



Surface Water Ambient Monitoring Program (SWAMP) Needs Assessment

Prepared by the Surface Water Ambient Monitoring Program
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List of Acronyms

AIS	Aquatic Invasive Species
BOG	Bioaccumulation Oversight Group
Cal/EPA	California Environmental Protection Agency
CDFG	California Department of Fish and Game
CEDEN	California Environmental Data Exchange Network
CSU	California State University
CWA	Clean Water Act
CWQMC	California Water Quality Monitoring Council
DDT	Dichloro-diphenyl-trichloroethane (a synthetic insecticide)
DMT	Data Management Team
IBI	Index of Biotic Integrity
MLML	Moss Landing Marine Laboratory
MOU	Memorandum of Understanding
MPSL	Marine Pollution Studies Laboratory
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OEHHA	Office of Environmental Health Hazard Assessment
PBDE	Polybrominated diphenyl ether
PCB	Polychlorinated biphenyls
PFC	Perfluorinated compound
ppm	parts per million
PSA	Perennial Streams Assessment
QA	Quality Assurance
QAMP	Quality Assurance Management Plan
QAPrP	Quality Assurance Program Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCMP	Reference Condition Management Program



RDC	Regional Data Center
SCCWRP	Southern California Coastal Water Research Project
SFEI	San Francisco Estuary Institute
SJSURF	San Jose State University Research Foundation
SOP	Standard Operating Procedure
SPoT	Stream Pollution Trends
SWAMP	Surface Water Ambient Monitoring Program
TMDL	Total Maximum Daily Load
UC	University of California
USEPA	U.S. Environmental Protection Agency



Executive Summary

This Needs Assessment was prepared in response to requirements stipulated in California Senate Bill 1070 (Kehoe, Statutes of 2006). This is a living document that will be evaluated and updated, as appropriate, as the vision described in the California Water Quality Monitoring Council's (2010) *Comprehensive Water Quality Monitoring Program Strategy for California* and the 2010 Update of the Surface Water Ambient Monitoring Program's (SWAMP) *Comprehensive Monitoring and Assessment Strategy to Protect and Restore California's Water Quality* takes shape and becomes more fully realized.

When the SWAMP was originally designed, it was envisioned to provide information for all the State Water Resource Control Board's decision-making needs. This included monitoring all waterbody types to assess attainment of all beneficial uses. In the November 2000 Report to the Legislature, it was estimated that full implementation of the SWAMP would cost between \$59 and \$115 million per year and require 87 to 132 staff positions. Funding for the program has never reached that level, and it is unlikely that the program will ever receive such resources. Furthermore, funding of SWAMP's regional monitoring programs has decreased in recent years. The lack of adequate resources has limited what the SWAMP is able to accomplish.

The SWAMP currently is funded at approximately \$8 million per year and 17 staff positions, through an Ambient Water Monitoring Surcharge on waste discharge permit fees and Clean Water Act (CWA) *Section 106* Grant funds. In response to these funding and staffing constraints, the SWAMP has focused its resources on conducting three statewide assessments, supporting regional monitoring, enhanced coordination with Water Board programs and other partners, and the development and implementation of supporting infrastructure and tools. Collaboration with the California Water Quality Monitoring Council represents a key component of the SWAMP's efforts related to each of these priorities.

The approach taken for the development of this Needs Assessment was to describe current funding levels, program priorities and activities, and opportunities to enhance the existing program should additional funds become available. The SWAMP evaluates programmatic priorities and funding allocations on an annual and/or multi-year basis through the development of workplans at the State and Regional levels. In the event additional funds were to be allocated to the SWAMP, those funds would be used to enhance the existing monitoring and assessment programs, our ability to coordinate with Water Board programs and other partners, and/or the continued development of needed infrastructure and tools.

SWAMP Funding

The State Water Resources Control Board's (State Water Board) Surface Water Ambient Monitoring Program (SWAMP) provides information on ambient water quality and the beneficial uses of California's surface waters; coordinates a statewide framework of

consistent and scientifically defensible methods and strategies that improve monitoring, assessment, and reporting of water quality; and fulfills federal Clean Water Act (CWA) requirements (namely, impaired water bodies list and surface water quality assessment). When the SWAMP was originally designed, it was envisioned to provide information for all the State Water Board’s decision-making needs. This included monitoring all waterbody types to assess attainment of all beneficial uses. It was estimated that to achieve this vision, the program would cost between \$59 and \$115 million per year and include 87 to 132 staff positions ([November 2000 Report to the Legislature](#)). Funding for the program has never reached that level, and it is highly unlikely that the program will ever receive such resources. Furthermore, funding of the SWAMP’s regional monitoring programs has decreased in recent years. The lack of adequate resources has seriously limited what the SWAMP is able to accomplish.

