SWAMP
Surface Water Ambient Monitoring Program

SWAMP Five-Year Work Plan	2012

Central Coast Ambient Monitoring Program
Five-Year Work Plan: 2012 - 2017

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INTRODUCTION

Fiscal Year (FY) 20011-12 will mark the tenth year of the coordinated implementation of the Surface Water Ambient Monitoring Program (SWAMP). The Central Coast Ambient Monitoring Program (CCAMP) conducts SWAMP monitoring for the Central Coast Water Board and receives the bulk of its funding through SWAMP. A description of the monitoring efforts that will be implemented in Region 3 through CCAMP from Fiscal Year 2011-12 through Fiscal Year 2015-16 is provided in this document.

The basic CCAMP study design has been in place since the inception of the CCAMP program in 1998. CCAMP employs a tributary-based approach to characterize all major waterbodies in the Region, as well as larger tributary inputs to those waterbodies. The CCAMP program uses two monitoring strategies: 1) coastal confluences monitoring, which involves long term trend monitoring at the lower ends of all of the larger coastal streams and rivers in the Region, and 2) watershed rotation area monitoring, where the Region is divided into five watershed areas and tributary based sampling is conducted each year in one of the areas (Figure 1). Over a five-year period all of the Hydrologic Units in the Region are monitored and evaluated. Watershed sites are revisited on a five year basis, allowing detection of change over time.

One of the primary purposes of CCAMP is to support the Clean Water Act 303(d) listing process and the 305(b) water quality assessment report. Assessment is consistent with the State's 303(d) Listing Policy (2004), in following one of two decision-making approaches to determine if beneficial uses are supported: 1) percent exceedance of water quality criteria or other accepted standards, using a binomial distribution, or 2) a weight-of-evidence approach, where data from multiple types of monitoring (biological, physical and chemical) are considered to evaluate beneficial use support. This latter approach is particularly important when evaluating problems for which no water quality criteria exist.

CCAMP data is also heavily used by permit staff, enforcement staff, and others for regulatory and management decision-making. The CCAMP program addresses a wide variety of water quality parameters and beneficial use questions with the intent providing information to inform further action by agency staff. The sampling design strives to provide a maximal amount of information within one sampling framework to support this broad mission. Further follow-up through enforcement staff, TMDL staff or others provides additional detail to understand the full scope of problems identified by CCAMP.

BACKGROUND

Central Coast Water Board Vision and Goals

CCAMP serves as the primary information gathering entity for the Central Coast Water Board. The Water Board has recently developed an agency vision of "Healthy Watersheds". Three goals support this mission. The first goal in particular drives a number of CCAMP assessment activities, including development of multi-metric health "indices" from the various data types collected by the program.

- By 2025**,** 80% of aquatic habitat is healthy**,** and the remaining 20% exhibits positive trends in key parameters**.**
- By 2025**,** 80% of lands within any watershed will be managed to maintain proper watershed functions, and the remaining 20% will exhibit positive trends in key watershed parameters**.**
- By 2025**,** 80% of groundwater will be clean, and the remaining 20% will exhibit positive trends in key parameters**.**

CCAMP Monitoring Goals, Questions and Objectives

The CCAMP mission 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. 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

CCAMP questions have been adapted from those posed in the 1999 SWAMP Site-Specific Monitoring Guidance related to beneficial use support. For each question, we have identified objectives, one or more associated beneficial uses, applicable water quality criteria that address these objectives, and the monitoring approach we are following. In addition, we have identified the limitations associated with our monitoring approach. We are screening widely for beneficial use support under a uniform monitoring strategy that is consistent with the requirements of the 303(d) listing policy. Given program funding and staffing, this maximizes the information we provide to decision-makers for their use and further investigation. CCAMP activities with SWAMP funding are primarily limited to monitoring of fresh water streams and lakes, with activities in marine and estuarine environments (if any) undertaken through other funding sources and collaborative efforts.

Is there evidence that it is unsafe to swim?
Are swimming conditions improving or getting worse?
Beneficial Use: Water Contact Recreation (REC-1)
Monitoring 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); compilation of other data sources
Assessment Limitations: CCAMP sampling approach does not meet the frequencies identified in the Central Coast Basin Plan of 5 times in a 30-day period for the geomean limit of 200 MPN/100 ml. However, it does meet the requirements for the 400 MPN/100 ml objective, which states that no more than 10% of samples may exceed 400 MPN/100 ml.
Criteria:

- Fecal coliform exceeding 400 MPN/100 ml
- *E. coli* exceeding 235 MPN/100 ml

Interpretation:

- Status - Application of the binomial test to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - Null Hypothesis: Actual exceedance proportion is <=10%
    - Alternate Hypothesis: Actual exceedance proportion >25%
    - A minimum of five exceedances is required to determine impairment.
- Trends – Non-parametric approaches, including Seasonal Mann-Kendall and Kruskall-Wallace tests, and change in exceedance rate over time.

Is there evidence that it is unsafe to drink the water?
Is there evidence that drinking water quality is improving or getting worse?
Beneficial Use: Municipal and Domestic Water Supply (MUN)
Objective(s): At sites throughout water bodies that are sources of drinking water or recharge ground water, determine percent of samples that exceed drinking water standards or adopted water quality objectives used to protect drinking water quality.
Monitoring Approach: Monthly sampling for nitrate and pH
Assessment Limitations: CCAMP does not typically sample for metals or organic chemicals in water; assessment is based only on conventional parameters that have drinking water standards.
Criteria:

- Nitrate (as N) exceeding 10 mg/L (as N)
- pH under 6.5 or over 8.3
- The binomial test is applied to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - Null Hypothesis: Actual exceedance proportion is <=10%
    - Alternate Hypothesis: Actual exceedance proportion >25%

Interpretation:

- Status - Application of the binomial test to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - For conventional pollutants (e.g. pH)
        - Null Hypothesis: Actual exceedance proportion is <=10%
        - Alternate Hypothesis: Actual exceedance proportion >25%
        - A minimum of five exceedances is required to determine impairment.

        - Because of the naturally high pH levels in Region 3, professional judgment is used to determine if anthropogenic and controllable sources are potential causes of pH problems. The data evaluator considers geology, patterns of land use and overall water quality to make this judgment. The only places this judgment has been applied are in watersheds where there are no known anthropogenic uses (grazing, rural roads, or other development).
    - For Toxicants (e.g. nitrate)
        - Null Hypothesis: Actual exceedance proportion is <=3%
        - Alternate Hypothesis: Actual exceedance proportion >18%
        - A minimum of two exceedances is required to determine impairment.
- Trends - Parametric (t-tests and regression analysis) and non-parametric approaches (Seasonal Mann-Kendall and Kruskall-Wallace tests, and change in exceedance rate over time).

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 lakes or other water bodies identified by statewide SWAMP bioaccumulation monitoring data as potentially representing a public health threat, collect multiple samples of sport fish species to determine whether samples exceed several critical threshold values of potential human impact (advisory or action levels). Sampling is coordinated with OEHHA to support public health advisories if necessary.
Monitoring Approach: Multiple samples of resident or planted sport fish species are analyzed for chemicals of concern according to OEHHA sampling guidelines.
Assessment Limitations: Due to limited sample count at most locations, this data is typically not evaluated for trends, but with at least two samples it can be evaluated for 303(d) listing. Not all water bodies have been sampled by the statewide program.

Criteria:
- Exceedance of Office of Environmental Health Hazard Assessment Criteria for fish and shellfish consumption. In the absence of OEHHA criteria, use U. S. Food and Drug Administration Action Levels, or Median International Standards, in that order.

Interpretation:
- Consumption Advisories – Data is evaluated by OEHHA to develop consumption advisories where needed.
- Status - The binomial test is applied to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - OEHHA consumption advisories warrant placement of a waterbody on the 303(d) list.
    - Null Hypothesis: Actual exceedance proportion is <=3%
    - Alternate Hypothesis: Actual exceedance proportion >18%
    - A minimum of two exceedances of a chemical criterion from two or more separate samples is required for a site to be considered impaired.
- Trends – Not typically determined due to low sample counts.

Is there evidence that aquatic life is not protected?

Are there significant trends in conditions for aquatic life?
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 main-stem 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 toxicity, sediment chemistry, benthic invertebrate assemblages, periphyton, and associated habitat quality. Wet and dry season sampling for water toxicity and organic chemicals. Toxicity Identification Evaluation and/or chemistry follow-up for toxic sites. Monthly water quality monitoring for nutrients, dissolved oxygen, pH, turbidity, zinc, copper and water temperature. Twenty-four hour continuous sampling for dissolved oxygen sags. Dry season screening for microcystin toxins using semi-permiable membrane technology. Dry season continuous monitoring for temperature using Hobo temperature loggers at all coastal confluence and watershed rotation area sites.
Assessment Limitations: CCAMP does not have the funding to sample all sites for benthic invertebrates, water and sediment toxicity and chemistry. When sediment chemistry is analyzed, an array of metals and organic chemicals is sampled that 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 spatially comprehensive.
Criteria:

Toxicity

- Sediment or water toxicity effects, including survival, growth, or reproduction, significantly greater than reference tests using the EPA (2010) Test of Significant Toxicity.

Sediment and Tissue Chemistry status

- Sediment concentrations over Probable Effects Levels (MacDonald, et al, 1996) or NOAA Effects Range Medium values (ERMs) (Long, et al, 1998) (for marine sediments) for chemicals with available criteria.
- Tissue concentrations of organic chemicals over established U.S. Fish and Wildlife and National Academy of Sciences guidelines for protection of aquatic life.
- For sediment and tissue chemistry exceedances, the binomial test is applied to sample exceedance rate according to the SWRCB Listing Policy (2004), where
  - Null Hypothesis: Actual exceedance proportion is <=3%
  - Alternate Hypothesis: Actual exceedance proportion >18%

Water Quality

- Dissolved oxygen samples below 7.0 mg/L (cold water streams) or 5.0 mg/L (warm water streams)
  - for data collected using continuous probes, only the lowest value in a 24 hour period is considered.
- pH samples under 7.0 or above 8.5
- Un-ionized ammonia samples over 0.025 mg/L NH_3 as N
- Nitrate over 1.0 mg/L with other supporting evidence of biostimulation (as per Worcester et al., 2010), including:

    - Chlorophyll *a* over 15 ug/L
    - Floating algal mats persistently greater than 50% coverage
    - Oxygen dropping below standards or above 13 mg/L
    - Predicted oxygen deficit over 1.25 mg/L, predicted benthic algal biomass and chlorophyll *a* over NNE thresholds (Creager, et. al, 2007)
- Zinc over 0.2 mg/L
- Copper over 0.03 mg/L
- Southern California Index of Biotic Integrity - score falls below 3.0 defined as poor condition.

