Final Report   2014

Review of the Surface Water Ambient Monitoring Program (SWAMP)

Water Boards

www.waterboards.ca.gov/swamp

Table of Contents

Executive Summary

Purpose of the SWAMP Program Review

In February of 2014, the Water Boards assembled a "Review Team" to conduct an internal programmatic review of the Surface Water Ambient Monitoring Program (SWAMP). The purpose of the review was to evaluate SWAMP's program functions and effectiveness, and to recommend actions to ensure the program's continued success. The review was requested by Water Board managers from the State Water Board and the Regional Water Boards, for three primary reasons. First, SWAMP is undergoing a major transition whereby key statewide infrastructure functions (i.e., data management, quality assurance, and logistical/contract support) are being converted from contract personnel to civil service. Second, the Water Boards are currently considering a similar transition whereby contract personnel that provide support to regional SWAMP programs may also be converted to civil service. And third, the State Water Board's executive management asked the SWAMP program to make recommendations about whether and how the SWAMP program could be refocused, retooled, and/or supplemented to take on the responsibility of coordinating all of the Water Boards' myriad surface water monitoring efforts.

Findings of the Review

1. **A robust surface water ambient monitoring program is essential for the Water Boards to achieve their mission.** The Water Boards, water resource managers, the Legislature, and the public need information about *all* of California's water resources, not just those waters that are monitored at sites where waste discharges are regulated.

2. **Since SWAMP was created in the year 2000, the Water Boards have built and maintained a technically capable and functioning monitoring program.** This review—and prior external reviews—have found that SWAMP has both the systems and expertise to meet California's ambient monitoring needs. SWAMP's capacity to answer management questions is limited primarily by the level of available resources.

3. **Both statewide assessments *and* regional assessments are needed to provide information at the scales needed by the Water Boards and society at large.** Statewide assessments provide a "big picture" of the overall status and trends of water quality in California, while regional assessments provide the more detailed information needed by water regulators and resource managers to detect and fix specific problems.

4. **Numerous Water Board programs (and external entities) utilize and value SWAMP data and products.** The review found that SWAMP data and tools are used in many ways, but the benefits of their use (e.g., inter-program consistency, and the usability and comparability of data) could be significantly increased if Water Board managers direct other Water Board programs to use SWAMP tools.

5. **Water Board monitoring needs greatly exceed existing resources.** The SWAMP program currently is funded at a small fraction of the originally identified need, and the costs of monitoring increase every year, further reducing what can be accomplished with available resources. Numerous human health and resource issues are not being addressed, or are being only partially addressed.

6. **Millions of dollars are spent each year on surface water monitoring for Water Board and other agency programs but the monitoring is not fully coordinated among programs. Better coordination could provide multiple benefits, but effective coordination is time-consuming and resource intensive**. Coordination of all Water Board (and external) monitoring efforts is a laudable goal, and the SWAMP program has the expertise to perform this function. But experience gained over the past decade demonstrates that such coordination is extremely time intensive, and the SWAMP program cannot effectively fulfill this role without substantial additional staff resources.

7. **While SWAMP has developed a robust and mature ambient monitoring program over the past fourteen years, improvements can be made.** Specific suggestions compiled during the review include: i) establish an annual strategic planning process to align SWAMP's statewide assessments with management priorities and available resources; ii) create a feedback loop for users of SWAMP assessments, data and tools to suggest improvements; and iii) use SWAMP's experience at monitoring and assessment to identify new or improved outcome-based performance measures for the Water Boards.

Key Recommendations

1. **SWAMP should maintain its focus on ambient monitoring as its core function.** The SWAMP Review Team is keenly aware that the Water Boards have myriad needs for other (i.e., "targeted") types of monitoring throughout their regulatory, planning, enforcement, and other programs. Despite those needs, Water Board managers should remain cognizant of the fact that ambient monitoring is absolutely essential to achieving the mission of the Water Boards. SWAMP's core focus on ambient monitoring should not be sacrificed to provide the "targeted" monitoring or coordination needs of other programs.

2. **SWAMP should maintain robust statewide assessments *and* regional assessments.** Given the utility of ambient monitoring information gathered at multiple spatial scales, and as previously recommended by external program reviewers ([Batiuk and others 2006](#)), SWAMP should continue its dual-scale assessments whereby the State Water Board leads the management of statewide assessments, and the Regional Water Boards conduct assessments at the regional, watershed, and water body scales.

3. **The Deputy Management Committee (DMC) should confer with SWAMP as the DMC refines the Water Boards' process for allocating "discretionary" contract funds for targeted monitoring projects.** The DMC currently is deliberating a process for addressing the many targeted monitoring needs of multiple Water Board programs via discretionary contract funds. The SWAMP Review Team applauds this effort, and invites the DMC to consult with SWAMP as these deliberations proceed.

Such consultation could maximize coordination with SWAMP's assessments, and ensure the comparability and usability of "targeted" data collected by other programs.

4. **In regards to monitoring coordination, Water Board executives should establish a process to compile coordination needs, set priorities, and deliberate options for fostering the highest priority coordination tasks.** The DMC (or some other panel of Water Board executives and/or managers) should lead SWAMP and other programs to: i) compile and prioritize the many needs for increased coordination of monitoring (and related functions, such as data management, water quality assessment, electronic data submittals, quality assurance, etc.); ii) define the specific coordination tasks necessary to meet each identified need; iii) quantify the resources needed to complete each task; and iv) evaluate the options for completing the highest priority tasks. In doing so, the integrity of SWAMP's ambient assessments should not be compromised to provide for increased coordination among the Water Boards' various programs. The Review Team recommends that managers consider other options, such as identifying/shifting resources from the affected/benefitting programs in order to fund the desired types and levels of coordination, and/or seeking new/additional resources to fund increased coordination.

5. **Water Board managers should promote question-driven science to answer key management questions, in part by encouraging (or *requiring*) other programs to utilize the many available "SWAMP Tools."** One outcome of this review is the realization that other Water Board programs do not take full advantage of existing SWAMP tools (i.e., assessment framework, monitoring SOPs, QA protocols, data management structures, etc.). Water Board management can promote inter-program consistency, data usability, and data comparability by encouraging (or directing) other programs to use relevant SWAMP tools and to more fully take advantage of SWAMP's experience and expertise.

6. **The SWAMP Review Team should update the SWAMP work plan as requested by the DMC.** On November 6, 2013 the DMC released a document titled *Water Board Roundtables Composition, Role, and Responsibilities*, which directs all Water Board roundtables to develop an annual work plan. The SWAMP Review Team should develop a work plan that considers all items from the DMC's *Roles and Responsibilities* document, as well as the following:

    a. Define the roles and responsibilities for both the full SWAMP Roundtable and the smaller Review Team.
    b. Establish an annual strategic planning process to evaluate (and adjust as appropriate) the objectives and priorities for SWAMP's statewide ambient assessments.
    c. Develop a specific definition of monitoring "coordination" and articulate the coordination tasks to be conducted (with available funds) by SWAMP staff at the State and Regional Water Boards.
    d. Specify actions to synthesize data into information that can readily be used by managers to aid in decision-making.
    e. Create a feedback loop for users of SWAMP tools to communicate issues, problems, and ideas/ suggestions for improvement.
    f. Identify new or improved outcome-based Performance Measures for the Water Boards based on SWAMP's assessments, data, and tools.

Introduction

From February through June of 2014, the Water Boards' Surface Water Ambient Monitoring Program (SWAMP) conducted an internal programmatic review to evaluate program functions and effectiveness, and to recommend actions to ensure the program's continued success. The review was requested by Water Board managers from the State Water Board and the Regional Water Boards, for three primary reasons. First, SWAMP is undergoing a major transition whereby key statewide infrastructure functions (i.e., data management, quality assurance, and logistical/contract support) are being converted from contract personnel (currently through the San Jose State University Research Foundation) to civil service (i.e., 12 new positions being created at the State Water Board). Second, the Water Boards are currently considering a similar transition whereby contract personnel that provide support to regional SWAMP programs may also be converted to civil service positions. And third, the State Water Board's executive management asked the SWAMP program to make recommendations about whether and how the SWAMP program could be refocused, retooled, and/or supplemented to take on the responsibility of coordinating all of the Water Boards' myriad surface water monitoring efforts.
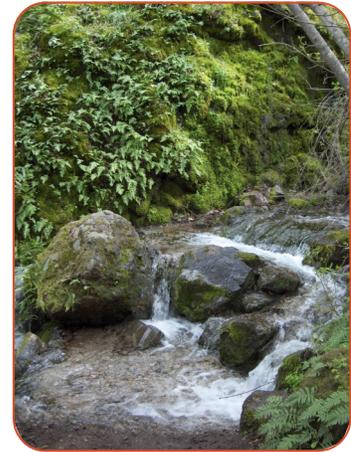
What is SWAMP?

