	0107
					Urban Runoff/Storm Sewers					
					Contaminated Sediments					
					Boatyards					
				Nutrients		High	700	Acres	0196	0198
					Agriculture					
					Urban Runoff/Storm Sewers					
				Pathogens		High	700	Acres	0697	0100
					Urban Runoff/Storm Sewers					
				Pesticides		High	700	Acres	0199	0102
					Agriculture					
					Contaminated Sediments					
				Priority Organics		High	700	Acres	0199	0102
					Contaminated Sediments					
					Unknown Nonpoint Source					
8	E	UPPER NEWPORT BAY ECOLOGICAL RESERVE	801.110							
				Metals		High	752	Acres	0199	0102
					Urban Runoff/Storm Sewers					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Nutrients		High	752	Acres	0196	0198
					Agriculture					
					Urban Runoff/Storm Sewers					
					Groundwater Loadings					
				Pathogens		High	752	Acres	0697	0100
					Urban Runoff/Storm Sewers					
				Pesticides		High	752	Acres	0199	0102
					Agriculture					
					Unknown Nonpoint Source					
				Sedimentation/Siltation		High	752	Acres	0196	0198
					Agriculture					
					Construction/Land Development					
					Channel Erosion					
					Erosion/Siltation					
8	L	BIG BEAR LAKE	801.710							
				Copper		Medium	2970	Acres	0102	0105
					Resource Extraction					
				Mercury		Medium	2970	Acres	0102	0105
					Resource Extraction					
				Metals		Medium	2970	Acres	0102	0105
					Resource Extraction					
				Noxious aquatic plants		Medium	2970	Acres	0102	0105
					Construction/Land Development					
					Unknown point source					
				Nutrients		Medium	2970	Acres	0102	0105
					Construction/Land Development					
					Snow Skiing Activities					
				Sedimentation/Siltation		Medium	2970	Acres	0102	0105
					Construction/Land Development					
					Snow Skiing Activities					
					Unknown Nonpoint Source					
8	L	CANYON LAKE (RAILROAD CANYON RESERVOIR)	802.120							
				Nutrients		Medium	600	Acres	0102	0104
					Nonpoint Source					
				Pathogens		Medium	600	Acres	0102	0104
					Nonpoint Source					
8	L	ELSINORE, LAKE	802.310							
				Nutrients		Medium	3300	Acres	0102	0104
					Unknown Nonpoint Source					
				Org. enrichment/Low D.O.		Medium	3300	Acres	0102	0104
					Unknown Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Sedimentation/Siltation		Medium	3300	Acres	0102	0104
					Urban Runoff/Storm Sewers					
				Unknown Toxicity		Medium	3300	Acres	0102	0104
					Unknown Nonpoint Source					
8	L	FULMOR, LAKE	802.210							
				Pathogens		Low	9	Acres	0108	0111
					Unknown Nonpoint Source					
8	L	PRADO PARK LAKE	801.210							
				Nutrients		Low	60	Acres	0108	0111
					Nonpoint Source					
				Pathogens		Low	60	Acres	0108	0111
					Nonpoint Source					
8	R	CHINO CREEK, REACH 1	801.210							
				Nutrients		Medium	2	Miles	0100	0105
					Agriculture					
					Dairies					
				Pathogens		Medium	2	Miles	0100	0105
					Dairies					
					Urban Runoff/Storm Sewers					
8	R	CHINO CREEK, REACH 2	801.210							
				High Coliform Count		Low	10	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	CUCAMONGA CREEK, VALLEY REACH	801.210							
				High Coliform Count		Low	13	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	GROUT CREEK	801.720							
				Metals		Medium	2	Miles	0102	0105
					Unknown Nonpoint Source					
				Nutrients		Medium	2	Miles	0102	0105
					Unknown Nonpoint Source					
8	R	KNICKERBOCKER CREEK	801.710							
				Metals		Medium	2	Miles	0103	0105
					Unknown Nonpoint Source					
				Pathogens		Medium	2	Miles	0103	0105
					Unknown Nonpoint Source					
8	R	LYTLE CREEK	801.400							
				Pathogens		Low	18	Miles	0108	0111
					Unknown Nonpoint Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
8	R	MILL CREEK (PRADO AREA)	801.250							
				Nutrients		Medium	4	Miles	0100	0105
					Agriculture					
					Dairies					
				Pathogens		Medium	4	Miles	0100	0105
					Dairies					
				Suspended solids		Medium	4	Miles	0100	0105
					Dairies					
8	R	MILL CREEK, REACH 1	801.580							
				Pathogens		Low	5	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	MILL CREEK, REACH 2	801.580							
				Pathogens		Low	8	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	MOUNTAIN HOME CREEK	801.580							
				Pathogens		Low	4	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	MOUNTAIN HOME CREEK, EAST FORK	801.700							
				Pathogens		Low	1	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	RATHBONE (RATHBUN) CREEK	801.720							
				Nutrients		Medium	2	Miles	0102	0105
					Snow Skiing Activities					
					Unknown Nonpoint Source					
				Sedimentation/Siltation		Medium	2	Miles	0102	0105
					Snow Skiing Activities					
					Unknown Nonpoint Source					
8	R	SAN DIEGO CREEK, REACH 1	801.110							
				Metals		High	6	Miles	0199	0102
					Unknown Nonpoint Source					
				Nutrients		High	6	Miles	0196	0198
					Agriculture					
					Urban Runoff/Storm Sewers					
					Groundwater Loadings					
				Pesticides		High	6	Miles	0199	0102
					Unknown Nonpoint Source					
				Sedimentation/Siltation		High	6	Miles	0196	0198
					Agriculture					
					Construction/Land Development					
					Channel Erosion					
					Erosion/Siltation					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
8	R	SAN DIEGO CREEK, REACH 2	801.110							
				Metals		High	6	Miles	0199	0102
					Urban Runoff/Storm Sewers					
				Nutrients		High	6	Miles	0196	0198
					Agriculture					
					Urban Runoff/Storm Sewers					
					Groundwater Loadings					
				Sedimentation/Siltation		High	6	Miles	0196	0198
					Agriculture					
					Construction/Land Development					
					Channel Erosion					
					Erosion/Siltation					
				Unknown Toxicity		High	6	Miles	0199	0102
					Unknown Nonpoint Source					
8	R	SANTA ANA RIVER, REACH 3	801.200							
				Nutrients		Medium	3	Miles	0100	0111
					Dairies					
				Pathogens		Medium	3	Miles	0100	0111
					Dairies					
				Salinity/TDS/Chlorides		Medium	3	Miles	0100	0111
					Dairies					
8	R	SANTA ANA RIVER, REACH 4	801.270							
				Pathogens		Low	12	Miles	0108	0111
					Nonpoint Source					
8	R	SANTIAGO CREEK, REACH 4	801.120							
				Salinity/TDS/Chlorides		Low	2	Miles	0108	0111
					Source Unknown					
8	R	SILVERADO CREEK	801.120							
				Pathogens		Low	2	Miles	0108	0111
					Unknown Nonpoint Source					
				Salinity/TDS/Chlorides		Low	2	Miles	0108	0111
					Unknown Nonpoint Source					
8	R	SUMMIT CREEK	801.710							
				Nutrients		Medium	2	Miles	0102	0105
					Construction/Land Development					
9	B	MISSION BAY	906.400							
				Eutrophic		Medium	1	Acres	0705	0708
					Nonpoint/Point Source					
				High Coliform Count		Low	1540	Acres	0799	0709
					Nonpoint/Point Source					

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Lead	Nonpoint/Point Source	Medium	1	Acres	0705	0708
9	B	SAN DIEGO BAY	900.00							
				Benthic Comm. Effects *The listing covers the following areas: Near Sub Base 16 acres, Near Grape Street 7 acres, Downtown Piers 10 acres, Near Coronado Bridge 30 acres, Near Chollas Creek 14 acres, San Diego Naval Station 76 acres, Seventh Street Channel 9 acres, North of 24th Street Marine Terminal 10 acres.*	High	172	Acres	0198	0703
				Copper *This listing is for dissolved copper in the Shelter Island yacht Basin in San Diego Bay.*	Nonpoint/Point Source	High	50	Acres	0198	0703
				Sediment Toxicity *The listing covers the following areas: Near Sub Base 16 acres, Near Grape Street 7 acres, Downtown Piers 10 acres, Near Coronado Bridge 30 acres, Near Chollas Creek 14 acres, San Diego Naval Station 76 acres, Seventh Street Channel 9 acres, North of 24th Street Marine Terminal 10 acres.*	High	172	Acres	0198	0703
9	C	PACIFIC OCEAN, ALISO HSA 901.13	901.13							
				High Coliform Count	Nonpoint/Point Source	Medium	0.01	Miles	0797	0701
9	C	PACIFIC OCEAN, BUENA VISTA HA 904.20	904.20							
				High Coliform Count	Nonpoint/Point Source	Low	0.02	Miles	0799	0709
9	C	PACIFIC OCEAN, CORONADO HA 910.10	910.10							
				High Coliform Count	Nonpoint/Point Source	Low	0.04	Miles	0799	0709
9	C	PACIFIC OCEAN, DANA POINT HSA 901.14	901.14							
				High Coliform Count	Nonpoint/Point Source	Low	0.06	Miles	0700	0710
9	C	PACIFIC OCEAN, ESCONDIDO CREEK HA 904.60	904.60							
				High Coliform Count	Nonpoint/Point Source	Low	0.02	Miles	0799	0709
9	C	PACIFIC OCEAN, LAGUNA BEACH HSA 901.12	901.12							
				High Coliform Count	Nonpoint/Point Source	Low	0.15	Miles	0700	0710