Interpretation:
- Status of Toxicants including toxicity, organic chemicals, metals - Binomial test is applied to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - Null Hypothesis: Actual exceedance proportion is <=3%
    - Alternate Hypothesis: Actual exceedance proportion >18%
    - A minimum of two exceedances from two or more separate samples is required for a site to be considered impaired.
    - Multiple lines of evidence demonstrating eutrophication, along with nitrate concentrations over 1.0 mg/L, justify a site to be considered impaired.
- Status of conventional pollutants, including pH and dissolved oxygen - Binomial test is applied to sample exceedance according to the SWRCB Listing Policy (2004), where
    - Null Hypothesis: Actual exceedance proportion is <=10%
    - Alternate Hypothesis: Actual exceedance proportion >25%
    - A minimum of five exceedances is required for a site to be considered impaired.
    - Because the local geology contributes to naturally high pH levels in Region 3, professional judgment is used to evaluate geology, patterns of land use and overall water quality to determine if pH exceedance is likely natural. The only places this judgment has been applied are in watersheds where there are no known anthropogenic disturbances (grazing, rural roads, or other development).
- Trends - Parametric (t-tests and regression analysis) and non-parametric approaches (Seasonal Mann-Kendall and Kruskall-Wallace tests, and change in exceedance rate over time), as appropriate.

Is there evidence that water is unsafe for agricultural use?
Is there evidence of trends in water quality for agricultural uses?
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
- Chloride over 106 mg/L
- Electrical conductivity results over 3000 uS/cm
- Boron over 0.75 mg/L

- Sodium over 69 mg/L
- Nitrate samples over 30 mg/L as N

Interpretation:

- Status - Application of the binomial test to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - For conventional pollutants (e.g. pH)
        - Null Hypothesis: Actual exceedance proportion is <=10%
        - Alternate Hypothesis: Actual exceedance proportion >25%
        - A minimum of five exceedances is required to determine impairment.
        - Because the local geology contributes to naturally high pH levels in Region 3, professional judgment is used to evaluate geology, patterns of land use and overall water quality to determine if pH exceedance is likely natural. The only places this judgment has been applied are in watersheds where there are no known anthropogenic disturbances (grazing, rural roads, or other development).
- Trends - Parametric (t-tests and regression analysis) and non-parametric approaches (Seasonal Mann-Kendall and Kruskall-Wallace tests, and change in exceedance rate over time).

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 coliform); monthly qualitative assessment of % algal cover, presence of scum, odor, etc.
Assessment Limitations: CCAMP does not currently conduct a formal assessment for trash.
Criteria:

- pH samples under 7.0 or over 8.3
- Fecal coliform over 400 MPN/100 ml
- *E. coli* over 400 MPN/100 ml
- Filamentous algal cover persistently over 50%
- Scum, odor, trash, oil films persistently present and causing nuisance condition

Interpretation:

- Status - Application of the binomial test to sample exceedance rate according to the SWRCB Listing Policy (2004), where
    - For conventional pollutants (e.g. pH)
        - Null Hypothesis: Actual exceedance proportion is <=10%
        - Alternate Hypothesis: Actual exceedance proportion >25%
        - Minimum of five exceedances of pH, fecal coliform, or *E. coli* criteria are required to determine impairment.
        - Because the local geology contributes to naturally high pH levels in Region 3, professional judgment is used to evaluate geology, patterns of land use and overall water quality to determine if pH exceedance is likely natural. The only places this judgment has been applied are in watersheds

where there are no known anthropogenic disturbances (grazing, rural roads, or other development).
    - Professional judgment is used to determine whether scum, odor, trash, or oil films are present at levels sufficient to represent a nuisance or hazard. Photo-documentation is used to support this determination and the judgment is made only in egregious cases.
- Trends - Parametric (t-tests and regression analysis) and non-parametric approaches (Seasonal Mann-Kendall and Kruskall-Wallace tests, and change in exceedance rate over time) for numeric data only.

Study Methods and Materials

CCAMP Monitoring Approaches

The CCAMP strategy of establishing and maintaining permanent long term monitoring sites provides a framework for trend analysis and detection of emerging water quality problems. CCAMP uses a variety of monitoring approaches to characterize status and trends of watersheds. The CCAMP program design includes monthly monitoring for conventional water quality (CWQ) and flow at all sites. At a subset of sites, generally selected based on availability of funds and hydrogeomorphological considerations or special interest (such as known discharges or existing TMDLs) other monitoring approaches are applied. These include toxicity, sediment chemistry, tissue chemistry, benthic macroinvertebrate and habitat assessment. As funding increases these additional monitoring approaches will be applied to more sites.

In order to develop a broad picture of the overall health of waters in Region 3, a similar baseline monitoring approach is applied in each watershed and coastal confluence site. This provides data comparability across the Region and allows for prioritization of problems across a relatively large spatial scale. 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 data from Department of Health Services, USGS, Department of Pesticide Regulation, NPDES discharge data, county, city, and other selected programs. CCAMP also utilizes previous CCAMP data as well as data collected by other Regional Board monitoring programs, including the irrigated agriculture waiver monitoring program, stormwater monitoring programs and TMDL monitoring. Selected data is compiled into the CCAMP data base format and used along with current data collected by CCAMP to evaluate criteria exceedances, pollutant levels which warrant attention, beneficial use impairment, and other pertinent information.

General monitoring design
Monitoring site selection is based on several factors. For all sites (rotation area and coastal confluence) safe, all-weather access is a priority for monthly conventional water quality monitoring activities. Many sites are located at bridges where sampling devices can be

suspended during periods of high flow. Watershed site selection targets the primary discharge point of the watershed, the discharge of major tributary which drains the watershed, and multiple locations along the main stem usually upstream from major tributary inputs. Some sites are also located above and below areas of significant human activity, including urban development, agriculture, and point source discharges.

Watershed rotation monitoring began in 1998 in the Pajaro watershed and rotates through all mainland hydrologic units in the Region over a five year period. The watershed rotation schedule moves from the Pajaro and Santa Cruz Coast area, to the Salinas, the Santa Maria, the Santa Barbara coast, and finally the Santa Lucia coast (Figure 1). Monthly watershed rotation area monitoring begins in January of a given year and last for 12 months. As funding allows, additional monitoring is conducted at a subset of the watershed rotation area sites. A brief description of additional monitoring types, site selection and frequency is provided below and in Table 1.

- Bioassessment for benthic invertebrates and algae is conducted upstream of conventional water quality sites (100m), out of the immediate influence of bridges. Sampling is always conducted within the Spring index period for the Region(May-July).   Site selection targets sites that are wadable, accessible, out of salt water influence, and safe for body contact.
- Sediment toxicity sampling is conducted at conventional water quality sampling locations in the Spring index period. Sampling is conducted concurrent with monthly monitoring for conventional pollutants. Site selection typically targets lower watershed sites or depositional areas.
- Water column toxicity sampling and associated chemistry is conducted at conventional water quality sampling locations twice annually, in wet and dry season flows. Sampling is conducted concurrent with monthly monitoring for conventional pollutants. Sites that are considered to be at higher risk for a problem, based on staff knowledge of upstream land uses, are highest priority for sampling.
- Sediment chemistry is conducted at the end of the fiscal year, in June, and is limited by remaining laboratory contract funds.

Coastal confluence monitoring was initiated in 2001 at 33 of the Region’s coastal streams and rivers. Coastal confluences program sites were selected based on watershed size and/or known water quality concerns in the watershed; in total, the 33 sites are downstream of more than 90% of the Region’s area, and likely more than 98% of its discharge. Sampling sites are located on the lowest reach of each creek or river but above the coastal lagoon and tidal influence whenever possible. Site selection is constrained by site accessibility. Monthly conventional water quality monitoring is ongoing at these sites. Continuous monitoring of these waters just upstream of their confluence with the Pacific Ocean is used for long term trend analysis, information on pollutant loading to the ocean, and to provide regular information on watersheds that are not the focus of the current watershed rotation area monitoring. Additional monitoring is also conducted at coastal confluence sites as they occur within a watershed rotation monitoring area. In addition, ten of these sites are also part of the State-wide SWAMP Stream Pollutant Trend (SPoT) program and are monitoring annually or every other year for sediment chemistry and toxicity. CCAMP augments SPOT sampling with water toxicity sampling to assess trends.

The general timing of monitoring types associated with the various overlapping monitoring projects is shown in Table 1.

Table 1: Time Schedule of CCAMP Monitoring Types. Includes conventional water quality (CWQ), bioassessment (BIO), sediment toxicity (S TOX), water toxicity (H20 TOX), and biotoxin (BIOTOX) monitoring.

Monitoring	**2012**				**2013**				**2014**			
Types	Jan-12	Mar-12	Jul-12	Dec-12	Jan-13	Mar-13	Jul-13	Dec-13	Jan-14	Mar-14	Jul-14	Dec-14
	Coastal Confluences											
CWQ												
BIO		May - July				May - July						
S TOX												
H2O TOX												
BIOTOX												
	Salinas Rotation Area											
CWQ												
BIO		May - July										
S TOX												
H2O TOX												
	Santa Maria Rotation Area											
CWQ												
BIO						May - July						
S TOX												
H2O TOX												
	Santa Barbara Rotation Area											
CWQ												
BIO										May - July		
S TOX												
H2O TOX												

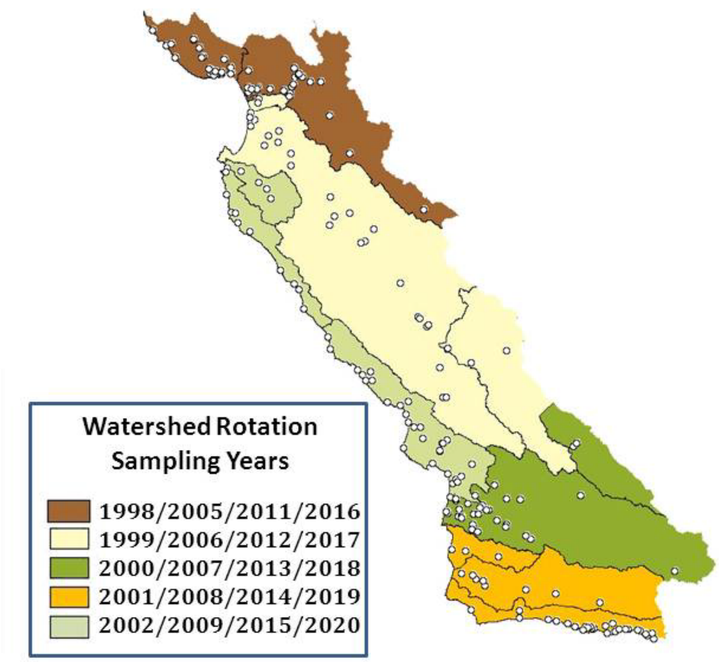

Figure 1: Region 3 watershed rotation area and coastal confluence sites

Monitoring Methods

CCAMP uses a variety of monitoring approaches to characterize status and trends at monitoring sites. The CCAMP program design includes monthly monitoring for conventional water quality (CWQ) and flow at all sites. At a subset of sites other monitoring approaches are applied. These include continuous temperature and oxygen monitoring, sediment chemistry, sediment and water toxicity, tissue chemistry, benthic macroinvertebrate assessment, periphyton assemblage assessment, and habitat assessment.