SWAMP was created in response to the need for a comprehensive surface water monitoring and assessment program in California. Prior to the creation of SWAMP, the Water Boards for decades conducted mostly discharge-focused, compliance-based monitoring. This left most of California's water resources unmonitored. In 1999, the Legislature directed the State Water Board to prepare a proposal for a comprehensive monitoring program for **all** of California's surface waters, and it provided funding for such a program beginning in 2000.

SWAMP is, by definition, an *ambient* monitoring program. Ambient monitoring considers *all* waters of the State, while compliance-based monitoring is limited to determining compliance with permit limits or other specific regulatory requirements. Compliance-based monitoring, by itself, produces fragmented and inconsistent monitoring data, making broad synthesis and analysis difficult or impossible. In contrast, SWAMP's more comprehensive monitoring programs evaluate the overall condition of surface waters throughout the State, thereby providing the information needed by Water Board staff, water managers, the Legislature, and the public to understand and better manage California's precious water resources.

SWAMP's high-quality data and assessments, and the tools SWAMP has developed for use by others (e.g., standardized sampling methods, robust quality assurance procedures, consistent data reporting templates) provide a foundation for technically sound, science-based decisions by the Water Boards and others. SWAMP data, assessments, and tools are used by the Water Boards to (among other things):

1. ***Assess status*** (e.g., Are the State's waters in good, fair, or poor condition?)

2. ***Track trends*** (e.g., Is the quality of the State's waters improving or declining over time?)

3. ***Prioritize management actions*** (e.g., What are the most polluted water bodies in need of corrective or regulatory action/s?)

4. ***Evaluate the effectiveness of Water Board programs*** (e.g., Have regulatory actions and grant programs improved water quality? Is a water body in good condition after multiple dischargers have met all of their individual permit limits?)

5. ***Identify emerging threats*** to human health and resources (e.g., How are new/emerging chemicals, harmful algal blooms, invasive species, and climate change affecting our waters?)

6. ***Characterize "reference conditions"*** (i.e., conditions at minimally disturbed sites) to track the effects of climate change and to support development and refinement of water quality objectives, biological expectations, in-stream flow requirements, and other permit requirements. (e.g., What should be the expected water quality and benthic condition for a creek in this ecoregion? How should the expected condition be adjusted over time in response to factors such as climate change?)

In addition, SWAMP's monitoring and assessment projects provide information about water quality and the attainment of beneficial uses at multiple spatial scales (i.e., water body, watershed, regional, and statewide scales). This information is often used to adjust compliance-based monitoring requirements, and can even reduce monitoring burden—and associated compliance costs—for regulated entities within the affected watershed or region.

In 1999, the California State Legislature directed the State Water Board to prepare a proposal for a comprehensive surface water monitoring program (AB 982, Statutes of 1999). The resulting Report to the Legislature estimated that a comprehensive surface water ambient monitoring program for California would require between 87–132 positions and cost between $59 and $115 million per year. SWAMP currently is funded at a small fraction of the identified need: $8 million per year with 17 staff positions. SWAMP's funding currently comes from two sources: 1) a State Ambient Water Monitoring Surcharge on waste discharge permit fees, and 2) federal Clean Water Act (CWA) Section 106 Grant funds. Staff positions are divided between the State and Regional Water Boards. Funding has fluctuated (both up and down) over the years, but is currently about the same as when the program was first created in 2000. While resources have remained relatively flat overall, demands on the program have steadily increased, and costs have substantially increased. The result is that SWAMP's capacity to generate information is substantially less than when it was created, and (if resources remain static) its capacity will continue to decline year-after-year.

SWAMP Achievements

In the fourteen years since SWAMP was created, the program has produced many valuable achievements. SWAMP has improved the quality and consistency of data collected by the Water Boards, the regulated community, NGOs, and citizen monitors. SWAMP has used its monitoring resources and expertise to leverage funds across programs and agencies, and to design, coordinate, and lead major statewide and regional assessments. And SWAMP tools and data have supported key regulatory programs and management actions. Examples include:

- SWAMP provided most of the data used for developing California's 2010 "Integrated Report" (a report required by the Clean Water Act sections 303(d) and 305(b) that includes statewide water quality assessments and the listing and de-listing of impaired water bodies)—and SWAMP's standardized data formats have helped to "automate" and streamline the assessment process;

- SWAMP data and tools support numerous key Water Board policies and actions, including: biological objectives, nutrient objectives, trash control policy, wetland and riparian protection policies, and the Statewide Mercury Program;

- SWAMP's Perennial Streams Assessment showed that about 50% of the State's streams are in good condition (i.e., supporting healthy aquatic communities), and it identified streams where actions are needed to improve/restore stream health;

- SWAMP's Reference Condition Management Program sampled more than 600 "reference" (i.e., minimally disturbed) streams across the State. Data from these sites provided the "yardstick" for judging stream health and established a baseline for tracking the effects of climate change;

- SWAMP's Bioaccumulation Monitoring Program conducted the first-ever statewide assessments of contamination in fish from lakes, rivers, and coastal waters across the State. The results demonstrated widespread contamination of fish tissue and led the State Water Board to initiate development of a statewide Total Maximum Daily Load (TMDL) for mercury in reservoirs. And follow-up monitoring has been conducted to support the development of fish consumption advisories to alert the public about significant health threats at specific water bodies.

- SWAMP's Stream Pollution Trends Monitoring Program (SPoT) measures contaminants and toxicity in the bottom sediments of rivers and streams, and correlates the findings to surrounding land uses. SPoT has detected declines in long-banned (organochlorine) pesticides, but increases in contamination and toxicity due to newer pesticides, such as pyrethroids. SPoT collaborates with multiple entities to leverage resources, and the findings will help managers and regulators to better control contamination in California's rivers and streams.

Additional examples and more information about SWAMP projects and accomplishments can be found in the online SWAMP Achievements Report.

Structure and Methods of the Program Review

The team responsible for conducting this review (referred to as the "Review Team") was assembled in March 2014 and included the following personnel: 1) SWAMP staff and managers from the State Water Board; 2) SWAMP coordinators from each of the nine Regional Water Boards; 3) two Regional Water Board Assistant Executive Officers (representing the Water Boards' Deputy Management Committee); 4) the Executive Director of the California Water Quality Monitoring Council; and 5) a representative of the U.S. Environmental Protection Agency.

The Program Review consisted of the following steps:

i. The Review Team revisited the 2010 "SWAMP Strategy" (SWAMP 2010)—the program's most recent strategic planning document—to determine where the program currently stands vis-à-vis the goals established for the program in 2010.

ii. The Review Team revisited prior program evaluations to determine what prior recommendations had (and had not) been implemented, which prior recommendations were still relevant today, and which prior recommendations should be carried forward as part of this review. The prior program evaluations included two major external program reviews: 1) a 2002-06 external review of the SWAMP program that was conducted by a blue-ribbon panel of scientists and managers with experience at large statewide and/or national monitoring programs (Scientific Planning and Review Committee, "SPARC"; Batiuk and others, 2006); and 2) a 2008-09 USEPA-sponsored review of the Water Board's freshwater biological assessment programs that was conducted by a team of nationally-recognized experts in the fields of bioassessment and biocriteria (Yoder and Plotnikoff 2009).

iii. The USEPA's representative on the Review Team evaluated the SWAMP program against the USEPA's *Elements of a State Water Monitoring and Assessment Program* (known colloquially as "the Ten Elements," USEPA 2003).
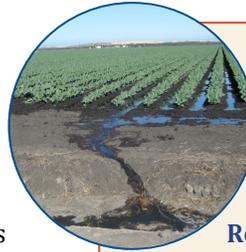
Data Management for Irrigated Lands Programs in Central Coast and Central Valley Regions

In Region 3, the Cooperative Monitoring Program for Agriculture (CMP) has collected data at 50 sites on a monthly basis since 2006. In Region 5, third-party coalition groups have monitored surface water at more than 200 sites since 2004 under the Irrigated Lands Regulatory Program (ILRP). SWAMP staff in both Regions 3 and 5 have worked with irrigated lands program staff and representatives of the agricultural industry to ensure that data collected for these programs are of known quality and accessible via the California Environmental Data Exchange Network (CEDEN). One of the advantages of these efforts is that the irrigated lands monitoring data is available for other assessments. In 2011, CMP, ILRP, and SWAMP toxicity monitoring data were combined to produce a statewide assessment of Toxicity in California.

iv. Members of the Review Team attended other Water Board program "Roundtables" to ask whether and how each program is using SWAMP data and tools, and to solicit other Water Board programs' and Monitoring Council input about what SWAMP is doing well, and what could be improved.

v. The Review Team engaged in multiple facilitated deliberations to make findings and develop recommendations.