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
9	C	PACIFIC OCEAN, LOMA ALTA HSA 904.10	904.10							
				High Coliform Count	Nonpoint/Point Source	Low	1	Miles	0799	0709
9	C	PACIFIC OCEAN, LOWER SAN JUAN HSA	901.270							
				High Coliform Count	Nonpoint/Point Source	Low	0.02	Miles	0700	0710
9	C	PACIFIC OCEAN, SAN CLEMENTE HA 901.30	901.30							
				High Coliform Count	Nonpoint/Point Source	Low	0.15	Miles	0700	0710
9	C	PACIFIC OCEAN, SAN DIEGO HU 907.00	907.00							
				High Coliform Count	Nonpoint/Point Source	Low	0.5	Miles	0799	0709
9	C	PACIFIC OCEAN, SAN DIEGUITO HU 905.00	905.00							
				High Coliform Count	Nonpoint/Point Source	Low	0.02	Miles	0799	0709
9	C	PACIFIC OCEAN, SAN LUIS REY HU 903.00	903.00							
				High Coliform Count	Nonpoint/Point Source	Low	0.01	Miles	0799	0709
9	C	PACIFIC OCEAN, SAN MARCOS HA 904.50	904.50							
				High Coliform Count	Nonpoint/Point Source	Low	0.01	Miles	0799	0709
9	C	PACIFIC OCEAN, SCRIPPS HA 906.30	906.30							
				High Coliform Count	Nonpoint/Point Source	Low	0.13	Miles	0799	0709
9	C	PACIFIC OCEAN, TIJUANA HU 911.00	911.00							
				High Coliform Count	Nonpoint/Point Source	Low	3.2	Miles	0798	0711
9	C	SAN DIEGO BAY, LINDBERGH HSA 908.21	908.21							
				High Coliform Count	Nonpoint/Point Source	Low	0.2	Miles	0799	0709

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1998 CALIFORNIA 303(d) LIST AND TMDL PRIORITY SCHEDULE

Approved by USEPA: 12-May-99

REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
9	C	SAN DIEGO BAY, TELEGRAPH HSA 909.11	909.11							
				High Coliform Count	Nonpoint/Point Source	Low	0.01	Miles	0799	0709
9	E	AGUA HEDIONDA LAGOON	904.310							
				High Coliform Count	Nonpoint/Point Source	Low	5	Acres	0799	0709
				Sedimentation/Siltation	Nonpoint/Point Source	Medium	5	Acres	0704	0707
9	E	ALISO CREEK MOUTH OF ORANGE	901.130							
				High Coliform Count	Nonpoint/Point Source	Medium	0.3	Acres	0797	0701
9	E	BUENA VISTA LAGOON	904.210							
				High Coliform Count	Nonpoint/Point Source	Low	350	Acres	0799	0709
				Nutrients	Nonpoint/Point Source	Low	150	Acres	0704	0707
				Sedimentation/Siltation	Nonpoint/Point Source	Medium	350	Acres	0704	0707
9	E	FAMOSA SLOUGH & CHANNEL	906.400							
				Eutrophic	Nonpoint Source	Medium	28	Acres	0705	0708
9	E	LOMA ALTA SLOUGH	904.100							
				Eutrophic	Nonpoint Source	Low	8	Acres	0799	0709
				High Coliform Count	Nonpoint Source	Low	8	Acres	0799	0709
9	E	LOS PENASQUITOS LAGOON	906.100							
				Sedimentation/Siltation	Nonpoint/Point Source	Medium	385	Acres	0705	0708
9	E	SAN ELIJO LAGOON	904.610							
				Eutrophic	Nonpoint/Point Source	Low	330	Acres	0799	0709
				High Coliform Count	Nonpoint/Point Source	Low	150	Acres	0799	0709
				Sedimentation/Siltation	Nonpoint/Point Source	Medium	150	Acres	0704	0707
9	E	SAN JUAN CREEK (MOUTH)	901.200							
				High Coliform Count	Nonpoint/Point Source	Low	2	Acres	0700	0710

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
9	E	SANTA MARGARITA LAGOON	902.110							
				Eutrophic		High	1	Acres	0796	0705
					Nonpoint/Point Source					
9	E	TIJUANA RIVER ESTUARY	911.110							
				Eutrophic		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
				High Coliform Count		Low	150	Acres	0798	0711
					Nonpoint/Point Source					
				Lead		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
				Nickel		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
				Pesticides		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
				Thallium		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
				Trash		Low	1	Acres	0798	0711
					Nonpoint/Point Source					
9	L	GUAJOME LAKE	903.110							
				Eutrophic		Medium	25	Acres	0708	0711
					Nonpoint/Point Source					
9	R	ALISO CREEK	901.130							
				High Coliform Count		Medium	1	Miles	0797	0701
					Nonpoint/Point Source					
9	R	CHOLLAS CREEK	908.220							
				Cadmium		High	1	Miles	0198	0703
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				Copper		High	1	Miles	0198	0703
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				High Coliform Count		Low	1	Miles	0799	0709
					Nonpoint/Point Source					
				Lead		High	1	Miles	0198	0703
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				Toxicity		High	1	Miles	0198	0703
				Toxicity in Stormwater.						
					Nonpoint/Point Source					
				Zinc		High	1	Miles	0198	0703
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
9	R	RAINBOW CREEK	902.200							
				Eutrophic		High	5	Miles	0798	0700
					Nonpoint/Point Source					
9	R	SAN JUAN CREEK LOWER	901.270							
				High Coliform Count		Low	1	Miles	0700	0710
					Nonpoint/Point Source					
9	R	TECOLOTE CREEK	906.500							
				Cadmium		Medium	6	Miles	0705	0708
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				Copper		Medium	6	Miles	0705	0708
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				High Coliform Count		Low	6	Miles	0799	0709
					Nonpoint/Point Source					
				Lead		Medium	6	Miles	0705	0708
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				Toxicity		Medium	6	Miles	0705	0708
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
				Zinc		Medium	6	Miles	0705	0708
				Elevated levels in Stormwater.						
					Nonpoint/Point Source					
9	R	TIJUANA RIVER	911.110							
				Eutrophic		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				High Coliform Count		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Org. enrichment/Low D.O.		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Pesticides		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Solids		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Synthetic Organics		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Trace Elements		Low	7	Miles	0798	0711
					Nonpoint/Point Source					
				Trash		Low	7	Miles	0798	0711
					Nonpoint/Point Source					

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REGION	TYPE	NAME	HYDRO UNIT	POLLUTANT/STRESSOR*	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE

ABBREVIATIONS

REGIONAL WATER QUALITY CONTROL BOARDS

1 North Coast
2 San Francisco Bay
3 Central Coast
4 Los Angeles
5 Central Valley
6 Lahontan
7 Colorado River Basin
8 Santa Ana
9 San Diego

WATER BODY TYPE

B =	BAYS AND HARBORS	L =	LAKES / RESERVOIRS	S =	SALINE LAKES
C =	COASTAL SHORELINES	O =	OCEAN AND OPEN BAYS	T =	WETLANDS, TIDAL
E =	ESTUARIES	R =	RIVERS / STREAMS	W=	WETLANDS, FRESHWATER
G =	GROUND WATER				

HYDRO UNIT

"Hydro Unit" is the State Water Resources Control Board hydrological subunit area.

START AND END DATES

Start and End Dates are shown as the year or as month/year.