The current program is funded at approximately \$8 million and 17 staff positions, through an Ambient Water Monitoring Surcharge on waste discharge permit fees and CWA *Section 106* Grant funds. A summary of how the SWAMP funds are currently allocated is provided in Table 1. This represents a snapshot of the budget as of fiscal year 10/11; however, shifts in funding are subject to occur as priorities change. The infrastructure and support line item includes a number of activities including the Quality Assurance Team, Data Management Team, California Environmental Data Exchange Network, program coordination, and communications and reporting. Allocation of the *Section 106* Grant funds is negotiated on an annual basis and articulated through the development of a workplan. To a large degree, the *Section 106* Grant funds support the statewide monitoring and assessment, data comparability, and infrastructure and support. Contact expenditures associated with the Ambient Water Monitoring Surcharge are allocated primarily to support regional monitoring and assessment activities. Regional SWAMP workplans and monitoring plans are developed on an annual or multi-year basis.

Table 1. Summary of SWAMP Budget for Fiscal Year 10/11.

Program	Current Funding	
	PYs	Contract Expenditures
Statewide Monitoring	1.5	\$2,968,170
Regional Monitoring	9.8	\$3,227,800
Data Comparability	2.0	\$253,200
Infrastructure and Support	3.7	\$1,618,800
Total	17	\$8,067,970

One area in particular need of improvement, as identified by both the SWAMP Roundtable¹ and the California Water Quality Monitoring Council, is the contracting process by which SWAMP accesses the capabilities of the University of California (UC) and California State University (CSU) to conduct monitoring, data management, and assessment. The current process impedes our ability to contract with these entities, which provide critical expertise and capabilities that allow for continued high quality monitoring and assessment, in an efficient and timely manner. The program relies heavily on contracting, as the resources allocated to the SWAMP are largely in the form of contract support. A significant amount of staff resources, particularly at the Regions, is devoted to contracting, leaving fewer resources for monitoring, assessment, reporting, and coordination. Streamlining the contracting process is critical for efficient use of program resources. The State Legislature has begun to address this issue with the passage and signing of California Assembly Bill 20 (Solorio, Statutes of 2009), which requires the Department of General Services to establish a model contract with standard contract provisions for UC and CSU agreements. This may be one step toward streamlining a contract process that currently requires multiple reviews and results in lengthy delays.

Given current resource limitations, the SWAMP has focused its statewide assessment efforts on a few waterbody/beneficial use combinations; collaborates with other monitoring programs and partners within the California Water Quality Monitoring Council framework to address other waterbody/beneficial use combinations; and has taken a lead role in developing the monitoring infrastructure needed to foster data comparability and collaboration with other monitoring partners. If additional funds were to be allocated to the SWAMP, those funds would be directed towards enhancing the existing programs. An overview of the SWAMP is provided in the following section. The discussion of each program element is followed by a list of potential ways the program could be enhanced with additional funding. Should additional funding become available, these lists would be evaluated, prioritized, and likely modified, based on programmatic direction and needs at that point in time.

Program Overview

The SWAMP was created in the year 2000 to fulfill the State Legislature's mandate for a unifying program that would (1) integrate the existing water quality monitoring of the State Water Board and Regional Water Quality Control Boards (Regional Water Boards) and (2) coordinate with monitoring programs of other agencies, dischargers, and citizens groups ([SWRCB, 2000](#)). The SWAMP was envisioned to meet the following four goals:

¹ The SWAMP Roundtable is the coordinating entity for the program. Participants include staff from the State and Regional Water Boards, the Department of Fish and Game, the Marine Pollution Studies Lab, Moss Landing Marine Laboratories, contractors and other interested entities.

1. Create an ambient monitoring program that addresses all hydrologic units of the State using consistent and objective monitoring, sampling and analytical methods; consistent data quality assurance protocols; and centralized data management. This will be an umbrella program that monitors and interprets that data for each hydrologic unit at least one time every five years.
2. Document ambient water quality conditions in potentially clean and polluted areas. The scale for these assessments ranges from the site-specific to statewide.
3. Identify specific water quality problems preventing the State Water Board, Regional Water Boards, and the public from realizing beneficial uses of water in targeted watersheds.
4. Provide the data to evaluate the overall effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.

The 2010 update to the SWAMP's *Comprehensive Monitoring and Assessment Strategy to Protect and Restore California's Water Quality* (Strategy) identifies statewide and regional monitoring and assessments, coordination, and the development and implementation of infrastructure and tools as the SWAMP's core implementation priorities. Existing resources are not sufficient for the SWAMP to monitor all water bodies for all beneficial uses, so efforts have been focused on a few statewide assessments of key beneficial uses, supporting regional monitoring, and improving coordination with other Water Board programs (e.g., National Pollutant Discharge Elimination System [NPDES], Stormwater, Irrigated Lands Regulatory Program, Nonpoint Source [NPS]) and external partners. Finally, the SWAMP has taken a lead role in developing the monitoring infrastructure and tools (e.g., indicators, methods, quality assurance/quality control [QA/QC], and data management) necessary to support a robust monitoring program while also fostering data comparability and collaboration with monitoring partners. The continued development, maintenance, and implementation of the monitoring infrastructure and tools remain a priority for the program.