Findings of the Program Review

1. ***A robust surface water ambient monitoring program is essential for the Water Boards to achieve their mission.***

    In order to achieve the Water Boards' mission "*to preserve, enhance and restore the quality of California's water resources*," the Water Boards and others (i.e., water resource managers, the Legislature, NGOs, and the public-at-large) need information about **all** of California's water resources—not just information about the relatively small percentage of the State's waters where waste discharges are regulated.

    Ambient monitoring allows the Water Boards to (over time) assess the status of **all** California waters. Those waters found to be in good condition can be protected by applying anti-degradation policies and regulations. It is much less expensive to prevent degradation of high-quality waters than to restore them after degradation has occurred. The necessary first step is to identify water body segments that currently are in good condition—and this can only be accomplished via ambient monitoring. And where water bodies are found to be degraded (as is the case for thousands of water body segments in California), ambient monitoring data are needed in order to prioritize restoration activities, and to set restoration goals.

    Ambient monitoring also allows the Water Boards to track trends in water quality over time, to prioritize management actions, to evaluate the effectiveness of Water Board programs, to identify emerging or previously unknown threats, and to characterize "reference conditions" at minimally disturbed sites (in order to establish—and adjust over time—expectations for water quality at sites where waste is discharged). Only via ambient monitoring can the Water Boards and our society at large truly have the perspective to judge the level and significance of degradation at sites affected by waste discharges.

2. ***Since SWAMP was created in the year 2000, the Water Boards have built and maintained a technically capable and functioning monitoring program.***

    The first programmatic review of SWAMP was conducted in 2005-06 by an external, multi-national panel of experts who have broad experience at managing large national, regional, and state monitoring programs. That review:

"…showed clearly that the SWAMP has achieved notable successes at both regional and statewide levels. The [panel] was particularly impressed by these accomplishments, given the relatively small budget the program has to work with" (Batiuk and others, 2006).

In 2008, a USEPA-sponsored review of SWAMP's bioassessment program, which also was conducted by nationally recognized experts, concluded that:

"As determined by the U.S. EPA Critical Technical Elements methodology, California's bioassessment program is currently at an above average level of rigor… With continued management support, SWAMP and DFG-ABL are capable of building, maintaining and refining the technical tools that the Water Boards will need to incorporate biological criteria and assessments into their water quality programs" (Yoder and Plotnikoff 2009).

At the outset of the current review (i.e., in March 2014), the Water Boards asked staff from USEPA Region 9 to evaluate the SWAMP program against the USEPA's *Elements of a State Water Monitoring and Assessment Program* (known colloquially as "the Ten Elements," USEPA 2003). That review (conducted by Terrence Fleming, USEPA Water Quality Standards lead for Region 9 States, Tribes and Territories [Appendix I]) concluded that SWAMP was above average (or better) in every category. Thus, according to the USEPA's widely acknowledged "Ten Elements," the SWAMP program has the appropriate devices, methods, systems, and procedures necessary to monitor and to compile and analyze data on the quality of surface waters throughout California.

All of the above is in stark contrast with the situation that existed prior to SWAMP—only fourteen years ago—when the Water Boards had no comprehensive statewide ambient monitoring program, no publicly accessible database, no standardized protocols, and either no quality assurance or (at best) inconsistent and/or undocumented quality assurance programs.

While the Water Boards' ambient monitoring needs exceed current resources (see Finding #5, below), the SWAMP program is technically sound, and poised to effectively utilize resources that are made available, now and into the future.

Trash Monitoring Data in Southern California Used to Support Ban on Plastic Bags in the City of Los Angeles

Trash monitoring data had an influential role in the Los Angeles City Council's decision to ban plastic bags in the City of Los Angeles. The monitoring data used in the decision were collected under a southern California regional monitoring program conducted by the Stormwater Monitoring Coalition (SMC), which is partly funded by the SWAMP programs of the Santa Ana, Los Angeles, and San Diego Regional Water Quality Control Boards. This regional trash assessment is one of the first probabilistic surveys of its type in the nation, and provides the first estimates about the true extent of trash in coastal watersheds in the region. The results from the trash assessment indicated that plastic bags were the most prevalent trash item in southern California's streams, representing nearly 20% of all items found during the survey.

3. ***Both statewide assessments <u>and</u> regional assessments are needed to provide information at the scales needed by the Water Boards and society at large.***

   SWAMP's statewide assessments provide a "big picture" of the overall status and trends of water quality throughout California, while its regional assessments provide the more detailed information needed by water regulators and managers to detect and fix specific problems. An expert panel of water scientists and managers that reviewed the SWAMP program in 2005-06 recommended specifically that the Water Boards carefully design and implement multiple robust statewide assessments *"without losing valuable regional flexibility"* (Batiuk and others, 2006).

   SWAMP's statewide assessments. SWAMP's four ongoing statewide assessments are:

   Bioaccumulation Monitoring Program – This program is focused on testing contaminants in fish and shellfish from lakes, rivers, streams, and coastal waters to assess whether the fish and shellfish are safe to eat.

   Stream Pollution Trends (SPoT) Monitoring Program – The SPoT program monitors trends in sediment toxicity and sediment contaminant concentrations in selected large rivers throughout California, and relates contaminant concentrations to watershed land uses. This helps water regulators and managers to quantify and understand the causes of toxicity in the State's large watersheds.

   Perennial Streams Assessment (PSA) – The PSA monitors the biota and habitat of rivers and streams throughout California to assess their overall health. The PSA determines whether streams are in good, fair, or poor condition, and tracks trends in river/stream health over time. The PSA also correlates biological conditions to associated stressors, to aid in the identification of corrective actions where stream health is degraded.

   Reference Condition Management Program (RCMP) — The RCMP monitors a network of stream and river "reference sites" (i.e., minimally disturbed sites) and uses the results to establish "reference conditions" (i.e., the yardstick used to judge stream and river health).

   The above statewide assessments allow the Water Boards, the USEPA, and many others to protect public health, identify and characterize threats to California's water resources, and to track and understand the overall status and trends in water quality over time.

   SWAMP's regional assessments. SWAMP's regional assessments are planned and executed by each of the nine Regional Water Quality Control Boards. Each region identifies its own ambient monitoring priorities, and designs assessments at the appropriate scale (i.e., regional, watershed, or water body scale) to answer specific monitoring questions. SWAMP's regional assessments supply numerous crucial benefits to the Water Boards. For example, the regions design SWAMP monitoring to:

   - identify pollutant sources
   - provide long-term data sets (to track trends over time)
   - target information gaps (to meet the needs of multiple programs)

- support CWA 303(d) listing and de-listing decisions
- support enforcement actions
- measure success of regulatory/management efforts
- match/leverage funding of multiple partners
- pilot innovations (which, once vetted, are used by others)

SWAMP's regional assessments complement the statewide assessments by allowing the flexibility needed to address the highest priority ambient monitoring needs at each region. For example, some (primarily urban) regions use much of their SWAMP resources to partner with other entities (such as regulated dischargers) to establish and implement coordinated regional monitoring partnerships, while other (primarily rural) regions have (depending on the watershed) fewer potential partners, and therefore use their SWAMP resources to conduct monitoring on their own.