Conventional Water Quality

Basic conventional pollutants, plus nutrients, zinc and copper, are monitored monthly at all coastal confluence and watershed rotation sites following the CCAMP SOP (Puckett, 2002). Monthly sampling provides an opportunity to evaluate seasonal variability as well as a variety of flow conditions. Sampling is maintained on a monthly interval without regard for timing of weather events. Even-interval sampling can be evaluated for long-term trends using time-series analysis techniques, such as the Mann-Kendall or seasonal Kendall tests described by the U.S. EPA in its guidance on Nonpoint Source Monitoring (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 DS5 multi-analyte probe is used to collect data for dissolved oxygen, pH, water temperature, turbidity, conductivity, salinity and chlorophyll *a*. In the field, observations of air temperature, algal growth, scum, odor, and other indications of water and habitat conditions are also recorded.

Field Measurement Quality Assurance

All field equipment is calibrated using certified calibration standards and following the manufacturer specifications prior to and following each sampling event. Calibration records are maintained at the Region 3 laboratory and are used to determine instrument accuracy and drift. Field probe measurements are recorded on field sheets, but also stored electronically in the field and downloaded directly to the database. All field measurements (100%) are checked against the field data sheet for accuracy.

Flow is estimated using a number of means, described in the SWAMP Standard Operating Procedure for field measures (MPSL, 2007). Wherever possible, sites are located near existing county and USGS gages. At most sites, flow is directly measured using a top setting rod and Marsh-McBurney electronic flow meter. Flow measurements are taken at a minimum of ten locations across a transect; if the wetted width is more than 20 feet additional measurements are taken. When flow is not measurable it is estimated using stream profiles, stage gages and flow calibration curves. In some locations and under some conditions flow measurements are not possible.

Grab Sample Quality Assurance

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 for 5% of samples collected. Water samples are bottled as appropriate and held at $4^{o}C$, before being transferred to the laboratory for analysis. Chain-of-Custody (COC) documentation is maintained for all samples. Samples are analyzed for analytes shown in Table 2. Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements (including continuing calibration verification, matrix spikes, laboratory control samples, blanks and duplicates) and follow U.S. EPA approved methods (BC Laboratories 2008). The SWAMP Quality Assurance Program Plan specifies target reporting limits for specific analyses (Puckett 2002).

Table 2: Conventional water quality parameters, methods, and reporting limits

Analyte	Method	Reporting Limit
Nitrate as N	EPA 300.0	0.1 mg/L
Nitrite as N	EPA 353.2	0.01 mg/L
Total Ammonia as N	EPA 350.1	0.1 mg/L
Total Phosphorus as P	EPA 365.4	0.06 mg/L
Ortho-phosphate as P	EPA 365.1	0.01 mg/L
Total Dissolved Solids	EPA 160.1	10.0 mg/L
Urea	Mulvenna&Savidge	10.0 ug/L
Silicate	EPA 200.7	0.1 mg/L
Fixed and Volatile Dissolved Solids	EPA 160.4	5.0 mg/L
Hardness as CaCO3	SM 2340B	1.0 mg/L
Total Suspended Solids	EPA 160.2	10 mg/L
Fixed Suspended Solids	EPA 160.4	0.5 mg/L
Volatile Suspended Solids	EPA 160.4	1.0 mg/L
Chlorophyll a	Optical sensor	2 ug/L
Calcium	EPA 200.7	0.05 mg/L
Magnesium	EPA 200.7	0.02 mg/L
Boron, dissolved	EPA 200.7	0.01 mg/L
Sodium	EPA 200.7	0.1 mg/L
Chloride	EPA 300.0	0.35 mg/L
Total and Fecal Coliform	25-tube dilution	NA
E. coli	Colilert	NA
Copper	EPA-6010B	0.1 mg/L
Zinc	EPA-6010B	0.1 mg/L

Biological Sampling

Benthic macroinvertebrate and algal assemblages serve as indicators of stream health. Different species of invertebrates and algae respond differently to water pollution and habitat degradation and provide information on biological integrity. Samples are collected during the index period for central and southern California, which extends from May through July following the SWAMP SOP for collection of reach wide algae in conjunction with Benthic Macroinvertebrates (Fletscher et al. 2009). Because many creeks dry up in the summer, sampling is strategized to sample more southerly sites first, typically starting in May.

Benthic macroinvertebrate and algae samples are collected from 11 transects over a 150 m reach (250 m if average width is > 10m). Samples are collected alternately at 25%, 50%, and 75% of the stream cross section. When stream substrate is fine-grained and habitat complexity is primarily along the margins of the stream, samples are collected alternately at the right margin, center, and left margin. The 11 grabs are combined into a single composite sample. Data is evaluated and displayed using the Southern California Index of Biotic Integrity (Ode, 2005).

Physical habitat quality is assessed at each sampling reach according to State physical habitat protocols (Fletscher et al. 2009). The habitat of the creek reach of interest is characterized according to geomorphic parameters, including bankful width, slope, particle size, sinuosity, depth, riparian complexity, instream habitat and other features. Data is collected at each transect and for some measures at the ten inter-transects as well.

Quality Assurance
Field duplicate samples are collected at 5% of the sites planned for each year. In addition, 5% of the samples identified are sent to an independent taxonomy laboratory for identification to ensure accuracy.

Water Toxicity
Chronic toxicity testing, on fathead minnow larvae (*Pimephales promelas*), water fleas (*Ceriodaphnia dubia*), and fresh water alga (*Selenastrum capricornutum*) is conducted at a subset of watershed rotation area sites. Samples are collected in four 1-gallon amber glass bottles and are maintained at $4^{o}C$ until delivery to the laboratory within 48 hours. Toxicity testing is performed at the University of California Davis Aquatic Toxicity Laboratory.

Water flea tests are seven-day chronic tests conducted at $25^{o}C$ according to EPA/821/R-02/013 (Test Method 1002.0), with survival and reproduction (number of young per brood) endpoints. Larval fathead minnow tests are also seven-day chronic tests conducted according to EPA/821/R-02/013 (Test Method 1000.0), with survival and growth (biomass) endpoints. The alga test is a 96-hour test according to EPA/821/R-02/013 (Test Method 1003.0), with growth (mean cell density) as the endpoint. Details of toxicity testing methods can be found in the 2002 SWAMP QAMP (Puckett 2002, Appendix F); measurement quality objectives are found in the 2008 SWAMP QAPrP, Appendix A (SWAMP, 2008).

Quality Assurance
Blind field replicates are collected for 5% of samples collected. Field duplicate samples are tested to estimate the variability in results associated with sampling and laboratory procedures. All toxicity tests include both positive and negative controls. Positive control tests are conducted monthly at the laboratory and concurrently with test samples. (see the U.C. Davis SOP document included in Puckett 2002 for more detailed QAQC information).

Sediment Toxicity
Bed sediment samples are collected by CCAMP staff at a subset of watershed rotation area sites targeting fine-grained sediments within the wetted creek channel. A pre-cleaned Teflon™ scoop is used to collect the top 2 cm of sediment from five or more sub-sites into a pre-cleaned glass composite jar. After an adequate amount of sediment is collected, it is homogenized thoroughly and aliquoted into pre-cleaned, pre-labeled sample jars (glass or polyethylene, as appropriate) for organic chemical, metal or toxicological analysis. Once collected, samples are stored at 4°C and shipped with appropriate chain-of-custody and handling procedures to the analytical laboratory. Field data sheets are completed for each sampling event to document conditions and sampling notes. Sampling details are described in the bed sediment sampling procedures outlined in SWAMP Standard Operating Procedure for field measures (MPSL, 2007).

Sediment toxicity analyses are conducted at the University of California, Santa Cruz Marine Pollution Studies Laboratory at Granite Canyon. EPA/600/R-99/064 (Test Method 100.1) is followed for ten-day sediment toxicity testing using *Hyalella azteca* (EPA 2000). The test is conducted using eight 100-mL replicates, each with 10 *Hyalella* individuals. Endpoints recorded after ten days are survival and growth (as dry weight). Details of toxicity testing methods can be found in the 2002 SWAMP QAMP (Puckett 2002, Appendix F); measurement quality objectives are found in the 2008 SWAMP QAPrP, Appendix A (SWAMP, 2008).

Quality Assurance

Field replicates are collected for 5% of samples collected. Sediment toxicity QA procedures such as field duplicates, and positive and negative controls are similar to those discussed in the section on water toxicity. See Puckett (2002) and the SWAMP QAPrP (2008) for a complete discussion on QAQC procedures. In sediment toxicity tests the positive control test consists of a dilution series of cadmium (from cadmium chloride). The negative control for *Hyalella* consists of reference sediment subjected to the same well-water renewals as the samples.

Sediment Chemistry

Field sampling of sediment for chemical analysis follows the same procedures as those outlined for sediment toxicity, using SWAMP SOPs for field measures (MPSL, 2007). Sediment sampling is typically conducted at the end of the fiscal year, using any remaining laboratory funds that are available. Lab fund use varies from year to year because sites dry up or are otherwise not sampled. As such, the amount available to be spent on sediment monitoring is variable and unpredictable. Sampling is typically conducted for metals, organochlorine pesticides, pyrethroid pesticides, and chlorpyrifos following SWAMP measurement quality objectives (SWAMP, 2008). 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) (Long, et al, 1998) and Florida Probable Effects Levels (PELs) (MacDonald et al., 1992, 1996).

