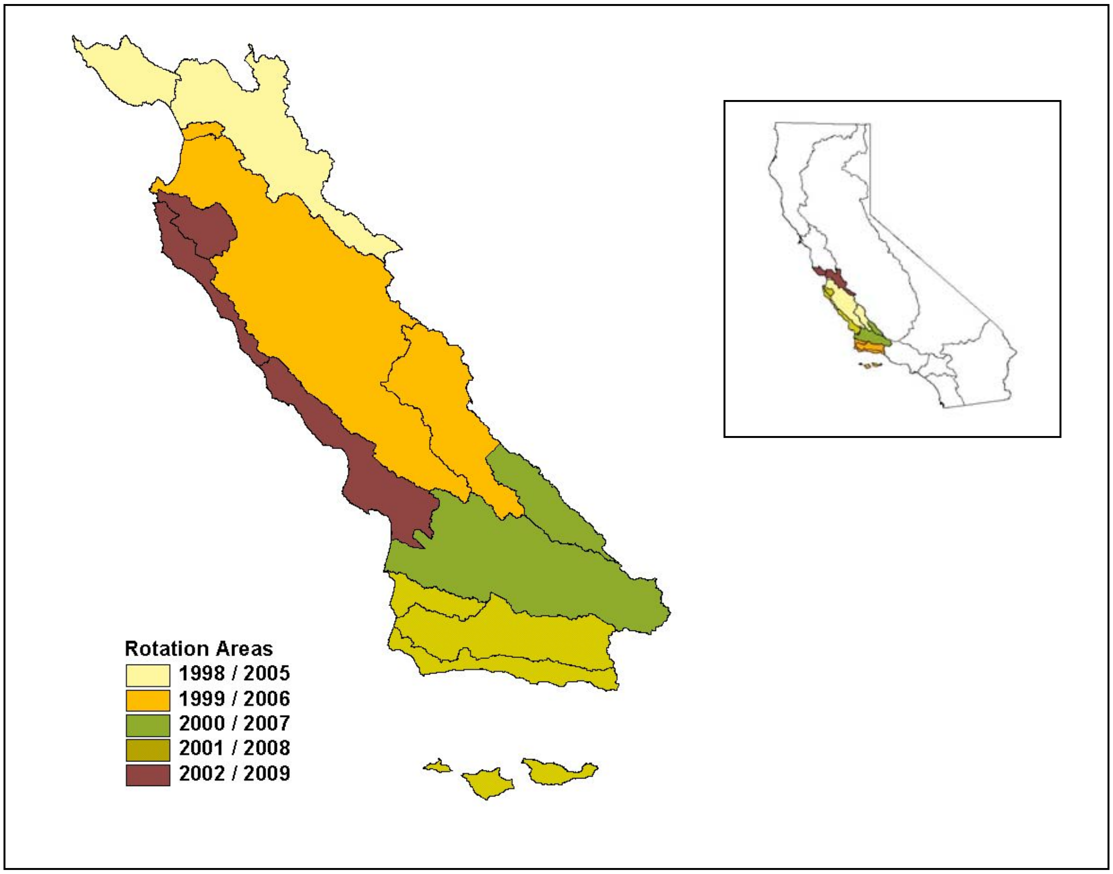
Surface Water Ambient Monitoring Program

FY 04-05 Site-Specific Monitoring Workplan

Central Coast Regional Water Quality Control Board (Region 3)



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Five Year Plan

Introduction

Fiscal Year (FY) 2004-05 will mark the forth year of the coordinated implementation of the Surface Water Ambient Monitoring Program (SWAMP). The "site-specific" monitoring efforts described as one component of SWAMP is presented in Section VI of the report to the Legislature titled "Proposal for a comprehensive ambient surface water quality monitoring program." This workplan is intended to address that component of the SWAMP program. A description of the monitoring efforts that will be implemented in Region 3 through the Central Coast Ambient Monitoring Program (CCAMP) is described in this document.

State Board guidance intended that this portion of SWAMP be targeted at specific locations in each region but provides the RWQCBs significant flexibility in this site selection effort. The RWQCBs at their discretion may perform monitoring at clean sites to determine baseline conditions or in areas suspected or known to be polluted. Because CCAMP has already been underway for six years and already includes both ambient and focused monitoring components, study design will follow that of previous years, where long-term "ambient" monitoring sites are selected at major tributary inputs and at the mainstem upstream of each tributary input, and "focused" monitoring sites are placed at other locations of interest in the watershed (such as above and below specific land uses, point sources, best management practices, or other areas in need of characterization). Ambient site selection is not based on suppositions regarding water quality, but rather on hydrogeomorphology. Focused monitoring sites are selected using a number of different criteria, including land use patterns, known problem areas, etc.

Included as part of this Region 3 SWAMP work plan are three additional study plans: Two for monitoring work being conducted as part of Total Maximum Daily Load assessments and a third for sediment chemistry and toxicity work in the Salinas and Central Valleys. One TMDL study plan is for fecal coliform in the Santa Maria and Oso Flaco watersheds (Attachment 4); the other is for nutrients in the Salinas and Tembladero watersheds (Attachment 5). Though funded through Clean Water Act Section 106 funds, work associated with these study plans is being conducted consistent with SWAMP quality assurance and data management requirements. Through incorporation into this SWAMP work plan, these field efforts will be included as a component of the SWAMP Quality Assurance Management Plan. In the future, the annual SWAMP work plan for Region 3 will regularly include study plans for TMDL monitoring conducted in collaboration with our program. The Salinas Valley study (Attachemnt 6) will focus on sediment associated pesticides as factors controlling macroinvertebrate distributions in streams of the Salinas and Central Valleys. This study is being conducted in coordination with the Central Valley RWQCB and all work is being conducted consistent with SWAMP quality assurance and data management requirements.

CCAMP Compliance with Governor's Action Plan, SWRCB Strategic Plan and U.S. EPA Partnership Agreement

Monitoring conducted by CCAMP/SWAMP addresses a number of the priority goals outlined in the 2004 Governor's Action Plan, the State Water Resources Control Board Strategic Plan, and the California Clean Water Partnership. Key elements of these plans are identified in Table 1. CCAMP program elements which aid in addressing each element are identified by number.

Table 1. Summary of Major Issues in the Governor's Action Plan, the State Board's Strategic Plan, and the U.S. EPA Partnership Agreement

Governor's Action Plan	**Foot Notes**
<u>Protect California's Water Supply and Water Quality</u>	
Action 1	NA
Action 2 – "Making sure that existing permitting fees are targeted toward resource management."	NA
Action 3 – "Protect the State's groundwater, surface water, and coastline…".	2,3,10
Ground Water Implementation Actions	16
Surface Water Implementation Actions	
1 Develop a Nonpoint Source Implemetation and Enforcement Policy (NPS Policy)	9,12
2 Implement Surface Water Ambient Monitoring Program (SWAMP)	1
Action 4 – "Direct State agencies to promote enhanced storm water mitigation techniques…".	18
Action 5 – "Direct all relevant state agencies to fill any gaps in wetlands protection…".	19
Action 6 – "Update and implement the state's Ocean Plan."	NA
Action 7 – "Implement programs and policies to restore salmon and other important fish populations."	2,3,5,15
Action 8 – "Update the Environmental Improvement Plan for Lake Tahoe."	NA
Action 9	NA
Action 10 – "Promote practices that help farmers reduce their pollution…"	9,11,12,15,16
SWRCB Strategic Plan	
Goal #1: The Boards' organizations are effective, innovative and responsive	11,14,17,18
Goal #2: Surface waters are safe for drinking, fishing, swimming, and support healthy ecosystems and other beneficial uses	2,3,15
Goal #3: Groundwater is safe for drinking and other beneficial uses	16
Goal #4: Water resources are fairly and equitably used and allocated consistent with public trust	NA
Goal #5: Individuals and other stakeholders support our efforts and understand their role in contributing to water quality	11,15,18
Goal #6: Water quality is comprehensively measured to evaluate protection and restoration efforts	2,3,9,11
USEPA Partnership Agreement	
Water Quality Standards/Basin Planning	
Water Quality Standards	5
Basin Planning	4, 5
Policy for Implementation of Toxics Standards for Inland Surface Waters	11
Bioassessment and adoption of biocriteria	15
Monitoring/Assessment	
Surface Water Ambient Monitoring Program	1
Quality Assurance Management Planning	21
Clean Water Act 305(b) Reporting	2,3,8
Nonpoint Source (NPS)	
Non-Point Source Plan Implementation	9,11,12
Clean Water Act 319 Reporting	9
Total Maximum Daily Load (TMDL)	
Clean Water Act 303(d) Listing	6
TMDL Guidelines	4,5,6
National Pollutant Discharge Elimination System (NPDES) Stormwater Permits	18
NPDES Wastewater Permits	17
Pretreatment	NA
Compliance/Enforcement Actions	NA
Concentrated Animal Feeding Operations (CAFO)	NA
Data Management	20
Quality Assurance/Quality Control (QA/QC)	21
State Revolving Fund (SRF)	NA
Implement the Law	6,7,8,9,10,11,12,13
Improve Efficiency	11,14,17
Target Critical Problems	2,3,6,8,11,12
Address Concerns of the Public	7,11,14,18

1. CCAMP is the Central Coast Region's implementation of the Surface Water Ambient Monitoring (SWAMP) program. CCAMP was originated before the Surface Water Ambient Monitoring Program came into existence and has integrated its work with the Surface Water Ambient Monitoring Program.

2. In 1998 CCAMP initiated a rotating basin approach as a region-wide monitoring strategy. The CCAMP rotating basin design involves sampling the major river and stream discharges in each hydrologic unit of the region every five years. Monitoring of all major stream and river discharges within each hydrologic unit facilitates characterization of watersheds with impaired discharges as well as watersheds which discharge exceptionally high quality water.

3. Long-term Trend Monitoring. In the year 2000, in order to more directly address potential discharges to near shore waters CCAMP initiated coastal confluences monitoring in stream and rivers throughout the region. The CCAMP coastal confluences monitoring design involves ongoing sampling of river and stream discharges to the sea.

4. Basin Planning. Region-wide monitoring data collected by CCAMP has provided an opportunity to evaluate basin plan objectives and water body specific objectives. Review of these objectives using actual monitoring data facilitates revisions of standards that pose implementation problems and provides a baseline set of reference conditions for beneficial use attainment analysis purposes

5. Water Quality Standards and Objectives. Region-wide monitoring data collected by CCAMP has been provided to the USEPA and their contractors for use in the development of nutrient criteria for western states. The CCAMP dataset represents a significant portion of the available data. In addition, CCAMP has independently developed a risk index approach for interpretation of narrative objectives for bio-stimulatory substances

6. Clean Water Act 303(d)(1)[Impaired Waters]: Data collected by CCAMP is the primary source of water quality data used for Clean Water Act Section 303(d) listing decisions in the Central Coast Region. CCAMP data has been used to support the listing process in both 2000 and 2004.

7. Clean Water Act 303(d)(3)[Non-impaired Waters]. The CCAMP region-wide array of watershed discharge sites, when combined with other sources of data such as Irrigated Agriculture Waiver monitoring, TMDL compliance monitoring, and monitoring required by waste discharge requirements, can provide a computational framework for a modeling approach to enable compliance with this requirement of the Clean Water Act for streams and rivers.

8. Clean Water Act 305(b). The CCAMP region-wide array of watershed discharge sites provides the ability to perform water body explicit assessments of streams and rivers and provides a method of integrating the 305(b) assessment process with requirements of 303(d)(1) and 303(d)(3).

9. Clean Water Act 319 and Coastal Zone Reauthorization Act 6217. The CCAMP region-wide array of watershed discharge sites provides one method of measuring aggregate impacts of non-point source pollution and potential water quality improvements resultant from management practice implementation. CCAMP data, when combined with new data to be provided through monitoring and management practice reporting associated with waivers of Waste Discharge Requirements for Irrigated Agriculture, can serve to address questions raised by the USEPA/California Non-Point Source Program.

10. CWC Section 13181. Water quality monitoring (Coastal Watersheds). The CCAMP region-wide array of Coastal Confluence monitoring sites is the Central Coast's implementation of ongoing Coastal Watershed Monitoring contemplated by Section 13181

11. CWC Section 13269. Waivers. Changes in the regulatory approach to the irrigated agriculture industry have been of major interest to both the industry and the environmental community. CCAMP data has been used to educate interested parties and to aid in design of the irrigated agriculture cooperative monitoring program. The program was designed in consideration of ambient water quality, groundwater quality, and distribution of irrigated agricultural activity, with the intention of reducing burden and costs for both the irrigated agriculture industry and the staff of the Regional Board. The program is also designed to be SWAMP and CCAMP compatible.

12. CWC Section 13369. Implementation of the Nonpoint Source Management Plan. Region-wide CCAMP data has contributed to knowledge of the spatial extent of known water quality problems and to identification of new sub-watersheds and water bodies of concern. Data provided by CCAMP is used by Regional Board staff to inform potential responsible parties of problems in order to develop and implement solutions. This feedback mechanism is included as an important element of the Cooperative Monitoring Program for Irrigated Agriculture,

13. CWC Section 13391. California Enclosed Bays and Estuaries Plan. Data collected by CCAMP during its watershed rotation sampling has provided information related to sources of pollutants responsible for Toxic Hot Spots in the region.

14. Web-based information dissemination on a watershed (hydrologic unit and hydrologic subarea), water body, and site-specific basis provides the public with information about water quality in their geographic areas of interest, as well as in the region as a whole.

15. Bio-criteria. Rapid bio-assessments using benthic invertebrates have been conducted in the Central Coast Region since 1993. Beginning in 1998, CCAMP expanded the area of coverage of this type of sampling to include the entire region as a part of CCAMP's watershed rotation sampling. The resulting region-wide collection of biological data and water quality data provides a framework for aquatic life beneficial use assessments and development of bio-criteria for the Central Coast Region. Bioassessment has also been included as a component of the Agricultural Waiver Cooperative Monitoring Program. CCAMP staff developed an Index of Biotic Integrity based on the work of Karr and Chu

in the mid 1990's and are now comparing performance of the existing CCAMP IBI with the newly developed Southern California IBI.

16. Groundwater. While CCAMP does not engage in sampling and analysis of groundwater, we collect groundwater data from other sources for use in examining potential relationships between surface and groundwater quality. Completion of the CCAMP five year rotation of all hydrologic units in the Central Coast Region has provided data that indicates that the groundwater recharge beneficial use for a number of surface waters is potentially impaired by a variety of pollutants, particularly nitrate. One of the program components of the Irrigated Agricultural Waiver Program includes evaluation of groundwater data for pollutants associated with agricultural activities, with feedback to growers in areas where problems are identified. This will expand our evaluation efforts of agricultural pollutants.

17. CCAMP has worked to provide a new monitoring focus for several Ocean discharge NPDES programs in the Monterey area. The Central Coast Long-term Environmental Assessment Network (CCLEAN) formed to support a monitoring effort in Monterey Bay that combines resources from five ocean dischargers. The program evaluates relative loading of priority pollutants, nutrients, and pathogens from both major rivers and streams and from major point source discharges to the Bay. It also examines fates of these pollutants in sediments and tissues. Data management is coordinated with CCAMP.

18. CCAMP and SWAMP support the activities of a number of volunteer monitoring groups. In particular, the Monterey Bay National Marine Sanctuary Citizen's Monitoring Network is conducting several types of monitoring activities which provide valuable data and which are not activities which can be undertaken by our program. For example, citizens mobilize to sample our first flush storm event for a number of urban pollutants. Citizens also sample storm drains for dry weather discharges and work to educate restaurant owners and others in problem drainages. Over 150 sites are monitored once a year for "Snapshot Day". CCAMP provides web site and data management support to these programs.

19. CCAMP is coordinating with several wetlands mapping and tracking efforts being undertaken by the California Coastal Commission. These include the Central Coast Wetlands GIS Project (CCWGIS), the California Rapid Assessment Method (CRAM), and the Wetland Project Tracker.

20. Data Management. CCAMP has developed a Microsoft Excel-based data management system intended for use as a tool to aid in data evaluation, quality checking, and display. The software also generates the CCAMP website. All data is batch loaded directly from laboratory files and field logging devices. Software features in development include export of data from this system into the SWAMP data management system and the USEPA STORET data management system. Other programs in the Region, such as the Citizen's Volunteer Monitoring Network, also utilize this software for website data display. The Cooperative Monitoring Program for Agricultural Waivers will submit data

in a format compatible with both SWAMP and CCAMP. This system is in development, with some technical assistance from Tetratech.

21. Quality Assurance. CCAMP operates under the SWAMP Quality Assurance Management Plan and utilizes standard operating procedures and laboratory methods consistent with SWAMP requirements. CCAMP has developed a number of software tools to facilitate data QA/QC checking, which incorporate SWAMP data quality objectives. TMDL activities are also now being conducted under the SWAMP Quality Assurance Management Plan, with QA oversight by CCAMP and the Regional QA officer. All QAPPs for grant programs are reviewed for SWAMP consistency.

CCAMP Long-term Goals and General Monitoring Approach

The CCAMP mission statement is to collect, assess and disseminate water quality information to aide decision makers and the public in maintaining, restoring and enhancing water quality and associated beneficial uses in the Central Coast Region.

It is the intent of the CCAMP program to monitor and assess all major waterbodies in the Region. In general, a tributary-based design is applied, with five major watershed areas monitored over the course of a five-year rotation. A weight-of-evidence approach is applied, where multiple types of monitoring are undertaken at each site. Data is intended for use in evaluating waterbodies for 305(b) reporting and 303(d) listing. General programmatic goals of the CCAMP monitoring program are to:

Determine the status and trends of surface, estuarine and coastal water quality and associated beneficial uses in the Central Coast Region
Coordinate with other data collection efforts
Provide information in easily accessible forms to support decision-making

The CCAMP monitoring strategy calls for dividing the Region into five watershed rotation areas and conducting synoptic, tributary based sampling each year in one of the areas. Over a five-year period all of the Hydrologic Units in the Region are monitored and evaluated. In addition to the synoptic site selection approach, 33 of the Regions coastal creeks and rivers are monitored continuously just upstream of their confluence with the Pacific Ocean.

The CCAMP strategy of establishing and maintaining permanent long term monitoring sites provides a framework for trend analysis and detection of emergent water quality problems. CCAMP uses a variety of monitoring approaches to characterize status and trends of coastal watersheds, as well as acquisition of basic GIS data layers, where available, describing land use, geology, soils, discharge locations, known problem sites, etc. Monitoring data collected by CCAMP for watershed assessment includes the following: Conventional water quality analysis, benthic invertebrate community assemblage, habitat assessments, toxicity evaluations as well as analysis of tissue, and sediment for organic chemicals and metals.

In order to develop a broad picture of the overall health of waters in Region 3, a similar baseline monitoring study design is applied in each watershed and coastal confluence site. This provides compatibility across the Region and allows for prioritization of problems across a relatively large spatial scale. However, it is important that each watershed analysis incorporate additional, watershed specific knowledge into the study design, so that questions which are narrower in focus can also be addressed. For example, in watersheds where Total Maximum Daily Load assessments are being undertaken, other program funds can be applied to support additional monitoring for TMDL development. Special studies are undertaken as funding and staffing permits to further focus monitoring on questions of interest specific in individual watersheds.