The regions also use SWAMP funds to conduct crucial follow-up in response to the findings of SWAMP's statewide assessments. For example, SWAMP's statewide Bioaccumulation Monitoring Program has identified a significant threat to human health due to mercury and other contaminants in fish tissue. But the statewide assessments are only "screening" studies, and as such they do not generally capture enough fish to allow the development of specific fish consumption advisories. As funding allows, the regions have followed up by capturing and testing enough fish for Cal/EPA-OEHHA to develop consumption advice for specific water bodies. The resulting "Safe Eating Guidelines" are disseminated to warn the public about the hazards, and to inform anglers about which species of fish at a particular water body are/aren't safe to eat. Without this crucial follow-up by the Regional Water Boards, Cal/EPA-OEHHA would not have the data to develop Safe Eating Guidelines.

4. ***Numerous Water Board programs (and external entities) utilize and value SWAMP data and products.***

SWAMP provides a majority of the data used by the Water Boards for conducting the assessments required by the Clean Water Act (CWA) sections 303(d) and 305(b). Of the 22,251 "lines of evidence" created for the 2010 Integrated Report,

Clean Water Team

Citizen Monitors are important players in protecting water quality. Concerned citizens conducting science in the watersheds also serve as "watchdogs" and have discovered many pollution events. SWAMP tools and products help citizen monitors produce data that is useable and of known quality while also ensuring value to their volunteers' time. For example, all of San Diego Coastkeeper's monitoring activities follow SWAMP quality assurance and sampling protocols and share data using CEDEN. In September 2011, during routine monthly monitoring, volunteers observed gray colored water, dead fish, and a strong sewage odor. Follow up investigations determined that Los Penasquitos Lagoon, a State Park Preserve, was the victim of a 3.5 million gallon sewage spill. Coastal waters were also impacted and deemed unsafe for recreational contact. The San Diego Water Board used Coastkeeper's data to establish a baseline for water quality conditions that were used as a target for cleanup and restoration.

11,743 (53%) were based on SWAMP data. SWAMP data also are invaluable for "de-listing" water bodies (i.e., removing water bodies/segments from the CWA 303(d) list of impaired waters) when water bodies are no longer impaired or were mistakenly listed.

SWAMP data are crucial for the Water Boards to develop and implement key policies and programs, such as biological objectives, nutrient objectives, trash control policy, wetland and riparian protection policies, and the Statewide Mercury Program. SWAMP data are widely used to characterize background receiving water quality for numerous permits, water quality certifications, enforcement actions, and many other Water Board programs. The Cal/EPA Office of Environmental Health Hazard Assessment (Cal/EPA-OEHHA) uses SWAMP data to develop fish consumption advisories to protect human health. And numerous other external entities (such as water managers, federal agencies, universities, NGOs, and interested citizens) often request SWAMP data for myriad other uses.

The SWAMP program has for more than a decade focused a considerable amount of attention and resources on building tools that the Water Boards will need to succeed in the 21st century. During the course of this review, the Review Team heard from numerous Water Board roundtables and staff that SWAMP-funded tools are both used and highly valued. In fact, many programs now require that monitoring activities utilize SWAMP methods and/or adhere to SWAMP quality assurance and data management protocols. SWAMP field/lab protocols, quality assurance procedures, and data formats are now required in numerous permits, water quality certifications, grant projects, and enforcement orders, which fosters consistency and ensures data usability and comparability.

As part of this review, SWAMP staff solicited feedback from other Water Board programs at Roundtable meetings and found that although most programs use SWAMP data and tools to some extent, many other needs exist—from technical assistance to monitoring that is needed to answer specific ("targeted") questions. Another challenge is that, in some cases, staff from other Water Board programs do not take full advantage of existing SWAMP data and tools, or are unaware that they may contact SWAMP staff for technical assistance.

5. ***Water Board monitoring needs greatly exceed existing resources.***

   SWAMP's statewide and regional monitoring programs have been very successful at addressing numerous key monitoring questions. However, since SWAMP was created fourteen years ago, the fact remains that *only a fraction* of California's surface waters (i.e., 211,000 miles of rivers and streams, 1.6 million acres of lakes, 1,100 miles of coastline, and 1.3 million acres of bays and estuaries) have been comprehensively assessed.

   As discussed above (see section titled "What is SWAMP?"), the SWAMP program currently is funded at only a small fraction of the originally identified need. And the costs of monitoring increase every year, further reducing what can be accomplished with available resources. The end result is that numerous human health and other water resource issues are not being addressed, or are being only partially addressed.

Over the past several years, SWAMP's four existing statewide assessments and all of its regional programs have been scaled back, due to static (or declining) resources and increasing costs. If budgets remain steady, SWAMP's assessments will need to be further curtailed as costs continue to rise.

While SWAMP's four existing statewide assessments have been scaled back due to rising costs, other (currently unfunded) statewide assessments are needed to protect human health and to fill other key data gaps, such as:

1) **Bacteria in inland waters.** Swimming safety is a core Clean Water Act use to be protected. There currently is no statewide program to assess indicator bacteria in inland waters, leaving the Water Boards and water managers unable to answer the question: *"Is it safe to swim in freshwater lakes and streams?"*

2) **Cyanotoxins.** A number of toxins released by cyanobacteria (blue-green algae) can be toxic to humans, pets, livestock, and wildlife, and harmful algae blooms are becoming increasingly common as climate change proceeds. Yet there is no comprehensive monitoring program for these toxins in California.

3) **The effects of contaminants (such as mercury) on non-human endpoints.** SWAMP's Bioaccumulation Monitoring Program measures contaminants in sport fish that are consumed by humans, but there is little monitoring of smaller "prey" fish or egg shells to assess toxic effects on wildlife.

4) **Biological integrity of numerous water body types.** SWAMP's Perennial Streams Assessment measures the health of perennial rivers and streams, but there is no such program for lakes, wetlands, non-perennial streams, or coastal/ocean waters.

5) **Constituents of emerging concern (CECs).** The State Water Board's recycled water program includes a modest component to monitor for CECs. But new chemicals continually enter the marketplace (and therefore the environment), often with little or no monitoring.

6) **Monitoring the effects of climate change on water quality and beneficial uses of water.** SWAMP's Reference Condition Management Program measures changes in ecological conditions at perennial river/stream "reference sites" throughout the State. Such data are essential for developing (and adjusting over time) water quality objectives, biological

Enforcement Action – CCAMP Follows Trail of Broccoli to Successful Enforcement

In 2006, upstream of a routine monitoring site, Central Coast Ambient Monitoring Program (CCAMP) field staff observed discharge of foul smelling water from a storm drain entering the waterway. Monitoring data showed very high nutrient and coliform concentrations, and a trail of broccoli (along with produce labels) being discharged from the drain. Follow-up toxicity sampling showed zero survival to Ceriodaphnia and lethal concentrations of chlorpyrifos and diazinon in the discharge. Enforcement staff were notified and action was taken. The packing plant ultimately complied by moving their discharge into the City's industrial waste system. The case resulted in fines of $107,820 and resolution of the toxic discharge.

Trail of Broccoli

expectations, in-stream flow requirements and other permit requirements. But that program has been scaled back due to budget cuts and rising costs—and there are no equivalent programs for lakes, wetlands, non-perennial streams, or coastal/ocean waters.

7) **Other key statewide assessments.** In addition to the above, needs have been identified for numerous other statewide assessments, such as the effects of algae and trash on recreation beneficial uses, the extent and magnitude of pesticide contamination of California's surface waters, and the need for additional multi-indicator tools to assess biological integrity of numerous water body types.

Despite the identified need for additional statewide assessments, given its current budget SWAMP is **not** able to initiate any new statewide assessments at this time. Nor can SWAMP (given its current budget and rising costs) conduct regional assessments for any more than a few of the highest priority concerns at each Regional Water Board.

The Regional Water Boards are increasingly unable to follow up on the findings of SWAMP's statewide assessments. For example, most Regional Water Boards have in the past used a portion of their SWAMP allocations to follow up on the statewide Lakes Survey by collecting additional data to facilitate the development of fish consumption advisories (to warn the public of significant health risks) at specific lakes and reservoirs where fish are contaminated. However, this follow-up is limited by budget constraints, meaning human health may be at risk at lakes where follow-up has not yet occurred.