Quality Assurance

Field replicates are collected for 5% of samples collected. Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements (including continuing calibration verification, matrix spikes, laboratory control samples, blanks and duplicates).

Tissue Bioaccumulation

Fish sampling is conducted as follow-up monitoring to data collected by the SWAMP Bioaccumulation Oversight Group (BOG). Follow-up locations are selected where statewide data indicates that human health may be at risk from elevated chemical levels. Tissue chemistry analysis is done through the by the Department of Fish and Game Marine Pollution Studies Laboratory.

Staff coordinates with OEHHA to design follow-up monitoring to inform consumption advisories. Fish tissue monitoring targets all sport fish present in a given lake, stream or nearshore area. At least two composite samples containing five fish each are collected for each species. Larger, older fish (meeting the minimum catch size) are targeted. In addition, bottom-feeding fish are also targeted to screen for additional pollutants and to inform development of consumption advisories. Measurement quality objectives for tissue analysis are described in the SWAMP QAPrP (2007).

Fish collection techniques include boat and backpack electro-fishing, gill netting and seine netting. Fish species and length are recorded. Fish are sacrificed and wrapped in aluminum foil or Teflon®. The heads and tails of fish larger than the wrapping material are removed prior to wrapping (gut contents are kept intact). Fish are kept on dry ice in the field, and then frozen at -20ºC prior to analysis. CCAMP selects chemical tests based on the initial findings of the BOG.

Quality Assurance
Field replicates are collected for 5% of samples collected. Quality assurance procedures at the laboratory are consistent with SWAMP approved quality assurance requirements (including continuing calibration verification, matrix spikes, laboratory control samples, blanks and duplicates).

Biotoxin Monitoring
CCAMP is collaborating with U.C. Santa Cruz to evaluate the presence of microcystin toxin in our coastal watersheds. Microcystin toxin sampling will be conducted using Solid Phase Adsorption Toxin Tracking or "SPATT". The technique involves the passive adsorption of biotoxins onto porous synthetic resin-filled sachets (SPATT bags) and their subsequent extraction and analysis.

Annually, CCAMP deploys SPATT at our 33 coastal confluence sites for an initial screening for biotoxins in our various watersheds. Deployment is conducted for three months during the dry season when algal blooms are most abundant. This monitoring began in August 2011 and will continue for at least three consecutive years. SPATT will be constructed and analyzed at the U.C. Santa Cruz Ocean Sciences Laboratory where the technology was developed. CCAMP staff will deploy bags at one sampling event and pick them up on the next sampling event a month later. One field duplicate will be included with each round of sampling. CCAMP staff will keep the bags in the dark and chilled on ice during all phases of handling and will deliver the bags back to the UC Santa Cruz lab with a chain of custody form.

SPATT bags will be rinsed with deionized water (Milli-Q) and processed using methods described by Lane et al. (2010). A holding time of 7 days will be applied to this methodology though longer holding times have been shown to be acceptable.

SPATT are constructed with nytex mesh and DIAON HP20 resin. SPATT construction and activation will follow the methods described by Lane et al. (2010). Toxin analysis will be conducted using an Agilent 6130 liquid chromatography-mass spectrometry (LC-MS) system with an Agilent Zorbax Rapid Resolution column and Selected Ion Monitoring (SIM) of microcystin-LA, -LR, -RR, and –YR generally following the method of Mekebri et al. (Mekebri et al. 2009) and adapted from an LC-MS-MS system to LC-MS as described in Miller et al. (Miller et al. 2010). The Method Detection Limit (MDL) will be <1 ppb (µg/L) on-column for all toxin congeners.

Quality Assurance
Field replicates are collected at 5 % of all sites. Sample concentrations are determined by calibration with certified standards obtained from various sources (Mekebri et al. 2009, Miller et

al. 2010).

CCAMP Monitoring Sites

Locations to be monitored for each of five watershed rotation years and for ongoing coastal confluences monitoring are shown in Table 3. Sampling sites are also shown in Figure 1. All sites are monitored monthly for conventional water quality. A subset of these sites is monitored for benthic macroinvertebrates, sediment chemistry, and toxicity. Because the number of sites sampled for these additional parameters is dictated by the annual budget and the specific issues of the rotation area, the location of these sites cannot be predetermined for this five-year plan. Typically, sites in the lower ends of watersheds downstream of urban and agricultural land uses are prioritized for toxicity monitoring, while upper watershed habitats which are more likely to be in better condition are prioritized for bioassessment. We strive to have at least one type of biological assessment at each site, and at many sites both types. Sediment chemistry is typically placed at the same sites prioritized for toxicity monitoring. We sample water toxicity at all SPoT sites coincident with SPOT sampling years.

Table 3: CCAMP Site List. All "Ongoing" sites are coastal confluence trend sites; those marked with SP are also SPOT sites.

Rotation Year	HSA	Waterbody	Site Tag	Site Description
Ongoing	30413	Aptos Creek	304APT	304APT-Aptos Creek @ Spreckles Drive
Ongoing	30420	Gazos Creek	304GAZ	304GAZ-Gazos Creek above lagoon @ Highway 1
Ongoing	30412	San Lorenzo River	304LOR	304LOR-San Lorenzo above estuary @ Laurel Street
Ongoing	30411	Scott Creek	304SCO	304SCO-Scott Creek Lagoon @ Highway 1
Ongoing; SP	30413	Soquel Creek	304SOK	304SOK-Soquel Creek @ Knob Hill
Ongoing	30411	Waddell Creek	304WAD	304WAD-Waddell Creek Lagoon @ Highway 1
Ongoing; SP	30510	Pajaro River	305THU	305THU-Pajaro River @ Thurwachter Bridge
Ongoing; SP	30700	Carmel River	307CML	307CML-Carmel River @ Highway 1
Ongoing	30800	Big Creek	308BGC	308BGC-Big Creek above Highway 1
Ongoing	30800	Big Sur River	308BSR	308BSR-Big Sur River @ Andrew Molera foot bridge
Ongoing	30800	Willow Creek	308WLO	308WLO-Willow Creek @ Highway 1
Ongoing; SP	30910	Salinas River (Lower)	309DAV	309DAV-Salinas River @ Davis Road
Ongoing	30910	Old Salinas River	309OLD	309OLD-Old Salinas River @ Monterey Dunes Way
Ongoing; SP	30910	Tembladero Slough	309TDW	309TDW-Tembladero Slough @ Molera Road
Ongoing	31012	Arroyo de la Cruz Creek	310ADC	310ADC-Arroyo de la Cruz @ Highway 1
Ongoing; SP	31031	Arroyo Grande Creek(below res.)	310ARG	310ARG-Arroyo Grande Creek @ 22nd Street
Ongoing	31026	Pismo Creek	310PIS	310PIS-Pismo Creek above Highway 101
Ongoing; SP	31025	San Luis Obispo Creek	310SLB	310SLB-San Luis Obispo Creek @ San Luis Bay Drive
Ongoing	31014	Santa Rosa Creek	310SRO	310SRO-Santa Rosa Creek @ Moonstone Drive
Ongoing	31013	San Simeon Creek	310SSC	310SSC-San Simeon Creek @ State Park foot bridge
Ongoing	31022	Chorro Creek	310TWB	310TWB-Chorro Creek @ South Bay Boulevard
Ongoing; SP	31210	Santa Maria River	312SMA	312SMA-Santa Maria River above Estuary
Ongoing; SP	31300	San Antonio Creek	313SAI	313SAI-San Antonio Creek @ San Antonio Road West
Ongoing; SP	31410	Santa Ynez River(below res.)	314SYN	314SYN-Santa Ynez River @ 13th Street
Ongoing	31532	Arroyo Burro Creek	315ABU	315ABU-Arroyo Burro Creek @ Cliff Drive
Ongoing; SP	31531	Atascadero Creek(315)	315ATA	315ATA-Atascadero Creek @ Ward Drive
Ongoing; SP	31534	Carpinteria Creek	315CRP	315CRP-Carpinteria Creek below Carpenteria Ave
Ongoing	31534	Franklin Creek	315FRC	315FRC-Franklin Creek @ Carpenteria Avenue
Ongoing	31510	Canada de la Gaviota	315GAV	315GAV-Canada de la Gaviota @ State Park entrance
Ongoing; SP	31532	Mission Creek	315MIS	315MIS-Mission Creek @ Montecito Street
Ongoing	31534	Rincon Creek	315RIN	315RIN-Rincon Creek @ Bates Road, u/s Highway 101
Ongoing	31510	Jalama Creek	315JAL	315JAL-Jalama Creek u/s County Park @ Rail Road Trussels
Ongoing	30800	Little Sur River	308LSR	308LSR-Little Sur River @ Highway 1
2012	30600	Carneros Creek	306CAR	306CAR-Carneros Creek in Los Lomas @ Blohm Road
2012	30910	Salinas Reclamation Canal	309ALD	309ALD-Salinas Reclamation Canal @ Boranda Road
2012	30910	Salinas Reclamation Canal	309ALU	309ALU-Salinas Reclamation Canal @ Airport Road
2012	30981	Atascadero Creek(309)	309ATS	309ATS-Atascadero Creek @ Highway 41
2012	30910	Salinas Reclamation Canal	309AXX	309AXX-Salinas Reclamation Canal Storm Drain @ Airport Road
2012	30940	Salinas River (Mid)	309DSA	309DSA-Salinas River d/s San Ardo @ Cattleman Road
2012	30920	Gabilan Creek	309GAB	309GAB-Gabilan Creek @ Independence and East Boranda
2012	30930	Salinas River (Mid)	309GRN	309GRN-Salinas River @ Elm Road in Greenfield
2012	30940	Salinas River (Mid)	309KNG	309KNG-Salinas River @ Highway 101 in King City
2012	30940	San Lorenzo Creek	309LOK	309LOK-San Lorenzo Creek @ First Street in King City
2012	30970	San Lorenzo Creek	309LOR	309LOR-San Lorenzo Creek @ Bitterwater Road east of King City
2012	30981	Nacimiento River(below res.)	309NAC	309NAC-Nacimiento River above Highway 101