The SWAMP's Statewide monitoring and assessment programs are designed to provide information on the status and trends of California's waters. These programs help to answer broad questions, such as, "what percent of river miles are in good conditions?" or "what percent of lakes have fish tissue contamination levels above an Office of Environmental Health Hazard Assessment (OEHHA) threshold?". Regional monitoring activities are based primarily on targeted monitoring designs to answer questions pertaining to specific sites. Targeted designs are good for evaluating trends at a particular location, for comparing conditions upstream-downstream of a particular source for compliance purposes, and for performing general gradient analyses.

A continuing goal of the SWAMP is to integrate its monitoring designs so that data collected at certain sites and times can be used for more than one program. Beyond the logistical and cost advantages, there are informational advantages because Statewide programs provide perspective for regional monitoring, and regional programs provide finer detail for Statewide programs. This enhances the value of each assessment for resource management decision

making. At a minimum, such evaluation of monitoring design should be conducted to avoid duplication of Water Board efforts. The ultimate objective is to better refine management questions and align the monitoring efforts of the SWAMP with those of other Water Board programs.

The following sections provide brief summaries of the SWAMP's current activities related to statewide and regional monitoring and assessment programs, data comparability, infrastructure and support, and the California Environmental Data Exchange Network (CEDEN).

Current Statewide Monitoring and Assessment Programs

The SWAMP is currently conducting three statewide monitoring programs that assess bioaccumulation of contaminants in sport fish (Bioaccumulation Monitoring Program), ecological condition in perennial streams (Bioassessment Monitoring Program), and trends in sediment contaminant concentrations and toxicity at watershed integrator sites (Stream Pollutions Trends Monitoring Program). Each of the statewide programs is designed to provide Water Board programs with background and context necessary to evaluate the data generated by local or regional programs.

Bioaccumulation Monitoring Program

The Bioaccumulation Monitoring Program is a 5-year rotating, screening-level study that evaluates contaminant levels of methylmercury, PCBs, DDTs, dieldrin, chlordane, and selenium in sport fish in lakes and reservoirs, coastal waters, and rivers. The objectives of this monitoring program are to:

1. determine the proportion of lakes, streams, and coastal sites in which edible fish tissues exceed thresholds for specified contaminants;
2. conduct screening of California waters to identify problem areas where additional monitoring should be conducted to determine whether a fish consumption advisory should be developed; and
3. determine, over the longer term, whether these proportions and contaminant concentrations are increasing or decreasing to evaluate the effectiveness of management actions in reducing contamination.

This monitoring program is coordinated by Bioaccumulation Oversight Group (BOG). The BOG was formed to evaluate monitoring needs relative to bioaccumulation of toxics in fish and the effect that these have on beneficial uses related to fish consumption and the protection of aquatic life. The BOG is a coordinated effort, consisting of representatives from the State and Regional Water Boards, San Francisco Estuary Institute (SFEI), Moss Landing Marine Laboratory (MLML), OEHHA, U.S. Environmental Protection Agency (USEPA),

California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Geological Survey, and California Department of Water Resources.

The Bioaccumulation Monitoring Program conducted 2-year screening studies of fish tissue contaminant levels in lakes and reservoirs in 2007 and 2008, coastal waters in 2009 and 2010, and one year of river sampling is planned for 2011. The results from the recent Lakes Study and past studies indicate that present concentrations of pollutants in fish collected from many of California's waterbodies are sufficiently high to cause concern for possible effects on human health and the fishing beneficial use. Results from the 2-Year Lakes Study (Davis et al., 2010) indicate that methylmercury poses the most widespread potential health risk to persons who consume fish caught in California lakes. Twenty-one percent (21%) of the lakes surveyed had at least one fish species with an average methylmercury level high enough (> 0.44 ppm) that OEHHA would consider recommending no consumption of contaminated species for the most sensitive population – women between 18 and 45 years of age and children between 1 and 17 years of age.

However, this screening study did not provide enough information for development of consumption guidelines, which would require monitoring a broader array of species, a larger number of fish, and a much higher level of funding. Consumption advisories exist for only a fraction of the waterbodies likely to need them. Many waterbodies with elevated contaminant levels in fish are near population centers and are popular fishing locations. Furthermore, consumption of contaminated fish is an environmental justice issue. Pollutant concentrations also pose a concern for sensitive wildlife species and aquatic life beneficial uses.

The following are recommendations for how additional funding could be used to augment the Bioaccumulation Monitoring Program (Davis et al., 2010):

- Follow-up sampling to develop consumption guidelines at lakes with highly contaminated fish,
- Focused evaluations of selected waterbodies to identify contaminant sources,
- Assessment of risks to wildlife from bioaccumulative contaminants,
- Evaluate emerging contaminants (e.g., polybrominated diphenyl ethers [PBDEs] and perfluorinated compounds [PFCs]), and
- Conduct trend monitoring.