"GROUP A" or "CHEM A" PESTICIDES

aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane (including lindane), endosulfan, and toxaphene

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APPENDIX C

CAUSES AND SOURCES OF GROUNDWATER IMPAIRMENT

APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
1	ALEXANDER VALLEY AREA	114.25	Oil and grease	23	Lust/Leaking Undergrnd Stor. Tanks	23	23
			Priority organics	23			
1	ANDERSON VALLEY	1-190	Oil and grease	5	Lust/Leaking Undergrnd Stor. Tanks	5	5
			Priority organics	5	Petroleum Activities	5	
					Resource Extraction	5	
					Spills	5	
1	ANNAPOLIS OHLSON RANCH	1-490	Oil and grease	10	Lust/Leaking Undergrnd Stor. Tanks	10	10
1	BIG RIVER VALLEY	1-450	Oil and grease	5	Lust/Leaking Undergrnd Stor. Tanks	5	5
			Priority organics	5	Spills	5	
1	BODEGA BAY AREA	1-210	Oil and grease	5	Lust/Leaking Undergrnd Stor. Tanks	5	5
			Petroleum/Gasoline	5	Spills	5	
			Priority organics	5			
1	CLOVERDALE AREA	114.25	Oil and grease	9	Lust/Leaking Undergrnd Stor. Tanks	9	9
			Pesticides	9	Spills	9	
			Priority organics	9			
1	EEL RIVER VALLEY	1-100	Oil and grease	120	Lust/Leaking Undergrnd Stor. Tanks	120	120
			Priority organics	120	Spills	120	
1	EUREKA PLAIN	1-90	Oil and grease	60	Land Disposal	60	60
			Priority organics	60	Landfills	60	
					Lust/Leaking Undergrnd Stor. Tanks	60	
					Petroleum Activities	60	
					Resource Extraction	60	
					Spills	60	
1	FORT BRAGG TERRACE AREA	1-210	Oil and grease	24	Lust/Leaking Undergrnd Stor. Tanks	24	24
			Priority organics	24	Spills	24	
1	GARBERVILLE TOWN AREA	1-320	Oil and grease	5	Lust/Leaking Undergrnd Stor. Tanks	5	5
			Priority organics	5	Spills	5	
1	GUALALA RIVER VALLEY	1-470	Oil and grease	5	Lust/Leaking Undergrnd Stor. Tanks	5	5
			Priority organics	5			
1	HEALDSBURG AREA	114.25	Oil and grease	27	Lust/Leaking Undergrnd Stor. Tanks	27	27
			Priority organics	27	Spills	27	
1	LEGGETT AREA	1000000	Oil and grease	2	Lust/Leaking Undergrnd Stor. Tanks	2	2

* Causes and Sources are not linked.

** "Size" refers to the affected size (square miles) of the water body and "Total Size" refers to the size of the entire water body.

APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Priority organics	2			
1	LITTLE LAKE VALLEY	1-130	Oil and grease	17	Lust/Leaking Undergrnd Stor. Tanks	17	17
			Priority organics	17	Spills	17	
1	LOWER RUSSIAN RIVER VALLEY	114.10	Oil and grease	9	Lust/Leaking Undergrnd Stor. Tanks	9	9
			Priority organics	9	Spills	9	
1	MAD RIVER VALLEY	1-80	Oil and grease	60	Lust/Leaking Undergrnd Stor. Tanks	60	60
			Priority organics	60	Spills	60	
1	MODOC PLATEAU PVA	1-240	Oil and grease	3000	Lust/Leaking Undergrnd Stor. Tanks	3000	3000
			Priority organics	3000	Petroleum Activities	3000	
					Resource Extraction	3000	
					Spills	3000	
1	SANTA ROSA PLAINS	114.22	Metals	96	Agriculture	96	96
			Nutrients	96	Lust/Leaking Undergrnd Stor. Tanks	96	
			Oil and grease	96	Petroleum Activities	96	
			Priority organics	96	Resource Extraction	96	
					Spills	96	
1	SHASTA VALLEY	1-40	Oil and grease	340	Lust/Leaking Undergrnd Stor. Tanks	340	340
			Pesticides	340	Petroleum Activities	340	
			Priority organics	340	Resource Extraction	340	
					Spills	340	
1	SMITH RIVER PLAIN	1-10	Pesticides	70	Agriculture	70	70
			Petroleum/Gasoline	70	Lust/Leaking Undergrnd Stor. Tanks	70	
			Priority organics	70	Spills	70	
1	UKIAH VALLEY	114.31	Metals	16	Lust/Leaking Undergrnd Stor. Tanks	16	16
			Priority organics	16	Petroleum Activities	16	
					Resource Extraction	16	
					Spills	16	
1	WEAVERVILLE AREA	1000000	Petroleum/Gasoline	2	Lust/Leaking Undergrnd Stor. Tanks	2	2
			Priority organics	2	Spills	2	
1	WINDSOR AREA	1000000	Metals	2	Lust/Leaking Undergrnd Stor. Tanks	2	2
			Oil and grease	2	Spills	2	
			Priority organics	2			

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
2	ALAMEDA CREEK (NILES CONE) GW	204.300	Nonpriority organics	96	Lust/Leaking Undergrnd Stor. Tanks	96	97
			Priority organics	96			
			Salinity/TDS/chlorides	96			
2	LIVERMORE VALLEY GW	204.300	Nonpriority organics	170	Lust/Leaking Undergrnd Stor. Tanks	170	170
2	Napa Valley GW	0650080	Priority organics	82.03	Land Disposal	82.03	82.03
					Lust/Leaking Undergrnd Stor. Tanks	82.03	
					Nonpoint Source	82.03	
					Septage Disposal	82.03	
2	PETALUMA VALLEY GW	206.300	Pathogens/Path.Indicators	41	Agriculture	41	41
2	Santa Clara Valley GW	0550040	Nonpriority organics	298.61	Lust/Leaking Undergrnd Stor. Tanks	298.61	298.6
			Priority organics	298.61			
			Salinity/TDS/chlorides	298.61			
3	ARROYO GRANDE VALLEY-NIPOMO MESA AREA	310.320	Chloroform	90	Industrial Point Sources	90	90
			Priority organics	90	Source Unknown	90	
			Toluene	90			
			Total Trihalomethanes	90			
3	BIG SUR GROUNDWATER BASIN	308.000	Chloroform	1	Source Unknown	1	1
			Dibromochloromethane/DBCM	1			
			Freon II	1			
			Nonpriority organics	1			
			Priority organics	1			
3	CARMEL VALLEY	307.000	Chloroform	10	Agriculture	10	10
			Nitrates	10	Source Unknown	10	
			Nutrients	10			
			PCE/Tetrachloroethylene	10			
			Priority organics	10			
3	CHORRO VALLEY	310.220	Bromodichloromethane/BDCM	20	Agricultural Return Flows	20	20
			Chloroform	20	Agriculture	20	
			Flow alteration	20	Groundwater Withdrawal	20	
			Nitrates	20	Irrigated Crop Production	20	
			Nutrients	20	Land Disposal	20	
			Priority organics	20	Municipal Point Sources	20	
			Salinity/TDS/chlorides	4	Nonpoint Source	20	

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Point Source	20	
					Saltwater Intrusion	20	
					Source Unknown	20	
3	CUYAMA VALLEY	312.000	Priority organics	105	Industrial Point Sources	105	105
			Toluene	105			
3	GILROY-HOLLISTER	305.000	Nitrates	350	Agriculture	350	350
			Nutrients	350	Industrial Point Sources	350	
			PCE/Tetrachloroethylene	350	Source Unknown	350	
			Priority organics	350			
			TCA/Trichloroethane	350			
			TCE/Trichloroethylene	350			
3	GOLETA BASIN	315.310	Bromoform	16	Source Unknown	16	16
			Chloroform	16			
			Dichlorobromomethane/DCBM	16			
			Freon II	16			
			Nonpriority organics	16			
			Priority organics	16			
			Total Trihalomethanes	16			
3	LANGLEY AREA GROUNDWATER BASIN	300.000	Nitrates	27	Agriculture	27	27
			Nutrients	27			
3	LOS OSOS VALLEY	310.220	Nitrates	20	Agriculture	20	20
			Nutrients	20	Groundwater Loadings	20	
			Salinity/TDS/chlorides	20	Groundwater Withdrawal	20	
					Irrigated Crop Production	20	
					Land Disposal	20	
					Nonpoint Source	20	
					Saltwater Intrusion	20	
					Septage Disposal	20	
3	MONTECITO AREA	315.330	Chloroform	3	Source Unknown	3	3
			Dichloroethylene/DCE	3			
			Priority organics	3			
			TCA/Trichloroethane	3			
3	PAJARO VALLEY	305.000	Bromodichloromethane/BDCM	120	Agricultural Return Flows	120	120
			Bromoform	120	Agriculture	120	