2012	30981	Salinas River (Upper)	309PSO	309PSO-Salinas River @ 13th Street in Paso Robles
2012	30920	Quail Creek	309QUA	309QUA-Quail Creek @ Potter Road
2012	30910	Santa Rita Creek	309RTA	309RTA-Santa Rita Creek @ Santa Rita Park
2012	30910	Salinas River (Lower)	309SAC	309SAC-Salinas River @ Chualar bridge on River Road
2012	30981	San Antonio River(below res.)	309SAN	309SAN-San Antonio River @ Highway 101
2012	30981	Salinas River (Upper)	309SAT	309SAT-Salinas River @ Highway 41 bridge
2012	30910	Salinas River (Lower)	309SDR	309SDR-Salinas Storm Drain u/s Davis Road
2012	30910	Salinas River (Mid)	309SAS	309SAS-Salinsa River @ Soledad Highway 101 bridge
2012	30960	Arroyo Seco River	309SEC	309SEC-Arroyo Seco River @ Elm Street
2012	30930	Arroyo Seco River	309SET	309SET-Arroyo Seco River @ Thorne Road
2012	30981	Salinas River (Upper)	309SUN	309SUN-Salinas River u/s Nacimiento @ Bradley Road
2012	30910	Tembladero Slough	309TEM	309TEM- Tembladero Slough @ Preston Road
2012	30981	Salinas River (Upper)	309USA	309USA-Salinas River u/s San Ardo @ the Bradley Bridge
2012	31700	Cholame Creek	317CHO	317CHO-Cholame Creek @ Bitterwater Road
2012	31700	Estrella River	317ESE	317EST-Estrella River @ Estrella Road
2012	31700	Estrella River	317EST	317EST-Estrella River @ Airport Road
2013	31100	Soda Lake	311SLN	311SLN-Soda Lake Culverts @ Seven Mile Road
2013	31230	Alamo Creek	312ALA	312ALA-Alamo Creek at Alamo Creek Road
2013	31210	Blosser Channel	312BCD	312BCD-Blosser Channel d/s of groundwater recharge ponds
2013	31210	Bradley Cyn Creek	312BCF	312BCF-Bradley Canyon diversion channel @ Foxen Canyon Road
2013	31210	Bradley Channel	312BCU	312BCU-Bradley Channel u/s of ponds @ Magellan Drive
2013	31220	LaBrea Creek	312BRE	312BRE-LaBrea Creek us Sisquoc River
2013	31230	Cuyama River(above res.)	312CAV	312CAV-Cuyama River @ Highway 33
2013	31230	Cuyama River(above res.)	312CCC	312CCC-Cuyama River d/s Cottonwood Canyon
2013	31230	Cuyama River(below res.)	312CUT	312CUT-Cuyama River below Twitchell @ White Rock Lane
2013	31230	Cuyama River(above res.)	312CUY	312CUY-Cuyama River d/s Buckhorn Road
2013	31230	Huasna River	312HUA	312HUA-Husana River @ Husana Townsite Road
2013	31210	Green Valley Creek	312GVS	312GVS-Green Valley Creek @ Simas Road
2013	31210	Green Valley Creek Tributary	312GVT	312GVT-Green Valley Creek Tributary @ Brown Road
2013	31210	Main Street Canal	312MSD	312MSD-Main Street Canal u/s Ray Road @ Highway 166
2013	31210	Main Street Canal	312MSS	312MSS-Main Street Canal East of Hansen Street
2013	31210	Nipomo Creek	312NIP	312NIP-Nipomo Creek @ Highway 166
2013	31210	Nipomo Creek	312NIT	312NIT-Nipomo Creek @ Tefft Street
2013	31210	Oso Flaco Creek	312OFC	312OFC-Oso Flaco Creek @ Oso Flaco Lake Road
2013	31210	Oso Flaco Lake	312OFL	312OFL-Oso Flaco Lake @ culvert
2013	31210	Oso Flaco Creek Triutary	312BSR	312BSR-Oso Flaco Creek Tributary at Bonita School Road
2013	31210	Little Oso Flaco Creek	312OFN	312OFN-Little Oso Flaco Creek
2013	31210	Betteravia Lakes	312OLA	312OLA-Betteravia Lakes at Black Road
2013	31210	Orcutt Solomon Creek	312ORB	312ORB-Orcutt-Solomon Creek @ Black Road
2013	31210	Orcutt Solomon Creek	312ORC	312ORC-Orcutt-Solomon Creek u/s Santa Maria River
2013	31210	Orcutt Solomon Creek	312ORI	312ORI-Orcutt-Solomon Creek @ Highway 1
2013	31210	Orcutt Solomon Creek	312ORS	312ORI-Orcutt-Solomon Creek @ Solomon Road
2013	31210	Santa Maria River	312SBC	312SBC-Santa Maria River @ Bull Canyon Road
2013	31220	Sisquoc River	312SIS	312SIS-Sisquoc River @ Santa Maria Way
2013	31220	Sisquoc River	312SIV	312SIV-Sisquoc River u/s Tepusquet Road
2013	31210	Santa Maria River	312SMI	312SMI-Santa Maria River @ Highway 1
2014	31300	San Antonio Creek	313SAB	313SAB-San Antonio Creek @ Rancho de las Flores Bridge, Hwy 135
2014	31300	San Antonio Creek	313SAC	313SAC-San Antonio Creek @ RR Bridge - Lagoon
2014	31410	San Miguelito Creek	314MIG	314MIG-San Miguelito Creek @ W. North Ave

2014	31410	Salsipuedes Creek(314)	314SAL	314SAL-Salsipuedes Creek @ Santa Rosa Road
2014	31410	Santa Ynez River(below res.)	314SYC	314SYC-Santa Ynez River d/s Lake Cachuma @ Highway 154
2014	31410	Santa Ynez River(below res.)	314SYF	314SYF-Santa Ynez River d/s Lompoc @ Floordale
2014	31410	Santa Ynez River(below res.)	314SYI	314SYI-Santa Ynez River @ Highway 101
2014	31410	Santa Ynez River(below res.)	314SYL	314SYL-Santa Ynez River u/s Lompoc @ Highway 246
2014	31410	Santa Ynez River(above res.)	314SYP	314SYP-Santa Ynez River @ Paradise Road
2014	31532	Arroyo Burro Creek	315ABH	315ABH-Arroyo Burro Creek @ Hope Street
2014	31531	Glenn Annie Creek	315ANN	315ANN-Glenn Annie Creek u/s Holister Road
2014	31534	Arroyo Paredon	315APC	315APC-Arroyo Paredon Creek @ Via Real
2014	31531	Atascadero Creek(315)	315ATU	315ATU-Atascadero Creek @ Patterson Avenue
2014	31510	Bell Creek	315BEL	315BEL-Bell Creek on Bacara Resort Access Road
2014	31510	El Capitan Creek	315CAP	315CAP-El Capitan Creek d/s Highway 101
2014	31534	Carpinteria Creek	315CAU	315CAU-Carpenteria Creek @ Highway 192
2014	31531	Devereux Slough	315DEV	315DEV-Devereux Slough @ the Golf Course culvert
2014	31510	Dos Pueblos Canyon Creek	315DOS	315DOS-Dos Pueblos Canyon Creek @ Highway 101
2014	31510	Canada de la Gaviota	315GAI	315GAI-Canada de la Gaviota @ Highway 1
2014	31531	Los Carneros Creek	315LCR	315LCR-Los Carneros Creek @ Hollister Road
2014	31532	Mission Creek	315MIU	315MIU-Mission Creek @ Cathedral Oaks Road
2014	31532	Montecito Creek	315MTC	315MTC-Montecito Creek @ Jamison Lane
2014	31531	Maria Ygnacio Creek	315MYC	315MYC-Maria Ynacio Creek @ Patterson Avenue
2014	31533	Romero Creek	315ROM	315ROM-Romero Creek @ Jamison Lane
2014	31510	Canada del Refugio	315RSB	315RSB-Canada del Refugio u/s Highway 101
2014	31533	Sycamore Creek	315SCC	315SCC-Sycamore Creek @ Punta Gorda Street
2014	31531	San Jose Creek	315SJC	315SJC-San Jose Creek @ Kellogg Boulevard
2014	31534	Santa Monica Creek	315SMC	315SMC-Santa Monica Creek @ Carpenteria Avenue
2014	31531	San Pedro Creek	315SPC	315SPC-San Pedro Creek d/s of Holister Road
2014	31510	Tecolote Creek	315TCI	315TCI-Tecolote Creek @ Bacara Resort access Road
2014	31534	Toro Canyon Creek	315TOR	315TOR-Toro Canyon Creek @ Via Real
2014	31532	San Ysidro Creek	315YSI	315YSI-San Ysidro Creek @ Jamison Lane
2015	31022	Chorro Creek	310CAN	310CAN-Chorro Creek @ Canet Road
2015	31023	Warden Creek	310TUR	310TUR-Warden Creek @ Turri Road
2015	30700	Carmel River	307CMD	307CMD-Carmel River @ Schulte Road
2015	30700	Carmel River	307CMN	307CMN-Carmel River @ Nason Road, Community Park
2015	30700	Carmel River	307CMU	307CMU-Carmel River @ Esquiline Road
2015	30700	Tularcitos Creek	307TUL	307TUL-Tularcitos Creek @ Carmel Valley Road
2015	30800	Big Sur River	308BSU	308BSU-Big Sur River @ Pfeiffer Big Sur State Park
2015	30800	Garrapata Creek	308GAR	308GAR-Garapata Creek @ Garapata Creek Road
2015	30800	Limekiln Creek	308LIM	308LIM-Limekiln Creek @ Limekiln State Park
2015	30800	Little Sur River	308LSU	308LSU-Little Sur River @ Old Coast Road
2015	30800	Mill Creek	308MIL	308MIL-Mill Creek @ Mill Creek Picnic Area
2015	30800	San Jose Creek	308SJC	308SJC-San Jose Creek @ Private Road Access
2015	31031	Arroyo Grande Creek(below res.)	310AGB	310AGB-Arroyo Grande Creek @ Biddle Park
2015	31031	Arroyo Grande Creek(below res.)	310AGF	310AGF-Arroyo Grande Creek @ Fair Oaks
2015	31031	Arroyo Grande Creek(below res.)	310AGS	310AGS-Arroyo Grande Creek @ Strother Park
2015	31031	Los Berros Creek	310BER	310BER-Los Berros Creek @ Valley Road
2015	31016	Cayucos Creek	310CAY	310CAY-Cayucos Creek @ Cayucos Creek Road and Highway 1
2015	31025	Coon Creek	310COO	310COO - Coon Creek @ Pecho Valley Road
2015	31021	Morro Creek	310MOR	310MOR-Morro Creek @ Lila Keiser Park
2015	31017	Old Creek(above res.)	310OLD	310OLD-Old Creek @ Cottontail Creek Road