Bioassessment Monitoring Program

One of the SWAMP's priorities has been to develop California's capacity to directly measure the biological integrity of the state's waterbodies. The SWAMP's current focus is on the bioassessment of wadeable perennial streams, using benthic macroinvertebrates as indicators of ecological condition. The SWAMP's Bioassessment Monitoring Program has two components: the Perennial Streams Assessment (PSA) and the Reference Condition

Management Program (RCMP). Together, these programs provide resource managers with a framework for interpreting monitoring data and have a wide range of applications.

The PSA is a survey of stream health that collects data on biological condition (benthic macroinvertebrates, algae), instream and riparian habitat condition, and water chemistry. The PSA is stratified into six major sub-regions of the State to permit both statewide and regional assessments. The program has collected and analyzed samples from each of the sub-regions and has produced a number of technical reports and fact sheets.

The PSA is designed to answer the following questions:

- What percent of California's perennial, wadeable streams are in good, fair, or poor ecological condition?
- What is the condition of streams in agricultural, urban, and forested land use areas?
- What is the relative risk of various stressors to biological condition?

Information obtained from this program will support the statewide assessment requirement stipulated in *Section 305(b)* of the federal Clean Water Act; determine relationships between stressors and effects for non-point source programs; examine trends related to particular stressors of concern; and provide a framework for prioritizing individual issues for further investigation. Data provided by this probability survey provides an important perspective for state and regional monitoring programs, as well as permit required site-specific monitoring. This information can be used to place targeted data in the context of the broader pattern within a region of interest.

The RCMP represents California's program for establishing and maintaining a network of "reference sites," and using this network to establish "reference conditions" for wadeable perennial streams throughout the State. Reference sites are segments of streams that represent the target state of stream condition for a region of interest (Ode et al. 2005) and provide a means of setting biological expectations for test sites (serve as a benchmark for comparison). The RCMP plays a central role in developing assessment thresholds for biotic integrity and in establishing [biological objectives](#).

Identifying reference sites for California's perennial streams is complicated by its size, diverse ecological settings, and anthropogenic influences. Therefore, a statewide framework for consistent selection of reference sites must account for this complexity (Ode and Schiff 2009). This will require a substantial network of reference sites, distributed across the different geographic regions of the State, that are managed through an iterative process to ensure continued suitability of sites and ensure adequate representation of natural gradients. In addition, these sites must be monitored to document the range of biological and physical conditions that exist there and changes to the condition of these sites over time (Ode and Schiff 2009). Implementation of the RCMP will be phased over three to four years (2008 through 2011), with funds in early years allocated more toward development and refinement of the site selection/screening process with increasing proportion of resources going toward site sampling in later years.

The SWAMP Strategy (2010) seeks to follow USEPA recommendations to develop multiple indicators of biological condition. To date, SWAMP has focused most of its effort and resources on the development of benthic macroinvertebrate-based indicators. However, the program is also developing the capacity for algae, habitat, and riverine wetland-based assessments as additional indicators for use in the development of biological objectives. A preliminary algal Index of Biotic Integrity (IBI) has been developed in the Lahontan Region (Region 6). In addition, Proposition 50 Grant funds are currently supporting the development of preliminary algal IBIs in the Central Coast Region (Region 3) and Southern California (Regions 4, 8, and 9).

If additional funds were made available, the following are potential aspects of the program that could be enhanced:

- Increased sampling (data density) in certain regions of the State (enhanced regional assessments);
- Expand assessment into non-perennial streams and large rivers;
- Inclusion of additional analytes;
- Method development and standardization for additional indicators;
- Continued development of the SWAMP Statewide Algae Program;
 - Development of a SWAMP Algae Laboratory Standard Operating Procedure,
 - Development of a Quality Assurance Project Plan for algae,
 - Development of an algae Reporting Module within the SWAMP database to calculate indices,
 - Development of standard taxonomic effort and on-line tools for identification of algae,
 - Development of taxonomic master lists for algae for inclusion in the SWAMP database,
 - Additional sampling to collect data necessary to develop algal IBIs in portions of the state not covered by the preliminary IBIs already developed (Lahontan Region) or under development (Central Coast and Southern California),
 - Conduct study to identify the peak times of algal biomass; and
- Invest in the development of an enhanced stream network data layer that allows for improved differentiation between perennial and non-perennial streams.

Stream Pollution Trends Monitoring Program

The Stream Pollution Trends (SPoT) Monitoring Program focuses on aquatic life protection in streams. The overall goal of this program is to detect meaningful change in concentrations of

stream-borne contaminants and their effects in large watersheds at time scales appropriate to management decision making. The objectives of this monitoring program are to:

1. Determine long-term trends in stream contaminant concentrations and their biological impacts statewide;
2. Relate water quality indicators to land-use characteristics and to the effectiveness of agency management efforts; and
3. Establish a network of sites throughout the state to serve as a backbone for collaboration with local, regional, & federal monitoring programs.

California streams are affected by nonpoint-source pollution from multiple and changing land-use activities within their watersheds. Stream conditions are also expected to be affected by environmental and resource agency management actions designed to improve water quality. The SPoT Monitoring Program is the SWAMP's statewide program designed to measure trends in contaminants and their effects, and to link those trends to changes in land use and resource management activity.