Watershed characterization involves three major components: acquisition and evaluation of existing data, monitoring of surface water and habitat quality, and developing a watershed assessment based on findings.

Evaluation of existing sources of data
Existing sources of data are evaluated for pollutants of concern, historic trends, data gaps, etc. These include Department of Health Services, USGS, Department of Fish and Game, Department of Pesticide Regulation, Toxic Substances Monitoring Program, STORET, NPDES discharge data, and other sources. Data from County, City, and other selected programs are also acquired. Selected data is compiled into the CCAMP data base format and used along with data collected by CCAMP to evaluate criteria exceedances, pollutant levels which warrant attention, beneficial use impairment, and other pertinent information.

Monitoring approaches
The CCAMP program design includes monthly monitoring for conventional water quality (CWQ) at all sites. At a subset of sites, generally selected based on hydrogeomorphological considerations or special interest, other monitoring approaches are applied. These include sediment chemistry and toxicity, tissue chemistry, benthic macroinvertebrate assessment and habitat assessment. Other approaches which have not yet been applied but which will be included as funding increases include water column chemistry, sedimentation assessment, habitat assessment, geomorphology, remote sensing and flow measurement. Table 2 indicates the relationship between monitoring types and beneficial uses recognized in the Central Coast Basin Plan. Monitoring approaches currently employed by CCAMP are shown in bold. Though the program will become more comprehensive as additional monitoring approaches are added, the current suite of monitoring activities address all beneficial uses to some degree. Virtually all major rivers and streams and their immediate tributaries in Region 3 are designated for commercial and sport fishing, contact and non-contact recreation, groundwater recharge, municipal and domestic supply, cold water fisheries, spawning, and migration beneficial uses. Many also support threatened and endangered species and biological habitats of special significance. Because these important beneficial uses tend to be universal in the Region and require most stringent water quality objectives, the CCAMP suite of indicators targets these beneficial uses particularly, and is intended to be applied uniformly to all sites.

Table 2. Relationship between beneficial uses in Region 3 and monitoring activities; Xs identify monitoring approaches currently employed by CCAMP.

	CWQ	Sed Chemistry	H2O Chemistry	Tissue Chemistry	Rapid Bioassessment	Toxicity	Geomorphology	Habitat	Remote Sensing	Flow	Sedimentation
Municipal & Domestic	X		+	X					+	X	
Estuarine Habitat	X	X	+	X	X	X	+	+	+	X	+
Marine Habitat	X	X	+	X	X	X	+	+	+		+
Wildlife Habitat	X	X	+	X	X	X	+	+	+	X	+
Biological Habitat of Special Significance	X	X	+	X	X	X	+	+	+	X	+
Rare & Endangered Species	X	X	+	X	X	X	+	+	+	X	+
Fish Migration	X	X	+	X	X	X	+	+	+	X	+
Fish Spawning	X	X	+	X	X	X	+	+	+	X	+
Shellfishing	X			X							
ASBS	X	X	+	X	X	X	+	+	+	X	+
Agricultural Supply	X	X	+							X	
Industrial Process Supply	X		+								
Industrial Service Supply	X								+		+
Groundwater Recharge	X		+				+		+	X	
Fresh Water Replenishment	X		+				+		+	X	
Navigation	X	X				X	+		+	X	+
Hydroelectric Power Generation	X						+		+	X	
Water Contact Recreation	X										
NonContact Recreation	X										
Commercial and Sport Fishing	X	X	+	X	X	X	+	+	+	X	
Aquaculture	X	X	+	X		X					
Warm Water Habitat	X	X	+	X	X	X	+	+	+	X	+
Coldwater Habitat	X	X	+	X	X	X	+	+	+	X	+

Monitoring Objectives and Methods

SWAMP Monitoring Objectives

The following objectives address questions posed in the SWAMP Site-Specific Monitoring Guidance related to beneficial use support. Monitoring activities which address these objectives are indicated in Table 2 and more specific data types or indicators which address specific questions are identified in Table 3.

Table 3. SWAMP Program questions and monitoring activities that can address them.

SWAMP Question	CWQ	SedChem	H2OChem	Tissue Chem	Rapid Bioassessment	Toxicity	Geomorphology	Habitat	Remote Sensing	Flow	Sedimentation
Safe to Swim	X										
Safe to Drink	X		+								
Safe to Eat Fish	X			X							
Aq. Pops Protected	X	X	+	X	X	X	+	X	+	X	+
Spawning	X	X	+		X	X	+	+		+	+
Flow	X				X		+	+		X	+
Ag Use	X										
Industrial Supply	X		+								
Non Contact Rec	X							+			

The following specific monitoring objectives address questions posed in the SWAMP Site-Specific Monitoring Guidance related to beneficial use support. Monitoring approach and the water quality criteria that address these objectives are also discussed.

Is there evidence that it is unsafe to swim?
Beneficial Use: Water Contact Recreation (REC-1)
Objective(s): At sites throughout water bodies that are used for swimming, or that drain to areas used for swimming, screen for indications of bacterial contamination by determining percent of samples exceeding adopted water quality objectives and EPA mandated objectives. CCAMP data as well as data collected by local agencies and organizations will be used to assess shoreline and creek conditions.
Monitoring Approach: Monthly monitoring for indicator organisms (e.g. *E. coli*, fecal coliform, Enterococcus); compilation of other data sources
Assessment Limitations: CCAMP currently samples for fecal and total coliform; assessments are typically based on these two parameters
Criteria:

- 10% of samples over 400 MPN/100 ml fecal coliform
- 10% of samples over 235 MPN/100 ml *E. coli*
- 10% of samples over 104 MPN/100 ml Enterococcus (bays and estuaries only)
- Fecal to Total coliform ratio over 0 .1 when Total Coliform exceeds 1000 MPN/100 ml (bays and estuaries only)

Is there evidence that it is unsafe to drink the water?

Beneficial Use: Municipal and Domestic Water Supply (MUN)
Objective(s): At sites throughout water bodies that are sources of drinking water, determine percent of samples that exceed drinking water standards or adopted water quality objectives used to protect drinking water quality. Screen for presence of chemical effects which may cause detrimental physiological response in humans using multi-species toxicity testing
Monitoring Approach: Monthly sampling for nitrate and pH; annual or bi-annual multi-species toxicity testing and followup chemistry or toxicity identification evaluations where possible.
Assessment Limitations: CCAMP does not typically sample for metals or organic chemicals in water; assessment is based on conventional parameters and toxicity
Criteria:

- Nitrate (as N) over 10 mg/L
- pH under 6.5 or above 8.3
- Water toxicity effects significantly greater than reference tests and survival, growth, or reproduction less than 80% of control

Is there evidence that it is unsafe to eat fish or other aquatic resources?
Beneficial Uses: Commercial and Sport Fishing (COMM), Shellfish Harvesting (SHELL)
Objective(s): At sites located near the lower ends of streams and rivers, and in lakes, enclosed bays and estuaries, screen for chemical pollutants by determining the concentration of chemical contaminants in fish and shellfish samples, and assessing whether samples exceed several critical threshold values of potential human impact (advisory or action levels).
Monitoring Approach: Annual fish and mussel tissue collection and chemical analysis
Assessment Limitations: CCAMP samples for samples for an array of metals and organic chemicals commonly analyzed by the State Mussel Watch Program. This array does not contain all currently applied pesticides, pharmaceuticals, and numerous other synthetic organic chemicals
Criteria:

- Exceedance of Office of Environmental Health Hazard Assessment Criteria for fish and shellfish tissue

Is there evidence that aquatic populations, communities, habitats and anadromous fisheries are not being protected?
Beneficial Uses: Cold Freshwater Habitat (COLD); Preservation of Biological Habitats (BIOL); Warm Freshwater Habitat (WARM); Wildlife Habitat (WILD); Rare and Endangered Species (RARE); Spawning (SPAWN)
Objective(s): At sites along the mainstem and at the lower ends of major tributaries of streams and rivers, screen for indications of water quality and sediment degradation for aquatic life and related uses, using several critical threshold values of toxicity, biostimulation, benthic community condition, habitat condition, and physical and chemical condition.
Monitoring Approach: Spring synoptic sampling for sediment and water column toxicity, sediment chemistry, benthic invertebrate assemblages, and associated habitat quality. Toxicity Identification Evaluation and/or chemistry follow-through for toxic sites. Monthly conventional water quality monitoring for nutrients, dissolved oxygen, pH, turbidity and water temperature. Pre-dawn or 24-hour continuous sampling for dissolved oxygen sags.
Assessment Limitations: CCAMP samples for samples for an array of metals and organic chemicals commonly analyzed by the State Mussel Watch Program. This array does not contain

all currently applied pesticides, pharmaceuticals, and numerous other synthetic organic chemicals. Habitat sampling is conducted only in association with benthic invertebrate sampling and is not comprehensive.

Critera:

- Sediment or water toxicity effects significantly greater than reference tests and survival, growth, or reproduction less than 80% of control
- Sediment concentrations of organic chemicals above detection limits
- Tissue concentrations of organic chemicals over established U.S. Fish and Wildlife and National Academy of Sciences guidelines for protection of aquatic life. Tissue concentrations for chemicals without guidelines above detection limits.
- Dissolved oxygen levels lower than 7.0 mg/L in cold water streams and 5.0 mg/l in warm water streams
- pH levels lower than 7.0 or above 8.5
- Unionized ammonia levels over 0.025 mg/L as N.
- Biostimulatory risk rank falls above scoring range of high quality sites, for a given stream stratum
- Index of Biotic Integrity falls within scoring range of high quality sites, for a given stream stratum

Is there evidence that water is unsafe for agricultural use?
Beneficial Use: Agricultural supply (AGR)
Objective(s): At sites throughout waterbodies that are used for agricultural purposes, determine percent of samples with concentrations of chemical pollutants above screening values or adopted water quality objectives used to protect agricultural uses.
Monitoring Approach: Monthly sampling for nutrients and salts
Assessment Limitations: CCAMP does not typically sample for all of the parameters identified in the Central Coast Water Quality Control Plan for protection of agricultural beneficial uses.
Criteria:

- pH below 6.5 or above 8.3
- Electrical conductivity over 3000 for salinity
- Sodium absorbtion ratio over 9.0
- Chloride over 106 mg/L
- Boron over 5.0 mg/L
- Sodium over 69 mg/L
- Ammonium over 30 mg/L
- Nitrate over 30 mg/L as N

Is there evidence of impairment to aesthetics or other non-contact recreational uses?
Beneficial Use: Non-Contact Water Recreation (REC-2)
Objective(s): At sites throughout waterbodies that are used for non-contact recreation, screen for indications of bacterial contamination by determining the percent of samples exceeding adopted water quality objectives and assess aesthetic condition for protection of non-contact water recreation
Monitoring Approach: Monthly sampling for pathogen indicator organisms (E. coli, total and fecal coliforms); monthly qualitative assessment of % algal cover, presence of scum, odor, etc.

Assessment Limitations: CCAMP does not currently conduct an as assessment for trash.
Criteria:

- pH under 6.5 or over 8.3
- 10% of samples over 4000 MPN/100 ml fecal coliform
- Dry weather turbidity persistently over 10 NTU
- Algal cover persistently over 25%
- Scum, odor, trash, oil films present

Identify Sites to Monitor

Locations to be monitored are shown in Table 4 for each of five Watershed Rotation Years and for ongoing Coastal Confluences monitoring. All sites (except offshore Mussel Watch sites) are monitored for conventional water quality. A subset of these sites is monitored for benthic macroinvertebrates, sediment chemistry, toxicity, and tissue bioaccumulation.

Table 4. Central Coast Ambient Monitoring Program Site List

Rotation Year	Hydrologic Sub Area	Water Body	Site Tag	Site Name
Ongoing	30411	Scott Creek	304SCO	304SCO-Scott Creek lagoon
Ongoing	30411	Waddell Creek	304WAD	304WAD-Waddell Creek lagoon
Ongoing	30412	San Lorenzo River	304LOR	304LOR-San Lorenzo Estuary
Ongoing	30413	Aptos Creek	304APT	304APT-Aptos Creek lagoon
Ongoing	30413	Soquel Creek	304SOQ	304SOQ-Soquel Creek lagoon
Ongoing	30420	Gazos Creek	304GAZ	304GAZ-Gazos Creek Lagoon
Ongoing	30510	Pajaro River	305PJP	305THU-Pajaro River @ Main Street
Ongoing	30700	Carmel River	307CML	307CML-Carmel River @ Highway 1
Ongoing	30800	Big Creek	308BGC	308BGC-Big Creek @ Highway 1
Ongoing	30800	Big Sur River	308BSR	308BSR-Big Sur River @ Andrew Molera
Ongoing	30800	Little Sur River	308LSR	308LSR-Little Sur River @ Highway 1
Ongoing	30800	Willow Creek	308WLO	308WLO-Willow Creek @ Highway 1
Ongoing	30910	Old Salinas River	309OLD	309OLD-Old Salinas River @ Monterey Dunes Way
Ongoing	30910	Salinas River (lower)	309DAV	309DAV-Salinas River @ Davis Road
Ongoing	30910	Tembladero Slough	309TDW	309TDW-Tembladero Slough @ Monterey Dunes Way
Ongoing	31012	Arroyo de la Cruz Creek	310ADC	310ADC-Arroyo de la Cruz @ Highway 1
Ongoing	31013	San Simeon Creek	310SSC	310SSC-San Simeon Creek @ State Park foot bridge
Ongoing	31014	Santa Rosa Creek	310SRO	310SRO-Santa Rosa Creek @ Moonstone Drive
Ongoing	31022	Chorro Creek	310TWB	310TWB-Chorro Creek @ South Bay Boulevard
Ongoing	31025	San Luis Obispo Creek	310SLB	310SLB-San Luis Obispo Creek @ San Luis Bay Drive
Ongoing	31026	Pismo Creek	310PIS	310PIS-Pismo Creek above Highway 101
Ongoing	31031	Arroyo Grande Creek	310ARG	310ARG-Arroyo Grande Creek @ 22nd Street
Ongoing	31210	Santa Maria River	312SMA	312SMA-Santa Maria River @ Estuary
Ongoing	31300	San Antonio Creek	313SAI	313SAI-San Antonio Creek @ San Antonio Creek Road West
Ongoing	31410	Santa Ynez River (lower)	314SYN	314SYN-Santa Ynez River @ 13th Street
Ongoing	31510	Canada de la Gaviota	315GAV	315GAV-Canada de la Gaviota @ State Park entrance
Ongoing	31510	Jalama Creek	315JAL	315JAL-Jalama Creek at RR bridge
Ongoing	31531	Atascadero Creek	315ATA	315ATA-Atascadero Creek @ Ward Drive
Ongoing	31532	Arroyo Burro Creek	315ABU	315ABU-Arroyo Burro Creek @ Cliff Drive
Ongoing	31532	Mission Creek	315MIS	315MIS-Mission Creek @ Montecito Street
Ongoing	31534	Carpinteria Creek	315CRP	315CRP-Carpinteria Creek @ 6th Street
Ongoing	31534	Franklin Creek	315FRC	315FRC-Franklin Creek @ Carpenteria Avenue
Ongoing	31534	Rincon Creek	315RIN	315RIN-Rincon Creek @ Bates Road, u/s Highway 101
2005	30413	Aptos Creek	304APS	304APS-Aptos Creek @ Soquel Road
2005	30412	Bear Creek	304BEP	304BEP-Bear Creek @ Elks Park
2005	30412	Boulder Creek	304BH9	304BH9-Boulder Creek @ Highway 9
2005	30412	Branciforte Creek	304BRA	304BRA-Branciforte Road @ Ocean Street
2005	30510	Harkins Slough	305HAR	305HAR-Harkins Slough @ Harkins Slough Road
2005	30530	Llagas Creek	305HOL	305HOL-Llagas Creek @ Holsclaw Road
2005	30530	Llagas Creek	305LLA	305LLA-Llagas Creek @ Bloomfield Avenue
2005	30412	Newell Creek	304NGA	304NGA-Newell Creek @ Glen Arbor
2005	30540	Pacheco Creek	305PAC	305PAC-Pacheco Creek
2005	30510	Pajaro River	305CHI	305CHI-Pajaro River @ Chittenden Gap
2005	30530	Pajaro River	305FRA	305FRA-Pajaro River @ Frazier Lake Road

Rotation Year	Hydrologic Sub Area	Water Body	Site Tag	Site Name
2005	30510	Pajaro River	305MUR	305MUR-Pajaro River @ Murphy's Crossing
2005	30520	Pajaro River	305PAJ	305PAJ-Pajaro River @ Betabel Road
2005	30510	Salsipuedes Creek	305COR	305COR-Salsipuedes Creek - Down stream of Corralitos Creek
2005	30550	San Benito River	305HRL	305HRL-San Benito River below Hernandez Reservoir
2005	30550	San Benito River	305SAN	305SAN-San Benito @ Y Road
2005	30412	San Lorenzo River	304RIV	304RIV-San Lorenzo River @ River Street
2005	30412	San Lorenzo River	304SLA	304SLA-San Lorenzo River @ Highland Park
2005	30412	San Lorenzo River	304SLE	304SLE-San Lorenzo @ Elks Park
2005	30412	San Lorenzo River	304SLP	304SLP-San Lorenzo River @ Graham Hill Road
2005	30411	Scott Creek	304SCM	304SCM-Scott Creek d/s Mill Creek
2005	30413	Soquel Creek	304SEO	304SEQ-Soquel East @ Olive Spring
2005	30530	Tequisquita Slough	305TES	305TES-Tequisquita Slough
2005	30550	Tres Pinos Creek	305TRE	305TRE-Tres Pinos Creek
2005	30530	Uvas Creek	305UVA	305UVA-Uvas Creek @ Bloomfield Avenue
2005	30413	Valencia Creek	304VAL	304VAL-Valencia Creek @ Soquel Road
2005	30510	Watsonville Slough	305WSA	305WSA-Watsonville Slough @ San Andreas Road
2005	30412	Zayante Creek	304ZAY	304ZAY-Zayante Creek @ Graham Hill Road
2006	30970	Alisal Creek	309UAL	309UAL-Salinas Reclamation Canal @ Old Stage Road
2006	30960	Arroyo Seco River	309SEC	309SEC-Arroyo Seco River @ Elm Street
2006	30930	Arroyo Seco River	309SET	309SET-Arroyo Seco River @ Thorne Road
2006	30981	Atascadero Creek	309ATS	309ATS-Atascadero Creek @ Highway 41
2006	31700	Cholame Creek	317CHO	317CHO-Cholame Creek @ Bitterwater Road
2006	31700	Estrella River	317ESE	317EST-Estrella River @ Estrella River Road, u/s Highway 46
2006	31700	Estrella River	317EST	317EST-Estrella River @ Airport Road
2006	30920	Gabilan Creek	309GAB	309GAB-Gabilan Creek @ Independence Road and East Boranda Road
2006	30981	Nacimiento River	309NAC	309NAC-Nacimiento River @ Highway 101
2006	30910	Old Salinas River	309POT	309POT-Old Salinas River @ Potrero Road
2006	30920	Quail Creek	309QUA	309QUA-Quail Creek @ Potter Road
2006	30920	Quail Creek	309UQA	309UQA-Quail Creek @ Old Stage Road
2006	30910	Salinas Reclamation Canal	309ALD	309ALD-Salinas Reclamation Canal @ Boranda Road
2006	30910	Salinas Reclamation Canal	309ALU	309ALU-Salinas Reclamation Canal @ Airport Road
2006	30910	Salinas Reclamation Canal	309AXX	309AXX-Salinas Reclamation Canal Storm Drain @ and Airport Road
2006	30910	Salinas River (Lower)	309SAC	309SAC-Salinas River @ Chualar bridge on River Road
2006	30910	Salinas River (Lower)	309SDR	309SDR-Salinas Storm Drain u/s Davis Road
2006	30940	Salinas River (Mid)	309DSA	309DSA-Salinas River d/s San Ardo @ Cattleman Road
2006	30930	Salinas River (Mid)	309GRN	309GRN-Salinas River @ Elm Road in Greenfield
2006	30940	Salinas River (Mid)	309KNG	309KNG-Salinas River @ Highway 101 in King City
2006	30981	Salinas River (Upper)	309PSO	309PSO-Salinas River @ 13th Street in Paso Robles
2006	30981	Salinas River (Upper)	309SAT	309SAT-Salinas River @ Highway 41 bridge
2006	30981	Salinas River (Upper)	309USA	309USA-Salinas River u/s San Ardo @ the Bradley bridge
2006	30981	San Antonio River	309SAN	309SAN-San Antonio River @ Highway 101
2006	30940	San Lorenzo Creek	309LOK	309LOK-San Lorenzo Creek @ First Street in King City
2006	30970	San Lorenzo Creek	309LOR	309LOR-San Lorenzo Creek @ Bitterwater Road east of King City
2006	30910	Tembladero Slough	309TEM	309TEM- Tembladero Slough @ Preston Road
2007	31230	Alamo Creek	312ALA	312ALA-Alamo Creek u/s Twitchell Reservoir