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Chloroform	120	Groundwater Loadings	120	
			Chromium	120	Groundwater Withdrawal	120	
			Dibromochloromethane/DBCM	120	Industrial Point Sources	120	
			Diethylhexylpthalate/DEHP	120	Irrigated Crop Production	120	
			Iron	120	Nonpoint Source	120	
			Lead	120	Point Source	120	
			Manganese	120	Source Unknown	120	
			Mercury	120			
			Metals	120			
			Nonpriority organics	120			
			Nutrients	120			
			PCE/Tetrachloroethylene	120			
			Priority organics	120			
			Salinity/TDS/chlorides	120			
			Saltwater Intrusion	120			
			Sulfates	120			
			TCE/Trichloroethylene	120			
			Total Trihalomethanes	120			
3	PASO ROBLES BASIN	309.800	Bromodichloromethane/BDCM	886	Source Unknown	886	886
			Bromoform	886			
			Chloroform	886			
			Dichlorobenzene	886			
			Dichloroethylene/DCE	886			
			Freon II	886			
			Nonpriority organics	886			
			Priority organics	886			
			Toluene	886			
			Total Trihalomethanes	886			
3	SALINAS VALLEY, EASTSIDE AQUIFER	309.000	Dichloroethane/DCA	124	Agriculture	124	124
			Freon II	124	Agriculture-irrigation tailwater	124	
			Nitrates	124	Animal Operations	124	
			Nonpriority organics	124	Land Disposal	124	
			Nutrients	124	Natural Sources	124	
			PCE/Tetrachloroethylene	124	Septage Disposal	124	
			Priority organics	124	Source Unknown	124	

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Salinity/TDS/chlorides	124			
			Toluene	124			
3	SALINAS VALLEY, FOREBAY	309.000	Nitrates	167	Agriculture	167	167
			Nutrients	167	Animal Operations	167	
			Priority organics	167	Lust/Leaking Undergrnd Stor. Tanks	167	
			Salinity/TDS/chlorides	167	Nonpoint Source	167	
3	SALINAS VALLEY, PRESSURE	309.000	Nitrates	124	Agriculture	124	124
			Nutrients	124	Animal Operations	124	
			Priority organics	124	Land Disposal	124	
			Salinity/TDS/chlorides	124	Point Source	124	
					Saltwater Intrusion	124	
					Septage Disposal	124	
3	SALINAS VALLEY, UPPER VALLEY AQUIFER	309.000	Cadmium	205	Agriculture	205	205
			Metals	205	Industrial Point Sources	205	
			Nitrates	205	Land Disposal	205	
			Nutrients	205	Natural Sources	205	
			Priority organics	205	Septage Disposal	205	
			Salinity/TDS/chlorides	205			
			Trace Elements	205			
3	SAN ANTONIO CREEK VALLEY	313.000	Chlorides	25	Industrial Point Sources	25	25
			Heptachlor	25	Source Unknown	25	
			Herbacides	25			
			Metals	25			
			Pesticides	25			
			Priority organics	25			
			Salinity/TDS/chlorides	25			
			Sulfates	25			
			Total Dissolved Solids	25			
3	SAN LUIS OBISPO VALLEY	310.240	Chloroform	15	Agriculture	15	15
			Overdraft	15	Industrial Point Sources	15	
			PCE/Tetrachloroethylene	15	Source Unknown	15	
			Priority organics	15			
3	SANTA BARBARA BASIN	315.320	Bromoform	20	Industrial Point Sources	20	20
			Dichloroethane/DCA	20	Source Unknown	20	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Dichloroethylene/DCE	20			
			Nonpriority organics	20			
			PCE/Tetrachloroethylene	20			
			Priority organics	20			
			Total Trihalomethanes	20			
3	SANTA MARIA RIVER VALLEY	312.000	Atrazine	265	Agriculture	265	265
			Bromoform	265	Industrial Point Sources	265	
			Dibromochloromethane/DBCM	265	Irrigated Crop Production	265	
			Dichloroethane/DCA	265	Municipal Point Sources	265	
			Freon II	265	Source Unknown	265	
			Nitrates	265			
			Nonpriority organics	265			
			Nutrients	265			
			Other inorganics	265			
			PCE/Tetrachloroethylene	265			
			Pesticides	265			
			Priority organics	265			
			Salinity/TDS/chlorides	265			
			TCA/Trichloroethane	265			
			TCE/Trichloroethylene	265			
			Total Trihalomethanes	265			
3	SANTA YNEZ RIVER VALLEY	314.000	Benzene	123	Agriculture	123	123
			Dichloroethylene/DCE	123	Agriculture-irrigation tailwater	123	
			Nonpriority organics	123	Agriculture-subsurface drainage	123	
			Priority organics	123	Lust/Leaking Undergrnd Stor. Tanks	123	
			Salinity/TDS/chlorides	123	Municipal Point Sources	123	
			Toluene	123	Point Source	123	
			Xylene	123	Source Unknown	123	
					Unknown point source	123	
3	SCOTTS VALLEY	304.000	Chloroform	60	Industrial Point Sources	60	60
			Dichlorobenzene	60	Source Unknown	60	
			Diethylhexylpthalate/DEHP	60			
			PCE/Tetrachloroethylene	60			
			Priority organics	60			
			TCE/Trichloroethylene	60			

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Toluene	60			
			Total Trihalomethanes	60			
3	SEASIDE AREA GROUNDWATER BASIN	309.500	Chlorine	50	Industrial Point Sources	50	50
			Dichloroethylene/DCE	50	Source Unknown	50	
			Freon II	50			
			Methylene	50			
			Nonpriority organics	50			
			PCE/Tetrachloroethylene	50			
			Priority organics	50			
			TCA/Trichloroethane	50			
			TCE/Trichloroethylene	50			
			Toluene	50			
4	ARROYO SANTA ROSA BASIN	403.63	Nonpriority organics	5	Agriculture	5	5
			Nutrients	5	Land Disposal	5	
					Septage Disposal	5	
4	CENTRAL BASIN LOWER-PRODUCTION ZONES	405.15	Priority organics	277	Groundwater Loadings	277	277
					Land Disposal	77	
					Landfills	277	
4	CENTRAL BASIN UPPER-SHALLOW AND SEMI-PERCHED AQUIFERS	405.15	Priority organics	277	Illegal dumping	277	277
					Industrial Point Sources	277	
					Other	277	
					Urban Runoff/Storm Sewers	277	
4	CHINO AREA BASIN	481.21	Nutrients	10	Agriculture	10	10
					Animal Operations	10	
					Land Disposal	10	
					Septage Disposal	10	
4	LOWER OJAI VALLEY BASIN	402.32	Nutrients	23	Agriculture	23	23
					Animal Operations	23	
					Land Disposal	23	
					Septage Disposal	23	
4	LOWER VENTURA BASIN	402.1	Nutrients	8	Agriculture	8	8
					Animal Operations	8	
					Land Disposal	8	
					Septage Disposal	8	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Urban Runoff/Storm Sewers	8	
4	MAIN SAN GABRIEL VALLEY BASIN	, 405.42	Priority organics	141	Industrial Point Sources	141	141
					Land Disposal	41	
					Landfills	141	
4	OXNARD PLAIN BASIN	403.11	Nutrients	111	Agriculture	111	111
			Salinity/TDS/chlorides	111	Groundwater Loadings	111	
					Groundwater Withdrawal	111	
					Land Disposal	111	
					Septage Disposal	111	
4	PLEASANT VALLEY BASIN	403.12	Salinity/TDS/chlorides	36	Groundwater Loadings	36	36
					Land Disposal	36	
					Septage Disposal	36	
4	PUENTE BASIN	405.41	Priority organics	16	Agriculture	16	16
			Salinity/TDS/chlorides	16	Industrial Point Sources	16	
					Land Disposal	16	
					Landfills	16	
4	RAYMOND BASIN	405.31	Priority organics	37	Industrial Point Sources	37	37
					Land Disposal	37	
					Landfills	37	
4	SAN ANTONIO CREEK AREA BASIN	402.2	Nutrients	4	Agriculture	4	4
					Animal Operations	4	
					Land Disposal	4	
					Septage Disposal	4	
					Urban Runoff/Storm Sewers	4	
4	SANTA CLARA-PIRU CREEK BASIN	403.41	Nutrients	14	Agriculture	14	14
					Animal Operations	14	
					Land Disposal	14	
					Septage Disposal	14	
					Urban Runoff/Storm Sewers	14	
4	SANTA CLARA-SESPE BASIN	403.31	Nutrients	31	Agriculture	31	31
					Land Disposal	31	
					Septage Disposal	31	
4	SANTA MONICA BASIN	405.13	Priority organics	40	Industrial Point Sources	40	40