Certain contaminants which sorb to sediment particles during transport through watersheds, will drop out of suspension when the water slows, and tend to accumulate in stream depositional areas. These contaminants remain fairly stable in sediments over intermediate time scales. Measuring stream sediment chemistry and toxicity at regular, seasonally-consistent intervals allows for the assessment of long-term trends, which indicate whether stream conditions are improving or degrading with land use change. This also provides a means to evaluate the effectiveness of water quality management programs.

Opportunities to enhance the SPoT monitoring program include:

- Include a rotating supplement that would sample at least two additional sites (at least three total) in at least 10 watersheds per year (as many as possible), with all three of the sites sampled three times per year. Evaluating spatial and temporal variability will be important in characterizing the level of uncertainty with which we can assess changes in pollutant concentrations and effects over time.
- Conduct toxicity testing at two temperatures concurrently (e.g., 23°C and 17°C). Place emphasis on this effort in urban and agricultural areas, as enhanced toxicity occurs at the lower temperature if due to a pyrethroid pesticide.
- Increase the number of watersheds that are sampled.

Regional Monitoring Programs

The SWAMP's regional monitoring programs are currently funded through the Ambient Water Monitoring Surcharge, on waste discharge permit fees. The Regional SWAMP monitoring programs conduct a variety of assessments to determine compliance with Basin Plan objectives, categorize impaired waters, identify causes of impairment, locate and manage

pollution sources, regulate discharges, and manage nonpoint sources such as urban stormwater and agricultural runoff. The regional programs vary across regions based on priorities, information needs and other factors within each Region. In many instances, regional monitoring activities are designed to leverage or expand upon the SWAMP's statewide monitoring and assessment programs. For example, the Lahontan Region (Region 6) has used its Regional SWAMP resources to expand the PSA monitoring in the Sierra Nevada, and the Los Angeles Region (Region 4) expanded and enhanced the Lakes Bioaccumulation fish contaminant screening surveys to include additional lakes in the Region. Fact sheets describing regional monitoring implemented by each of the Regional Water Quality Control Boards are included as Appendix E in the 2010 SWAMP Strategy.

Each of the regional programs is managed by a [SWAMP Coordinator](#). These Coordinators fulfill a number of important roles including serving as a member of the SWAMP Roundtable; serving as a technical resource to Water Board staff and others concerning monitoring design, indicators and assessment thresholds, current monitoring activities, etc.; preparing peer-reviewed monitoring plans; and working with other Water Board programs and outside partners to prioritize and refine monitoring objectives and coordinate monitoring activities. However, the capacity of the regional SWAMP programs to conduct monitoring and coordinate their activities with Water Board programs and other partners is constrained due to resource limitation and has not been able to meet regional needs and concerns adequately. This constraint has been exasperated in recent years as SWAMP Regional allocations have declined.

The need exists for regional SWAMP programs to be able to monitor and assess a greater number of water bodies and beneficial uses. This will require additional funding and an increase in coordination with partner programs that monitor areas and waterbody/beneficial use combinations where SWAMP cannot. Although not conducted in a comprehensive manner across all regions, the SWAMP Regional programs are actively recruiting partners in other Water Board programs, other California Environmental Protection Agencies (Cal/EPA) and California Natural Resources Agencies, the regulated community, and citizen monitoring organizations and encouraging them to generate and contribute data that can be integrated into comprehensive assessments that would otherwise exceed SWAMP's scope.

Additional funds could be used to enhance the SWAMP Regional monitoring programs through:

- Increased coordination with Water Board programs and other partners to leverage resources within their Region;
 - Meet with programs to understand their assessment needs and seek to optimize monitoring designs to maximize utility for other Water Board programs,
 - Increase the number of Water Board programs that utilize SWAMP data, standards, and guidance,
 - Coordinate with existing and developing Regional Monitoring Programs,



- Participate on California Water Quality Monitoring Council web portal work groups (support development of portals and identify areas of potential coordination),
- Serve as technical resource for development of indicators, assessment thresholds, etc.;
- Increased scope of monitoring programs (e.g., number of sites, analytes, etc.); and
- Increase the capacity of the programs in applying new technology for water quality monitoring.

Data Comparability

Tremendous amounts of ambient data are collected by Water Board programs and other monitoring entities for a wide array of purposes. In many instances, these data are not comparable across programs, limiting our ability to bring data together from different sources to develop integrated assessments and creating the circumstance where the data have limited utility beyond their original, intended use.

The SWAMP's mission is to provide resource managers, decision makers, and the public with timely information to evaluate the condition of surface waters throughout California. The SWAMP accomplishes this through carefully designed, externally reviewed monitoring programs, and by assisting other entities statewide in the generation of comparable data that can be brought together in integrated assessments that provide answers to current management questions. Implementation of standards for data comparability would also allow local entities to both contribute data to statewide assessments and view the results of those assessments as context for local monitoring and management.