Rotation Year	Hydrologic Sub Area	Water Body	Site Tag	Site Name
2007	31210	Blosser Channel	312BCD	312BCD-Blosser Channel d/s of ponds
2007	31210	Bradley Channel	312BCU	312BCU-Bradley Channel u/s of ponds
2007	31210	Bradley Cyn Creek	312BCF	312BCF-Bradley Canyon diversion channel @ Foxen Canyon Road
2007	31230	Cuyama River	312CAV	312CAV-Cuyama River u/s Ventucopa @ Highway 33
2007	31230	Cuyama River	312CCC	312CCC-Cuyama River d/s Cottonwood Canyon
2007	31230	Cuyama River	312CUT	312CUT-Cuyama River below Twitchell @ White Rock Lane
2007	31230	Cuyama River	312CUY	312CUY-Cuyama River d/s Buckhorn Road
2007	31230	Huasna River	312HUA	312HUA-Huasna River @ Huasna Townsite Road
2007	31220	LaBrea Creek	312BRE	312BRE-LaBrea Creek @ vineyard
2007	31210	Little Oso Flaco Creek	312OFN	312OFN-Little Oso Flaco Creek
2007	31210	Main Street Canal	312MSD	312MSD-Main Street Canal u/s Ray Road
2007	31210	Nipomo Creek	312NIP	312NIP-Nipomo Creek @ Highway 166
2007	31210	Nipomo Creek	312NIT	312NIT-Nipomo Creek @ Teft Street
2007	31210	Orcutt Solomon Creek	312OLA	312OLA-Orcutt Solomon tributary @ Betteravia Lakes
2007	31210	Orcutt Solomon Creek	312ORB	312ORB-Orcutt Solomon Creek @ Black Road
2007	31210	Orcutt Solomon Creek	312ORC	312ORC-Orcutt Solomon Creek u/s Santa Maria River
2007	31210	Orcutt Solomon Creek	312ORI	312ORI-Orcutt Solomon Creek @ Highway 1
2007	31210	Oso Flaco Creek	312OFC	312OFC-Oso Flaco Creek @ Oso Flaco Lake Road
2007	31210	Oso Flaco Lake	312OFL	312OFL-Oso Flaco Lake @ culvert
2007	31210	Santa Maria River	312SBC	312SBC-Santa Maria River @ Bull Canyon Road
2007	31210	Santa Maria River	312SMI	312SMI-Santa Maria River @ Highway 1
2007	31220	Sisquoc River	312SIS	312SIS-Sisquoc River @ Santa Maria Way
2007	31220	Sisquoc River	312SIV	312SIV-Sisquoc River
2007	31100	Soda Lake	311SLE	311SLE-Soda Lake Northeast
2007	31100	Soda Lake	311SLN	311SLN-Soda Lake Culverts at Seven Mile Road
2008	31532	Arroyo Burro Creek	315ABH	315ABH-Arroyo Burro Creek @ Hope Street
2008	31534	Arroyo Paredon	315APC	315APC-Arroyo Paredon Creek @ Via Real
2008	31531	Atascadero Creek	315ATU	315ATU-Atascadero Creek @ Patterson Avenue
2008	31510	Bell Creek	315BEL	315BEL-Bell Creek on Bacara Resort Access Road
2008	31510	Canada de la Gaviota	315GAI	315GAI-315GAI-Canada de la Gaviota @ Highway 1
2008	31510	Canada del Refugio	315RSB	315RSB-315RSB-Canada del Refugio u/s Highway 101
2008	31534	Carpinteria Creek	315CAU	315CAU-Carpenteria Creek @ Highway 192
2008	31510	Devereux Slough	315DEV	315DEV-Devereux Slough @ the Golf Course culvert
2008	31510	Dos Pueblos Canyon Creek	315DOS	315DOS-Dos Pueblos Canyon Creek @ Highway 101
2008	31510	El Capitan Creek	315CAP	315CAP-El Capitan Creek ds Highway 101
2008	31531	Glenn Annie Creek	315ANN	315ANN-Glenn Annie Creek u/s Holister Road
2008	31510	Los Carneros Creek	315LCR	315LCR-315LCR-Los Carneros Creek @ Hollister Road
2008	31531	Maria Ynacio Creek	315MYC	315MYC-315MYC-Maria Ynacio Creek @ Patterson Avenue
2008	31532	Mission Creek	315MIU	315MIU-315MIU-Mission Creek @ Cathedral Oaks Road
2008	31532	Montecito Creek	315MTC	315MTC-315MTC-Montecito Creek @ Jamison Lane
2008	31533	Romero Creek	315ROM	315ROM-315ROM-Romero Creek @ Jamison Lane
2008	31410	Salsipuedes Creek(314)	314SAL	314SAL-Salsipuedes Creek @ Santa Rosa Road
2008	31300	San Antonio Creek	313SAB	313SAB-San Antonio Creek @ Rancho de las Flores Bridge/Highway 135
2008	31300	San Antonio Creek	313SAI	313SAI-San Antonio Creek @ San Antonio Road West

Rotation Year	Hydrologic Sub Area	Water Body	Site Tag	Site Name
2008	31531	San Jose Creek	315SJC	315SJC-315SJC-San Jose Creek @ Kellogg Boulevard
2008	31410	San Miguelito Creek	314MIG	314MIG-San Miguelito Creek at W.North Ave.
2008	31531	San Pedro Creek	315SPC	315SPC-315SPC-San Pedro Creek d/s of Holister Road
2008	31532	San Ysidro Creek	315YSI	315YSI-315YSI-San Ysidro Creek @ Jamison Lane
2008	31534	Santa Monica Creek	315SMC	315SMC-Santa Monica Creek @ Carpenteria Avenue
2008	31410	Santa Ynez River (lower)	314SYF	314SYF-Santa Ynez River d/s Lompoc @ Floordale
2008	31410	Santa Ynez River (lower)	314SYI	314SYI-Santa Ynez River @ Highway 101
2008	31410	Santa Ynez River (lower)	314SYL	314SYL-Santa Ynez River u/s Lompoc @ Highway 246
2008	31410	Santa Ynez River (upper)	314SYC	314SYC-Santa Ynez River d/s Lake Cachuma @ Highway 154
2008	31410	Santa Ynez River (upper)	314SYP	314SYP-Santa Ynez River @ Paradise Road
2008	31533	Sycamore Creek	315SCC	315SCC-315SCC-Sycamore Creek @ Punta Gorda Street
2008	31510	Tecolote Creek	315TCI	315TCI-315TCI-Tecolote Creek @ Bacara Resort access Road
2008	31534	Toro Canyon Creek	315TOR	315TOR-315TOR-Toro Canyon Creek @ Via Real
2009	31031	Arroyo Grande Creek	310AGB	310AGB-Arroyo Grande Creek @ Biddle Park
2009	31031	Arroyo Grande Creek	310AGF	310AGF-Arroyo Grande Creek @ Fair Oaks
2009	31031	Arroyo Grande Creek	310AGS	310AGS-Arroyo Grande Creek @ Strother Park
2009	30800	Big Sur River	308BSU	308BSU-Big Sur River @ Pfeiffer, Weyland camp
2009	30700	Carmel River	307CMD	307CMD-Carmel River @ Schulte Road
2009	30700	Carmel River	307CMN	307CMN-Carmel River @ Nason Road, Community Park
2009	30700	Carmel River	307CMU	307CMU-Carmel River @ Esquiline Road
2009	31016	Cayucos Creek	310CAY	310CAY-Cayucos Creek @ Cayucos Creek Road
2009	31022	Chorro Creek	310CAN	310CAN-Chorro Creek @ Canet Road
2009	31025	Coon Creek	310COO	310COO - Coon Creek @ Pecho Valley Road
2009	30800	Garapata Creek	308GAR	308GAR-Garapata Creek @ Garapata Creek Road
2009	30800	Limekiln Creek	308LIM	308LIM-Limekiln Creek @ Limekiln State Park
2009	31031	Los Berros Creek	310BER	310BER-Los Berros Creek @ Valley Road
2009	30800	Mill Creek	308MIL	308MIL-Mill Creek @ Mill Creek Picnic Area
2009	31021	Morro Creek	310MOR	310MOR-Morro Creek @ Lila Keiser Park
2009	31017	Old Creek	310OLD	310OLD-Old Creek @ Cottontail Creek Road
2009	31013	Pico Creek	310PCO	310PCO-Pico Creek @ Highway 1
2009	31024	Prefumo Creek	310PRE	310PRE-Prefumo Creek @ Calle Joaquin
2009	31011	San Carpoforo Creek	310SCP	310SCP-San Carpoforo Creek @ Highway 1
2009	30800	San Jose Creek	308SJC	308SJC-San Jose Creek @ Private Road Access
2009	31024	San Luis Obispo Creek	310SLC	310SLC-San Luis Obispo Creek @ Cuesta Park
2009	31024	San Luis Obispo Creek	310SLM	310SLM-San Luis Obispo Creek @ Mission Plaza
2009	31024	San Luis Obispo Creek	310SLV	310SLV-San Luis Obispo Creek @ Los Osos Valley Road
2009	31013	San Simeon Creek	310SSU	310SSU-San Simeon Creek @ San Simeon Road
2009	31014	Santa Rosa Creek	310SRU	310SRU-Santa Rosa Creek @ Main Street
2009	31024	Stenner Creek	310SCN	310SCN-Stenner Creek @ Nipomo street
2009	31018	Toro Creek	310TOR	310TOR-Toro Creek us Highway 1
2009	30700	Tularcitos Creek	307TUL	307TUL-Tularcitos Creek @ Carmel Valley Road
2009	31015	Villa Creek	310VIA	310VIA-Villa Creek us Highway 1

Deliverables

A schedule of the monitoring plan deliverables is provided in Table 5. This timeline is dependent on delivery of final data from the various contract laboratories. However, the desired delivery dates are shown below. Annual workplans and annual reports will follow SWAMP specified formats.

Table 5. Monitoring schedule and deliverables.

Task Deliverable	Time line / due date	Task completed
SWAMP annual report 2001-2003	September 2004	
FY 04-05 Site specific workplan	September 2004	September 2004
FY 04-05 DFG master contract work order	September 2004	September 2004
Harbors study final data delivery	November 2004	
Harbors study annual report	April 2005	
2004 Sed Chem, TOX and BMI final data delivery	April 2005	
Coastal confluences annual report	September 2005	
FY 05-06 Site specific workplan	March 2005	
FY 05-06 DFG master contract work order	May 2005	
2005 Sed Chem, TOX and BMI final data delivery	April 2006	
Pajaro and North Coast rotation area annual report	August 2006	
FY 06-07 Site specific workplan	March 2006	
FY 06-07 DFG master contract work order	May 2006	
2006 Sed Chem, TOX and BMI final data delivery	April 2007	
Salinas watershed rotation area annual report	August 2007	
FY 07-08 Site specific workplan	March 2007	
FY 07-08 DFG master contract work order	May 2007	
2007 Sed Chem, TOX and BMI final data delivery	April 2008	
Santa Maria watershed rotation area annual report	August 2008	
FY 08-09 Site specific workplan	March 2008	
FY 08-09 DFR master contract work order	May 2008	
2008 Sed Chem, TOX and BMI final data delivery	April 2009	
South Coast watershed rotation area annual report	August 2009	
FY 09-10 Site specific workplan	March 2010	
FY 09-10 DFG master contract work order	May 2010	

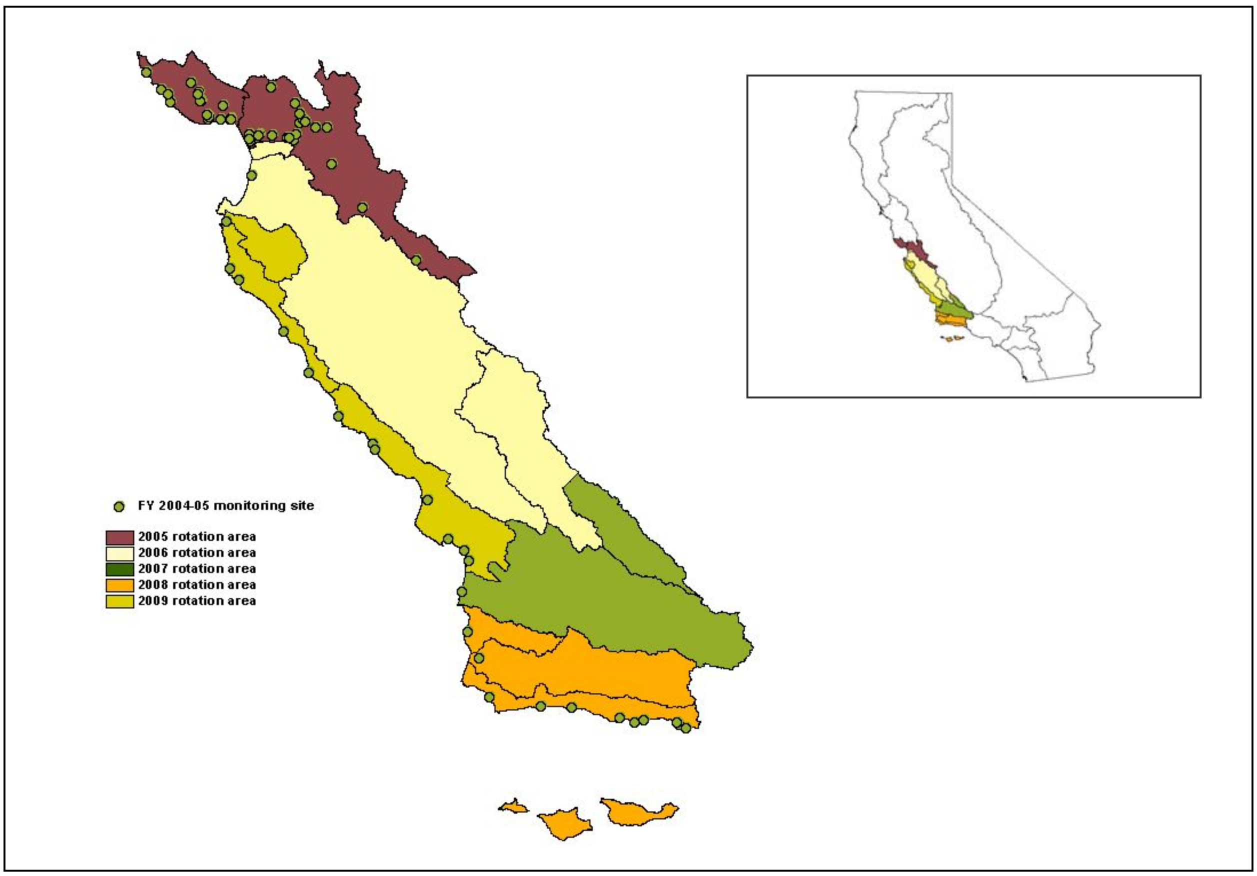
Annual Plan

Introduction

The Central Coast Ambient Monitoring Program (CCAMP) monitoring strategy for watershed characterization calls for dividing the Region into five watershed rotation areas and conducting synoptic, tributary based sampling each year in one of the areas. Over a five-year period all of the Hydrologic Units in the Region are monitored and evaluated. In addition to watershed rotation monitoring CCAMP also conducts monitoring at 33 coastal stream mouths throughout the Region as part of coastal confluences monitoring. Watershed rotation monitoring, which has been on hold for two years due to funding and contracting problems, will resume January 2005. This will mark the initiation of the second round of watershed rotation area monitoring and the second round of sampling in the Pajaro Hydrologic Unit. CCAMP will also continue monitoring at the 33 coastal confluence sites. Coastal confluences monitoring was reinstated in February 2004. Figure 1 shows the spatial representation of the coastal confluence and 2005 watershed rotation area sites relative to the five watershed rotation areas in Region 3.

CCAMP uses a variety of monitoring approaches to characterize status and trends at monitoring sites. Monitoring approaches include conventional water quality analysis, benthic macroinvertebrate community assemblages, tissue chemistry, sediment chemistry, toxicity evaluations, and habitat assessments. These data provide information at a level of detail suitable for assessment reporting requirements, including Clean Water Act 305(b) and 303(d), and for supporting various statewide programs and initiatives (e.g. Non-point source and Watershed Management Initiative).

Figure 1. Region 3 watershed rotation areas and sites to be monitored in FY 2004-05



Monitoring Objectives and Methods

Site Selection – The 33 watersheds sampled through the Coastal Confluences program were selected based on watershed size, geomorphology and/or known water quality concerns in the watershed. Sampling sites are located on the lowest reach of the creek or river but above the coastal lagoon and tidal influence whenever possible. Watershed rotation areas sites are located at the primary discharge point of the watershed, at the discharge of each major tributary into the watercourse which drains the watershed, and along the main stem usually upstream from major tributary inputs. For the purposes of site selection a "major tributary" is defined as a watercourse which drains a minimum percentage of the rotation area or which is the major watercourse that drains a Hydrological Area, Hydrological Subarea, or watershed of special concern. Some sites are also located above and below areas of significant human activity, including urban development, agriculture, and point source discharges. Site selection is constrained by site accessibility. Safe, all-weather access sites are located preferably at bridges where sampling devices can be suspended during periods of high flow. Benthic invertebrates are collected upstream of conventional water quality sites, out of the immediate influence of bridges. Other sampling activities are conducted at conventional water quality sampling locations.