2015	31013	Pico Creek	310PCO	310PCO-Pico Creek @ Highway 1	
2015	31024	Prefumo Creek	310PRE	310PRE-Prefumo Creek @ Calle Joaquin	
2015	31024	Stenner Creek	310SCN	310SCN-Stenner Creek @ Nipomo street	
2015	31011	San Carpoforo Creek	310SCP	310SCP-San Carpoforo Creek @ Highway 1	
2015	31024	San Luis Obispo Creek	310SLC	310SLC-San Luis Obispo Creek @ Cuesta Park	
2015	31024	San Luis Obispo Creek	310SLM	310SLM-San Luis Obispo Creek @ Mission Plaza	
2015	31024	San Luis Obispo Creek	310SLV	310SLV-San Luis Obispo Creek @ Los Osos Valley Road	
2015	31014	Santa Rosa Creek	310SRU	310SRU-Santa Rosa Creek @ Ferrasci Road	
2015	31013	San Simeon Creek	310SSU	310SSU-San Simeon Creek @ San Simeon Road	
2015	31018	Toro Creek	310TOR	310TOR-Toro Creek u/s Highway 1	
2015	31015	Villa Creek	310VIA	310VIA-Villa Creek u/s Highway 1	
2016	30413	Aptos Creek	304APS	304APS-Aptos Creek at Nisene Marks park road	
2016	30412	Arana Gulch Creek	304ARA	304ARA-Arana Gulch below golf course	
2016	30412	Bear Creek	304BEP	304BEP-Bear Creek @ Elks Park	
2016	30412	Boulder Creek	304BH9	304BH9-Boulder Creek @ Highway 9	
2016	30412	San Lorenzo River	304RIV	304RIV-San Lorenzo River @ Crossing Road	
2016	30411	Scott Creek	304SCM	304SCM-Scott Creek above Mill Creek	
2016	30412	San Lorenzo River	304SL9	304SL9-San Lorenzo River @ Highway 9	
2016	30412	San Lorenzo River	304SLB	304SLB-San Lorenzo River @ Big Trees	
2016	30412	San Lorenzo River	304SLE	304SLE-San Lorenzo @ Elks Park above Bear Creek	
2016	30413	Soquel Creek	304SOU	304SOU-Soquel Creek @ Soquel Creek Road	
2016	30413	Valencia Creek	304VAL	304VAL-Valencia Creek u/s Aptos Creek Confluence	
2016	30412	Zayante Creek	304ZAY	304ZAY-Zayante Creek @ Graham Hill Road	
2016	30550	San Benito River	305BRI	305BRI-San Benito River, Bridge d/s Willow Creek	
2016	30530	Carnadero Creek	305CAN	305CAN-Carnadero Creek above Pajaro River	
2016	30510	Pajaro River	305CHI	305CHI-Pajaro River @ Chittenden Gap	
2016	30510	Salsipuedes Creek	305COR	305COR-Salsipuedes Creek d/s of Corralitos Creek	
2016	30510	Corralitos Creek	305COR2	305COR2-Upper Corralitos Creek	
2016	30530	Pajaro River	305FRA	305FRA-Miller's Canal @ Frazier Lake Road	
2016	30510	Furlong Creek	305FUF	305FUF-Furlong Creek @ Fraiser Lake Road	
2016	30510	Harkins Slough	305HAR	305HAR-Harkins Slough @ Harkins Slough Road	
2016	30530	Llagas Creek(below res.)	305HOL	305HOL-Llagas Creek @ Holsclaw and Leavesley Roads	
2016	30530	Llagas Creek(below res.)	305LLA	305LLA-Llagas Creek @ Bloomfield Avenue	
2016	30510	Pajaro River	305MUR	305MUR-Pajaro River @ Murphy's Crossing	
2016	30540	Pacheco Creek	305PAC	305PAC-Pacheco Creek @ San Felipe Road	
2016	30520	Pajaro River	305PAJ	305PAJ-Pajaro River @ Betabel Road	
2016	30550	San Benito River	305SAN	305SAN-San Benito @ Y Road	
2016	30510	San Juan Creek	305SJN	305SJN-San Juan Creek @ Anzar	
2016	30510	Struve Slough	305STL	305STL-Struve Slough @ Lee Road	
2016	30550	Tres Pinos Creek	305TRE	305TRE-Tres Pinos Creek	
2016	30530	Uvas Creek(below res.)	305UVA	305UVA-Uvas Creek @ Bloomfield Avenue	
2016	30510	Watsonville Slough	305WSA	305WSA-Watsonville Slough @ San Andreas Road	

Coordination and Review Strategy

CCAMP staff coordinates with other Region 3 staff and outside programs to ensure consistency with SWAMP in data gathering methods, data quality objectives, and data reporting formats. Prior to the start of field sampling by SWAMP Master Contract crews, CCAMP staff meets with SWAMP field coordinators to ensure that sampling plans are implemented as planned and that any difficulties related to access, site location, holding times, etc. are discussed in advance and resolved. CCAMP data collected in-house is verified, validated and flagged according to SWAMP method quality objectives prior to delivery. In-house data is not directly entered into the SWAMP database, but is delivered in CEDEN formats on a quarterly basis. CCAMP workplans and reports are submitted for SWAMP peer review prior to finalization. The CCAMP Program Director participates routinely in SWAMP decisions through roundtable meetings and related sub-committees, and the field coordinator and sampling staff participate in all required or related SWAMP field trainings.

Table 4 summarizes coordinating activities with other monitoring efforts in Region 3. Prior to the start of each monitoring year, CCAMP holds a stakeholder coordination meeting. Both Regional Board staff and outside entities, including other professional and volunteer monitoring organizations, City and County staff, environmental organizations, and other interested parties, are invited to the meeting. CCAMP staff summarizes past data findings, and discuss the monitoring details for the upcoming year, including site locations, analytes, coordinating efforts, etc. Stakeholder input is used to adjust monitoring plans as necessary.

CCAMP coordinates closely with monitoring activities of the Cooperative Monitoring Program for Irrigated Agricultural (CMP). Monitoring conducted by the CMP includes monthly conventional monitoring for a subset of the CCAMP analyte list (probe measurements, nutrients and TDS), spring benthic macroinvertebrate collection following SWAMP 2007 protocols, and water and sediment toxicity monitoring during both wet and dry seasons at all sites. Several CCAMP sites are co-located with Ag Monitoring program sites; CCAMP samples these sites for conventional water quality to ensure that the full complement of CCAMP parameters is collected. CCAMP does not collect toxicity and benthic macro-invertebrate data at these sites. Data is shared between the two programs.

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Table 4: Intra- and Inter-agency monitoring in coordination with CCAMP

Monitoring Activity	Monitoring Program description	Available Data Format	Using SWAMP QAMP	Using SWAMP format QAPP	Data format CEDEN compatible	Data used for 303(d) and 305(b) analysis
CCAMP	CCAMP watershed rotation monitoring.	Region 3 database is directly ODBC linked for CEDEN uploads	X		X	X
CCAMP	CCAMP coastal confluences monitoring at creek mouths.	Region database is directly ODBC linked for CEDEN uploads	X		X	X
TMDL	TMDL staff currently use CCAMP data or data from outside sources only	Most data is from CCAMP. * Some outside sources may be in hard copy or non-CEDEN formats.	X*		X*	X*
Cooperative Monitoring Program for Agriculture	Agriculture monitoring is required in association with irrigation discharge waiver	Program provides data to CCAMP in CEDEN comparable templates via CalDUCS and has a SWAMP reviewed QAPP		X	X	X
Grant Projects	Diverse	Data is submitted in electronic format using SWAMP templates through CalDUCs. QAPPs use SWAMP QAPP templates and are reviewed and approved by R3 QA officer.		X	X	X
CCLEAN	Ocean discharger monitoring	Data is submitted in electronic format using CEDEN template to 303(d)/305(b) solicitation process. QAPP is SWAMP comparable and approved by R3 QA officer.		X	X	X
Morro Bay Volunteer Monitoring Program	Morro Bay watershed and estuary monitoring; diverse monitoring types	Data maintained in CEDEN templates and submitted to 303(d)/305(b) solicitation. QAPP is EPA and R3 approved		X	X	X
MBNMS Citizen's Monitoring Network	Snapshot Day and First Flush monitoring	Data maintained in CEDEN templates and submitted to 303(d)/305(b) solicitation. QAPP is R3 approved		X	X	X
Elkhorn Slough Foundation	Routine monthly monitoring in Elkhorn Slough watershed	Data maintained in CEDEN templates and submitted to 303(d)/305(b) solicitation. QAPP is R3 approved		X	X	X

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Quality Assurance

CCAMP follows measurement quality objectives (MQOs) defined in the SWAMP QAPrP (2008). Data analyzed through SWAMP laboratories (organic chemicals in water, toxicity and identification of benthic invertebrates and algae) are handled directly by SWAMP data managers and hence follows their detailed quality assurance protocols. CCAMP data, which is collected by R3 staff on a monthly basis and analyzed using a contract laboratory, is handled by CCAMP staff and delivered directly to CEDEN. Validation of CCAMP data prior to delivery to CEDEN follows the SWAMP quality assurance guidance ensuring MQOs are met and data is qualified appropriately.

<u>Evaluating field data</u>

CCAMP staff follows the SWAMP Standard Operating Procedures (SOPs) for verification of field data (SWAMP DMT 2004). Specifically, CCAMP staff verifies accuracy of field measurements and observations by checking 100% of the data from field data sheets and calibration logs. Data are flagged if results are outside the calibration range or if post sampling calibration results are outside the allowable drift in the SWAMP QAPrP Table B42. In addition, CCAMP staff verifies the following in the electronic data format to ensure that they are reported correctly and are compliant with SWAMP QAPrP requirements: pre-sampling calibration, result qualifier codes, equipment IDs, units and QA codes. Finally, CCAMP staff verifies completeness of data entry.

Corrective Action – If allowable drift exceeds the SWAMP MQO, staff check, clean, repair and recalibrate equipment before conducting a re-check for accuracy. If this does not resolve the problem, equipment are returned to the manufacturer for repair. If data entry errors are found during the field verification process, CCAMP staff revises errors and re-verifies the data. All data verification is conducted prior to loading data to the permanent Region 3 database and to CEDEN.