A major focus of the SWAMP is to work with other Water Board programs to ensure that their ambient monitoring data are collected and stored in a way that they can be combined with other data sets for broader-scale assessments such as CWA *Section 303(d)* listing decisions. Each of the SWAMP's core implementation priorities (monitoring and assessment, coordination, and infrastructure and tools) contain attributes related to data comparability. For example, through its Quality Assurance and Data Management Teams, the SWAMP has written a Quality Assurance Program Plan (QAPrP), set up data management and quality assurance help desks, developed the SWAMP Advisor (user friendly software to develop a Quality Assurance Project Plan), created data and Quality Assurance Project Plan (QAPP) templates, and conducted trainings to facilitate the production of comparable data. Opportunities exist to increase outreach and support from the QA Team and Data Management Teams to further support the integration of SWAMP-comparability with partner programs.

Increased comparability within and between data types, and development of tools to improve data integration is a key component of the California Water Quality Monitoring Council's (CWQMC) vision to maximize the efficiency and effectiveness of water quality and related ecosystem monitoring, assessment, and reporting ([CWQMC, 2008](#)). An important role for the



CWQMC is to help develop, promote, and implement statewide standardization of monitoring methods, assessment approaches, quality assurance protocols, and data formats. The CWQMC intends to work with individual work groups to identify those core program elements that require statewide standardization in order to support comprehensive assessments, and those that can vary regionally based on local needs. The SWAMP will continue to coordinate with the CWQMC and provide guidance to partner organizations concerning monitoring design, quality assurance and data management tools that foster data comparability (SWAMP, 2010).

Opportunities to enhance efforts related to data comparability should additional funds be made available are included in the Regional Monitoring Programs, Infrastructure and Support, and California Environmental Data Exchange Network sections of this document.

Infrastructure and Support

Quality Assurance and Data Management

The SWAMP's vision is to develop, implement, and maintain the quality assurance tools and capabilities needed to implement the SWAMP, share these tools with partner programs, and facilitate the generation and management of comparable data from multiple sources for use in comprehensive water quality assessments. The role of the SWAMP's quality assurance program is to foster the production of data to inform decision-making (i.e., identifying water quality impairments, fish consumption advisories, TMDL targets, etc.).

Under 40 CFR 130 4(b), state monitoring programs are to include the collection and analysis of physical, chemical, and biological data, and Quality Assurance/Quality Control (QA/QC) programs to ensure the data are scientifically valid. Specifically, Section 106-funded QA programs must describe how:

- Each study or monitoring program objective is defined in specific qualitative and quantitative terms and linked to a management decision or reporting requirement associated with the Clean Water Act; and
- The quality of data is assessed and validated to ensure that the quality objectives of the programs were met.

In January 2005, SWAMP formed its QA Team, consisting of a QA Officer, QA Coordinator and several QA Specialists. The QA Team creates and facilitates a framework within which all SWAMP programs and participating partner programs can generate data of known and documented quality, appropriate to project information needs, and comparable for integrated assessments. The initial SWAMP Quality Assurance Management Plan (QAMP) was finalized in 2002. In 2008, the QA Team, in conjunction with the Roundtable and stakeholders, released the Quality Assurance Program Plan (QAPrP) to replace the 2002 QAMP. The QA Team also reviews new and existing quality assurance project plans (QAPPs) for Regional Water Boards, bond fund grantees, and partner programs.

The QA Team formed focus groups in May 2005 to address each program testing parameter. There are six focus groups consisting of toxicity testing, organic analytes, inorganic analytes, conventional analytes, bioassessment studies, and field measurements. Each group is used as a resource for sample collection, analysis, reporting, and data assessment. In addition, as part of a system-based approach, the QA Team has developed SWAMP-specific standard operating procedures (SOPs) for contract laboratory assessments (audits), data verification, data classification, corrective actions, communication of quality assurance program updates, and quality assurance policy and decision-making.

With respect to data management, the SWAMP's vision is to manage the flow of data from initial measurement, through acquisition and storage in data management systems, to data output and assessment, so that accurate information is available in a timely manner to decision makers and the public. This is accomplished using standardized processes for loading data into the SWAMP database, documenting the quality of the data that is loaded, and then migrating data into a final "permanent" database where it becomes publically accessible through the [California Environmental Data Exchange Network](#) (CEDEN).

Data generated by statewide and Regional SWAMP programs are submitted to the SWAMP database, which is managed by the Data Management Team (SWAMP DMT). The SWAMP DMT also provides technical support, tools, and training for submitting data to the database. Where possible, data are made comparable by sharing common lookup values and business rules and by following documented data management procedures. Quality control samples are required with data submissions and verified against the SWAMP QAPrP, prior to migrating data to the permanent database.