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
4	SIERRA PELONA VALLEY BASIN	403.55	Nutrients	11	Agriculture	11	11
					Animal Operations	11	
					Land Disposal	11	
					Septage Disposal	11	
4	VERDUGO BASIN	405.24	Nutrients	11	Land Disposal	11	11
					Septage Disposal	11	
4	WEST COAST BASIN LOWER-PRODUCTION ZONES	405.12	Salinity/TDS/chlorides	141	Groundwater Loadings	141	141
					Groundwater Withdrawal	141	
4	WEST COAST BASIN UPPER-SHALLOW AND SEMI-PERCHED ZONES	405.12	Priority organics	141	Groundwater Withdrawal	141	141
			Salinity/TDS/chlorides	141	Illegal dumping	141	
					Industrial Point Sources	141	
					Urban Runoff/Storm Sewers	141	
5	CHOWCHILLA BASIN PORT	5-22	DBCP/Dibromochlorpropane	230	Agriculture	230	230
			Nitrates	230	Animal Operations	230	
			Nonpriority organics	230	Dairies	230	
			Nutrients	230	Industrial Point Sources	230	
			Pesticides	230	Land Disposal	230	
			Priority organics	230	Lust/Leaking Undergrnd Stor. Tanks	230	
			Salinity/TDS/chlorides	230	Septage Disposal	230	
5	DELTA - MENDOTA BASIN PORT	5-22	Arsenic	365	Agriculture	365	365
			Boron	365	Industrial Point Sources	365	
			Metals	365	Lust/Leaking Undergrnd Stor. Tanks	365	
			Nitrates	365	Natural Sources	365	
			Nonpriority organics	365			
			Nutrients	365			
			Priority organics	365			
			Salinity/TDS/chlorides	365			
			Selenium	365			
			Trace Elements	365			
5	EASTERN SAN JOAQUIN COUNTY BASIN PORT	5-22	DBCP/Dibromochlorpropane	1140	Agriculture	1140	1140
			Nitrates	1140	Animal Operations	1140	
			Nonpriority organics	1140	Dairies	1140	
			Nutrients	1140	Industrial Point Sources	1140	
			Pesticides	1140	Land Disposal	1140	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Priority organics	1140	Lust/Leaking Undergrnd Stor. Tanks	1140	
			Salinity/TDS/chlorides	1140	Natural Sources	1140	
					Septage Disposal	1140	
5	KAWEAH BASIN PORT	5-22	DBCP/Dibromochlorpropane	690	Agriculture	690	690
			Nitrates	690	Animal Operations	690	
			Nonpriority organics	690	Dairies	690	
			Nutrients	690	Industrial Point Sources	690	
			Pesticides	690	Land Disposal	690	
			Priority organics	690	Lust/Leaking Undergrnd Stor. Tanks	690	
			Salinity/TDS/chlorides	690	Septage Disposal	690	
5	KERN COUNTY BASIN PORT	5-22	Arsenic	3770	Agriculture	3770	3770
			DBCP/Dibromochlorpropane	3770	Animal Operations	3770	
			Metals	3770	Dairies	3770	
			Nitrates	3770	Industrial Point Sources	3770	
			Nonpriority organics	3770	Land Disposal	3770	
			Nutrients	3770	Lust/Leaking Undergrnd Stor. Tanks	3770	
			Pesticides	3770	Natural Sources	3770	
			Priority organics	3770	Septage Disposal	3770	
			Salinity/TDS/chlorides	3770			
			Selenium	3770			
			Trace Elements	3770			
5	KINGS BASIN PORT	5-22	DBCP/Dibromochlorpropane	1610	Agriculture	1610	1610
			Nitrates	1610	Animal Operations	1610	
			Nonpriority organics	1610	Dairies	1610	
			Nutrients	1610	Industrial Point Sources	1610	
			Pesticides	1610	Land Disposal	610	
			Priority organics	1610	Lust/Leaking Undergrnd Stor. Tanks	1610	
			Salinity/TDS/chlorides	1610	Septage Disposal	610	
5	MADERA BASIN PORT	5-22	DBCP/Dibromochlorpropane	580	Agriculture	580	580
			Nitrates	580	Animal Operations	580	
			Nonpriority organics	580	Dairies	580	
			Nutrients	580	Industrial Point Sources	580	
			Pesticides	580	Land Disposal	580	
			Priority organics	580	Lust/Leaking Undergrnd Stor. Tanks	580	
			Salinity/TDS/chlorides	580	Septage Disposal	580	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
5	MERCED BASIN PORT	5-22	DBCP/Dibromochlorpropane	690	Agriculture	690	690
			Nitrates	690	Animal Operations	690	
			Nonpriority organics	690	Dairies	690	
			Nutrients	690	Industrial Point Sources	690	
			Pesticides	690	Land Disposal	690	
			Priority organics	690	Lust/Leaking Undergrnd Stor. Tanks	690	
					Septage Disposal	690	
5	MODESTO BASIN PORT	5-22	DBCP/Dibromochlorpropane	340	Agriculture	340	340
			Nitrates	340	Dairies	340	
			Nonpriority organics	340	Industrial Point Sources	340	
			Nutrients	340	Land Disposal	340	
			Pesticides	340	Lust/Leaking Undergrnd Stor. Tanks	340	
			Priority organics	340	Septage Disposal	340	
5	SACRAMENTO COUNTY BASIN PORT	5-22	Nonpriority organics	750	Industrial Point Sources	750	750
			Priority organics	750	Lust/Leaking Undergrnd Stor. Tanks	750	
5	TRACY BASIN PORT	5-22	Arsenic	570	Agriculture	570	570
			Boron	570	Industrial Point Sources	570	
			Metals	570	Land Disposal	570	
			Molybdenum	570	Lust/Leaking Undergrnd Stor. Tanks	570	
			Nitrates	570	Natural Sources	570	
			Nonpriority organics	570	Septage Disposal	570	
			Nutrients	570			
			Priority organics	570			
			Salinity/TDS/chlorides	570			
			Trace Elements	570			
5	TULARE LAKE BASIN PORT	5-22	Arsenic	780	Agriculture	780	780
			Boron	780	Industrial Point Sources	780	
			Metals	780	Lust/Leaking Undergrnd Stor. Tanks	780	
			Molybdenum	780	Natural Sources	780	
			Nitrates	780			
			Nonpriority organics	780			
			Nutrients	780			
			Priority organics	780			
			Salinity/TDS/chlorides	780			

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Selenium	780			
			Trace Elements	780			
			Uranium	780			
5	TULE BASIN PORT	5-22	Arsenic	730	Agriculture	730	730
			DBCP/Dibromochlorpropane	730	Animal Operations	730	
			Metals	730	Dairies	730	
			Nitrates	730	Industrial Point Sources	730	
			Nonpriority organics	730	Land Disposal	730	
			Nutrients	730	Lust/Leaking Undergrnd Stor. Tanks	730	
			Pesticides	730	Natural Sources	730	
			Priority organics	730	Septage Disposal	730	
			Salinity/TDS/chlorides	730			
			Trace Elements	730			
5	TURLOCK BASIN PORT	5-22	DBCP/Dibromochlorpropane	545	Agriculture	545	545
			Nitrates	545	Dairies	545	
			Nonpriority organics	545	Industrial Point Sources	545	
			Nutrients	545	Land Disposal	545	
			Pesticides	545	Lust/Leaking Undergrnd Stor. Tanks	545	
			Priority organics	545	Septage Disposal	545	
			Salinity/TDS/chlorides	545			
5	WESTSIDE BASIN PORT	5-22	Boron	1040	Agriculture	1040	1040
			Metals	1040	Natural Sources	1040	
			Salinity/TDS/chlorides	1040			
			Selenium	1040			
			Trace Elements	1040			
6	ANTELOPE VALLEY (NL)	6-7	Metals	1	Agriculture	36	36
			Nitrates	36	Land Disposal	36	
			Nutrients	36	Natural Sources	1	
			Salinity/TDS/chlorides	1	Septage Disposal	36	
			Trace Elements	1			
6	ANTELOPE VALLEY (SL)	6-44	Coliform	122	Hazardous Waste	122	1622
			Flow alteration	1622	Land Disposal	1622	
			Metals	122	Landfills	1622	
			Nitrates	122	Lust/Leaking Undergrnd Stor. Tanks	122	

* Causes and Sources are not linked.