Conventional Water Quality – The Central Coast Basin Plan has identified several numeric objectives for conventional pollutants. Basic conventional pollutants are monitored monthly at all coastal confluence and watershed rotation sites. Monthly sampling provides an opportunity to evaluate seasonal variability as well as a variety of flow conditions. This program is not designed to be a storm event-monitoring program. Sampling is maintained on an even monthly interval without regard for timing of weather events. Even-interval sampling can be evaluated for long-term trends using certain time-series analysis techniques, such as the Mann-Kendall or seasonal Kendall tests described by the U.S. EPA National Monitoring Program (EPA 1997).

CCAMP uses a multi-analyte probe to measure several parameters in the field, and collects grab samples to be analyzed by the Regional Board's contract laboratory. A Hydrolab DS4a multi-analyte probe is used to collect data for dissolved oxygen, pH, water temperature, turbidity, conductivity, salinity and chlorophyll *a*. All field equipment is calibrated using certified calibration standards and following the manufacturer specifications. Calibration records are maintained at the Region 3 laboratory. In the field, observations of air temperature, algal growth, scum, odor, and other indications of water and habitat conditions are also recorded. Flow is estimated using a number of means. Wherever possible, sites are located near existing county and USGS gages. Stream profiles, stage gages and flow calibration curves are used elsewhere. In some locations flow measurements are not possible.

Samples to be analyzed by the Regional Board's contract laboratory are collected at each site in clean bottles provided by the contract laboratory. Blind field replicates are collected each field day (approximately 10% duplication rate of the total samples collected). Water samples are bottled as appropriate and held at $4^{o}C$, before being transferred to a commercial laboratory for analysis. Chain-of-Custody (COC) documentation is maintained for all samples. Samples are analyzed for nutrients, dissolved solids, suspended solids, salts and coliforms. Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements and follow U.S. EPA approved methods (BC Laboratories 1998). See the SWAMP

QAPP target reporting limits and analytical methods for more information on specific analyses (Puckett 2002).

Benthic Macroinvertebrate Sampling - Benthic macroinvertebrate assemblages are indicators of stream health. Different species of invertebrates respond differently to water pollution and habitat degradation and provide information on biological integrity. Benthic macroinvertebrate community assemblages will be sampled at 27 of the coastal confluence sites and 20 watershed rotation sites.

Benthic macroinvertebrate communities are sampled using California Rapid Bioassessment Protocols and quality assurance guidance for non-point source assessments (Harrington 2003). Benthic invertebrates are collected in spring at selected sites. Three riffle locations are selected randomly from within stream reaches associated with water and sediment sampling. When stream morphology limits riffle habitat, a low gradient protocol is adopted which includes sampling of stream margins. The creek reach of interest is characterized according to geomorphic parameters, including bankful width, slope, drainage area, upstream river miles, particle size and other features. Geomorphic characteristics are considered during data evaluation.

Physical habitat quality is assessed at each sampling reach according to state protocols, using the habitat assessment scoring methods developed by the California Aquatic Bioassessment Laboratory (CABL). This assessment is qualitative in nature and can be fairly subjective. Therefore, field crews intercalibrate their assessments with CABL staff prior to conducting fieldwork.

Sediment Chemistry and Toxicity– Some organic chemicals are found adhered to fine sediments; metals can also be found at elevated concentrations in sediment. Organic chemicals and metals may also bioaccumulate in the tissues of aquatic organisms and at elevated concentrations can be directly toxic. The Central Coast Basin Plan has a narrative objective for pollutants in sediment, and therefore CCAMP utilizes several peer-reviewed criteria to evaluate sediment data for probable effects, including NOAA Effects Range Medium values (ERMs) and Florida Probable Effects Levels (PELs). Sediment samples are analyzed by Department of Fish and Game laboratories at Rancho Cordova and Moss Landing, and on occasion by the Regional Board's contracted private laboratory. Laboratory analysis includes polyaromatic hydrocarbons, organochlorine and organophosphate chemicals, metals, particle size distribution, and total organic carbon. See the SWAMP QAPP for more information on QAQC procedures (Puckett 2002).

Sediment samples for chemistry and toxicity analysis are collected at each site by CDFG staff, and sampling targets fine grain sediments. Precleaned Teflon™ scoops are used to collect the top 2 cm of sediment from five or more locations at each site. The scooped samples are collected in a precleaned glass composite jar. The sample is subsequently homogenized thoroughly and aliquoted into precleaned sample jars (as appropriate) for chemical or toxicological analysis. Samples are then stored at 4°C and shipped with appropriate COC and handling procedures to the analytical laboratories. See bed sediment procedures in the SWAMP QAPP for more detail on sediment sampling (Puckett 2002).

Ten-day sediment toxicity testing is performed at the UC Davis – Granite Canyon Marine Pollution Control Laboratory using *Hyalella azteca* according to standard EPA protocols (EPA 2000). For each sediment sample, eight replicates each containing 10 *H. azteca* individuals are tested. Endpoints recorded after ten days are survival and growth (as dry weight). See the Granite Canyon QAQC and SOP contained in the SWAMP QAPP for more information on these analyses (Puckett 2002).

Site-specific Monitoring Activities

CCAMP monitoring conducted during FY 2004-05 will consist of continued monitoring at coastal confluences sites and in January 2005 the initiation of watershed rotation area monitoring in the Pajaro (305) and Big Basin (304) Hydrologic Units. Figure 2 shows the watershed rotation area sites and Figure 3 shows the coastal confluence sites. At each site, conventional water quality analyses will be conducted monthly and at a subset of these sites additional monitoring will be conducted including benthic macroinvertebrate analysis, sediment chemistry and toxicity (Table 6). Planned sampling funding sources include SWAMP, as well as CCAMP's Guadalupe and Elkhorn Endowments and the State Mussel Watch Endowment. Several special projects are anticipated, which will be funded through other sources and are not described in detail in this work plan. For example, CCAMP is supporting work by the California Department of Fish and Game to analyze sea otter tissues for bioaccumulated chemicals; data will be used to determine if there are associations between high tissue burdens of chemicals and impaired immune function and increased rates of mortality from disease. We have also provided CDFG and U.C. Davis funding to sample mussels and other invertebrates for specific pathogens known to be of concern for sea otter health. This work will help us understand mechanisms and sources of infection in several geographic areas of concern in marine waters of the Central Coast Region.

Table 6. FY 2004-05 monitoring activities at coastal confluence and 2005 watershed rotation area sites.

Site Name	CWQ	Water Tox	Sed Tox	Sed Chem	BMI
304APS-Aptos Creek @ Aptos County Park	X				X
304APT-Aptos Creek @ Spreckels Drive	X				X
304BEP-Bear Creek @ Elks Park	X				X
304BH9-Boulder Creek @ Highway 9	X				X
304BRA-Branciforte Road @ Ocean Street	X	X			X
304GAZ-Gazos Creek above Highway 1	X				X
304LOR-San Lorenzo River @ Laurel Street	X	X	X	X	X
304NGA-Newell Creek @ Glen Arbor	X				
304RIV-San Lorenzo River @ River Street	X	X	X	X	X
304SCM-Scott Creek d/s Mill Creek	X				X
304SCO-Scott Creek lagoon	X				
304SOU-Soquel Creek @ Olive Springs	X				
304SLH-San Lorenzo River @ Highland Park	X	X			X
304SLE-San Lorenzo @ Elks Park	X				
304SLP-San Lorenzo River @ Covered Bridge Road	X	X	X	X	X
304SOQ-Soquel Creek @ Rail Road Trussel	X				X
304VAL-Valencia Creek above Aptos Creek	X				X
304WAD-Waddell Creek @ Highway 1	X				
304ZAY-Zayante Creek @ Graham Hill Road	X	X			X
305BRI-San Benito River d/s Willow Creek	X				
305CHI-Pajaro River @ Chittenden Gap	X	X	X	X	X
305COR-Salsipuedes Creek below Corralitos Creek	X	X	X	X	X
305FRA-Pajaro River @ Frazier Lake Road	X				
305HAR-Harkins Slough @ Harkins Slough Road	X				
305HOL-Llagas Creek @ Holsclaw Road	X				
305HRL-San Benito River below Hernandez Reservoir	X	X	X	X	X
305HSA-Harkins Slough @ San Andreas Road	X	X	X	X	
305LLA-Llagas Creek @ Bloomfield Avenue	X	X	X	X	X
305MUR-Pajaro River @ Murphy's Crossing	X				
305OAK-Llagas Creek @ Oak Glen	X				
305PAC-Pacheco Creek	X	X	X	X	X
305PAJ-Pajaro River @ Betabel Road	X	X	X	X	X
305PJP-Pajaro River @ Main Street	X	X	X	X	X
305SAN-San Benito @ Y Road	X	X	X	X	X
305TES-Tequisquita Slough	X	X	X	X	
305THU-Pajaro River @ Thurwatcher	X				
305TRE-Tres Pinos Creek	X				
305UVA-Uvas Creek @ Bloomfield Avenue	X	X			X
305VIS-Llagas Creek @ Buena Vista Avenue	X				
305WSA-Watsonville Slough @ San Andreas Road	X				
307CML-Carmel River @ Highway 1	X				X

308BGC-Big Creek @ Highway 1	X	X
308BSR-Big Sur River @ Andrew Molera	X	X
308LSR-Little Sur River @ Highway 1	X	
308WLO-Willow Creek @ Highway 1	X	X
309DAV-Salinas River @ Davis Road	X	X
309OLD-Old Salinas River @ Monterey Dunes Way	X	
309TDW-Tembladero Slough @ Monterey Dunes Way	X	
310ADC-Arroyo de la Cruz @ Highway 1	X	X
310ARG-Arroyo Grande Creek @ 22nd Street	X	X
310PIS-Pismo Creek above Highway 101	X	X
310SLB-San Luis Obispo Creek @ San Luis Bay Drive	X	X
310SRO-Santa Rosa Creek @ Moonstone Drive	X	X
310SSC-San Simeon Creek @ State Park foot bridge	X	X
310TWB-Chorro Creek @ South Bay Boulevard	X	X
312SMA-Santa Maria River @ Estuary	X	X
313SAI-San Antonio Creek @ San Antonio Road West	X	X
314SYN-Santa Ynez River @ 13th Street	X	X
315ABU-Arroyo Burro Creek @ Cliff Drive	X	X
315ATA-Atascadero Creek @ Ward Drive	X	X
315CRP-Carpinteria Creek @ 6th Street	X	X
315FRC-Franklin Creek @ Carpentaria Avenue	X	
315GAV-Canada de la Gaviota @ State Park entrance	X	X
315JAL-Jalama Creek at RR bridge	X	X
315MIS-Mission Creek @ Montecito Street	X	X
315RIN-Rincon Creek @ Bates Road, u/s Highway 101	X	X

Figure 2 – Sites in the Pajaro/Big Basin Watershed Rotation Area

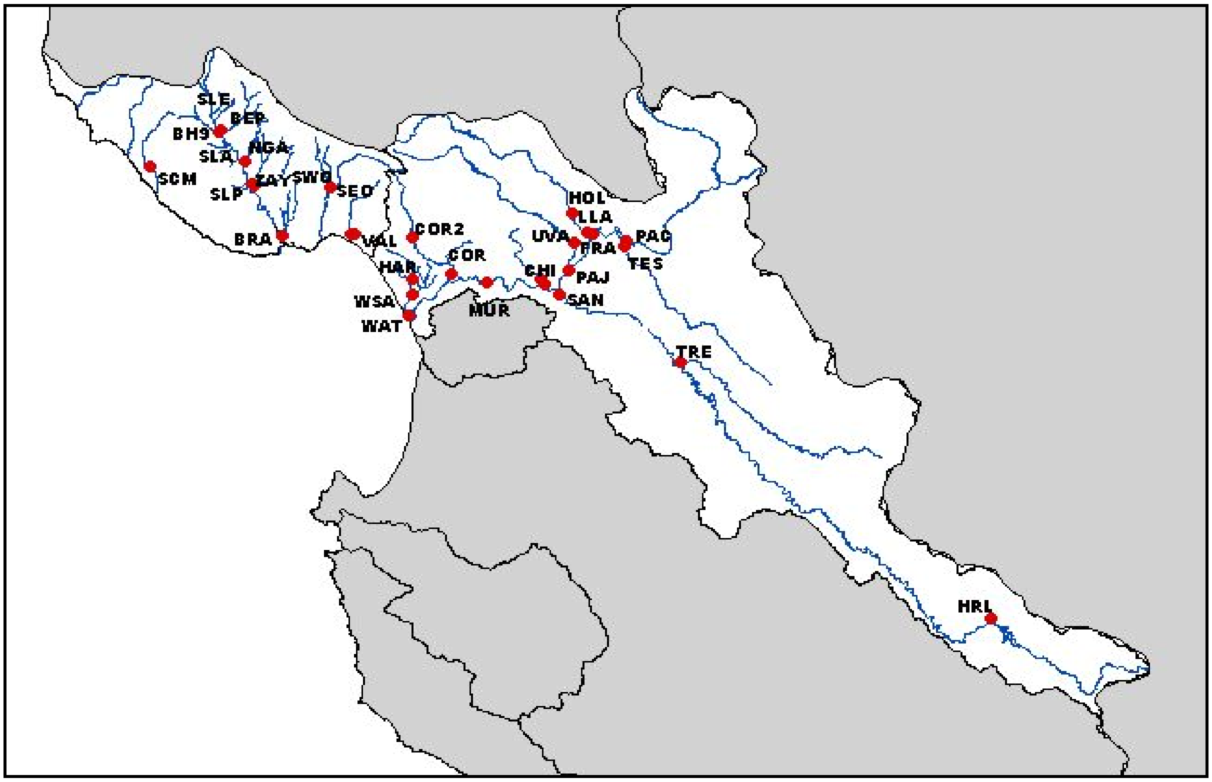
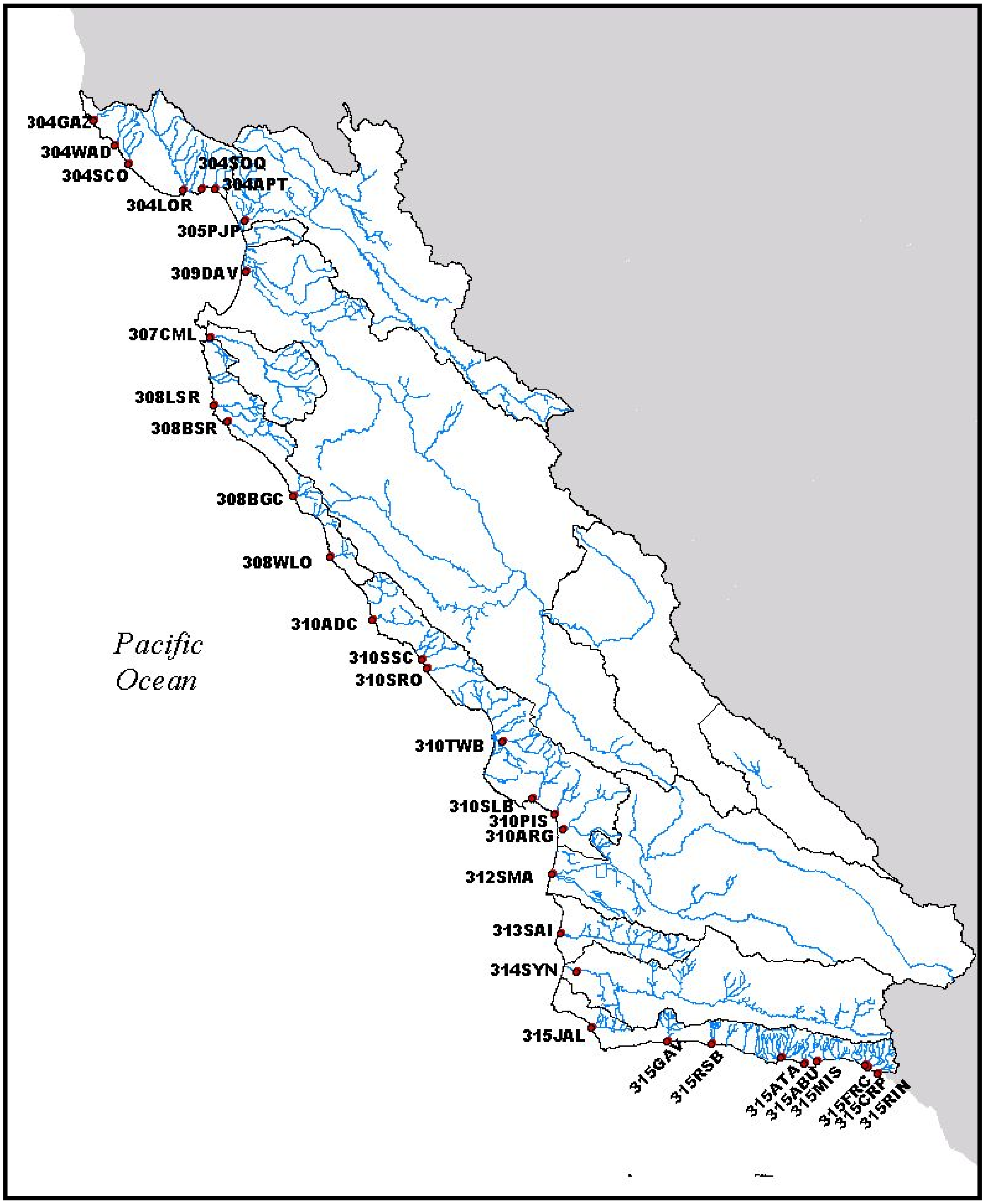


Figure 3. Coastal confluence site locations in Region 3.



Watershed Characterizations

The 2005 watershed rotation area includes coastal watersheds in southern San Mateo and northern Santa Cruz counties, the San Lorenzo River watershed, coastal watersheds south of Santa Cruz including Aptos and Soquel creeks, and the Pajaro River watershed. The northern coastal watersheds include Gazos Creek in San Mateo County, and Waddell, Scott, and Davenport creeks in northern Santa Cruz County. Most of these creeks support important steelhead trout and cojo salmon runs, have relatively little urban development and row crop agriculture, and have relatively good water quality. Timber harvest tends to be an important issue in these watersheds because of the extensive fir and redwood forests found in this part of the Region. The San Lorenzo River is a much larger system, which flows through several urban areas including the City of Santa Cruz. Aptos and Soquel Creeks, south of the San Lorenzo, have modest development in the lower watersheds and timber harvest in the upper watersheds. The Pajaro watershed is a very large and complex watershed, with extensive areas of row crop agriculture, several urban areas, diverse climate, and a multiplicity of water quality issues. Larger watersheds will be described in more detail below. Extensive literature is available for San Lorenzo and Pajaro watersheds. Much less background information is available for some of the smaller watersheds.

Additionally, several watersheds will be monitored as part of the Coastal Confluence component of the CCAMP monitoring strategy. These include coastal creeks and rivers of the Big Sur Coast, San Luis Obispo and Santa Barbara Counties. Each of these watersheds is discussed in some detail in the FY 2003-04 Work Plan.

Big Basin Watersheds – Hydrologic SubAreas 304.11 and 304.20

Major issues in the Gazos/Scott Creek area include siltation, water diversions, migration barriers and loss of riparian habitat. The County of Santa Cruz has gathered data at various locations in the smaller watersheds of this area for a number of years. In addition, several volunteer monitoring programs are collecting data in various watersheds.

CCAMP data for most of the other smaller watersheds along the coast indicate few water quality problems. However, the CCAMP program is not currently geared to assess instream sediment impacts, which are some of the more likely impacts in these watersheds.