Providing access to data, with tools that readily query needed data from the database, is essential for the ultimate usability of the SWAMP database to SWAMP participants. Another critical SWAMP function is providing training and tools for groups within the SWAMP, as well as groups trying to be SWAMP comparable. This is achieved by making data management documentation available through a SWAMP website and by providing trainings on the various aspects of data management. Finally, in order for the data management team to stay effective in data handling and aware of current data needs, their efforts must be coordinated through regular meetings with SWAMP data users and CEDEN partners.

Expenditures related to the SWAMP QA/QC and data management activities represent approximately 12% of the SWAMP's annual budget. Current funding levels for these activities are sufficient. Changes in programmatic needs will be addressed through prioritization of workload, rather than increasing funding levels.

Program Coordination

The SWAMP Program Coordination includes general programmatic and technical planning, as well as effective and efficient contracting and financial mechanisms to support Statewide and Regional SWAMP ambient monitoring activities. This coordination role covers a variety of activities such as technical and scientific planning assistance, contractual oversight and

management, program budgeting, financial tracking, planning or conducting workshops or meetings on a variety of technical topics, and through the preparation of various statewide technical reports and reporting templates, as needed. These objectives are met by contracting with San Jose State University Research Foundation (SJSURF—Moss Landing Marine Laboratory), who in turn subcontract for collaborative assistance with the California Department of Fish and Game (CDFG - MPSL), and UC Davis (Granite Canyon - MPSL). Effective and efficient implementation of the program coordination activities support the primary SWAMP program goal of producing credible, comparable, and scientifically defensible data that can then be used by the Regional and State Water Boards to assess ambient conditions of surface waters of the state, and to provide that data and findings to the general public via various reporting formats. Current funding levels allocated to program coordination are sufficient to meet programmatic needs.

Communications and Reporting

Our vision is to make all SWAMP data available to the public, to translate SWAMP data into information useful for making resource management decisions, and to provide timely reports in formats most accessible to target audiences. To accomplish this, SWAMP identifies target audiences, selects the most effective media to reach them, and provides a range of products from newsletters and fact sheets to interpretive reports and statutory documents, such as the Integrated Report (CWA *Section 303(d)* list / *305(b)* Report), and the CWQMC [My Water Quality](#) web portals. SWAMP reports can be found at: http://www.swrcb.ca.gov/water_issues/programs/swamp/reports.shtml. SWAMP Regional programs have produced numerous reports to address Basin Plan priorities and local issues. These can be found at: http://www.swrcb.ca.gov/water_issues/programs/swamp/regionalreports.shtml. Current funding levels allocated to communication and reporting are sufficient to meet programmatic needs.

Clean Water Team

Citizen Monitoring encompasses any monitoring activities related to aquatic resources, aquatic habitat, and/or water quality that rely in whole or in part on participation by volunteers, students, or non-paid staff. Their efforts are of particular value in providing quality data and building stewardship of local waters. The SWAMP supports citizen monitoring programs through the [Clean Water Team](#) (CWT). The CWT works to build and support the State's Watersheds Stewardship through involvement by Citizen Monitoring in order to reduce and prevent water pollution and recover lost beneficial uses. The CWT assists citizen monitoring organizations through six core functions: outreach and communication, technical assistance/quality assurance, training, loans of equipment, event support, and information management. Opportunities to enhance the CWT's support of citizen monitoring programs include:

- Training: Providing additional water quality monitoring workshops beyond current capacity.
- Training videos: Contract to produce training videos; purchase digital camera, software and supplies for in-house training video production.
- Equipment Loan Library: Obtain water quality monitoring meters, calibration supplies, and reagents. The CWT equipment library is 10 years old and in need of new equipment. Water quality meters and tools are needed to replace broken and outdated equipment. In addition to equipment, batteries and battery testers; calibration buffers, and solutions; reagents; and aquatic invasive species (AIS) decontamination supplies are also needed. Equipment is used for training, short term trials by monitoring programs, and longer term loans. The current need for equipment is high, due in part to the reduction of grant funds and the current state of the economy.
- Safety: Provide staff with proper field gear (e.g., waders, gloves, goggles) and AIS decontamination supplies.
- Laboratory access: Provide access to a laboratory for processing citizen monitoring water quality samples for analytes of SWAMP's interest (e.g., metals, pesticides)

California Environmental Data Exchange Network (CEDEN)

Assembly Bill 982 (Ducheny, Statutes of 1999) requires the SWAMP to make monitoring data easily accessible to all users including the public. SWAMP's ambient monitoring data are accessible to the public through [CEDEN](#). CEDEN is a distributed database system comprised of a network of four Regional Data Centers (RDCs), which include Moss Landing Marine Laboratories Data Center, the Southern California Coastal Water Research Project (SCCWRP) Data Center, the SFEI Data Center, and the Central Valley Regional Data Center. The RDCs are assistance centers to receive, transform, process, and pass on data according to regional needs. Collectively, the RDCs provide six core services: upload and check data, store and manage data, exchange data, access data, coordinate and transfer technology, and integrate data. In addition, SWAMP collaborates with CEDEN in developing data analysis tools that meet the needs of State and Regional programs and the public.