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Nutrients	122	Natural Sources	1622	
			Pathogens/Path.Indicators	122	Resource Extraction	1622	
			Priority organics	122	Septage Disposal	1622	
			Salinity/TDS/chlorides	1622	Spills	122	
					Urban Runoff/Storm Sewers	122	
6	BICYCLE VALLEY	6-25	Salinity/TDS/chlorides	120	Natural Sources	120	120
6	BRIDGEPORT VALLEY	6-8	Coliform	100	Agriculture	100	100
			Metals	100	Land Disposal	100	
			Nitrates	100	Lust/Leaking Undergrnd Stor. Tanks	2	
			Nutrients	100	Natural Sources	100	
			Oil and grease	2	Resource Extraction	100	
			Other inorganics	100	Septage Disposal	100	
			Pathogens/Path.Indicators	100	Urban Runoff/Storm Sewers	2	
			Priority organics	2			
			Salinity/TDS/chlorides	100			
6	BROADWELL VALLEY	6-32	Flow alteration	120	Flow Regulation/Modification	120	120
			Salinity/TDS/chlorides	120	Hydromodification	120	
					Natural Sources	120	
6	CADY SPRINGS RECHARGE AREA	6-0000	Coliform	6	Land Disposal	6	6
			Nitrates	6	Nonpoint Source	6	
			Nutrients	6	Septage Disposal	6	
			Pathogens/Path.Indicators	6	Wastewater - land disposal	6	
			Salinity/TDS/chlorides	6			
6	CALIFORNIA VALLEY	6-79	Salinity/TDS/chlorides	60	Natural Sources	60	60
6	Carson Valley	3310013	Nutrients	17.49	Agriculture	17.49	17.49
			Pathogens/Path.Indicators	17.49	Land Disposal	17.49	
					Septage Disposal	17.49	
6	CAVES CANYON VALLEY	6-38	Salinity/TDS/chlorides	100	Natural Sources	100	100
6	COSO VALLEY	6-55	Salinity/TDS/chlorides	50	Natural Sources	50	50
6	COYOTE LAKE VALLEY	6-37	Salinity/TDS/chlorides	150	Natural Sources	150	150
6	CUDDEBACK VALLEY	6-50	Salinity/TDS/chlorides	180	Natural Sources	180	180
6	DARWIN VALLEY	6-57	Salinity/TDS/chlorides	70	Natural Sources	70	70

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
6	DEATH VALLEY	6-18	Flow alteration	1320	Flow Regulation/Modification	1320	1320
			Metals	1320	Hydromodification	1320	
			Salinity/TDS/chlorides	1320	Natural Sources	1320	
			Trace Elements	1320			
6	DENNING SPRING VALLEY	6-78	Salinity/TDS/chlorides	18	Natural Sources	18	18
6	DOG VALLEY	6-0000	Arsenic	1	Flow Regulation/Modification	7	7
			Coliform	7	Hydromodification	7	
			Flow alteration	7	Land Disposal	7	
			Metals	1	Lust/Leaking Undergrnd Stor. Tanks	1	
			Nitrates	7	Natural Sources	7	
			Nutrients	7	Septage Disposal	7	
			Oil and grease	1			
			Pathogens/Path.Indicators	7			
			Priority organics	1			
			Trace Elements	1			
6	EAGLE LAKE AREA	6-96	Coliform	2	Agriculture	22	22
			Metals	22	Land Disposal	2	
			Nitrates	2	Lust/Leaking Undergrnd Stor. Tanks	2	
			Nutrients	2	Natural Sources	22	
			Oil and grease	2	Septage Disposal	2	
			Pathogens/Path.Indicators	2			
			Priority organics	2			
6	EL MIRAGE VALLEY	6-43	Salinity/TDS/chlorides	70	Natural Sources	70	120
6	FREMONT VALLEY	6-46	Flow alteration	220	Agriculture	330	330
			Metals	220	Flow Regulation/Modification	330	
			Salinity/TDS/chlorides	220	Hydromodification	330	
			Trace Elements	220	Mine Tailings	330	
					Natural Sources	330	
					Resource Extraction	330	
6	GOLDSTONE VALLEY	6-48	Salinity/TDS/chlorides	30	Natural Sources	30	30
6	HARPER VALLEY	6-47	Salinity/TDS/chlorides	210	Natural Sources	210	510
6	HONEY LAKE VALLEY	6-4	Coliform	490	Agriculture	490	490
			Flow alteration	490	Agriculture-subsurface drainage	490	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Metals	1	Construction/Land Development	490	
			Nitrates	490	Geothermal Development	490	
			Nonpriority organics	1	Hazardous Waste	1	
			Nutrients	490	Land Disposal	1	
			Oil and grease	1	Lust/Leaking Undergrnd Stor. Tanks	1	
			Pathogens/Path.Indicators	490	Natural Sources	490	
			Priority organics	1	Nonpoint Source	490	
			Salinity/TDS/chlorides	490	Out-of-state source	490	
			Trace Elements	490	Resource Extraction	490	
					Septage Disposal	490	
6	INDIAN WELLS VALLEY	6-54	Flow alteration	20	Groundwater Withdrawal	20	520
			Salinity/TDS/chlorides	20	Hydromodification	20	
					Natural Sources	20	
6	IVANPAH VALLEY	6-30	Flow alteration	300	Flow Regulation/Modification	300	300
			Metals	300	Hydromodification	300	
			Salinity/TDS/chlorides	180	Natural Sources	300	
			Trace Elements	180	Resource Extraction	300	
6	KELSO LANDER VALLEY	6-69	Salinity/TDS/chlorides	17	Natural Sources	17	17
6	LANGFORD VALLEY	6-36	Salinity/TDS/chlorides	50	Hazardous Waste	50	50
					Land Disposal	50	
					Lust/Leaking Undergrnd Stor. Tanks	50	
					Natural Sources	50	
					Spills	50	
6	LEACH VALLEY	6-27	Salinity/TDS/chlorides	70	Natural Sources	70	70
6	LEVIATHAN MINE AREA	6-0000	Metals	1	Acid Mine Drainage	1	1
			pH (High or Low)	1	Hydromodification	1	
					Resource Extraction	1	
6	LONG VALLEY (NL)	6-104	Coliform	28	Agriculture	28	28
			Flow alteration	28	Flow Regulation/Modification	28	
			Nitrates	28	Hydromodification	28	
			Nutrients	28	Land Disposal	28	
			Pathogens/Path.Indicators	28	Septage Disposal	28	
6	LOWER KINGSTON VALLEY	6-21	Salinity/TDS/chlorides	290	Natural Sources	290	290

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
6	LOWER MOJAVE RIVER VALLEY	6-40	Flow alteration	300	Agriculture	51	300
			Metals	1	Flow Regulation/Modification	300	
			Nitrates	51	Hazardous Waste	51	
			Nutrients	51	Hydromodification	300	
			Oil and grease	51	Land Disposal	51	
			Priority organics	51	Landfills	51	
			Salinity/TDS/chlorides	300	Lust/Leaking Undergrnd Stor. Tanks	51	
			Trace Elements	300	Natural Sources	300	
					Nonpoint Source	300	
					Septage Disposal	51	
					Spills	51	
6	MADELINE PLAINS	6-2	Coliform	270	Land Disposal	270	270
			Metals	270	Natural Sources	270	
			Nitrates	270	Septage Disposal	270	
			Nutrients	270			
			Other inorganics	270			
			Pathogens/Path.Indicators	270			
			Salinity/TDS/chlorides	270			
			Trace Elements	270			
6	Martis Valley	3520040	Flow alteration	64.34	Flow Regulation/Modification	64.34	64.34
			Metals	64.34	Highway Maintenance And Runoff	64.34	
			Nutrients	64.34	Hydromodification	64.34	
			Oil and grease	64.34	Land Disposal	64.34	
			Pathogens/Path.Indicators	64.34	Lust/Leaking Undergrnd Stor. Tanks	64.34	
			Priority organics	64.34	Natural Sources	64.34	
					Septage Disposal	64.34	
					Urban Runoff/Storm Sewers	64.34	
6	MESQUITE VALLEY	6-29	Salinity/TDS/chlorides	70	Natural Sources	70	120
6	MIDDLE AMARGOSA VALLEY	6-20	Salinity/TDS/chlorides	620	Natural Sources	620	620
6	Middle Mojave River Valley	2830000	Cause Unknown	425.11	Agriculture	425.11	425.1
			Metals	425.11	Industrial Land Treatment	425.11	
			Oil and grease	425.11	Land Disposal	425.11	
			Priority organics	425.11	Landfills	425.11	
			Salinity/TDS/chlorides	425.11	Lust/Leaking Undergrnd Stor. Tanks	425.11	