In addition to the Water Boards' ambient monitoring needs, many Water Board programs also have substantial needs for "targeted" monitoring. For example, "targeted" monitoring is needed to: develop TMDLs, to develop/refine water quality standards, to determine specific pollutant sources (in order to assign responsibility and design corrective measures), to support enforcement actions, to support "de-listing" of water bodies that are listed as impaired, etc. Given its current budget, SWAMP cannot fulfill the many targeted monitoring needs of the Water Boards' many other programs.

6. *Millions of dollars are spent each year on surface water monitoring for Water Board and other agency programs but the monitoring is not fully coordinated among programs. Better coordination would provide multiple benefits, but is time-consuming and resource intensive.*

The Water Boards' executive management has expressed a desire for better coordination of the surface water monitoring and assessment efforts conducted by the various Water Board programs and external entities. Improved coordination can result in increased efficiencies, improved data comparability and usability, cost savings in some areas, reduced cost of compliance for dischargers, and better management decisions. But experience has shown that such coordination is time-intensive, and therefore has substantial costs (See Appendix II for examples).

SWAMP possesses the expertise to foster and/or lead the coordination of surface water monitoring efforts, but it currently has insufficient resources to do so. This longstanding issue was raised previously by a panel of external scientists and managers who reviewed the SWAMP program in 2005-06. That

expert panel concluded that there is *"insufficient funding"* and *"insufficient institutional support for monitoring coordination"* at the Water Boards (Batiuk and others, 2006, at p. 4).

In 2007, the California Water Quality Monitoring Council (Council) was created to develop a strategy to coordinate water quality and related ecosystem monitoring efforts throughout California. The Council's primary goal is to improve the efficiency and effectiveness of California's monitoring, assessment, and reporting through better coordination. In 2010, the Council and SWAMP aligned their efforts by writing strategic plans that assign to SWAMP the lead role for coordinating the monitoring of bioaccumulation (i.e., the accumulation of contaminants in fish and shellfish) and the health of aquatic life in streams, rivers, and lakes (CWQMC 2010; SWAMP 2010). The coordination of other assessments was assigned to other entities. However, the Council has no budget allocation for implementation (i.e., for monitoring, coordination, or to develop or maintain its web portals), and SWAMP was not allocated any additional resources to conduct its coordination role. Ever since, SWAMP has carefully balanced the needs for coordination with the needs for monitoring, assessment, and data management/display.

SWAMP's current staff resources thus (in most situations) provide only for "opportunistic" coordination (i.e., to pursue prospects for matching funds or leveraging resources), and/or when planning and executing a specific SWAMP monitoring project. Such coordination efforts are necessarily limited and uneven. As a result, data collected by other Water Board programs and by external entities often are not collected or managed in a way in which those data can be combined with SWAMP data to answer management questions, the quality of the non-SWAMP data is not documented, and/or the quality of the non-SWAMP data is not sufficient for Water Board staff to use.

SWAMP has in the past contributed substantial staff time and financial resources to the inter-agency California Water Quality Monitoring Council in order to produce a series of Internet pages to make SWAMP data and assessments more widely available to the public. The Council's "My Water Quality" website provides an interactive, user-friendly portal for the public to obtain

SWAMP Bioassessment Data Provided Critical Information in the Adoption of the New Riverside Municipal Stormwater Permit (San Diego Region)

In preparation for the Riverside Municipal Separate Storm Sewer System (MS4) Permit reissuance, a review of SWAMP bioassessment data demonstrated that the ecological health of urban sites in southwestern Riverside County was consistently poor and had declined over the past several years. The degradation of water quality was sufficiently troubling to warrant permit changes. The San Diego Water Board adopted a new MS4 Permit for southwestern Riverside County on November 10, 2010. The new permit is comparable to the Orange County Municipal Stormwater Permit that was adopted in 2009. These two municipal stormwater permits now include numeric action levels, detailed and extensive monitoring requirements, as well as the inclusion of low impact development mandates and the obligation to develop hydro-modification management plans.

information about the State's water resources—but it has essentially no dedicated funding, and relies mostly on voluntary contributions from member agencies and external partners. It is an open question whether the "My Water Quality" concept is sustainable without a dedicated funding source. SWAMP's ability to contribute to the Council's website is being increasingly impacted by rising costs in all areas of the program.

Initially (in the year 2000), the "Clean Water Team" had four staff members assigned to coordinate citizen monitoring efforts throughout California. The Team's efforts help to ensure that citizen monitoring data are accessible and of sufficient quality to be useful in Water Board programs, such as the Integrated Report and enforcement of water quality standards and permit requirements. Due to declining budgets and continuously rising costs, SWAMP's Clean Water Team now consists of *one staff member* to coordinate citizen monitoring throughout the entire State of California.

Additional monitoring coordination needs are large. The Water Boards require most of the 514 wastewater dischargers and 376 large municipal stormwater dischargers to conduct surface water and/or receiving water monitoring. Another 156 small municipal stormwater dischargers will be monitoring surface water under the new permit adopted in July 2013. All of the 180 TMDLs that the Water Boards have adopted include surface water monitoring requirements. The number of adopted TMDLs (and associated monitoring requirements) will increase significantly in the coming years as the remaining 2,000 listings for water quality impairment are addressed. The Water Boards regulate nearly 40,000 agricultural operations that are required to monitor water quality at approximately 118 sites on a monthly basis. Monitoring is also required by numerous other programs, such as waste discharge requirements (WDRs), water quality certifications, nonpoint source, Water Code Section 13267 orders, enforcements orders, and clean water grants. And new regulatory programs—such as Biological Objectives, the Statewide Mercury Program, and the Grazing Regulatory Action Project—are currently being developed that will likely require at least some additional new monitoring. And that is just what the Water Boards require. Other entities—such as federal agencies, other state agencies, universities, NGOs, and citizen monitors—conduct surface water monitoring that represent a very large additional coordinating need with significant staffing resource costs.

To address the myriad coordination needs, the Water Boards need staff dedicated to coordination. Those staff should inventory, understand, and evaluate monitoring questions and designs; understand

> **TMDL Outcomes in the Central Coast Region**
>
> Of the seven TMDL outcome reports posted by the Central Coast Region, six have been based on data from the SWAMP program in Region 3 (CCAMP). Two of these reports, for dissolved oxygen and nitrate in Chorro Creek, show improvements associated with a treatment plant upgrade and other watershed management activities. CCAMP data were able to support a proposed delisting of the creek for dissolved oxygen (target > 7.0 mg/L). If improving trends for nitrate continue, the Nitrate target (<1.5 mg/L) will be met by the proposed 2016 target deadline.
>
> TMDL Outcome reports are available at the State Water Board website.

met/unmet and current/future monitoring needs; work with programs and stakeholders to prioritize and integrate monitoring; make recommendations for monitoring designs; ensure consistency by applying SWAMP quality assurance and data management tools to all monitoring; ensure data are stored, managed and made readily available; and ensure data are assessed, integrated and turned into information to support management decisions. (See Appendix II for coordination examples.)

Because SWAMP has a finite budget that is insufficient to conduct comprehensive monitoring and full coordination, increasing either activity would necessarily occur at the expense of the other. Further shifting of SWAMP's focus from ambient monitoring to coordination could result in the loss of the Water Board's robust ambient monitoring and assessment capabilities. Such trade-offs should be thoroughly weighed and judiciously deliberated before any changes are made to SWAMP's current carefully balanced strategy.

7. ***While SWAMP has developed a robust and mature ambient monitoring program over the past fourteen years, improvements can be made.***

    During this review, the Review Team heard and compiled several suggestions that could be implemented to improve the program's effectiveness and utility, including:

    i.   The SWAMP Review Team should establish an annual strategic planning process to evaluate (and adjust as appropriate) the objectives and priorities for SWAMP's statewide ambient assessments. The four existing statewide assessments have been curtailed in recent years due to budget cuts and cost increases. A deliberative process is needed to more carefully allocate funding among SWAMP's statewide assessments, to optimize the expenditure of scarce resources and ensure the greatest utility toward answering key management questions.

    ii.   The SWAMP Roundtable should create a "feedback loop" for users of SWAMP tools to communicate issues, problems, and ideas/suggestions for improvement and to prioritize improvement.

    iii. The SWAMP Roundtable should suggest new and/or improved Performance Measures for the Water Boards that focus on environmental outcomes, based on lessons learned from the past decade of assessments, data, and tools.