Coastal confluences data are collected from the mouths of Gazos, Waddell, and Scott Creeks (in addition to San Lorenzo, Soquel, Aptos, and Pajaro Rivers, discussed above). The CCAMP sites at Gazos Creek lagoon had one dissolved oxygen value below the Basin Plan criteria for cold-water fish; this value was taken before dawn in August. One relatively high winter turbidity measurement was also taken on Gazos Creek, at 1000 mg/L. Most sites had occasional excursions above the Basin Plan pH criteria for domestic use of 8.3. There was no evidence of temperature problems at any sites.

Several waterbodies in the Big Basin Hydrologic Unit (304) are on the 303(d) list of impaired waterbodies due to specific pollutants and or stressors. These waterbodies are listed in Table 7.

Table 7. Big Basin Hydrologic Unit waters currently identified as impaired on the 303(d) list.

Waterbody	Pollutant/stressor	Pollutant/stressor	Pollutant/stressor
San Lorenzo Watershed			
Branciforte Creek	Siltation		
Carbonera Creek	Nutrients	Pathogens	Siltation
Boulder Creek	Siltation		
Bear Creek	Siltation		
Fall Creek	Siltation		
Kings Creek	Siltation		
Lompico Creek	Nutrients	Pathogens	Siltation
Love Creek	Siltation		
Mountain Charlie Gulch	Siltation		
Newell Creek	Siltation		
Shingle Mill Creek	Nutrients	Siltation	
San Lorenzo Lagoon	Boron	Fecal Coliform	
San Lorenzo River	Nutrients	Pathogens	Siltation
Aptos Watershed			
Aptos Creek	Pathogens	Siltation	
Valencia Creek	Pathogens	Siltation	
Other watersheds			
Soquel Lagoon	Nutrients	Pathogens	Siltation
Waddell Creek East Branch	Pathogens	Siltation	

Aptos Creek – Hydrologic SubArea 304.13

Aptos Creek is located in southern Santa Cruz County and is approximately 24.5 square miles in size. It drains to Monterey Bay south of the City of Santa Cruz. Its main tributaries are Valencia Creek, Mangles Gulch, and Bridge Creek. Both Aptos and Valencia Creeks are listed on the 303(d) impaired waterbodies list for siltation and pathogens, and are the subject of a Total Maximum Daily Load analysis.

The entire upper watershed was logged during the late 1800s, and 140 million board feet of first-growth redwood was removed. Much of the land that was logged is now known as Niesene Marks State Park (Powell 1986). The California Department of Fish and Game (1977) conducted inventories of fisheries resources and found that factors limiting steelhead populations in the creek include temperature, sedimentation, barriers to fish passage, inadequate woody debris, and inadequate canopy cover. Titus et al. (1994) indicate that declining fish populations are primarily caused by sedimentation in Aptos Creek. He indicated that a disastrous flood in 1982 created landslides and mass wasting, as well as debris jams, which blocked fish passage. The 1982 steelhead year-class was essentially eliminated. Surveys in 1999 (Nelson 2000) documented a number of steelhead once again present in the creek

Montgomery (1979) indicated that data for Aptos Creek was limited. However, the County of Santa Cruz has continued to monitor sites on Aptos and Valencia Creek since 1975. Their data shows that both creeks are fairly alkaline compared to other creeks they monitor, averaging 242 and 229 mg/L, respectively. Conductivity is also higher than on many of the other coastal streams monitored.

One of the County's sites, at the Spreckels Drive bridge, had elevated fecal coliform 57% of the time relative to the Basin Plan objective of 200MPN/100mL (a criteria which is applied to 5 samples collected within a 30 day period). Other sites in the watershed were relatively clean. CCAMP coastal confluence monitoring data for fecal coliform at the Aptos Creek site had a geomean which exceeded the Central Coast Basin Plan objective of 400 MPN/100 ml. Nitrate levels were relatively low, averaging less than 0.2 mg/L (NO_3 as N). Orthophosphate (as P) levels were slightly elevated, averaging somewhat less than 0.2 mg/L. This compares well with the County's data. Oxygen levels were fully saturated with a relatively narrow range of values.

Conventional water quality has been monitored by volunteer monitors from the Coastal Watershed Council. Findings from the spring and summer of 2000 indicate that most parameters met water quality standards. However, turbidity was elevated on Valencia Creek, and flow was low at the confluence of Valencia Creek with Aptos Creek.

Mussel Watch data shows no exceedances of FDA action levels for metals or organic chemicals in fish tissue collected from Aptos Creek.

Soquel Creek – Hydrologic SubArea 304.13

The Soquel Creek Lagoon is listed on the 303(d) impaired waterbodies list for pathogens, nutrients, and siltation. Montgomery (1979) indicated that water quality influences on the watershed are primarily from urban runoff and residential development in the upper watershed with associated septic system use. Forestry activities in the upper watershed contribute to the sedimentation problem. Cafferata and Poole (1993) completed a watershed assessment of sediment impacts to the East Branch of Soquel Creek.

USGS conducted water sampling at their gaging station between 1953 and 1966, which gives an indication of general mineral composition of Soquel Creek water; hardness and dissolved solids are relatively high, but are comparable to ground water supply in the area. County of Santa Cruz data show that Soquel Creek, along with Aptos and Valencia, have among the highest alkalinity levels of all creeks sampled by their program, averaging 210 mg/L in Soquel Creek.

CCAMP monitoring for fecal coliform at the Soquel Creek coastal confluence site resulted in a geomean of all samples of 401 MPN/100 ml, with 33% of measurements exceeding the Central Coast Basin Plan single sample maximum of 400 MPN/100 ml. Nitrate levels were very low, averaging less than 0.1 mg/L (NO_3 as N). Orthophosphate (as P) averaged 0.11 mg/L. Dissolved oxygen levels showed no signs of depression. However, the maximum value was 13.88, which may indicate super-saturation. pH occasionally exceeded 8.3 (the Basin Plan criteria for domestic supply), but averaged 8.17. Multiple years of data collected by Santa Cruz County generally supports these findings.

Mussel Watch data shows no exceedances of FDA action levels for metals or organic chemicals in bivalve tissue collected from Soquel Creek.

San Lorenzo River Watershed – Hydrologic Subarea 304.12

The San Lorenzo River is listed on the 1998 303(d) list as impaired by nutrients, pathogens and sedimentation. The San Lorenzo River estuary is also listed for pathogens and sedimentation. Carbonera and Lompico Creeks, tributaries to the San Lorenzo River, are also listed for pathogens, nutrients and sedimentation. Shingle Mill Creek is listed for nutrients and siltation. Schwan Lake, which is also in the watershed, is listed for nutrients and pathogens. Revisions to the list currently under consideration would add a number of the tributaries specifically for sediment, but would delist the San Lorenzo for nutrients.

General Watershed Description – The San Lorenzo River is a 25-mile long river that drains to the Pacific Ocean at the northern end of Monterey Bay. It drains a 115 square mile watershed, which is mostly a steep, heavily forested landscape on the west slope of the central Santa Cruz mountains. Average rainfall is about 47 inches, most of which falls between December and April (County of Santa Cruz 1979; Phillip Williams & Assoc. 1989).

The San Lorenzo River is a perennial stream with average summer flows typically under 10 cfs but flood flows recorded as high as 35,000 cfs. The lower 2.2 miles of the stream have been channelized and levied for flood control purposes, as the stream flows through downtown Santa Cruz. This reach of stream does not have a well-shaded canopy, though vegetation restoration projects have begun to improve bank vegetation along the levees. The San Lorenzo River lagoon provides critical summer habitat for juvenile steelhead. Breaching of the lagoon to prevent flooding is an ongoing management concern for protection of steelhead habitat.

As of 1970, 23.2% of the watershed was in urban and suburban land use. Besides the City of Santa Cruz, the San Lorenzo River and its tributaries flow past the communities of Boulder Creek, Ben Lomond, Felton, Lompico, Zayante, Mount Hermon, and the City of Scotts Valley (County of Santa Cruz 1979). In addition to urban, suburban and timber harvest uses, others include recreation (including golf courses), range and pasture land, and small animal holding facilities.

The main tributaries to San Lorenzo River include Carbonera Creek (7.4 sq. mi.), Zayante Creek (13.8 sq. mi.), Bear Creek (16.2 sq. mi.), Boulder Creek (10.2 sq. mi.), Newell Creek (9.7 sq. mi.), and Branciforte Creek (18.1 sq. mi.). Branciforte Creek is channelized in its lowest mile before it joins the San Lorenzo River. Loch Lomond is an impoundment on Newell Creek, formed in 1961 (County of Santa Cruz 1979).

Conventional Water Quality Findings - Though nitrate levels in the San Lorenzo system are relatively low compared to other agriculture dominated watersheds in the area (such as the Pajaro River), the river was listed as impaired by nitrate based on impacts to taste and odor in the municipal water supply.

CCAMP coastal confluences monitoring rank the San Lorenzo River among the lowest in the Region for nitrate concentrations; it averaged 0.19 mg/L (NO_3 as N) and never exceeded 0.8 mg/L (unlike the Pajaro River, which averaged 4.48 mg/L near its mouth). The San Lorenzo watershed has relatively rich natural sources of phosphorus (County of Santa Cruz 1979); Coastal Confluence monitoring indicated an average value of 0.45 mg/L phosphorus as P. The low nitrogen to phosphorus ratio indicates that the watershed is nitrate limited. Therefore, controls on nitrate are important in the watershed to reduce taste and odor problems originating from algal growth.

The CCAMP program has acquired and reviewed the extensive water quality data collected by the Santa Cruz County Environmental Health Department. Virtually no indications of problems from nitrite or ammonia were found. An examination of dissolved oxygen levels over a twenty-year period of record showed only three excursions below 7.0 mg/L (the Basin Plan criteria for cold water fish) on tributaries. Violations were on Bear Creek, Gold Gulch and Kings Creek. No measurements were recorded below 6.4 mg/L. On the main stem of the San Lorenzo violations were more common, with measurements dropping below 7.0 mg/L 10.3% of the time. However, most violations were from one of the 18 sites monitored on the San Lorenzo; this was Station 1-01-002 below Boulder Creek, which violated 52% of the time, but never dropped below 5.3. Two violations were recorded at Waterman Gap and one at Irwin Way check dam. Overall, dissolved oxygen levels in the watershed appear to be in good condition.

CCAMP data show the San Lorenzo River to have the highest fecal coliform levels of all coastal confluences measured, which include 33 major watershed systems of the Central Coast. The fecal coliform geomean at the lower end of the river was 953 MPN/100 ml, with single sample maximums ranging as high as 92,000. This site violated the Central Coast Basin Plan objective (single sample maximum of 400 MPN/100ml) in 71% of the 17 samples taken (between April 2001 and March 2003). Fecal coliform appears to be a significant problem in almost all tributaries, according to data collected by the County of Santa Cruz Environmental Health Department. Fall Creek and Clear Creek rarely or never exceeded 200 MPN/100 ml, the basin plan objective for the geomean of all samples. All other tributaries and the San Lorenzo River itself exceeded this value regularly. For example, of the 100 samples taken along the main stem over the twenty-five year period of record, 49 samples exceeded 200 MPN/100 ml and the geometric mean of all samples was 6749 MPN/100 ml. The worst site on the San Lorenzo River mainstem was at Big Trees, where 67% of all samples violated the standard. Branciforte Creek, Carbonera Creek, Camp Evers tributary, and Schwann Lake also had relatively high percent violations. High fecal coliform levels are attributable at least in part to old and failing septic systems in the upper watershed.

Metals - State Mussel Watch Program data indicates that some metals may exceed Median International Standards (MIS) in mussel tissue in the Santa Cruz area. Samples have been collected from a number of locations in the San Lorenzo watershed and in the Santa Cruz Harbor. The MIS for copper was exceeded on the San Lorenzo River at Big Trees in the early 1980's. Santa Cruz Harbor exceeded MIS standards in shellfish on several occasions for cadmium, chromium, copper, and zinc. Fish tissue samples from Corcoran Lagoon and Moran Lake also had elevated levels of cadmium and chromium. In freshwater clam and fish tissue samples collected by Department of Fish and Game staff throughout the watershed, cadmium and copper levels did exceed the MIS levels on occasion.

The County of Santa Cruz sampled for metals in water throughout the San Lorenzo watershed on a number of occasions. The Basin Plan standard in cold water fish habitat for both cadmium and chromium is 0.03 ppm and 0.05 ppm respectively. These values were exceeded on several occasions in urban runoff. Sediment chemistry data collected at the CCAMP coastal confluences site in 1998 did not show levels of these or any other metals elevated above the effects range medium (ERM) value.

Habitat – Sediment is a problem in a number of locations in the watershed and is the subject of several TMDL analyses. Fine sediment in spawning gravels results in reduction in carrying capacity for anadromous fish, and can severely reduce fish populations. Several studies describe the problem in detail (Leonard 1972, SCCPD 1979, Swanson Hydrology 2001, and Soil Conservation Service 1990) and Regional 3 staff has compiled a literature review of studies related to the problem (Jagger et al. 1993). Sedimentation sources are various and the problem is a complex one. The major sources of erosion defined in the Zayante Creek sedimentation study (Swanson Hydrology 2001) are from roads (from timber harvest, private, and public purposes), active timber harvest, mass wasting, channel erosion and other urban and rural land uses. This study estimated that the Zayante watershed yielded 115,116 tons per year of sediment, of which 23% is potentially controllable. Hecht (1998) indicates that stream conditions have not improved since the Watershed Management Plan, developed in 1979 by the County of Santa Cruz, was written. The proportion of bed material composed by baserock used for road surfacing has increased over the years, indicating significant wasting of roads in the upper watershed. The bed material is generally composed of finer material, with proportionally less material originating in the upper watershed, and more from the lower, sandier areas.

Algal growth has been documented in excessive amounts in the lower San Lorenzo River. Studies have been done to assess the extent of the algal growth problem in the watershed. Species found at Boulder Creek and Ben Lomond were particularly indicative of a nutrient enrichment problem. Relatively low dissolved oxygen levels at Boulder Creek support this finding. As the river moves downstream through Henry Cowell State Park this condition improves substantially (County of Santa Cruz 1979).

Fish and Game surveys (CDFG 1996) indicate that water diversions by the City Water Department and by riparian users significantly impact summer stream flow, to the point that dewatering occurs at times. Water impoundment by Loch Lomond Reservoir also results in a reduction of flows to the lagoon Channelization, riparian habitat removal, and lack of wood debris greatly reduce habitat quality in the lower reaches of the river. The same surveys describe numerous problems in tributary streams, including siltation, degradation of stream flow from water diversion, removal of riparian vegetation, improper placement of culverts, and degradation of water quality from septic systems.

Pajaro River Watershed – Hydrologic Unit 305

The Pajaro River watershed was the focus of CCAMP watershed rotation monitoring in 1998, unlike the watersheds in the 304 Hydrologic Unit that will be sampled by CCAMP for the first time during the 2002 watershed rotation. The Pajaro River was the first watershed sampled by CCAMP, and because of limited resources, other more northerly watersheds in the rotation area were not sampled at that time. Much of the following description of water quality issues stems from data collected by CCAMP in 1998.

Several waterbodies in the Pajaro watershed are listed on the CWA 303(d) list of impaired waterbodies, as follows:

Water Body	Pollutant	Pollutant	Pollutant	Pollutant	Pollutant
Pajaro River	Sedimentation	Nutrients			
Watsonville Slough	Sedimentation	Pathogens	Oil and Grease	Metals	Pesticides
Llagas Creek	Sedimentation	Nutrients			
Rider Gulch	Sedimentation				
San Benito River	Sedimentation				
Clear Creek	Mercury				
Hernandez Reservoir	Mercury				
Schwan Lake	Nutrients	Pathogens			

General Watershed Description - The Pajaro River watershed encompasses over 1,300 square miles of central California. The major direct tributaries to the Pajaro River include San Benito River, Tequisquita Slough/Santa Ana Creek, Pacheco Creek, Llagas Creek, Uvas Creek, and Corralitos Creek (See Figure 2 for a map of the Pajaro River watershed). The Pajaro River flows to Monterey Bay north of Moss Landing Harbor.

The Pajaro River watershed encompasses parts of four counties: San Benito County (about 65% of the watershed area), Santa Clara County (about 20% of the watershed), Santa Cruz County (about 10% of the watershed) and Monterey County (less than 5% of the watershed). There are five incorporated cities within the watershed: Watsonville, Gilroy, Morgan Hill, Hollister, and San Juan Bautista. The Pajaro River watershed contains a wide variety of land uses, including row crop agriculture, livestock grazing, forestry, industrial, and rural/urban residential. The watershed also contains significant amounts of natural vegetative cover, which provides habitat to numerous native bird and wildlife species.

Pajaro River watershed flow patterns are characteristic of a Mediterranean climate, with higher flows during the wetter, cooler winter months and low flows during the warmer, drier summer months. Principal water sources for the Pajaro River and its tributaries are surface runoff, springs, subsurface flow into the channels, and reclaimed water entering the creek through percolation from water discharged by South County Regional Wastewater Authority (SCRWA). The first three water sources are subject to large flow variations due to climatic influences, while the discharge from the SCWRA tends to influence flow year-round.

Water Quality Findings - The Pajaro River watershed was monitored (water, sediment, and tissue samples) by the Central Coast Regional Water Quality Control Board (RWQCB) and subcontract laboratories from December 1997 through January 1999 to assess the relative contributions of conventional pollutants (nutrients, sediment, etc.), toxins, metals, and other pollutants from major tributary streams to document ambient water quality.

Conventional Water Quality - CCAMP has documented levels of pH, nutrients (nitrate and ammonia), dissolved oxygen, and total dissolved solids in the Pajaro River watershed that do not meet Central Coast Water Quality Control Plan (Basin Plan) water quality criteria. CCAMP has also determined that other water quality parameters of concern include temperature, algae (attached and suspended), sediment, and bacteria.

Sedimentation has been documented as a problem in portions of the watershed in other studies (Balance Hydrologics 1990, Phillip Williams and Associates 1996 and Golder 1997). Much of this is due to bank sloughing, land slides of sandstone and shales in headwater areas, and sheet and rill erosion from adjacent land uses. The lower portion of the San Benito River is degrading as a result of gravel mining, and is in a state of disequilibrium, which can result in erosion of banks (Applied Science Engineering et al. 1999). CCAMP monitoring in 1998 did not address instream impacts of sedimentation in a detailed way, but did assess sediment impacts as part of bioassessment habitat analysis. That "snapshot" view indicated that lower Llagas Creek and the Pajaro River at Betabel Road were most severely impacted by sediment.

CCAMP monitoring documented specific violations of Basin Plan pH criteria (mean values greater than standard of 8.3 pH units) at two sites in the Pajaro River watershed (Tres Pinos Creek and Pajaro River at Frazier Lake Road). Limited pH data has been collected on the San Benito and Pajaro Rivers. Dynamac Corporation (1998) reported "background concentrations" of pH data collected in the San Benito River up stream and down stream of the confluence with Clear Creek (upper San Benito River) exceeded regulatory limits (pH values from 8.4 to 8.8). Similarly, Williamson (1994) documented a pH range of 7.8 to 9.3 at the Frazier Lake Road site. A report by Greenlee (1981) contained 1978 Pajaro River surface water data collected by the State Water Resources Control Board showing pH values ranging from 6.6 to 9.4. This range of pH values in the Pajaro River is supported by historical data from the Chittenden stream gauge station (USGS and DWR data summarized by Williamson (1994)).