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Natural Sources	425.11	
					Spills	425.11	
6	MODOC PLATEAU PVA (REG 6)	6-103	Salinity/TDS/chlorides	100	Natural Sources	100	100
6	MONO VALLEY	6-9	Coliform	82	Flow Regulation/Modification	250	250
			Flow alteration	82	Hydromodification	250	
			Nitrates	82	Land Disposal	82	
			Nutrients	82	Natural Sources	250	
			Pathogens/Path.Indicators	82	Septage Disposal	82	
			Salinity/TDS/chlorides	82			
			Trace Elements	82			
6	Owens Valley	0320000	Cause Unknown	1159.9	Flow Regulation/Modification	1159.9	1160
			Flow alteration	1159.9	Hazardous Waste	1159.9	
			Metals	1159.9	Hydromodification	1159.9	
			Nutrients	1159.9	Land Disposal	1159.9	
			Oil and grease	1159.9	Landfills	1159.9	
			Pathogens/Path.Indicators	1159.9	Lust/Leaking Undergrnd Stor. Tanks	1159.9	
			Priority organics	1159.9	Nonpoint Source	1159.9	
			Salinity/TDS/chlorides	1159.9	Resource Extraction	1159.9	
					Septage Disposal	1159.9	
6	PANAMINT VALLEY	6-58	Metals	360	Lust/Leaking Undergrnd Stor. Tanks	360	360
			Oil and grease	360	Mine Tailings	360	
			Priority organics	360	Natural Sources	360	
			Salinity/TDS/chlorides	360	Resource Extraction	360	
			Trace Elements	360	Spills	360	
6	RIGGS VALLEY	6-23	Salinity/TDS/chlorides	100	Natural Sources	100	100
6	SEARLES VALLEY	6-52	Metals	1	Mine Tailings	1	250
			Oil and grease	1	Natural Sources	250	
			Salinity/TDS/chlorides	250	Resource Extraction	1	
6	SILVER LAKE VALLEY	6-34	Salinity/TDS/chlorides	40	Natural Sources	40	40
6	SODA LAKE VALLEY	6-33	Salinity/TDS/chlorides	500	Natural Sources	500	590
6	SQUAW VALLEY	6-0000	Flow alteration	3	Flow Regulation/Modification	3	3
			Herbacides	1	Highway Maintenance And Runoff	3	
			Nitrates	3	Hydromodification	3	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Nutrients	3	Land Disposal	3	
			Oil and grease	1	Lust/Leaking Undergrnd Stor. Tanks	1	
			Pesticides	1	Recreational Activities	3	
			Priority organics	1	Spills	1	
					Urban Runoff/Storm Sewers	3	
6	SUPERIOR VALLEY	6-49	Salinity/TDS/chlorides	170	Natural Sources	170	170
6	SURPRISE VALLEY	6-1	Coliform	151	Agriculture	151	350
			Flow alteration	151	Irrigated Crop Production	151	
			Metals	151	Land Disposal	151	
			Nitrates	151	Natural Sources	151	
			Nutrients	151	Resource Extraction	151	
			Pathogens/Path.Indicators	151	Septage Disposal	151	
			Salinity/TDS/chlorides	151			
			Trace Elements	151			
6	Tahoe Valley South	3410040	Metals	42.76	Highway Maintenance And Runoff	42.76	42.76
			Nutrients	42.76	Land Disposal	42.76	
			Priority organics	42.76	Lust/Leaking Undergrnd Stor. Tanks	42.76	
			Radiation	42.76	Natural Sources	42.76	
			Salinity/TDS/chlorides	42.76	Nonpoint Source	42.76	
					Recreational Activities	42.76	
					Source Unknown	42.76	
					Urban Runoff/Storm Sewers	42.76	
					Wastewater - land disposal	42.76	
6	TAHOE VALLEY-NORTH	6-5.02	Arsenic	1	Groundwater Withdrawal	4	4
			Flow alteration	4	Hydromodification	4	
			Metals	1	Land Disposal	4	
			Nutrients	4	Landfills	4	
			Priority organics	1	Lust/Leaking Undergrnd Stor. Tanks	4	
			Trace Elements	1	Natural Sources	4	
					Nonpoint Source	4	
					Septage Disposal	4	
					Spills	4	
					Urban Runoff/Storm Sewers	4	
					Wastewater - land disposal	4	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
6	TROY VALLEY	6-39	Salinity/TDS/chlorides	130	Natural Sources	120	130
6	TWIN LAKE AREA	6-0000	Coliform	5	Highway Maintenance And Runoff	5	5
			Nitrates	5	Land Disposal	5	
			Nutrients	5	Septage Disposal	5	
			Oil and grease	2	Urban Runoff/Storm Sewers	5	
			Pathogens/Path.Indicators	5			
			Priority organics	2			
6	UPPER KINGSTON VALLEY	6-22	Salinity/TDS/chlorides	270	Natural Sources	270	270
6	UPPER MOJAVE RIVER VALLEY	6-42	Coliform	625	Hazardous Waste	75	625
			Flow alteration	625	Land Disposal	75	
			Nitrates	625	Lust/Leaking Undergrnd Stor. Tanks	75	
			Nutrients	625	Natural Sources	625	
			Pathogens/Path.Indicators	625	Resource Extraction	625	
			Priority organics	25	Septage Disposal	625	
			Salinity/TDS/chlorides	625	Spills	625	
6	WILLOW CREEK VALLEY	6-3	Nutrients	1	Nonpoint Source	20	20
6	WINGATE VALLEY	6-19	Salinity/TDS/chlorides	70	Natural Sources	70	70
7	BORREGO VALLEY	722.13	Nonpriority organics	110	Lust/Leaking Undergrnd Stor. Tanks	110	110
7	COACHELLA VA. GW.	719.47	Cause Unknown	690	Land Disposal	690	690
			Nitrates	690	Landfills	690	
			Nonpriority organics	690	Lust/Leaking Undergrnd Stor. Tanks	690	
			Nutrients	690	Septage Disposal	690	
			Pathogens/Path.Indicators	690			
7	LUCERNE VALLEY	701.00	Nonpriority organics	260	Lust/Leaking Undergrnd Stor. Tanks	260	260
7	MORONGO VALLEY	719.43	Cause Unknown	1	Land Disposal	1	14
					Landfills	1	
7	NEEDLES VALLEY	713.30	Chromium	140	Hazardous Waste	140	140
			Metals	140	Land Disposal	140	
			Nonpriority organics	140	Lust/Leaking Undergrnd Stor. Tanks	140	
7	PALO VERDE VA.	715.40	Nonpriority organics	200	Lust/Leaking Undergrnd Stor. Tanks	200	200
7	TWENTYNINE PALMS VALLEY	709.10	Priority organics	180	Land Disposal	180	180
					Landfills	180	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
7	WARD VALLEY	712	Radiation	770	Land Disposal	770	770
					Landfills	770	
8	BUNKER HILL I GW	801.520	PCE/Tetrachloroethylene	22	Industrial Point Sources	22	22
			Priority organics	22			
			TCE/Trichloroethylene	22			
8	BUNKER HILL II GW	801.520	DBCP/Dibromochlorpropane	77	Agriculture	77	77
			Nitrates	77	Industrial Point Sources	77	
			Nutrients	77	Nonpoint Source	77	
			PCE/Tetrachloroethylene	77	Point Source	77	
			Pesticides	77			
			Priority organics	77			
			TCE/Trichloroethylene	77			
8	BUNKER HILL PRESSURE GW	801.520	DBCP/Dibromochlorpropane	24	Agriculture	24	24
			Nitrates	24	Construction/Land Development	24	
			Nutrients	24	Industrial Point Sources	24	
			PCE/Tetrachloroethylene	24	Nonpoint Source	24	
			Pesticides	24	Point Source	24	
			Priority organics	24	Urban Runoff/Storm Sewers	24	
			Salinity/TDS/chlorides	24			
			TCE/Trichloroethylene	24			
8	CHINO I GW	801.210	DBCP/Dibromochlorpropane	90	Agriculture	90	90
			Nitrates	90	Construction/Land Development	90	
			Nutrients	90	Urban Runoff/Storm Sewers	90	
			Pesticides	90			
8	CHINO II GW	801.210	DBCP/Dibromochlorpropane	104	Agriculture	104	104
			Nitrates	104	Dairies	104	
			Nutrients	104	Industrial Point Sources	104	
			PCE/Tetrachloroethylene	104	Nonpoint Source	104	
			Pesticides	104			
			Priority organics	104			
			Salinity/TDS/chlorides	104			
			TCE/Trichloroethylene	104			
			Total Dissolved Solids	104			
8	CHINO III GW	801.210	Nitrates	48	Agriculture	48	48

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
			Nutrients	48	Dairies	48	
			Salinity/TDS/chlorides	48			
8	SANTA ANA FOREBAY GW	801.110	Nitrates	105	Agriculture	105	105
			Nutrients	105	Construction/Land Development	105	
			Organic enrichment/Low DO	105	Industrial Point Sources	105	
			PCE/Tetrachloroethylene	105	Municipal Point Sources	105	
			Priority organics	105			
			Salinity/TDS/chlorides	105			
			TCE/Trichloroethylene	105			
			TOC/Total Organic Carbon	105			
8	SANTA ANA PRESSURE GW	801.110	Nitrates	139	Industrial Point Sources	139	139
			Nutrients	139	Municipal Point Sources	139	
			Organic enrichment/Low DO	139	Urban Runoff/Storm Sewers	139	
			PCE/Tetrachloroethylene	139			
			Priority organics	139			
			Salinity/TDS/chlorides	139			
			TCE/Trichloroethylene	139			
			TOC/Total Organic Carbon	139			
9	BARRETT LAKE HA GW	911.30	Salinity/TDS/chlorides	97	Agriculture	97	97
					Agriculture-animal	97	
					Animal Operations	97	
					Irrigated Crop Production	97	
9	CAMERON HA GW	911.70	Salinity/TDS/chlorides	45	Agriculture	45	45
					Agriculture-animal	45	
					Animal Operations	45	
					Irrigated Crop Production	45	
9	CAMPO HA GW	911.80	Salinity/TDS/chlorides	107	Agriculture	107	107
					Agriculture-animal	107	
					Animal Operations	107	
					Irrigated Crop Production	107	
9	DULZURA HA GW	910.30	Salinity/TDS/chlorides	100	Agriculture	100	100
					Agriculture-animal	100	
					Animal Operations	100	
					Irrigated Crop Production	100	