Recommendations

1. **SWAMP should maintain its focus on ambient monitoring as its core function.** The Review Team is keenly aware that the Water Boards have myriad needs for other (i.e., "targeted") types of monitoring throughout their regulatory, planning, enforcement, and other programs. Despite those needs, the fundamental fact remains that ambient monitoring is absolutely essential to achieving the mission of the Water Boards. SWAMP's core focus on ambient monitoring should not be sacrificed to provide the "targeted" monitoring needs of other programs.

2. **SWAMP should maintain robust statewide assessments *and* regional assessments.** Given the utility of ambient monitoring information gathered at multiple spatial scales, and as previously recommended by a blue-ribbon panel of external program reviewers (SPARC 2006), SWAMP should continue its dual-scale assessments whereby the State Water Board leads the management of statewide assessments, and the Regional Water Boards conduct assessments at the "local" (i.e., regional, watershed, and water body) scales.

3. **The Deputy Management Committee (DMC) should work with SWAMP as the DMC refines the Water Boards' process for allocating "discretionary" contract funds toward targeted monitoring projects.** The DMC currently is deliberating a process for addressing the many "targeted" monitoring needs of multiple Water Board programs via "discretionary" contract funds. The SWAMP Review Team supports this effort, and should be consulted as those deliberations proceed. Such consultation could maximize coordination with SWAMP assessments, and ensure the comparability and usability of "targeted" data collected by other programs.

4. **In regards to monitoring coordination, Water Board executives should establish a process to compile coordination needs, set priorities, and deliberate options for fostering the highest priority coordination tasks.** The DMC (or some other panel of Water Board executives and/or managers) should lead SWAMP and other programs to: i) compile and prioritize the many needs for increased coordination of monitoring (and related functions, such as data management, water quality assessment, electronic data submittals, quality assurance, etc.); ii) define the specific coordination tasks necessary to meet each identified need; iii) quantify the resources needed to complete each task; and iv) evaluate the options for completing the highest priority tasks. In doing so, the integrity of SWAMP's ambient assessments should not be compromised to provide for increased coordination among the Water Boards' various programs. The Review Team recommends that managers consider other options, such as identifying/shifting resources from the affected/benefitting programs in order to fund the desired types and levels of coordination, and/or seeking new/additional resources to fund increased coordination.

5. **Water Board management (MCC, DMC, State Board Exec) should promote question-driven science to answer key management questions, in part by encouraging (or *requiring*) other programs to utilize the many available "SWAMP Tools."** One outcome of this review is the realization that other Water Board programs do not take full advantage of existing SWAMP tools (i.e., assessment framework, monitoring SOPs, QA protocols, data management structures, etc.). Water Board management can promote inter-program consistency, data usability, and data comparability by encouraging (or directing) other programs to use relevant SWAMP tools and to more fully take advantage of SWAMP staffs' experience and expertise.

6. **The SWAMP Review Team (Water Board and USEPA staff) should update the SWAMP work plan as requested by the DMC.** On November 6, 2013 the DMC released the *Water Board Roundtables Composition, Role, and Responsibilities* document, which directed all Water Board roundtables to develop an annual work plan. The SWAMP Review Team should develop a work plan that considers all items from the DMC's *Roles and Responsibilities* document, as well as the following:

a. Define the roles and responsibilities for both the full SWAMP Roundtable and the smaller Review Team.

b. Establish an annual strategic planning process to evaluate (and adjust as appropriate) the objectives and priorities for SWAMP's statewide ambient assessments.

c. Develop a specific definition of monitoring "coordination" and articulate the coordination tasks to be conducted (with available funds) by SWAMP staff at the State and Regional Water Boards.

d. Specify actions to synthesize data into information that can readily be used by managers to aid in decision-making.

e. Create a feedback loop for users of SWAMP tools to communicate issues, problems, and ideas/ suggestions for improvement, and to prioritize improvements.

f. Identify new or improved environmental outcome-based Performance Measures for the Water Boards based on SWAMP's assessments, data, and tools.

References

Batiuk, R., B. Bernstein, C. Hawkins, F. Holland, P. Kazyak, J. Maxted, R. Ward. 2006. Review of California's Surface Water Ambient Monitoring Program (SWAMP). Technical Report #486, Southern California Coastal Water Research Project. May 2006. 25 pp.

California Water Quality Monitoring Council. 2010. A Comprehensive Monitoring Program Strategy for California: Recommendations of the California Water Quality Monitoring Council. State of California. December 23, 2010. 48 pp. plus appendices.

Surface Water Ambient Monitoring Program. 2010. 2010 SWAMP Strategy: 2010 Update of the Comprehensive Monitoring and Assessment Strategy to Protect and Restore California's Water Quality. California State Water Resources Control Board, Sacramento, CA. December 2010. 54 pp. plus appendices.

U.S. Environmental Protection Agency. 2003. Elements of a State Water Monitoring and Assessment Program. EPA-841-B-03-003. Office of Wetlands, Oceans and Watersheds, U.S. Environmental Protection Agency. March 2003.

Yoder, C.O., and R. Plotnikoff. 2009. Evaluation of the California State Water Resources Control Board's Bioassessment Program. Final Report to USEPA's Office of Science and Technology and Region IX. May 15, 2009. 42 pp.

Appendix I: Ten-Element Review of SWAMP

This review includes an evaluation of the monitoring program strategy to determine how well each of the ten elements is addressed and how to incorporate needed changes and additions into future monitoring cycles. This evaluation takes into consideration the effects of funding shortfalls on implementation of the monitoring program strategy. Similar reviews were performed in 2005 at the beginning of the SWAMP and again in 2010. A summary of the SWAMP's progress in 2015 toward meeting the ten monitoring program elements is provided below.

Strategy. *SWAMP's mission is to provide resource managers, decision makers, and the public with timely, high quality information to evaluate the condition of surface waters throughout California.* State Water Board does not have the resources to monitor all water resources within the State. In 2010, the SWAMP Strategy was revised to acknowledge the formation of the California Water Quality Monitoring Council (CWQMC) to provide for increased coordination of monitoring and assessment. The program has been successful at providing information to the general public and managers, but it is less clear how the program is affecting decisions at the State and Regional Boards.

Objectives. *Our vision is to clearly articulate monitoring objectives as attainable targets for producing the information needed to answer assessment questions at the Statewide and Regional levels.* The original Strategy called for SWAMP to answer questions about the quality of four core beneficial uses (swimmable, fishable, aquatic life use, drinking water) in multiple water body types across the state. SWAMP has focused on aquatic life use in streams and fish tissue contamination in lakes, rivers, and the coast. Through coordination with the CWQMC, assessment questions are being addressed to assess aquatic life use in wetlands, estuaries and the rocky intertidal; swimming use at coastal beaches; and drinking water use in both surface and groundwater.

Design. *Our vision is to develop scientifically sound monitoring designs to guide the efficient collection of data to meet SWAMP's monitoring objectives with available resources, and to coordinate monitoring designs among SWAMP programs, other Water Board programs, and other agencies and partners through the CWQMC.* Statewide probability monitoring programs have leveraged and influenced monitoring efforts where the focus has been on large scale assessments. Monitoring designs at the Regional Boards vary widely, due to difference in priorities and the need for finer scale assessments necessary for Water Board programs such as listings, permits, compliance, enforcement or TMDLs. Instead, SWAMP focus has been on consistency of methods, performance and integration of data for SWAMP-funded projects.

Indicators and Thresholds. *Our vision is to develop, select, and implement indicators and assessment thresholds that appropriately represent the condition of the environmental attributes and beneficial uses to be assessed, diagnose the causes and sources of impairment, and evaluate the effectiveness of management actions to improve water quality in California.* SWAMP emphasis has been on direct indicators of beneficial uses. This work is primarily focused on aquatic life in perennial streams, fish tissue contamination fish from multiple habitats, and toxicity tests in freshwater and coastal environments. Some have expressed interest in developing biological indicators for other habitats (e.g. lakes, large rivers, and non-perennial streams). The

lack of agreed upon thresholds and techniques for causal assessment may be impeding the use of biological indicators in Water Board programs.

QA/QC. *Our vision is to develop, implement, and maintain the quality assurance tools and capabilities needed by SWAMP, and shared with partner programs, to allow comparable data from many sources to be used in comprehensive water quality assessments. The role of 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.).* The SWAMP QA/QC program is used for all SWAMP activities. However, integrating SWAMP QA/QC into Water Boards programs remains a challenge. Efforts are underway for Water Board programs to develop QA program plans. However, it is unclear if Water Board programs will be able to support the level of QC required by the SWAMP Program Plan.