Water samples from three stations along the southern portion of Llagas Creek exceeded the State nitrate drinking water objective of 10 mg/L (NO_3 as N) on multiple occasions, and ranged as high as 31.7 mg/l at Holsclaw Road. Williamson (1994) reported similar elevated nitrate levels at two sampling stations (17.7 and 19.0 mg/L NO_3 as N) on Llagas Creek. Similarly, James Montgomery Consulting Engineers (1993) documented nitrate levels on Llagas Creek between 4.5 and 17.0 mg/L NO_3 as N. Historical data (1955 through 1991) from various stations on Llagas Creek show nitrate levels on Llagas Creek ranging between 0.1 and 10.3 mg/L NO_3 as N (sources include USGS 1982 – 1990 Water Resources Data Reports, Regional Water Quality Control Board 1983 Staff Report, Department of Water Resources). Haase (Appled Science Engineering et al., 1999) theorized that a reducing substance was infiltrating into the reach where seepage from the City of Gilroy's treatment plant is prevalent (from Holsclaw Road downstream to Bloomfield Road), because of the declining nitrate levels and sometimes increased ammonia levels across this reach.

The Basin Plan unionized ammonia objective of 0.025 mg/L NH3 as N was exceeded once at the Tequisquita Slough site reaching 0.072 mg/L NH3 as N. Limited ammonia data has been collected in the Pajaro River watershed. James Montgomery Consulting Engineers (1993) documented ammonia levels on Llagas Creek between 0.0007 and 0.0014 mg/L NO_3 as N. Williamson (1994) reported similar ammonia levels (a limited review of the data revealed ammonia levels from 0.011 to 0.032 mg/L NH3 as N) at six sampling stations in the Pajaro River watershed. The levels documented are typically below the 0.025 mg/l NH3 as N limit and indicate no problem with ammonia toxicity.

Over 35 violations of Basin Plan dissolved oxygen criteria for the COLD beneficial use (minimum values less than standard of 7.0 mg/L) were observed at twelve sites in the Pajaro River watershed. Williamson (1994) reported similar dissolved oxygen levels (a limited review of the data revealed 11 dissolved oxygen measurements below 7.0 mg/L) at six sampling stations (four on Llagas Creek and two on the Pajaro River) in the Pajaro River watershed. James Montgomery Consulting Engineers (1993) also documented 16 dissolved oxygen measurements below 7.0 mg/L on Llagas Creek, Miller Canal, and Pajaro River. The Greenlee (1981) report containing 1978 Pajaro River surface water data collected by the State Water Resources Control Board documented one instance of dissolved oxygen below 7.0 mg/L.

Three violations of Basin Plan dissolved oxygen criteria for the WARM beneficial use (minimum values less than standard of 5.0 mg/L for WARM) were observed at the Tequisquita Slough site in the Pajaro River watershed. Of the data reviewed, no others documented dissolved oxygen levels lower than this value in water bodies designated as WARM.

All but two sites sampled in the Pajaro River watershed had at least one dissolved oxygen measurement depressed below 85% saturation, however the Basin Plan objective is applied to the median dissolved oxygen saturation value of 85%. Both Tequisquita Slough and the Pajaro River sites at Betabel Road and Thurwachter Bridge violated the oxygen saturation criteria 50 percent of the time. Of other data sources reviewed, none recorded oxygen saturation levels.

Average total dissolved solids (TDS) levels, at all Llagas Creek sites, exceeded the Basin Plan waterbody specific objective of 200 mg/L. On the San Benito River, at the Y Road site, TDS levels exceeded the Basin Plan surface water quality objective of 1400 mg/L in September and October 1998. TDS values at the lower Pajaro River sites at Chittenden Gap and Murphy's Crossing reached or exceeded the Basin Plan surface water quality objective of 1000 mg/L for TDS in August, September, and October 1998.

James Montgomery Consulting Engineers (1993) documented a range of average TDS values of 736 to 848 mg/L on Llagas Creek. Only two samples out of 25 collected were below the water quality objective of 200 mg/L. James Montgomery Consulting Engineers (1993) also observed an average range of TDS values of 829 to 839 mg/L on Pajaro River. Average TDS values reported for this section of the Pajaro River were below the Basin Plan surface water quality objective of 1000 mg/L, but several individual measurements exceeded the objective.

Metals – State Mussel Watch Program tissue data collected during the 1998 CCAMP sampling from the San Benito River at Y Road had the highest values of all sites for several different metals, notably aluminum, cadmium, chromium, copper, mercury, nickel, silver, and zinc, implying metals may be a problem in this watershed. Chromium, copper and zinc levels in tissue were high throughout the watershed compared to Median International Standards. Chromium levels were also elevated throughout the watershed in sediment samples. Chromium concentrations are commonly high in areas with serpentine soils.

Manganese levels in tissue were high throughout the Pajaro watershed overall compared to the Mussel Watch EDL 95 for transplanted freshwater clams, and in Llagas Creek samples were particularly high. Historical data from the Pajaro Valley Water Management Agency has shown manganese to also be elevated in Corralitos Creek (Applied Science Engineering et al. 1999)

On the Pajaro River at Betabel Road, several metals (lead, copper, nickel and zinc) were above cold water habitat Basin Plan criteria, in a single water sample taken in March. Metals data from the Chittendon Gap site on the Pajaro River have historically been elevated for both mercury and lead. Mercury and lead are also periodically elevated on Llagas Creek (Applied Science Engineering et al. 1999).

A management plan developed for Watsonville Slough identified copper, nickel and zinc at high levels in tissue and sediment in the Slough (Questa Engineering 1995). Lead at potentially toxic levels has also been detected repeatedly over the years (Applied Science Engineering et al. 1999).

Mercury was elevated (over the California Toxics Rule water quality objective) at sites on the San Benito watershed, in water samples collected for CCAMP by the State Mussel Watch Program. Sediment samples from the upper San Benito watershed also had elevated mercury levels (exceeding the NOAA ERL). There are a number of historical references to elevated mercury levels in this watershed (Applied Science Engineering 1999). Both Clear Creek and Hernandez Reservoir are listed on the 303(d) list for mercury.

A Clear Creek study conducted for the Bureau of Land Management (Dynamac 1998) found elevated levels of chromium, nickel and copper in water quality samples. Sediment samples were high in cobalt, nickel and mercury at several sites, and antimony, chromium, cadmium, copper, and arsenic at a few sites. Some references also indicate elevated levels of barium in Clear Creek (Applied Science Engineering 1999).

<u>Synthetic Organic Chemicals</u> **-** Legacy organochlorine pesticides and several currently applied organophosphate pesticides can be found in most tributaries of the Pajaro River system. DDT compounds were widespread in CCAMP sediment and tissue samples. Several main stem sites had elevated levels of DDT, dieldrin, and chlordane compounds. The Betabel Road site had the highest values of dieldrin and toxaphene. Chittendon Gap had relatively high levels of dieldrin and toxaphene as well as chlordane compounds. Llagas Creek also had relatively high levels of chlordane compounds.

Salsipuedes Creek stands out in CCAMP data for the relatively large number of chemicals that were present in clam tissue. DDT compounds were found at levels exceeding several criteria at this site in sediment, water and tissue. Relatively low levels of diazinon and chlorpyrifos were found in sediment, water, and/or tissue. Other chemicals included dieldrin, chlordane, and oxadiazon (sediment and tissue); and toxaphene, heptachlor epoxide, and ethyl parathion (tissue only).

The most prevalent findings related to currently applied pesticides were relatively high values of diazinon in clam tissue collected in several main stem Pajaro River sites, particularly at Betabel Road. Pacheco Creek also had somewhat elevated levels of ethyl parathion, which though being phased out, is still applied to certain crops.

Toxicity Identification Evaluation studies conducted on samples from lower Pajaro watershed sites (by Granite Canyons Marine Polution Studies Laboratory staff in 1998) suggested the toxicity found on the main stem and in some of the agricultural drains were attributable to organochlorine pesticides. 78% of samples collected from drainage ditches were acutely toxic. Sampling by M. Swanson and the Habitat Restoration Group in the winter of 91/92 identified 4'4'DDE and endosulphan sulphate in the Pajaro lagoon. The Questa Engineering study (1995) confirmed elevated levels of diazinon and DDT/DDE in water quality samples. State Mussel Watch data confirms that Watsonville Slough has had extremely high levels of organochlorine pesticides in past years, particularly DDT, chlordane, dieldrin, endosulphan, toxaphene, hexachlorobenzene and PCBs; some of these levels are the highest documented in the State.

<u>Oil and Grease</u> – Recent stormwater data collected from Watsonville Slough (RWQCB, 2001) indicate that oil and grease are found there at levels that are sometimes of concern. Watsonville Slough is listed as impaired by oil and grease.

Intra-agency Coordination

CCAMP staff is coordinating with other Region 3 staff to ensure consistency with SWAMP in data gathering methods, data quality objectives, and data reporting formats. Table 8 summarizes monitoring activities Region 3.

Table 8. Intra agency monitoring in coordination with CCAMP.

Intra agency group	**Monitoring Program description**	**Available Data Format**	**Using SWAMP QAPP**	**Data format SWAMP compatible**	**Data used for 303(d) and 305(b) analysis**
CCAMP	CCAMP watershed rotation monitoring.	R3 has data in electronic format (SWAMP compatible)	X	X	X
CCAMP	CCAMP coastal confluences monitoring at creek mouths.	Ongoing. R3 has data in electronic format (SWAMP compatible)	X	X	X
TMDL	TMDL monitoring for loading assessments in Region 3 streams including Pajaro, Aptos,	Data currently being collected and planned over the next several years.		X	X

	San Lorenzo, Chorro, Los Osos, San Luis Obispo, Santa Maria and a number of tributary streams.	R3 has most data available in electronic format (SWAMP compatible)			
Ag Waiver Replacement	Agriculture monitoring is required in association with waivers	Program is being initiated. This program will be utilizing the EDF data format and will provide data to SWAMP for batch upload	X	X	X
Grant Projects	Contractors are required to meet with Region 3 quality assurance staff in the first quarter of the grant, to discuss development of the QAPP, Monitoring Plan, and data management.	Data will be submitted in electronic format using SWAMP templates.		X	X

Inter-agency and Organizational Coordination

CCAMP staff is currently in coordination with several local agencies and organizations collecting data from coastal streams and in nearshore areas. Table 9 summarizes monitoring activities which are underway in watersheds monitored by CCAMP.

Table 9. Monitoring organizations and activities at work in coastal confluence and watersheds in the 304 and 305 Hydrologic Units.

Federal	**Monitoring Activities**	**Coordination Status**
NOAA Status and Trends	Several mussel monitoring sites are maintained in nearshore areas of Monterey and Santa Cruz Counties. The CCLEAN program will collect data.	Data to be collected through CCLEAN.
EMAP	23 sites monitored in surface waters of Region 3. Data collected by DFG staff, 2003.	Data requested. Report pending.
EMAP	30 sites monitored in Morro Bay. Data collected by DFG staff, September 2003.	Data requested. Report pending.
NOAA Monterey Bay Marine Sanctuary Integrated Monitoring Network (SIMON)	Ecological monitoring program which primarily coordinates existing research, and initiates new monitoring in Monterey Bay. CCAMP is coordinated with the program and is the primary water quality data gathering program within SIMON.	Information sharing. CCAMP data available to SIMON
Vandenberg Air Force Base	Water quality monitoring on San Antonio Creek and Santa Ynez River. Several long-term sites maintained. CCAMP coordinating on site selection, water quality information, data sharing and monitoring training.	Technical support. Annual data acquired.
State		
State Mussel Watch Program (SMW) and Toxic Substances Monitoring Program (TSM)	Monitoring in association with CCAMP watershed rotation area program through 2003. Program terminated in 2003 due to budget cuts.	Data acquired.
CDFG and UC Santa Barbara	Sand crab tissue bioaccumulation monitoring coast wide.	Data acquired.
SMW	Bivalve tissue bioaccumulation. 3 sites in Region 3 (using SMW Endowment funds). Ongoing.	Annual data acquired.
SMW	Carmel Area WWTP monitoring. Recently terminated due to MRP changes.	Data acquired.

Department of Health Services (DHS)	DHS samples Morro Bay as part of the National Shellfish Protection Program for toxic phytoplankton (in coordination with volunteers) and also samples commercial shellfish growing operation. Ongoing.	Data acquired. (Hard copy format)
California Cooperative Fisheries Investigations	CalCOFI has conducted marine surveys for basic water quality parameters offshore southern and central California for many years. Ongoing.	Data available online.
California State Parks Santa Barbara Region	Monitoring basic water quality parameters and benthic macroinvertebrates in Santa Barbara State Parks.	Technical support. Data acquired through 2000.
California State Parks North Coast Region	Flow, basic water quality and benthic macroinvertebrate monitoring in Wilder and Waddell State Parks	Data requested.
Local		
San Mateo County AB 411 monitoring	Collection of shoreline bacteria data at Gazos Creek State Beach. Ongoing.	Data acquired.
Santa Cruz County Environmental Health Department	Extensive network of conventional water quality monitoring sites throughout Santa Cruz County with many years of record.	Data obtained through 1999.
Santa Cruz County AB 411 monitoring	Collection of shoreline bacteria data. Numerous sites. Ongoing.	Data acquired and available online.
City of Santa Cruz , Watsonville, Monterey Regional and Carmel Area Municipal WWTPs	Discharge to nearshore areas. Dischargers participate in regional monitoring activities through the CCLEAN Program. Includes shoreline mussel and coliform sampling, river mouth monitoring, and nearshore sediment monitoring.	Annual data acquired.
Monterey County AB 411 monitoring	Ongoing collection of shoreline bacteria data.	Data acquired and available online.
City of Watsonville	Surface water quality monitoring for conventional pollutants and pesticides in Pajaro River and some tributaries. Ongoing.	Some data obtained.
Hollister WWTP	Percolation ponds monitoring adjacent to San Benito River.	Data acquired. (Hard copy)
South County Municipal Wastewater Treatment Authority	Percolation ponds monitoring adjacent to Llagas Creek. Monitoring sites on Llagas Creek above and below ponds. Data used for TMDL development.	Data acquired.
San Luis Obispo County AB 411 monitoring	Collection of shoreline bacteria data. Numerous sites. Ongoing.	Data acquired and available online.
Cambria Sanitary District	Percolation ponds monitoring adjacent to San Simeon Creek. Limited monitoring of San Simeon Creek and lagoon.	Data acquired. (Hard copy)
California Men's Colony WWTP	Discharges directly to Chorro Creek. Monitoring data includes upstream and downstream sites. Ongoing. Data used for TMDL development.	Data acquired.
City of Morro Bay WWTP	Discharges to Pacific Ocean. Extensive nearshore monitoring as a result of 301(h) waiver.	Data acquired. (Hard copy)
City of San Luis Obispo WWTP	Discharges to San Luis Obispo Creek. Monitors 7 creek sites in addition to effluent monitoring. Data used for TMDL development.	Data acquired.
Pismo and South County WWTPs	Discharge to nearshore areas. Plants have minimal receiving water monitoring activities.	Data acquired. (Hard copy)
Pacific Gas and Electric Company	Many years of intensive monitoring of Diablo Cove for impacts associated with the Diablo Canyon Nuclear Power Plant.	Data acquired. (Hard copy)
County of Santa Barbara AB 411 monitoring	Collection of shoreline bacteria data. Numerous sites. Ongoing.	Data acquired and available online.

County of Santa Barbara Project Clean Water Project	Storm event volunteer monitoring at several creeks in the county.	Data acquired.
City of Lompoc WWTP	Monitoring of effluent discharges and of the Santa Ynez River.	Data acquired. (Hard copy)
University		
PISCO – UC Santa Cruz and UC Santa Barbara	Intertidal and subtidal ecological monitoring along the California Coast. Ongoing. CCAMP hopes to coordinate by adding mussel bioaccumulation data at these sites (funding pending).	Data will be available online at PISCO website.
UC Santa Cruz	Nutrients in the Pajaro watershed, particularly related to surface/groundwater interactions. Data to be used for TMDL development. Multiple year project.	Data not yet acquired.
Cabrillo College Geography Dept.	Basic water quality, fecal coliform and salinity monitoring in Aptos Creek.	Data not yet acquired.
UC Monterey Bay-Watershed Institute	Basic water quality, pesticide, sediment and flow monitoring in the lower Salinas River watershed.	Data acquired. Report completed.
UC Monterey Bay-Watershed Institute	Basic water quality monitoring in the Carmel and Salinas River lagoons.	Data acquired. Report completed.
California Polytechnic State University, SLO	Buoyed multi-analyte probe monitoring in real time. Avila Bay. Program initiation 2003. Monitoring will be ongoing.	Data not yet acquired; will be available online.
California Polytechnic State University, SLO	Sampling paired watershed for effectiveness of best management practices related to timber harvest in the Scott Creek watershed.	Coordination in monitoring design. Data not yet acquired.
Long Term Ecological Research-UC Santa Barbara	Nutrient loading to coastal wetlands and the ocean. Bi-weekly monitoring in Carpinteria and Santa Barbara area creeks. Several sites at the same location as CCAMP coastal confluence sites. Ongoing.	Data Requested. (Pending publication)
Volunteer		
Monterey Bay Citizen Monitoring Network	Coordination of volunteer monitoring activities in coastal waters throughout the Sanctuary. First Flush, Urban Watch and Snap Shot Day data. Volunteer coordinator is acquiring local data. Ongoing. CCAMP provides technical support for data and website management.	Data acquired and in CCAMP format. CCAMP provides website support for data,
Arana Gulch Watershed Alliance	Watershed education. Data collected in coordination with the National Marine Sanctuary (NMS) Volunteer Coordinator.	Data to be acquired via NMS Volunteer Coordinator.
Scott Creek Watershed Council	Basic water quality monitoring on Scott and Little Creek. Data collected in coordination with the NMS Volunteer Coordinator.	Data to be acquired via NMS Volunteer Coordinator.
Santa Cruz Blue Water Task Force	Ocean monitoring of E coli and total coliform.	Data available on website???
Friends of Soquel Creek	Summer baseflow monitoring in coordination with the NMS Volunteer Coordinator.	Data to be acquired via NMS Volunteer Coordinator.
California Dept. of Fire and Forestry	Benthic macroinvertebrates and steelhead counts in Soquel Creek.	Data not acquired
San Lorenzo Valley Unified School District Charter 25-Home School Program	Visual assessment of riparian corridor, flow, benthic invertebrate communities in Soquel Creek	Data to be acquired via NMS Volunteer Coordinator.
San Lorenzo Valley High School Watershed Academy	Water quality, fecal coliform, riparian birds	Data to be acquired via NMS Volunteer Coordinator.