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REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
9	EL MONTE	907.15	Salinity/TDS/chlorides	15	Agriculture	15	15
					Agriculture-animal	15	
					Animal Operations	15	
					Irrigated Crop Production	15	
9	JAMUL VALLEY	909.21	Salinity/TDS/chlorides	5	Agriculture	5	5
					Agriculture-animal	5	
					Animal Operations	5	
					Irrigated Crop Production	5	
9	LAS PULGAS VALLEY	901.52	Salinity/TDS/chlorides	3	Agriculture	3	3
					Agriculture-animal	3	
					Animal Operations	3	
					Irrigated Crop Production	3	
9	LOWER SAN LUIS REY HA GW	903.10	Salinity/TDS/chlorides	40	Agriculture	40	186
					Agriculture-animal	40	
					Animal Operations	40	
					Irrigated Crop Production	40	
9	LOWER SWEETWATER HA GW	909.10	Salinity/TDS/chlorides	49	Animal Operations	49	49
					Irrigated Crop Production	49	
9	MIDDLE SWEETWATER HA GW	909.20	Salinity/TDS/chlorides	85	Agriculture	85	85
					Agriculture-animal	85	
					Animal Operations	85	
					Irrigated Crop Production	85	
9	MISSION VALLEY	907.11	Salinity/TDS/chlorides	11	Agriculture	11	11
					Agriculture-animal	11	
					Animal Operations	11	
					Irrigated Crop Production	11	
9	MONSERATE HA GW	903.20	Salinity/TDS/chlorides	171	Agriculture	171	171
					Animal Operations	171	
9	MORENA HA GW	911.50	Salinity/TDS/chlorides	24	Agriculture	24	24
					Agriculture-animal	24	
					Irrigated Crop Production	24	
9	NATIONAL CITY HA GW	908.30	Salinity/TDS/chlorides	11	Agriculture	11	11
					Agriculture-animal	11	

* Causes and Sources are not linked.

** "Size" refers to the affected size (square miles) of the water body and "Total Size" refers to the size of the entire water body.

APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Animal Operations	11	
					Irrigated Crop Production	11	
9	OTAY VALLEY HA GW	910.20	Metals	1	Agriculture	1	47
			Organics	1	Agriculture-animal	1	
			Priority organics	1	Animal Operations	1	
			Salinity/TDS/chlorides	1	Irrigated Crop Production	1	
9	PINE VALLEY	911.30	Salinity/TDS/chlorides	2	Agriculture	2	2
					Agriculture-animal	2	
					Animal Operations	2	
					Irrigated Crop Production	2	
9	POTRERO HA GW	911.20	Salinity/TDS/chlorides	81	Agriculture	81	81
					Agriculture-animal	81	
					Animal Operations	81	
					Irrigated Crop Production	81	
9	POWAY HA GW	906.20	Salinity/TDS/chlorides	41	Agriculture	41	41
					Agriculture-animal	41	
					Animal Operations	41	
					Irrigated Crop Production	41	
9	RANCHO SANTA FE	905.11	Salinity/TDS/chlorides	6	Agriculture	6	6
					Agriculture-animal	6	
					Animal Operations	6	
					Irrigated Crop Production	6	
9	SAN DIEGUITO VALLEY	9-12	Salinity/TDS/chlorides	6	Agriculture	6	6
					Agriculture-animal	6	
					Animal Operations	6	
					Irrigated Crop Production	6	
9	SAN MATEO CANYON HA GW	901.40	Salinity/TDS/chlorides	135	Agriculture	135	135
					Agriculture-animal	135	
					Animal Operations	135	
					Irrigated Crop Production	135	
9	SAN ONOFRE HA GW	901.50	Salinity/TDS/chlorides	103	Agriculture	103	103
					Agriculture-animal	103	
					Animal Operations	103	

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Irrigated Crop Production	103	
9	SAN PASQUAL HA GW	905.30	Salinity/TDS/chlorides	6	Agriculture	6	66
					Agriculture-animal	6	
					Animal Operations	6	
					Irrigated Crop Production	6	
9	SANTA MARGARITA GW	902.11	Salinity/TDS/chlorides	13	Agriculture	13	13
					Agriculture-animal	13	
					Animal Operations	13	
					Irrigated Crop Production	13	
9	SANTA MARIA VALLEY HA GW	905.40	Nitrates	24	Agriculture	24	57
			Salinity/TDS/chlorides	24	Animal Operations	24	
					Irrigated Crop Production	24	
9	SWEETWATER VALLEY	909.11	Salinity/TDS/chlorides	3	Agriculture	3	3
					Agriculture-animal	3	
					Animal Operations	3	
					Irrigated Crop Production	3	
9	TECATE VALLEY	911.81	Salinity/TDS/chlorides	1	Agriculture	1	1
					Agriculture-animal	1	
					Animal Operations	1	
					Irrigated Crop Production	1	
9	TEMECULA VALLEY	9-5	Chlorides	150	Agriculture	150	150
			Diesel	150	Landfills	150	
			Herbacides	150	Lust/Leaking Undergrnd Stor. Tanks	150	
			Iron	150	Municipal Point Sources	150	
			Manganese	150	Septage Disposal	150	
			Metals	150	Source Unknown	150	
			Nitrates	150	Specialty Crop Production	150	
			Nutrients	150	Surface Mining	150	
			Oil and grease	150	Urban Runoff/Storm Sewers	150	
			Pesticides	150			
			Salinity/TDS/chlorides	150			
			Sulfates	150			
			Total Dissolved Solids	150			
9	TIJUANA VALLEY HA GW	911.10	Salinity/TDS/chlorides	30	Agriculture	30	30

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APPENDIX C: CAUSES AND SOURCES OF GROUND WATER IMPAIRMENT

REGION	WATER BODY NAME	HYDRO UNIT	CAUSES*	SIZE**	SOURCES*	SIZE**	TOTAL SIZE**
					Agriculture-animal	30	
					Animal Operations	30	
					Irrigated Crop Production	30	

ABBREVIATIONS

REGIONAL WATER QUALITY CONTROL BOARDS

1	North Coast
2	San Francisco Bay
3	Central Coast
4	Los Angeles
5	Central Valley
6	Lahontan
7	Colorado River Basin
8	Santa Ana
9	San Diego

* Causes and Sources are not linked.

** "Size" refers to the affected size (square miles) of the water body and "Total Size" refers to the size of the entire water body.

STATE WATER RESOURCES CONTROL BOARD

P.O. BOX 100, Sacramento, CA 95812-0100

www.swrcb.ca.gov

Office of Legislative and Public Affairs: (916) 341-5250
Water Quality Information: (916) 341-5455

Clean Water Programs Information: (916) 341-5700
Water Rights Information: (916) 341-5300

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARDS

NORTH COAST REGION (1)
5550 Skylane Blvd., Ste. A
Santa Rosa, CA 95403
(707) 576-2220

SAN FRANCISCO BAY REGION (2)
1515 Clay Street, Ste. 1400
Oakland, CA 94612
(510) 622-2300

CENTRAL COAST REGION (3)
81 Higuera Street, Ste. 200
San Luis Obispo, CA 93401-5427
(805) 549-3147

LOS ANGELES REGION (4)
320 W. 4th Street, Ste. 200
Los Angeles, CA 90013
(213) 576-6600

CENTRAL VALLEY REGION (5)
3443 Routier Road, Suite A
Sacramento, CA 95827-3098
(916) 255-3000

FRESNO BRANCH OFFICE
3614 East Ashlan Avenue
Fresno, CA 93726
(559) 445-5116

REDDING BRANCH OFFICE
415 Knollcrest Drive, Suite 100
Redding, CA 96002
(530) 224-4845

LAHONTAN REGION (6)
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(530) 542-5400

VICTORVILLE BRANCH OFFICE
15428 Civic Drive, Ste. 100
Victorville, CA 92392-2383
(760) 241-6583

COLORADO RIVER BASIN REGION (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SANTA ANA REGION (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

SAN DIEGO REGION (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952



STATE OF CALIFORNIA
Gray Davis, Governor

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
Winston H. Hickox, Secretary

STATE WATER RESOURCES CONTROL BOARD
Arthur G. Baggett, Jr., Vice Chair

11/00