Information Management. *Our 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.* The SWAMP investments in the SWAMP database and the California Environmental Data Exchange Network (CEDEN) have substantially increased the amount of data used in 303(d) assessments. SWAMP and CEDEN also provide information for the My Water Quality Portal. However, with the transition from contract to personnel, SWAMP will need to evaluate if it can maintain the SWAMP database in its current form. SWAMP has also made significant investments in CEDEN as a tool for agencies to share data and will need to evaluate if it can continue to support two data systems.

Analysis and Assessment. *Our vision is to provide a consistent science-based assessment framework that integrates data from SWAMP and partner programs to effectively answer assessment questions and inform water quality management decisions at the State and Regional levels.* SWAMP's question-based framework for assessing beneficial uses has allowed better integration of monitoring data. The portal workgroups also provide a forum for integrating data around a common assessment question. However, as much as the State Board priorities are driven by the 303(d) list, SWAMP should consider closer coordination with the 303(d) listing staff and ways to improve the listing policy.

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. SWAMP continues to p*roduce several statewide condition surveys and numerous regional reports. SWAMP has also produced a diverse array of other products including regional reports, special studies, fact sheets, newsletters, press releases, and presentations at professional meetings. Production of reports has fallen recently and certain SWAMP publications are missing the SWAMP brand. On the other hand, there has been increased focus on portals and the State Board Achievement Reports.

Programmatic Evaluation. *Our vision is to conduct periodic reviews of each aspect of the program to determine its scientific validity, whether it is being implemented as designed, and how well it serves the water quality decision needs of the state.* A programmatic peer review of the SWAMP was completed in 2005. Since then, peer reviews have been focused on particular aspects of the program. Both BOG and SPoT have annual reviews from a Technical Committee. The Regional Board work plans to undergo a peer review at the State Board.

Infrastructure Planning. *Our vision is to provide the support needed to implement a coordinated and comprehensive monitoring and assessment program, and to maintain the infrastructure and program capabilities necessary to accomplish program goals*. Funding for basic infrastructure is switching from a contractor-supported system to in-house staff support, which requires new hires at the State Board. 2014-15 will be a period of transition. A plan for long-term stability of the program will need to be developed.

Evaluation of California Monitoring Strategy (2005 to 2014)
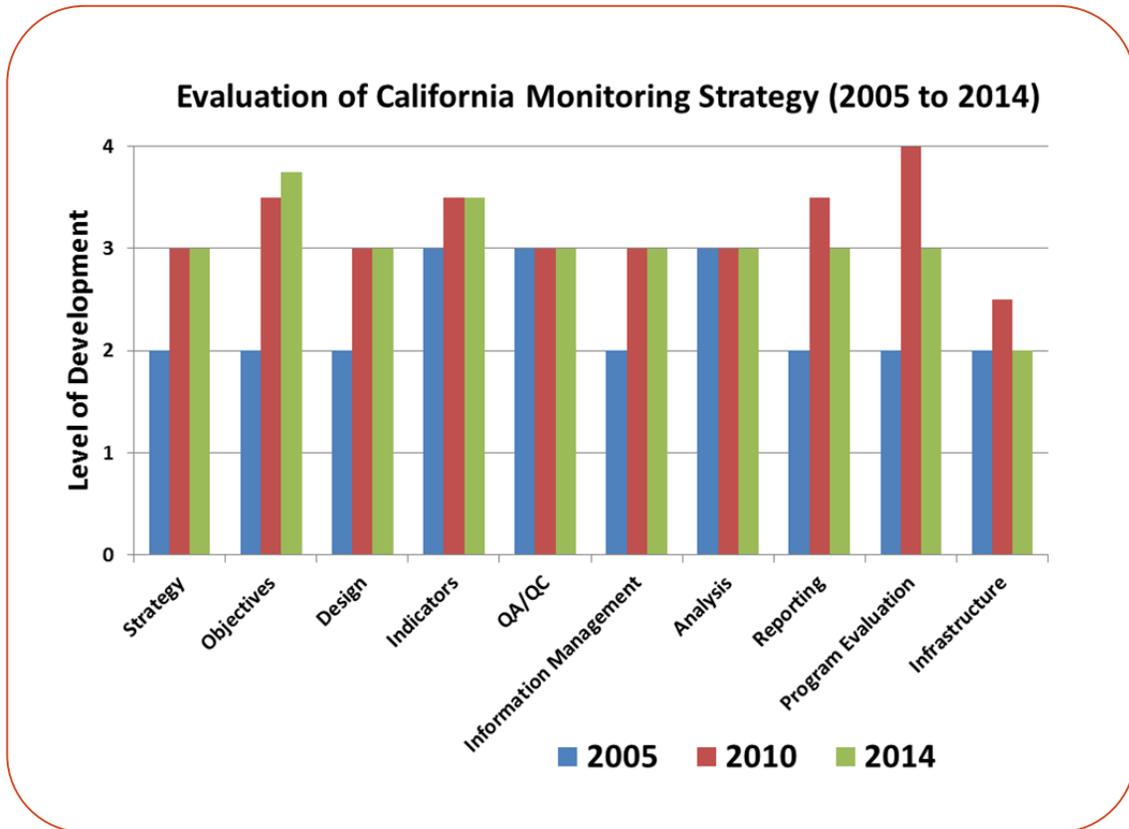
Appendix II: Coordination Case Studies

The Central Coast Region

The Central Coast Region has augmented staffing and fiscal resources for monitoring significantly over that provided through the SWAMP program. A significant portion of the additional staff time goes towards coordinating internal and external monitoring, quality assurance, and data management activities. This case study will highlight one of those projects.

Background

Additional Staffing Resources – The SWAMP program provides the Central Coast Region with 0.8 PY for SWAMP monitoring. This staff time is spent coordinating Central Coast Ambient Monitoring Program (CCAMP) field monitoring activities and those of our contractors, processing data for SWAMP delivery, verifying data quality, working with laboratories to ensure that data meets SWAMP Measurement Quality Objectives (MQOs), developing work plans, assessing data, writing reports, and other work directly associated with spending SWAMP funds. This work fully expends the 0.8 PY provided by SWAMP, and is comparable work to that done in other Regions with their SWAMP dollars.

For over ten years, the Central Coast Region has funded an additional PY to support a Senior Environmental Scientist to conduct monitoring and assessment activities above and beyond the work described above. Other than attending the SWAMP Roundtable and working on assessment and reporting of CCAMP data, this additional position is not directly involved in the daily work of managing the CCAMP monitoring program. The PY has been supported each year by a "tax" on other programs (typically between 0.1 and 0.3 PY per program per year) that benefit from monitoring coordination activities. These programs have included Basin Planning, Irrigated Lands, Nonpoint Source Pollution, National Pollutant Discharge Elimination System (NPDES), Storm Water, Grants, and others.

Additional Fiscal Resources – The Central Coast Water Board set up an endowment to support monitoring activities in 2000.   This endowment is held by a non-profit organization and has been supported by settlement funds from two different enforcement cases. The fund has allowed CCAMP to hire field staff, provide lab contracting needs, and hire a contracted software designer to support data management and assessment activities. From the standpoint of coordination, particularly for data management and data display purposes, the extra staffing resources provided by the software contract position have been invaluable.

CCAMP Coordination Activities – Much of the monitoring coordination work undertaken by CCAMP staff (with support by the software contractor) has required new program development, which often requires a very large initial amount of time invested, and then smaller amounts of time to support ongoing activities. Activities have centered around regional monitoring program development, Monitoring and Reporting Program (MRP) development for permits, and quality assurance plan review and data management to support these programs. The senior position also fulfills the "unfunded mandate" of quality assurance lead,

which requires review and approval of quality assurance plans associated with grants projects, regional monitoring programs, and other efforts. Coordination projects over the past decade have included:

- Irrigated Agriculture monitoring program development and support
- Regional Stormwater Program development and support
- Regional Ocean Discharger Monitoring Program development and support
- Volunteer monitoring data management coordination
- Data synthesis projects (organizing data from multiple monitoring entities into a single format for delivery into a single database [pre-CEDEN])
- Grants data delivery system
- 303(d) data organization and tool development for creating lines of evidence (now used at State Board)
- Web site development for display of data from multiple projects (including CCAMP)
- Web site based report card of health for display of multiple data sets, including programmatic performance data from storm water and ag programs (currently in development).