San Lorenzo Watershed Caretakers	Watershed education and implementation	
City of Santa Cruz Urban Watch Program	Stormwater monitoring using EPA pollution detection kit. CCAMP is coordinating with the National Marine Sanctuary Volunteer Coordinator.	Data acquired.
Coastal Watershed Council	Water quality, flow, benthic invertebrates, stream morphology – Arana, Soquel, and Gazos Creek	Data to be acquired via NMS Volunteer Coordinator.
Big Creek Ecological Reserve	Watershed education and water quality monitoring for CWQ and benthic invertebrate community assemblages.	Data available online.
Garrapata Creek watershed council	Watershed education	Information sharing.
Carmel River Watershed Council	Watershed education; currently gathering existing data and information under Prop. 13 grant	Metadata will be available through SIMoN
Upper Salinas Las Tablas Resource Conservation District	Watershed education and collection of water quality and flow data in Upper Salinas watershed	Annual data acquired.
Morro Bay Volunteer Monitoring Program	Ongoing Chorro and Los Osos Creek and Morro Bay water quality sampling, some habitat, BMI and flow sampling. Ongoing. CCAMP provides technical support for data management.	Annual data acquired.
San Luis Obispo Land Conservancy	Watershed education and water quality data for San Luis Obispo Creek.	Annual Data acquired.
Central Coast Salmon Enhancement	Watershed education and water quality monitoring in Arroyo Grande and Nipomo Creeks. Future monitoring planned for Pismo Creek. Ongoing. CCAMP provides technical support for data management.	Annual Data acquired.
Monterey and San Luis Obispo County Surfrider Foundations	Monitoring shoreline for pathogen indicators. Ongoing.	Data not yet acquired.

Budget

The Region 3 allotment from the SWAMP program for FY 2004-05 is $207,666 with additional unused funding available from previous years totaling $190,681. Other funding sources applied toward monitoring activities include State Mussel Watch endowment, and CCAMP endowments. Budget allocations to different elements of the program are shown. Because funds are provided on a fiscal year basis and sampling rotation years are managed on a calendar year basis, the budget reflects continuation of the coastal confluence monitoring that was initiated in the previous fiscal year and the initiation of the 2004-05 watershed rotation area in the Pajaro/Big Basin Hydrologic Units. Table 10 shows the CCAMP budget for FY 2004 - 05, including all currently available funding sources.

Table 10. CCAMP FY 2004-05 Budget

CCamp Budget 04/05	Sites	Duplicate samples/event	Quality Assurance Sites/Event	$/Sample	Sample events/yr	Total Samples	Total	Funding	CCAMP Endowment	SWAMP funds	Monterey County Foundation Endowment	San Jose State Foundation	State Mussel Watch Endowment	SubTotal
Pajaro Watershed (Jan 05 - June 05)														
Conventional Water Quality	33	3		$194	6	216	$41,904			$41,904				$41,904
Sed Chem (collection, organics, metals and grain size)	12	1		$2,998	1	13	$38,974			$38,974				$38,974
Sediment Tox -Hyalella 10d with ELISA	12	1		$952	1	13	$12,376			$12,376				$12,376
Ceriodaphnia 7-day Survival & Reproduction (one of EPA 3-sp	15	2		$717	2	34	$24,378			$24,378				$24,378
Pimephales (fathead minnow) 7-day test (one of EPA 3-spp)	15	2		$717	2	34	$24,378			$24,378				$24,378
Selenastrum (algae) test (one of EPA 3-spp)	15	2		$717	2	34	$24,378			$24,378				$24,378
ELISA for Diazinon	15	2		$35	2	34	$1,190			$1,190				$1,190
ELISA for Chlorpyrifos	15	2		$35	2	34	$1,190			$1,190				$1,190
Sample sorting, taxonomy, QA, report (no sample collection; s	20	1		$981	1	21	$20,601			$20,601				$20,601
Watershed Characterization subtotal							**$189,369**		**$0**	**$189,369**	**$0**	**$0**	**$0**	**$189,369**
Coastal Confluences (July 04 - June 05)														
Conventional Water Quality	33	3		$194	12	432	$83,808			$83,808				$83,808
Sed Chem (collection, organics, metals and grain size)	2			$2,998	1	2	$5,996			$5,996				$5,996
Sediment Tox -Hyalella 10d with ELISA	2			$952	1	2	$1,904			$1,904				$1,904
Ceriodaphnia 7-day Survival & Reproduction (one of EPA 3-sp	2			$717	2	4	$2,868			$2,868				$2,868
Pimephales (fathead minnow) 7-day test (one of EPA 3-spp)	2			$717	2	4	$2,868			$2,868				$2,868
Selenastrum (algae) test (one of EPA 3-spp)	2			$717	2	4	$2,868			$2,868				$2,868
ELISA for Diazinon	2			$35	2	4	$140			$140				$140
ELISA for Chlorpyrifos	2			$35	2	4	$140			$140				$140
Sample sorting, taxonomy, QA, report (no sample collection; s	27	2		$981	1	29	$28,449			$28,449				$28,449
TIE as needed				$3,990		2	$7,980			$7,980				$7,980
Coastal Confluences subtotal							**$137,021**		**$0**	**$137,021**	**$0**	**$0**	**$0**	**$137,021**
Nearshore														
SMW 3 sites monitored annually							$10,254						$10,254	$10,254
Nearshore Subtotal							**$10,254**		**$0**	**$0**	**$0**	**$0**	**$10,254**	**$10,254**
Special Studies														
Salinas Pyrethroid Toxicity study							**$25,000**			$25,000				$25,000
TMDL Lab support							**$24,288**			$24,288				$24,288
Special Studies Subtotal							**$49,288**		**$0**	**$49,288**	**$0**	**$0**	**$0**	**$49,288**

CCamp Budget 04/05	Sites	Duplicate samples/event	Quality Assurance Sites/Event	$/Sample	Sample events/yr	Total Samples	Total	Funding	CCAMP Endowment	SWAMP funds	$0	San Jose State Foundation	State Mussel Watch Endowment	SubTotal
Misc														
SWAMP Overhead							$3,300			$3,300				$3,300
Sampling/Cruise Report							$615			$615				$615
Regional Annual Interpretive Report / Publication							$10,000			$10,000				$10,000
Misc Subtotal							**$13,915**		**$0**	**$13,915**	**$0**	**$0**	**$0**	**$13,915**
Hardware														
Misc.							$5,000		$5,000					$5,000
Hardware Subtotal							**$5,000**		**$5,000**	**$0**	**$0**	**$0**	**$0**	**$5,000**
Support Staff	**Number**	**Weeks**		**$/Hr**	**Hrs/Wk**									
Field team leader	1	50		$15	20		$15,000		$15,000					$15,000
Students	2	50		$13	20		$26,000				$26,000			$26,000
Data management														$0
Web site and Mastermon Support							$30,000		$30,000					$30,000
MBNMS Volunteer Monitoring Support											$0			$0
Support Staff Subtotal							**$71,000**		**$45,000**	**$0**	**$26,000**	**$0**	**$0**	**$71,000**
CCamp Total Expenditures							**$475,847**		**$50,000**	**$389,593**	**$26,000**	**$0**	**$10,254**	**$475,847**

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Attachment 1 – SWAMP Master Contract Request Form

DFG Master Contract Needs

Please complete each "Master" Contract Request; email to Pam Wilson, Val Connor and Max Puckett Requests for FY 04/05

Region: 3	**"Level of Effort"/Cost Estimate**
Contact:	
Study design assistance: *No*	
Site reconnaissance: *No*	
Field Sampling: *Yes* *Sediment collection (walk in)*	Collect sediment toxicity and chemistry samples **Cost:** $ 12,645
Lab Analyses • **Organics** *Yes* • **Metals** *Yes* • **Toxicity** *Yes* • **Biological Assessment** *Yes*	Analyze sediment samples for full suite Analyze Sediment and water toxicity samples and determine concentration of chlorpyrifos and diazinon Analyze benthic invert samples **Cost:** $ 186,686
Data Validation/QA verification	**Cost:** R3 internal $0
Database entry	**Cost:** Included with Sample Collection
Data Analysis	**Cost:** R3 Internal $0
Reporting: *No*	 **Cost:**
SWAMP Overhead	**Cost:** (estimated) $3,300
Total	Amount: $202,631

Attachment 2 –Contract Request Form (Region 3 Contract Lab)

Request for SWAMP Contract

Region: Region 3
Contract # (if an amendment): 03-035-130-0 (possibly changing, the 03-04 contract has an extension option for up to 3 years)
Proposed Contractor: BC Laboratories
Contract Amount: $150,000
Contract Manager: Karen Worcester
Duration of Contract: July 1, 2004 – June 30, 2005
Contract Request Package will be submitted to DWQ no later than: *4/1/04* **All FY 03-04 contract packages must be received by 12/03; FY 04-05 contract packages by 7/04**
How will you comply with Civil Service Constraints? Contract has gone through full bid process, including distribution to small and minority owned businesses, etc.
How will you insure compliance with SWAMP QMP? Contract bid solicitation assessed lab ability to meet SWAMP Target Reporting Limits. Lab may be required to participate in an inter-calibration exercise. (budget $5000)
Who/when will data be entered into SWAMP database? **Metadata:** 1. Field Data: CCAMP electronic uptake Lab Data: CCAMP electronic uptake
Will you include SWAMP QA and data reporting requirements in contract boilerplate? Contract has already been let, but includes language about reporting in EDF format
Why is the contract needed? (Why can't you use the Master Contract?) CCAMP most efficiently utilizes resources for conventional water quality monitoring through private lab contract using electronic uptake and QA checking tools. The Regions contract lab is also available to pick up samples and meet short holding times.

Attachment 3 – Region 3 FY 2004-05 Work Order

SWAMP FY04-05 RWQCB 3 WDPF Funds- Task Order No. SJS 04-3 001	Task Order Title: "SJS Field and Lab Services for RWQCB 3 for FY04-05 WDPF funds"	SWAMP Station Name and Number (please use required SWAMP conventions) ------->	304APS-Aptos Creek @ Aptos County Park	304APT-Aptos Creek @ Spreckels Drive	304BEP-Bear Creek @ Elks Park	304BHS-Boulder Creek @ Highway 9	304BRA-Branciforte Creek @ Water Street	304GAZ-Gazos Creek Lagoon @ Highway 1	304LOR-San Lorenzo Estuary @ Laurel St.	304NOA-Newell Creek @ Rancho Rio Road	304RIV-San Lorenzo River @ Crossing Street	304SCM-Scott Creek d/s Mill Creek	304SCO-Scott Creek Lagoon @ Highway 1	304SLE-San Lorenzo @ Elks Park	304SLH-San Lorenzo River @ Highland Park u/s Newell	304SLP-San Lorenzo River @ Covered Bridge Road	304SOQ-Soquel Creek Rail Road Trussels	304SOU-Soquel Creek @ Olive Spring	304VAL-Valencia Creek u/s Aptos Creek Confluence	304WAD-Waddell Creek Lagoon @ Highway 1	304ZAY-Zayante Creek @ Graham Hill Road	305BRI-San Benito River, Bridge d/s Willow Creek	305CHI-Pajaro River @ Chittenden Gap	305COR-Salsipuedes Creek - Down stream of Corralitos Creek	305FRA-Pajaro River @ Frazier Lake Road	305HAR-Harkins Slough @ Harkins Slough Road	305HOL-Llagas Creek @ HolsclawRoad	305HRL-San Benito River below Hernandez Reservoir	305HSA-Harkins Slough @ San Andreas Road	305LLA-Llagas Creek @ Bloomfield Avenue	305MUR-Pajaro River @ Murphy's Crossing	305OAK-Llagas Creek @ Oak Glen Avenue	305PAC-Pacheco Creek	305PAJ-Pajaro River @ Betabel Road	305THU-Pajaro River@Thurwatcher Bridge	305PJP-Pajaro River @ Main Street	305SAN-San Benito @ Y Road	305TES-Tequisquita Slough	305TRE-Tres Pinos Creek	305UVA-Uvas Creek @ Bloomfield Avenue	305VIS-Llagas Creek @ Buena Vista Avenue	305WSA-Watsonville Slough @ u/s Harkins Slough	307CML-Carmel River at Highwy 1	308BGC-Big Creek at Highway 1	308LSR-Little Sur River at Highway 1	308BSR-Big Sur River @ AndrewMolera foot bridge	308WLO-WillowCreek @ Highway 1	309DAV-Salinas River @ Davis Road	309OLD-Old Salinas River @ Monterey Dunes Way	309TDW-Tembladero Slough @ Monterey Dunes Way	310ADC-Arroyo de la Cruz @ Highway 1	310ARG-Arroyo Grande Creek @ 22nd Street	310PIS-Pismo Creek above Highway 101	310SLB-San Luis Obispo Creek @ San Luis Bay Drive	310SRO-Santa Rosa Creek @ Moonstone Drive	310SSC-San Simeon Creek @ State Park foot bridge	310TWB-Chorro Creek @ South Bay Boulevard	312SMA-Santa Maria River @ Estuary	313SAI-San Antonio Creek @ San Antonio Rd W.	314SYN-Santa Ynez River @ 13th Street	315ABU-Arroyo Burro Creek @ Cliff Drive	315ATA-Atascadero Creek @ Ward Drive	315CRP-Carpinteria Creek down stream Carpenteria Ave	315FRC-Franklin Creek @ Carpenteria Avenue	315JAL-Jalama Creek at RR bridge	315GAV-Canada de la Gaviota @ State Park entrance	315MIS-Mission Creek @ Montecito Street	315RIN-Rincon Creek @ Bates Road, u/s Highway 101	Field Duplicate X (300FDQ000X)	Total units	Total Cost (Total Units x cost/unit)
Analysis or Service to be Performed	**Description**	**Unit Cost (per sample)**																																																																				
Sediment and/or Water Sample Collection ***(costs shown are estimated; actual costs negotiated with RB, depending on site logistics, etc).***	Collect sed and/or water samples; conduct centroid velocity measurement as possible; conduct multiparameter probe reading as possible; includes all sample shipping. For close access, drive-up/walk-in sites only. Sample collection costs not only include field time/costs, but also field data entry&QA, pre-trip preparation, post-trip duties, etc.	$843							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$12,645
Trace Organic Chemistry	Full Scan (pesticides and pcb congeners) + PAH's - sediment	$1,599							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$23,985
Trace Metal Chemistry	**Sediment ICP-MS metals suite** (Includes Al, Cr, Mn, Ni, Cu, Zn, Ag, Cd, Pb, As--all costs): Se not included--see below	$263							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$3,945
	Mercury in sediment	$103							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$1,545
Sediment Physical Characteristics	Sediment Total Organic Carbon (TOC)	$60							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$900
	Sediment grain size - full analysis (phi scale)	$130							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$1,950
Bioassessment	Sample sorting, taxonomy, QA, report (no sample collection; sample must be provided by RWQCB)--one sample per site, using 300 count standard taxonomy	$327	3	3	3	3	3	3			3	3		3	3	3			3		3		3	3				3		3			3	3		3	3			3			3	3		3	3	3			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	9	144	$47,088
Toxicity Testing - Fresh Water Origin	**Water (fresh water)**																																																																					
	Ceriodaphnia 7-day Survival & Reproduction (one of EPA 3-spp)	$717					2		2		2				2	2	2				2		2	2				2	2	2			2	2		2	2	2		2																													2	38	$27,246
	Pimephales (fathead minnow) 7-day test (one of EPA 3-spp)	$717					2		2		2				2	2	2				2		2	2				2	2	2			2	2		2	2	2		2																													2	38	$27,246
	Selenastrum (algae) test (one of EPA 3-spp)	$717					2		2		2				2	2	2				2		2	2				2	2	2			2	2		2	2	2		2																													2	38	$27,246
	ELISA for Diazinon	$35					2		2		2				2	2	2				2		2	2				2	2	2			2	2		2	2	2		2																													2	38	$1,330
	ELISA for Chlorpyrifos	$35					2		2		2				2	2	2				2		2	2				2	2	2			2	2		2	2	2		2																													2	38	$1,330
	Sediment																																																																					
	Amphipod 10-d Survival (*Hyalella*)--acute	$882							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$13,230
	ELISA for Diazinon	$35							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$525
	ELISA for Chlorpyrifos	$35							1		1					1	1						1	1				1	1	1			1	1		1	1	1																															1	15	$525
	TIE analysis (as needed, contact R3 staff first)	$3,990																																																																			2	$7,980
SJSUF Miscellaneous	Regional proportional share of statewide cost of SJSUF pass-thru subcontract ovrhd, coordination/logistics/management cost (*will calculate after know total $ each region in each subcontract)	$3,300																																																																			1	$3,300
	Sampling/Cruise Reports - $815 per sampling seasonal event	$815																																																																			1	$815
	Regional Annual Interpretive Report / Publication																																																																					
TOTAL COST FOR ALL SERVICES/ANALYSES DESCRIBED ABOVE:																																																																						**$202,631**

Region 3 FY 2004-05 Work Order (see attached Excel File)

Attachment 4 – Oso Flaco/Santa Maria Fecal Coliform TMDL Source Analysis Study Plan

Santa Maria/Oso Flaco Fecal Coliform TMDL Source Analysis Study Plan

2. Introduction

The Santa Maria and Oso Flaco watersheds have been listed as impaired by fecal coliform on the 2002 303(d) list. The basis for the listing is primarily data from the Central Coast Ambient Monitoring Program, collected in 2000. Data will be collected in this study to support development of a Total Maximum Daily Load (TMDL) analysis of fecal coliform in these two watersheds.

3. Goals and Objectives of Monitoring

The goal of monitoring is to better characterize sources of fecal coliform in the Oso Flaco and Santa Maria watersheds. This information will be used to develop TMDL Source Analyses for the waterbodies identified as impaired for fecal coliform, based on violation of the water-contract recreation (REC-1) WQO. The objectives of monitoring are as follows:

1) to evaluate relative contributions upstream and downstream of sources, such as the urban areas within the City of Santa Maria and irrigated agriculture;
2) to evaluate relative contributions in discharge from tile drains and in creek drainages adjacent to irrigated agriculture;
3) to determine concentrations in runoff from the Nipomo Mesa; and
4) to determine concentrations in Correlitos Creek, an unimpaired waterbody, to gain information on background or reference conditions.

4. Monitoring Methods

5. Site Selection

Staff has identified potential sites that meet the goals and objectives of monitoring discussed above. These are identified in Table 1. Sites have been selected both for purposes of identifying background conditions and for understanding source contributions from various land uses in the area. Sites are located in two primary watersheds. Oso Flaco Creek and Little Oso Flaco Creek drain to Oso Flaco Lake and are located within the Oso Flaco watershed in southern San Luis Obispo County. Blosser Channel, Bradley Channel, and Bradley Canyon Creek are located within the Santa Maria watershed and ultimately drain to the Santa Maria estuary. Correlitos Creek is located south of the Santa Maria River and drains to Point Sal. All Santa Maria and Correlitos Creek watershed sites are located within Santa Barbara County.

Table 1. Site Descriptions, site tags, and objectives.