<u>Evaluating Laboratory Data</u>

The Region 3 contract laboratory defines corrective actions taken to verify and document quality control measures in their own QAPP (BC Labs, 2008). CCAMP staff conducts independent checks of all quality control following the SWAMP Standard Operating Procedure (SOP) for Verification of the Surface Water Ambient Monitoring Program Database (SWAMP, 2011) to ensure the data is complete, correct and meets the MQOs defined in the SWAMP QAPrP. Specifically, the data is verified for handling requirements of the SWAMP QAPrP including the following: Holding times, method blanks, laboratory control samples, matrix spikes and matrix spike duplicates, certified reference materials, laboratory duplicates, field duplicates and target reporting limits. Any data not meeting the SWAMP MQOs for completeness or sample handling requirements are flagged with the appropriate QA Code defined in the SWAMP QA Code Look-Up Table.

Corrective Action – If errors are found that prevent data from being verified, staff request that the contract laboratory revise the information the data so that it is complete.

All data verification is conducted prior to loading data to the permanent CCAMP database and to CEDEN.

Utility of Qualified Data – Data qualified with a QA Code are typically useable for determining status and trends in Central Coast waterbodies. The one exception to this is data which are rejected with an "R" code, and are not included in any further analyses.

Data Management

Data collected by CCAMP staff and (both in the field and samples analyzed at the Region 3 contract Laboratory) is processed using several template formats which are combined into a single format and uploaded into the Region 3 Database. A brief description of the processing for each of the CCAMP data formats follows. Prior to loading to the Region 3 database, data is checked through the California Data Upload and Checking System (CalDUCS) (temporarily located at http://www.ccamp.info/CalDucs/index.html) to ensure that language is consistent with California Environmental Data Exchange Network (CEDEN) requirements.

Region 3 Data Templates - There are several templates CCAMP staff use to upload data and check for completeness. These include the following templates: 1) Calibration Logs 2) Site Visit and COC inventory, 3) Field data entry format and 4) Lab data entry format. Each of these formats is verified following the SWAMP SOPs for data verification (SWAMP, 2004; SWAMP, 2011). Once verified and QA codes are assigned, these formats are loaded to CalDUCS and checked against the SWAMP lookup tables. If no errors are identified (all required fields are populated and information is consistent with lookup tables) data are loaded to the temporary side of the Region 3 database. Upload templates are described below.

1. Calibration Log Format – Staff maintain both paper and electronic copied of the calibration data collected for all field probes. Staff record pre- and post-calibration measurements for all parameters in this log, which is used to determine if probes have exceeded the allowable drift defined in the SWAMP QAPrP (Table B42) after each sample event.
2. Site Visit and COC Inventory Format - Staff maintains an electronic inventory for each unique sample. The Site Visit and COC inventory formats document all data collected, including field measurements, field observations and grab sample analyses conducted at the laboratory. This format is used to check the data for completeness prior to loading to the permanent side of the Region 3 database and to CEDEN.
3. Field Data Entry Format – Staff use software to combine field probe results (downloaded from the field data logger) with hand-entered field observations (such as shading and algae cover), field measurements (such as flow and air temperature) and comments on field conditions or sample collection. This template also documents pre- and post- calibration dates. Once this information is combined into the Field Data Entry format, staff follows the SWAMP verification

SOP to verify accuracy of field measurements and observations and checks for instrument drift. If Measurement Quality Objectives are not met, staff assigns QA Codes as appropriate. Once verified and QA codes are assigned, this table is loaded to CalDUCS and checked against the SWAMP lookup tables. If no errors are identified (all required fields are populated and information is consistent with lookup tables) data are loaded to the temporary side of the CCAMP database.

4. Laboratory Data Entry Format – Staff use software to move files delivered from the Region's contract laboratory into this format. CCAMP staff verifies 100% of the data, checking project names, station codes, measurement quality objectives, identification of replicates and sample type codes as described in the SWAMP QAPrP and the SOP for Verification of Laboratory Data (SWAMP, 2011). Staff also compares blind field replicates to the original samples as defined in the SWAMP QAPrP. QA codes are assigned to all data that exceed SWAMP MQOs. Once verified and QA codes are assigned, this format is loaded to CalDUCS and checked against SWAMP lookup tables. If no errors are identified (all required fields are populated and information is consistent with lookup tables) data are loaded to the temporary side of the Region 3 database.

CalDUCS and Region 3 Database transfer to CEDEN

CalDUCS **-** Multiple data providers use the CalDucs system to provide data to the Region 3 database and to CEDEN. The CalDUCS checker compares the contents of data templates to lookup tables to ensure that all terminology matches acceptable entries and also checks to ensure that all required fields are populated. When data in one of the templates "passes" the checker (no errors are identified), the file is ready to be loaded to the temporary side of the Region 3 database. CalDUCS data is currently managed at the Regional Board, but this responsibility will be moved to Moss Landing in the near future.

Temporary Side of Region 3 Database **–** This area contains only data currently being processed. Data does not accumulate in the temporary side of the database. Completeness is verified again by electronically comparing contents of this temporary file to the Site Visit and COC inventory format. Any discrepancies are resolved prior to data being loaded to the permanent side of the Region 3 Database. Software tools are used to make changes to the data in the temporary side. Changes include addition of fields required for CEDEN delivery, populating those fields with standard language, calculation of unionized ammonia (using field pH, water temperature and lab results for total ammonia), and calculation of Nitrate + Nitrite. Once data is finalized it is moved to the permanent side of the Region 3 database.

Permanent Side of Region 3 Database **–** Data in the permanent side of the database is finalized and not further manipulated. The Region 3 database is the backbone of the

CCAMP data website and the database from which data is delivered to other programs and databases (i.e. CEDEN). It is the "final" database for CCAMP purposes, but data delivery to CEDEN is necessary to finalize the data management loop and SWAMP requirements. Data is available to CEDEN through an “Open Database Connectivity” or ODBC link. Data is made available to CEDEN quarterly.

CEDEN Delivery - CEDEN "delivery" for CCAMP data is handled through an ODBC link. In order to make data available in CEDEN for statewide performance metrics development, data is scheduled for CEDEN pickup on a quarterly basis. To support this schedule, it is important that data throughput be kept up-to-date, with no more than a 30-day batch data processing window from the time the laboratory data is received to the time it is available in the Region 3 Database. In particular, data throughput at the close of the fiscal year must be completed as rapidly as possible so that final metrics are up-to-date. The ODBC link address, user names and passwords are maintained in hard copy by the CCAMP Program Manager.

Reporting

CCAMP uses a variety of approaches to report findings both internally to other Water Board staff and externally to the public. Additional detail for several of these reporting mechanisms is described below.

The Integrated Report (IR), required by the EPA and the Clean Water Act Section’s 303(d)/305(b), is prepared every other year by CCAMP staff, and relies heavily on CCAMP data and other data sources which have been delivered in CEDEN comparable formats. For the 2010 IR update, CCAMP staff developed an electronic tool that generates Lines of Evidence that were directly loaded into the California Water Quality Assessment Database. That tool has been adapted for use by State Board staff for the 2012 listing process. Between the large CCAMP dataset, CMP data, and other data sources that have been adapted to CalDUCS templates in Region 3, our data generates thousands of lines of evidence for each listing round. Each of these is packaged by CCAMP staff into a decision supporting listing or delisting, and into 305(b) water body status assessments. This results in a robust formal assessment of the Region’s waters that meet state and federal requirements. Data collected under the 2012 – 2016 work plan will be evaluated in the 2014, 2016, and 2018 Integrated Reports.

The CCAMP website is another primary means for providing public access to CCAMP data. The CCAMP website, located at www.ccamp.org, includes a data navigator that allows the viewer to select watershed areas, waterbodies, sites, analytes and charting styles of interest, and examine CCAMP data both in map and chart format. The website includes a rule-driven approach that colors sites according to severity of impairment. The rules associated with the website coloring scheme are found in Appendix A. The website also evaluates change over time at the site level using a simple t-test approach and displays site icons where change is evident as arrows. We plan to upgrade the website during this workplan period to incorporate data from other monitoring programs in the Region. The website is a primary source of reporting for CCAMP. In addition, the CCAMP website posts relevant journal articles and SWAMP publications at www.ccamp.org/reports.

CCAMP staff also maintains an "incident report" database, that documents problems found in the field that need attention by enforcement or other Water Board field staff. Typically a short incident report accompanies each entry, which includes relevant data, staff observations and photographs. CCAMP staff also interacts directly with appropriate Region 3 staff to inform them of observations in the field.

CCAMP staff prepares periodic written and peer reviewed reports that are made available through the SWAMP website. CCAMP staff plans to develop a region-wide status report, that summarizes data collected to date by CCAMP and includes a multivariate examination of water quality data as it relates to land uses in the Region. In addition, staff plans to prepare a report on the findings of follow-up monitoring on lakes where BOG fish sampling has shown the potential for risk to human health.

CCAMP staff prepares a presentation for Region 3 staff (approximately once a year) to inform staff of water quality findings, participate in WebEx presentations to the rest of the State Water Board on a periodic basis, present formal papers based on CCAMP data at the biannual National Water Quality Monitoring Conference and collaborate with researchers to develop peer reviewed journal articles (available at www.ccamp.org/reports).

In addition to state-required performance reports, CCAMP staff prepares a Region 3 report that summarizes number of website hits, number of documents written that incorporate CCAMP data, and other meaningful metrics of internal data use.

Project Schedule

Deliverables

A schedule of CCAMP monitoring program deliverables is provided in Table 5. Because a large component of SWAMP assessment effort and staff time is dedicated to developing decisions for the Integrated Report, target dates include milestones related to Integrated Report development.