In spite of this additional effort, other coordination needs exist in Region 3 (e.g., NPDES electronic data submittal and quality assurance, TMDL monitoring needs, programmatic quality assurance planning documents, internal staff trainings, etc.). But the additional Region 3 staffing support provides a good example of what types of coordinating work can be accomplished with additional monitoring resources. Below is one case study highlighting the types of work undertaken by monitoring staff in support of another program at the Central Coast Water Board.

Case Study: Central Coast Irrigated Lands Program

Purpose/Goal: Develop MRPs and provide associated technical expertise, tools, and other support to Irrigated Lands monitoring programs.

Tasks

A. Assess available data to describe the regional impacts associated with irrigated agriculture. Develop a comprehensive report to the Board on surface water findings to support the Agricultural Order – 0.4 PY. This task required compilation of data from multiple sources, development of a report card approach to view major problem areas in the region, development of a written synthesis report along with a wiki report of findings, assessment of Marine Protected Areas at high risk from loading of chemical contamination, and presentation of findings at multiple Board workshops and public hearings.

B. Develop overall study design and associated MRP for regional agricultural receiving water monitoring – 0.2 PY. This task required study design expertise in monitoring program development, framed in the context of the regulatory requirements of the Ag Order. The MRP required ongoing trend monitoring at 50 sites in ag areas that were associated with 303(d) listings for ag chemicals.

C. Develop overall study design and associated MRP individual discharge monitoring for high risk growers – 0.15 PY. This task required that a simple monitoring program framework be developed to be implemented at the farm scale. The monitoring design balanced cost with information needs for decision-making. Three different MRPs were developed to support the three tiers of growers, based on threat to water quality.

D. Develop a Quality Assurance Project Plan (QAPP) template for use by individual growers required to monitor their discharge – 0.15 PY. This task involved adapting the standard QAPP framework for use by growers. The template provides a "fill-in-the blank" approach with detailed instructions and significant portions of required text already prepared, based on the details of the MRP. This template proved to be a successful approach to managing multiple QAPP deliveries from inexperienced growers, greatly reducing time spent to review and finalize these documents.

E. Facilitate delivery of agricultural data to the Regional Data Center through the development of an online data delivery system – 0.4 PY. A Data Uploading and Checking tool was developed specifically to support Agriculture program needs in 2006. The tool served its purpose for a number of years, before being transferred to Moss Landing to support the Regional Data Center. It was then modified to support other data delivery types, including grants and volunteer programs.

F. Make agricultural program data available to the public online, along with CCAMP data, at the CCAMP website – 0.3 PY. This task involved significant time to quality check data delivered from the Ag program, along with software development to adapt the existing CCAMP Data Navigator for data from multiple sources. Agricultural data has been available on the CCAMP website since 2006.

G. Review and approve all QAPPs for agricultural monitoring programs – 0.2 PY. This task has included review and approval of the regional ag receiving water program QAPP, as well as approximately a dozen individual discharger monitoring QAPPs. Once approved, these projects may at times need document amendment or technical support.

H. Provide continuing technical support to the Irrigated Ag program via data synthesis and analysis, technical report review, MRP product reviews, quality assurance support, technical feedback on data quality to monitoring organizations, etc. – 0.2 PY ongoing.

Experiences

The receiving water monitoring program for agriculture (managed by a non-profit) has been in continuous operation since 2005, sampling 50 sites on a monthly basis for long-term trends, and is a successful and relatively stable program. The data to a great extent is SWAMP comparable, meeting SWAMP MQOs and documentation requirements. The data set is of extremely high value, and can now show significant trends over time for multiple analytes. It nearly doubles the amount of data available in our Region (with CCAMP providing the other primary source). Between these two monitoring programs, the Region has 80 locations being monitored monthly for long-term trends, which is a tremendous resource for understanding program effectiveness. However, the effort to develop and support this program has been enormous and the development period (prior to adoption of the Order) required essentially two monitoring PYs working full time on monitoring program and software development. After adoption of the Order, the monitoring coordination and support requirements dropped considerably, but data management and quality assurance issues remain time consuming.

The individual discharge monitoring programs are challenging to manage because of the lack of experience of the growers and the highly technical nature of the data. The quality assurance template was very successful at getting growers to submit documents that met the needs of the quality assurance review process in a relatively consistent way. Approximately a dozen documents were reviewed and approved. The growers who have sought professional consulting assistance are fairing better than those who have attempted to do the monitoring themselves. The program is still too young to evaluate comprehensively, but data reports from several farms have been received and in some cases show high nitrate loads and toxic discharges entering receiving waters.

Staff time required: 1.8 PY for project development; 0.2 PY ongoing

The San Diego Region

A Case Study in the San Diego River Watershed

It is critical to coordinate monitoring and assessment with other programs and agencies in order to build a strong, efficient, cost-effective, and coordinated monitoring and assessment program. The newly adopted Monitoring and Assessment Framework for the San Diego Region outlines the need for coordination, and a 10-step collaborative process for developing monitoring and assessment programs. The fundamental purposes for a monitoring and assessment program, at a watershed scale, are the following: (1) Providing a framework for periodic and comprehensive assessments of watershed condition, (2) Expanding the monitoring of ambient conditions related to key beneficial uses to the entire watershed and to a broader range of indicators, and (3) Improving the coordination and cost-effectiveness of disparate monitoring efforts.

In 2011, the San Diego Water Board initiated monitoring coordination in one of its eleven watersheds and formed a collaborative workgroup for the San Diego River watershed. Dr. Brock Bernstein, independent consultant, was supported by SWAMP regional funds in order to facilitate the coordination process. Several San Diego Water Board staff members were involved in the coordination process, including the Region 9 SWAMP coordinator, staff from the Monitoring, Assessment and Research Unit, and staff from other Water Board programs, including municipal stormwater, TMDLs, nonpoint source, and 401s. The workgroup included over twenty external stakeholder groups from State and federal regulatory agencies, key permittees in the watershed, other resource management agencies, academic institutions, and conservation organizations active in the watershed.

The watershed monitoring and assessment program is structured around the following four key management questions: (1) Are aquatic ecosystems healthy? (2) Is water quality safe for swimming? (3) Are fish and shellfish safe to eat? (4) Is water safe to drink? For each question, the monitoring program describes a monitoring approach, including a basic design and rationale, indicators to be measured, and expected data products. The workgroup identified and evaluated adjustments and additions to current monitoring programs in the San Diego River watershed that would increase coordination and efficiency, and improve the capability to conduct watershed-scale assessment.

The watershed monitoring and assessment program reflects substantial input from and discussion among a broadly representative group of stakeholders in the watershed. It represents a significant advance towards the broader integration of monitoring efforts and data for the purpose of assessing watershed condition. The proposed program clearly recognizes that any final decisions about modifications to existing monitoring efforts and/or about the initiation of new efforts will depend on detailed negotiations among the major stakeholders (San Diego Water Board, NPDES permittees, conservation groups, other potential partners such as State and federal resource agencies) in the watershed.

In 2013, program implementation began for some components of the monitoring and assessment program. Additional components will be phased in during 2014. In addition, the workgroup will evaluate and choose among alternatives for managing the watershed program over the longer term. These building blocks provide tools that can be used to adapt the monitoring and assessment program over time in response to improved knowledge and/or shifting management information needs.

The coordination effort in the San Diego River watershed includes a high level of complexity, a large stakeholder group, multiple partnerships, the design of a monitoring program with a large set of indicators, and the development of watershed report cards as an assessment tool. So far, Dr. Brock Bernstein, who facilitated the coordination process, has spent over 700 hours on this project. In addition, external stakeholders and staff from the San Diego Water Board have spent several hundred hours to work on the coordination process. It is expected that the implementation phase of the coordination program will include significant additional efforts to complete; however, the benefits of having a coordinated monitoring and assessment program for the San Diego River watershed are invaluable, and the San Diego River watershed monitoring and assessment program can serve as a pilot study for other watersheds in the region. In times of limited resources, coordination between and among water quality agencies and stakeholders is essential to produce information that is needed to protect and restore California's water resources.