Site Description	**Site Tag**	**Objective**[4]
Blosser Channel	312BCD	1
Blosser Channel upstream within/at boundary of the City of Santa Maria	312BCDUS	1
Bradley Channel	312BCU	1
Bradley Channel upstream of City of Santa Maria	312BCUUS	1
Bradley Canyon Creek at Foxen Canyon Road[1, 2]	312BCF and tile drains 312BCFTD	2
Oso Flaco Creek[1]	312OFC and tile	2

	drains (312OFCTD)	
Little Oso Flaco Creek[2]	312OFN and 312OFNTD	2
Nipomo Mesa Runoff[2]	312NMR	3
Correlitos Creek[2,3]	312COR	4

[1] primary/sole source is irrigated agriculture
[2] pending access granted for sampling
[3] to identify background levels
[4] see objective descriptions above

CCAMP sampling locations will be identified using CCAMP site tags. Locations upstream of CCAMP sampling locations will be identified with a "US" suffix. Tile drains adjacent to CCAMP sampling locations will be identified with a "TD" suffix. Different tile drains may be sampled at each sampling period depending on irrigation schedules. If different tile drains are sampled, each will be labeled uniquely based on mileage or numbers of drains (i.e. "TD1", "TD2" etc) from CCAMP sampling locations. Photos of site locations and latitude/longitude will also be taken. The project id will be "**OFSM-FC-TMDL".**

6. Analytical Method

The IDEXX Colilert-18 method will be used to determine most probable number of *E.coli*. The results will be used as an indicator of fecal coliform, the constituent of concern on the 303(d) list. IDEXX Colilert-18 and Dilution protocols are included in Attachment A and can also be found at http://www.idexx.com/water/products/colilert18/.

7. Sample Handling

Gloves will be used during sample collection. Samples will be maintained at 4^{o}C during transport. Regional Board staff will collect and transfer samples and analyze them at the RWQCB laboratory. Analysis will be attempted within 6 hours of sample collection, but a 24-hour holding time will be considered acceptable. If the samples are in more than one staff person's custody, a Chain of Custody form will be attached to the field sheet.

8. Sampling Duration, Timing, and Frequency

Samples will be taken during FY 04/05 when flow is available and depending on landowner access, irrigation schedules, precipitation/runoff, and laboratory and staff resources. The timing and numbers of samples that staff is planning to collect are identified in Table 2. Dilutions will be used as necessary to meet monitoring objectives and as resources allow. Staff anticipates collecting between 60 and 76 total samples. Sterile pipettes and additional IDEXX Quanti-Trays and reagent may be needed if additional dilutions are needed.

Table 2. Timing and range of frequencies of sampling periods.

Site Tag	Timing	Frequency
312BCD	During/following storm events	3-4
312BCDUS	During/following storm events	3-4
312BCU	Monthly, or during periods of runoff	6-8
312BCUUS	Monthly, or during periods of runoff	6-8
312BCF	During irrigation	5-6

312BCFTD	During irrigation	5-6
312OFC	During irrigation	5-6
312OFCTD	During irrigation	5-6
312OFN	During irrigation	5-6
312OFNTD	During irrigation	5-6
312NMR	During/following storm events	3-4
312COR	Monthly, or during periods of runoff	3-4
312DUP	Duplicate samples	6-8
Total		**60-76**

9.

10. Quality Assurance

Fields sampling protocols will follow SWAMP and CCAMP standard operating procedures. Blind field duplicate samples will be taken for 5% of total sites or 1 per sampling period. Duplicates samples are collected side by side with the original sample. All data will be double checked following data entry into the database. Data will be checked for outliers and for exceedances of SWAMP data quality objectives.

Data from duplicates is compared to original samples and evaluated using the SWAMP maximum for relative percent difference of 25% (Puckett 2002, Appendix C).

Data is qualified with a flag if it meets one of the following criteria:

- Blind field duplicates for coliforms exceed the 95% confidence interval values from Standard Methods (1999) for multiple tube dilutions.
- Holding time is not met.

11. Data Management

The following fields will be included on the data sheet:

ProjId	SiteTag	Entry QA	QAQC	Date Time	Sampler	Purpose	Notes	Weather	ECOLI

Data will be entered into the CCAMP data management system for upload into the Surface Water Ambient Monitoring Program system and STORET. All sites will be documented with full site descriptions, latitude and longitude.

S:\TMDLs & Watershed Assessment\New TMDL and Related Projects- Region 3\Los Osos Creek\Nutrients\6 Regulatory Action\TMDL\Proposed RB Agenda Item\ResLosOsosNutr091704.DOC

Appendix A – Colilert-18 Test Kit and Dilution Procedure

Colilert-18 Test Kit

Introduction
Colilert-18 simultaneously detects total coliforms and *E. coli* in water. It is base on IDEXX's patented Defined Substrate Technology (DST). When total coliforms metabolize Colilert-18's nutrient-indicator, ONPG, the sample turns yellow. When total coliforms metabolize Colilert-18's nutrient-indicator, MUG, the sample fluoresces. Colilert-18 can simultaneously detect these bacteria at 1 cfu/100 ml within 18 hours even with as many as 2 million heterotrophic bacteria per 1200 ml present.

Contents
- WP020-18 contains 20 Snap Packs for 100 mls samples
- WP200-18 contains 200 Snap Packs for 100 mls samples

Storage
Store at 2-25^{o}C away from light.

Presence/Absence (P/A) Procedure
1. Add contents of one pack to a 100 ml sample in a sterile, transparent, non-fluorescing vessel.
2. Cap vessel and shake.
3. If sample is not already at 33-38^{o}C, the place vessel in a 35^{o}C water bath for 20 minutes or, alternatively, a 44.5 water bath for 7 – 10 minutes.
4. Incubate at 35 +/- 0.5^{o}C for the remainder of the 18 hours.
5. Read results according to Result Interpretation Table below

Quanti-Tray Enumeration Procedure
1. Add contents of one pack to a 100 ml room temperature water sample in a sterile vessel.
2. Cap vessel and shake until dissolved
3. Pour sample/reagent mixture into a Quanti-Tray or Qunati-Tray/2000 and seal in an IDEXX Quanti-Tray Sealer.
4. Place the sealed tray in a 35 +/-0.5^{o}C incubator for 18 hours (pre-warming to 35^{o}C is not required).
5. Read results according to the Result Interpretation below. Count the number of positive wells and refer to the MPN table provided with the trays to obtain a Most Probable Number

Result Interpretation

Less yellow than the comparator	Negative for total coliforms and *E. coli*
Yellow equal to or greater than the comparator	Positive for total coliforms
Yellow and fluorescence equal to or greater than the comparator	Positive for E. coli

- Look for fluorescence with a 6 watt, 365 nm, UV light within 5 inches of the sample, in a dark environment. Face light away from your eyes and towards the sample.
- Colilert-18 results are definitive at 18- 22 hours. In addition, positives for both total coliforms and *E. coli* observed before 18 hours and negatives observed after 22 hours are also valid.

Procedural Notes

- A slight tinge may be observed when Colilert-18 is added to the sample.
- If excess foam causes problems while using Quanti-Tray, you may choose to use IDEXX Antifoam Solution (Catalog #WAFDB) or IDEXX 120 ml vessels with Antifoam (Catalog #WV120SBAF-200).
- This insert may not reflect your local regulations. For compliance testing, be sure to follow appropriate regulatory procedures
- Colilert-18 can be run in any multiple tube format. Standard Methods for the Examination of Water and Wastewater MPN tables should be used to find Most Probable Numbers (MPNs).
- If a water sample has some background color, compare inoculated Colilert-18 sample to a control blank of the same water sample.
- Colilert-18 can be used for *E.coli* (but not coliforms) in marine water. Samples must be diluted at least tenfold. Multiply the MPN value by the dilution factor to obtain the proper quantitative result.
- Use only sterile, non-buffered oxidant-free water for dilutions.
- Colilert-18 is a primary water test. Colilert-18 performance characteristics do not apply to samples altered by any pre-enrichment or concentration.
- In samples with excessive chlorine, a blue flash may be seen when adding Colilert-18. If this is seen, consider sample invalid and discontinue testing.
- Aseptic technique should always be followed when using Colilert-18. Dispose of in accordance with Good Laboratory Practices.

Quality Control Procedures

The following quality control procedure is recommended for each lot of Colilert-18:

1. Inoculate 3 sterile vessels filled with 100 ml sterile water with the following:
    A) One with Quanti-Cult *E. coli* or a sterile loop of ATCC 25922 or 11775 (*E. coli*)
    B) One with Quanti-Cult *Klebsiella pneumoniae* or a sterile loop of ATCC 31488 (total coliform)
    C) One with Quanti-Cult *Pseudomonas aeruginosa* or a sterile loop of ATCC 10145 or 27853 (non-coliform)
2. Follow the P/A Procedure or Quanti-Tray Enumeration Procedure above.
3. Results should match the Result Interpretation Table above.

Dilution Protocols for Colilert 15-tube MPN Dilution Procedure
(Using 2 Presence/Absence Snap Packs)

The following protocol is suggested for testing of non-potable waters with Colilert

Note: Mix the sample well before using

A. UNDILUTED
Add 1 Snap Pack of P/A to a sterile vessel containing 100 ml of a well mixed sample. Close the vessel and mix well to dissolve. Aseptically pipette 10 ml of the well mixed sample into each of five 10 ml sterile tubes. Cap and mix well. Label the tubes appropriately.

B. 1:10 DILUTION
Add 100 ml of either sterile deionized or distilled water to a sterile vessel. Add 1 P/A Colilert Snap Pack to this vessel, cap and mix well to dissolve. Aseptically pipette 9 ml into each of ten 10 ml sterile tubes (5 for the 1:10 and 5 for the 1:100 dilution, below). Label 5 tubes 1:10 and the other 5 tubes 1:100. Pipette 1 ml of the well mixed sample into each of the five tubes (1:10). Cap and mix well.

C. 1:100 DILUTION
Pipette 10 ml of the well mixed sample into a vessel containing 90 ml of either sterile deionized or distilled water. Close the vessel and mix well. Pipette 1.0 ml of the well mixed sample into each of the five tubes prepared above. Cap and mix well.

D. ADDITIONAL DILUTIONS
Please follow the outline above for any additional dilutions required.

E. INCUBATION
Incubate all inoculated tubes at 35 C +/- 0.5 C according to the package insert instructions. Observe for yellow color and fluorescence using a 6 watt UV lamp. Determine the MPN/100 ml from the table in Standard Methods for the Examination of Water and Wastewater, 18th ed. (APHA, AWWA, WEF).

Attachment 5 – Monitoring For Salinas River Nutrient TMDL

MONITORING FOR SALINAS RIVER NUTRIENT TMDL

Introduction

The Salinas River is listed as impaired for nutrients in its lower reaches, approximately from the City of Gonzales north to the Pacific Ocean. The Salinas River Lagoon North (Lagoon) is similarly listed. Both waterbodies are included in this study. Data from the Central Coast Ambient Monitoring Program (1999) and the Elkhorn Slough National Estuarine Research Reserve support the basis for the listing. Data will be collected in this study to support development of a Total Maximum Daily Load (TMDL) analysis of nitrate and unionized ammonia in these two waterbodies.

Objectives of Monitoring

The objectives of monitoring for this project include:

1. Confirm exceedance of existing Basin Plan objectives with respect to nitrate and unionized ammonia.
2. Quantify the level of exceedance.
3. Determine sources of nitrate and unionized ammonia.

Monitoring Methods

TMDL staff will collect monthly grab samples and field measurements for nutrients and physical parameters at all sites. Sampling will be conducted following the protocols outlined in CCAMP Standard Operating Procedures (CCAMP 2000).

Field measurements will be taken using a multi-analyte Hydrolab DS4a. Measured values are stored in a Surveyor 4a and subsequently downloaded. Data are also recorded on field data sheets, and are used to verify electronically recorded values. Probes are lowered to approximately two-thirds of the water's depth and allowed to equilibrate for at least one minute prior to recording measurements. Field measurements include dissolved oxygen, pH, conductivity, salinity, water temperature, chlorophyll a, and turbidity.

All field equipment is calibrated using certified calibration standards and following the manufacturer specifications. Calibration records are maintained at the Region 3 laboratory. Visual observations for algal growth, emergent vegetation, water clarity, stream shading, and other notable parameters are recorded in the field.

Samples to be analyzed by the Regional Board's contract laboratory are collected at each site in clean bottles provided by the contract laboratory. Blind field replicates are collected each field day (approximately 5% duplication rate of the total samples collected). Water samples are bottled as appropriate and held at $4^{o}C$, before being transferred to a commercial laboratory for analysis. Chain-of-Custody (COC) documentation is maintained for all samples. Samples are analyzed for nitrate, total ammonia, total nitrogen, orthophosphate, and total phosphorus. Unionized ammonia is calculated from total ammonia using temperature and pH. Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements and follow U.S. EPA approved methods (BC Laboratories 1998).

Site Selection

Table 1 describes sites being monitored for the project. Sites have been selected to best characterize source areas of nutrients in the lower Salinas Valley, from Gonzales north to the Pacific Ocean, and including Tembladero Slough. A map of the study area is attached (Figure 1).

Analytical Methods

Samples are analyzed at the laboratory for nitrate (EPA 300.0), total ammonia (EPA 350.1), orthophosphate (EPA 365.1), and total phosphorus (EPA 365.4). Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements and follow U.S. EPA approved methods (BC Laboratories 1998). See the SWAMP QAPP target reporting limits and analytical methods for more information on specific analyses (Puckett 2002).

The multi-probe Hydrolab DS4a utilizes several analytical approaches:

Dissolved Oxygen	Membrane
pH	pH glass electrode
Conductivity	5-electrode sensor
Turbidity	Nephelometric - ISO 7027
Water Temperature	Thermistor tube

Sample Handling

Samples are collected for laboratory analysis at the Central Coast Region's contract laboratory, BC Laboratories in Bakersfield, California. Pre-cleaned 1L plastic bottles are used to collect samples for nutrients. Once collected, samples are stored in ice chests at 4º C until they are transferred to the contract laboratory. Proper chain of custody documentation is maintained for all samples as described in the SWAMP QAMP (Puckett 2002).

Sampling Duration and Frequency

Monitoring will occur on a monthly basis beginning July 2004 and ending November 2004. The frequency of monitoring may increase during late summer if resources are available.

Quality Assurance

Monitoring for the Salinas River Nutrient TMDL (project) will be completed in accordance with the requirements described in the SWAMP QAPP (QAPP). The SWAMP QAPP can be reviewed at: http://www.swrcb.ca.gov/swamp/qapp.html.

Field requirements aimed at meeting the QAPP requirements include (based on the constituents being analyzed), but are not limited to:
Field duplicates at a rate of 5% or one every sampling event.
Separate log book for equipment.
Calibration of equipment within 24 hours before and after sampling event.

All data entry will be double checked and scanned for outliers. Recorded data will include the analytical result, method detection limit, reporting limit, and relevant quality assurance (QA) information (or metadata information within the data report) on surrogate recovery, duplicate relative percent difference (RPD), matrix spike percent recovery and RPD, and blank spike percent recovery and RPD. Any deviations from QA goals established in the QAPP will be noted. See the SWAMP QAPP for a more detailed description of laboratory requirements.

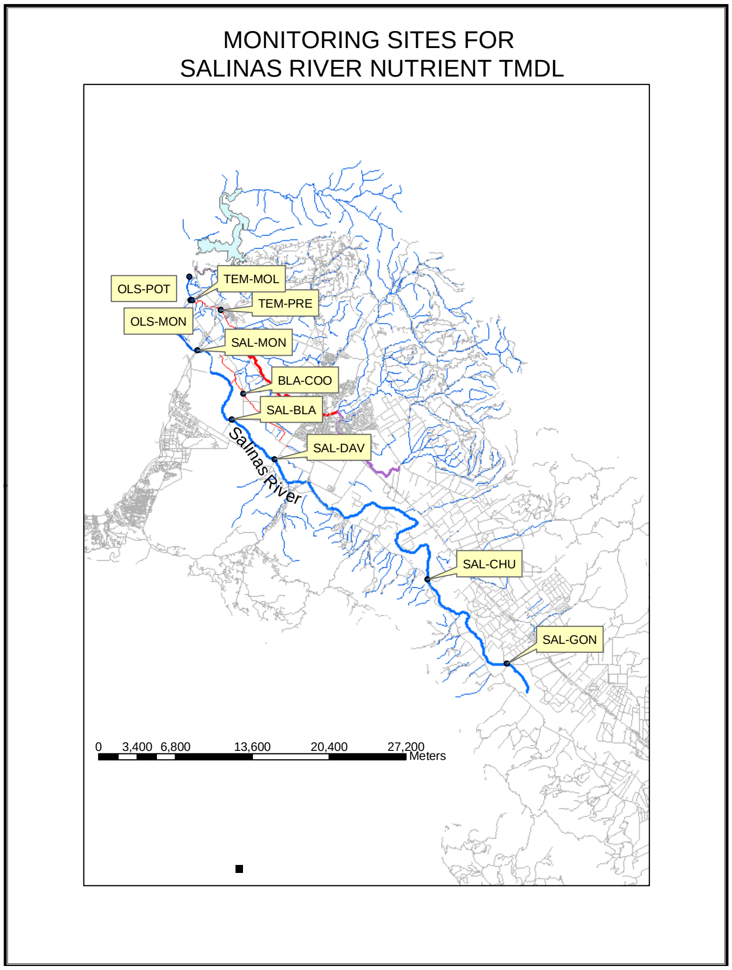
Data Management

Data will be received from the laboratory in electronic format. The data will be transferred to the CCAMP database and additional field data will be entered into the database. The CCAMP database has built within it algorithms designed to flag non-compliance with QAPP requirements. CCAMP data will be uploaded into the SWAMP database.

Table 1. Site identification information, location and purpose, for the Salinas Nutrient TMDL Project

SiteID	CCAMPSiteTag	LATdd	LONGdd	Waterbody	Site Description	Purpose as monitoring site
309SALGON		36.487222	-121.4691667	Salinas River	Salinas River at Gonzales Rd.	Salinas River upstream of SAL-CHU draining ag. Northern most extent of listing.
309SALCHU	309SAC	36.5556	-121.5486	Salinas River	Salinas River at Chualar River Rd.	Salinas River upstream of SAL-DAV draining ag
309SALDAV	309DAV	36.646667	-121.7025	Salinas River	Salinas River at Davis Rd.	Salinas River upstream of SAL-BLA draining ag
309SALBLA		36.678056	-121.7452778	Salinas River	Salinas River at Blanco Rd.	Receiving ag drainage, site above Blanco drain confluence
309BLACOO		36.6983857	-121.7347468	Blanco Drain	Blanco Drain at Cooper Rd. near intersection with Nashua Rd.	Blanco Drain drains into Salinas River upstream of SAL-MON, drains ag land on all sides
309SALMON	309SBR	36.731111	-121.7452778	Salinas River	Del Monte Rd.	Below confluence with Blanco Drain
309OLSMON	309OLD	36.772291	-121.787855	Old Salinas	Monterey Dunes Colony Rd.	Salinas River site just upstream of confluence with Tembladero Slough
309TEMPRE	309TEM	36.765	-121.75917	Tembladero Sl.	Preston Rd. in Castroville	Upstream of TEM-MOL. Drains ag on all sides
309TEMMOL	309TDW	36.772183	-121.786597	Tembladero Sl.	Molera Rd. near intersection w/Monterey Dunes Colony Rd.	Last site of Tembladero slough before drains into Old Salinas. Drains ag on all sides.
309OLSPOT	309POT	36.7905512	-121.7905511	Old Salinas	Potrero Rd. at tidegates	Downstream of confluence with Tembladero Slough

The monitoring sites are illustrated in the map below.



For more information, contact:

Chris Rose
RWQCB, Central Coast Region
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crose@rb3.swrcb.ca.gov

Attachment 6 – Sediment associated pesticides as factors controlling macroinvertebrate distributions