The CEDEN complements and expands on SWAMP's goal of data integration for inter and intra agency programs. CEDEN also will be a primary source of data for the CWQMC's [My Water Quality](#) web portals that present answers to key assessment questions asked by decision makers and the public. The SWAMP is committed to the CWQMC work group and web portal approach as a way to share guidance and information on indicators and their appropriate use, leading to increased data sharing and comprehensive assessments based on data from multiple programs.

Until recently, the development and implementation of the CEDEN was supported primarily through the allocation of SWAMP funds. At present, CEDEN is being funded through a Grant that will expire in 2013. A key product of this grant will be the development of a long-term funding strategy that would facilitate CEDEN and the RDCs becoming self-sustaining from a funding perspective. Opportunities for program enhancement include:

- Increase outreach role on the part of RDCs to expand the amount and types of data currently available through CEDEN;
- Expand CEDEN by working with other programs to develop formats and crosswalks to allow for the exchange of data with CEDEN;
- Continued development of data checkers and upload tools to support data transfers and comparability with partner programs; and
- Develop additional data assessment and visualization tools; and

Collaboration with California Water Quality Monitoring Council

In November 2007, a [Memorandum of Understanding](#) (MOU) was signed by the Secretaries of the Cal/EPA and the California Natural Resources Agency to establish the [California Water Quality Monitoring Council](#) (CWQMC). The MOU was mandated by [California Senate Bill 1070](#) (Kehoe, Statutes of 2006) and requires the boards, departments and offices within the Cal/EPA and the California Natural Resources Agency to integrate and coordinate their water quality and related ecosystem monitoring, assessment, and reporting.

California Senate Bill 1070 (Water Code Sections 13167 and 13181) and the MOU require that the CWQMC develop specific recommendations to improve the coordination and cost-effectiveness of water quality and ecosystem monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information. While the CWQMC may recommend new monitoring or management initiatives, it will build on existing effort to the greatest extent possible.

The CWQMC recommended that issue-specific work groups, under the overarching guidance of the CWQMC, evaluate existing monitoring, assessment and reporting efforts and work to enhance those efforts to improve the delivery of water quality information to the user. The work groups also provide a venue for increased coordination among monitoring entities, to identify and fill data gaps, and improve monitoring efficiency. The CWQMC has formed work groups that are tasked with developing assessment questions around themes: Is it safe to eat fish and shellfish?; Is it safe to swim at my beach?; Is our water safe to drink?; and Are our ecosystems healthy? The work groups then identify and obtain data sets to answer the questions and develop web portals to convey the assessments to the public.

SWAMP is committed to the CWQMC work group and web portal approach as a way to identify opportunities for improved coordination of monitoring activities, share guidance and

information on indicators and their appropriate use, and ultimately lead to increased data sharing and comprehensive assessments based on data from multiple programs. In June, 2010, the SWAMP and the CWQMC held a joint meeting to align strategies and strategy documents. It was agreed that the SWAMP should focus its limited funds for statewide assessments on two questions: “Is it safe to eat the fish?” (Bioaccumulation Monitoring Program) and “Is aquatic life protected in freshwater streams?” (Bioassessment and SPoT Monitoring Programs) (Table). In addition to identifying those waterbody / beneficial use combinations that the SWAMP statewide assessments are currently addressing, Table 2 highlights those waterbody / beneficial use combinations for which CWQMC work groups have been established to develop a web portal and bring those assessments to decision makers and the public. The SWAMP has taken the lead in the effort to develop two of the web portals (Table 2). It should be noted that SWAMP’s regional monitoring programs address other waterbody / beneficial use combinations identified in Table 2; however, these efforts vary by region and have not been integrated into a statewide assessment.

The SWAMP will remain an active participant in the CWQMC. Personnel and contract resources associated with continued collaboration with the CWQMC are allocated across each of the program elements identified in Table 1 (statewide and regional monitoring and assessment, data comparability, and infrastructure and support). As resources become scarcer, the coordination and collaboration as envisioned by the CWQMC will be all the more important. As the workgroups mature and become fully functional, estimates of the resources needed to support the workgroups will need to be revised and incorporated into this Needs Assessment.

Table 2. SWAMP statewide monitoring and assessment programs and existing CWQMC work groups organized according to waterbody / beneficial use combination

Waterbody Type	Core Beneficial Use			
	Aquatic Life	“Swimmable”	“Fishable”	“Drinkable”
Wadeable Streams	SWAMP – Statewide (Bioassessment & SPoT) CWQMC ¹		SWAMP – Statewide (Bioaccumulation) CWQMC ^{1, 2}	
Large Rivers	SWAMP – Statewide (SPoT) CWQMC ¹			
Lakes	CWQMC			
Estuaries	CWQMC	CWQMC ²		
Ocean, Coastal, Bays	CWQMC			
Wetlands	CWQMC ²			

¹ CWQMC work groups for which the SWAMP has assumed a lead role.

² CWQMC web portals are live and available for viewing at the [My Water Quality](http://www.waterboards.ca.gov/swamp) website.

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