Table 5: Monitoring schedule and deliverables

Task Deliverable	Time line / target date
Begin developing decisions for 2012 Integrated Report	November 2011
11/12- Q1 data available for CEDEN upload	November 2011
2012 - 2016 R3 workplan to peer review	November 2011
Salinas Stakeholder Meeting	November 2011
2012 – 2016 R3 workplan finalized	January 2012
Begin Salinas Watershed Rotation Monitoring	**January 2012**
11/12-Q2 data available for CEDEN upload	February 2012
Integrated Report Decisions for R3 data completed	February 2012
CCAMP website fact sheet	June 2012
11/12-Q3 data available for CEDEN upload	May 2012
Draft Region-wide status report to peer review	September 2012
11/12-Q4 data available for CEDEN upload	August 2012
12/13- Q1 data available for CEDEN upload	November 2012
Santa Maria Stakeholder Meeting	November 2012
Begin Santa Maria Watershed Rotation Monitoring	**January 2013**
Region-wide status report finalized	March 2013
12/13-Q2 data available for CEDEN upload	February 2013
12/13-Q3 data available for CEDEN upload	May 2013
Begin developing Decisions for 2014 Integrated Report	June 2013
12/13-Q4 data available for CEDEN upload	August 2013
13/14- Q1 data available for CEDEN upload	November 2013
Santa Barbara Stakeholder Meeting	November 2013
Begin Santa Barbara Watershed Rotation Monitoring	**January 2014**
Integrated Report Decisions for R3 data completed	January 2014
Draft Lakes Follow-up Report to peer review	January 2014
13/14-Q2 data available for CEDEN upload	February 2014
13/14-Q3 data available for CEDEN upload	May 2014
Lakes Follow-up Report finalized	May 2014
13/14-Q4 data available for CEDEN upload	August 2014
14/15 - Q1 data available for CEDEN upload	November 2014
Santa Lucia Stakeholder Meeting	November 2014
Begin Santa Lucia Watershed Rotation Monitoring	**January 2015**
14/15 -Q2 data available for CEDEN upload	February 2015
14/15 -Q3 data available for CEDEN upload	May 2015
14/15 -Q4 data available for CEDEN upload	August 2015

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Appendix A. Rules for Scoring Parameters on www.CCAMP.org

Each parameter is scored for each site according to the rules described below. Green is good, yellow shows some evidence of a problem, red definitely has a problem, and dark red has a serious problem. Water quality indices are scored by combining parameter scores, where Green = 3, Yellow = 2, Red = 1, and Dark Red = 0, and then scores are percentile ranked so that 100 is a site where all parameters are in good shape (all parameters are green) and 0 is a site where all parameters are in serious condition.

Parameter rules vary depending on characteristics of data and the desired emphasis. For example, storm events during the wet season can drive elevated turbidity (to some extent a natural phenomenon), but tailwater discharges during the dry season can also drive elevated turbidity. The turbidity rule is designed to emphasize persistence in the data. Consequently, the turbidity parameter is scored dark red when the 25th percentile exceeds a value of concern (this means that 75% or more of the data is over this value). Several other parameters, such as toxicity or nitrate, are scored dark red when the 75th percentile of the data exceeds a criterion or guideline value (this means that 25% of the data or more is over a limit of concern). Note that use of the 90th percentile, instead of the maximum value, prevents a single outlier from determining status.

Water Quality Index

Nitrate-Nitrite (as N) (mg/L)

1 mg/L is a guideline value to protect aquatic life (Worcester et al., 2010); 10 mg/L is the Basin Plan standard to protect drinking water (CCWRQCB, 1994)

- If the 90th percentile <= 1 then the status = Green
- If the 90th percentile > 1 and the 90th percentile <= 10 then the status = Yellow
- If the 75th percentile <= 10 and the 90th percentile > 10 then the status = Orange
- If the 75th percentile > 10 and the median <= 10 then the status = Red
- If the median > 10 then the status = Dark Red

Water Column Chlorophyll *a* (ug/L)

15 ug/L and 40 ug/L are guideline values adapted from cold and warm water standards used in North Carolina and Oregon. 40 ug/L is the guideline value adopted for 303(d) listing by the Central Coast Region

- If the 90th percentile <= 15 then the status = Green
- If the 90th percentile > 15 and the 90th percentile <= 40 then the status = Yellow
- If the 75th percentile <= 40 and the 90th percentile > 40 then the status = Orange
- If the 75th percentile > 40 and the median <= 40 then the status = Red
- If the median > 40 then the status = Dark Red

Turbidity (NTU)

25 NTU is the guideline value adopted for 303(d) listing by the Central Coast Region, and supported by Sigler et al., 1984

- If the 75th percentile <= 25 then the status = Green
- If the 75th percentile > 25 and the median <= 25 then the status = Yellow
- If the median > 25 and the 25th percentile <= 25 then the status = Orange
- If the 25th percentile > 25 and the 75th percentile <= 250 then the status = Red
- If the 25th percentile > 25 and the 75th percentile > 250 then the status = Dark Red

Un-ionized Ammonia (mg/L)

0.025 mg/L is a General Basin Plan standard. Other values are based on CCAMP data distribution, and are typical of good water quality (<0.01 mg/L), or very poor water quality (> 0.1 mg/L)

- If the 90th percentile <= 0.01 then the status = Green
- If the 90th percentile > 0.01 and the 90th percentile <= 0.025 then the status = Yellow
- If the 90th percentile > 0.025 and the 75th percentile <= 0.025 then the status = Orange
- If the 75th percentile > 0.025 and the 90th percentile < 0.1 then the status = Red
- If the 75th percentile > 0.025 and the 90th percentile > 0.1 then the status = Dark Red

Water Temperature (degrees C)

21 C is the evaluation guideline used to protect the Cold Freshwater Habitat beneficial use and is supported by Moyle 1976. Other values are based on CCAMP data

distribution, and are typical of good water quality (<18 C), or very poor water quality (> 25 C)

- If the 90th percentile <= 18 then the status = Green
- If the 90th percentile > 18 and the 90th percentile <= 21 then the status = Yellow
- If the 75th percentile <= 21 and the 90th percentile > 21 then the status = Orange
- If the 75th percentile > 21 and the 90th percentile <= 25 then the status = Red
- If the 75th percentile > 21 and the 90th percentile > 25 then the status = Dark Red

Dissolved Oxygen (mg/L)

This rule is expressed as mg/L diverging outside of the desirable range of 7 to 13 mg/L. 7 mg/L is a Basin Plan objective for protecting cold water habitat; 13 mg/L has been identified as the upper range of desirable conditions in the Central Coast application of Numeric Nutrient Endpoints (Worcester, 2010). So, for example, if 90% of measurements fall within the desired range of 7 - 13 mg/L, the status is green, if 90% of the measurement fall within 1 mg/L of the desired range the status is yellow.

- If the 90th percentile = 0 then the status = Green
- If the 90th percentile > 0 and the 90th percentile <= 1 then the status = Yellow
- If the 90th percentile > 1 and the 90th percentile <= 2 then the status = Orange
- If the 90th percentile > 2 and the 75th percentile <= 2 then the status = Red
- If the 75th percentile > 2 then the status = Dark Red

Total Dissolved Solids (mg/L)

Saline, tidal, and marine sites are excluded from this rule. This rule is based on limits set to protect agriculture in the Central Coast Basin Plan (1994) (Table 3-3 and 3-4).

- If the 75th percentile <= 500 then the status = Green
- If the 75th percentile > 500 and the 75th percentile <= 1000 then the status = Yellow
- If the 75th percentile > 1000 and the 90th percentile <= 2000 then the status = Orange
- If the 75th percentile > 1000 and the 75th percentile <= 2000 and the 90th percentile > 2000 then the status = Red
- If the 75th percentile > 2000 then the status = Dark Red

Ortho-Phosphate (as P) (mg/L)

0.12 mg/L is a screening value identified in Williamson (1994)

- If the 90th percentile <= 0.12 then the status = Green
- If the 75th percentile <= 0.12 and the 90th percentile > 0.12 then the status = Yellow
- If the 75th percentile > 0.12 and the median <= 0.12 then the status = Orange
- If the median > 0.12 and the 25th percentile <= 0.12 then the status = Red
- If the 25th percentile > 0.12 then the status = Dark Red

Toxicity Index

Note: the Toxicity Index is only scored for sites that have data for more than one species. For the purposes of this index, we have used "percent of control" between the sample and the control test. For example, if sample survival is 63% and control survival is 91%, the percent of control is 63/91 * 100 or 69.2%. When only one sample is toxic, we distinguish between samples which show some toxicity, where the test is 50 to 80% of the control, and samples that are quite toxic, where the test is less than 50% of the control.

- If the minimum >= 80 then the status = Green
- If the minimum < 80 and the minimum >= 50 then the status = Yellow
- If the minimum < 50 and the 25th percentile >= 80 then the status = Orange
- If the 25th percentile < 80 and the median >= 80 then the status = Red
- If the median < 80 then the status = Dark Red

For small sample counts (three or fewer):

- If Minimum > 80 Then status = Green (No samples toxic)
If Minimum <= 80 and Minimum > 50 Then status = Yellow (Some toxicity)
If Minimum < 50 And Median >= 80 Then status = Red
- If Minimum < 50 And Median < 80 Then status = Dark Red (At least two samples are toxic and one of them is quite toxic)

Coliform Index

Fecal Coliform (MPN/100mL)

400 MPN/100 ml is the Basin Plan standard to protect for Water Contact Recreation (CCRWQCB, 1994)

- If the 90th percentile <= 400 then the status = Green
- If the 75th percentile <= 400 and the 90th percentile > 400 then the status = Yellow
- If the 75th percentile > 400 and the median <= 400 then the status = Orange
- If the median > 400 and the 25th percentile <= 400 then the status = Red
- If the 25th percentile > 400 then the status = Dark Red

E. coli (MPN/100mL)

235 MPN/100 ml is the evaluation guideline adopted for 303(d) listing by the Central Coast Region to protect for Water Contact Recreation, and is supported by USEPA Ambient Water Quality Criteria for Bacteria (1986)

- If the 90th percentile <= 235 then the status = Green
- If the 75th percentile <= 235 and the 90th percentile > 235 then the status = Yellow
- If the 75th percentile > 235 and the median <= 235 then the status = Orange
- If the median > 235 and the 25th percentile <= 235 then the status = Red
- If the 25th percentile > 235 then the status = Dark Red

Total Coliform (MPN/100mL)

10000 MPN/100 ml is a California Ocean Plan standard and is used here as a screening value for fresh water. This value is also used in other countries to protect for Waterbody Contact Recreation.

- If the 90th percentile <= 10000 then the status = Green
- If the 75th percentile <= 10000 and the 90th percentile > 10000 then the status = Yellow
- If the 75th percentile > 10000 and the median <= 10000 then the status = Orange
- If the median > 10000 and the 25th percentile <= 10000 then the status = Red
- If the 25th percentile > 10000 then the status = Dark Red