Coordinating Site-Specific NPDES Monitoring to Achieve Regional Monitoring in Southern California

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Abstract

Regional-scale monitoring provides environmental decision-makers with important information for developing long-term, comprehensive management strategies. However, sustained funding for such efforts through large government programs has proven difficult. An alternative or supplemental approach for achieving regional monitoring is to integrate ambient monitoring efforts required under National Pollutant Discharge Elimination System (NPDES) discharge permits. This approach was successfully implemented in the Southern California Bight coastal area during the summer of 1994, with the cooperation of twelve organizations leading to a $4 million program that sampled biological, chemical and oceanographic parameters at 261 sites from Point Conception to the Mexican border. Key factors that led to success of the southern California regional monitoring program include: 1) cooperation between regulator and discharger communities, based on a shared need for regional-scale data; 2) a commitment from regulators to exchange a portion of routine discharger monitoring requirements, for participation in regional monitoring, providing cost-neutrality for dischargers who participated; 3) a participatory management structure in which the program was jointly developed by regulators and dischargers and 4) the presence of a neutral local, scientific organization to serve as a facilitator.

The survey produced the first integrated snapshot of near coastal marine conditions in the Bight, allowing managers to assess relative risk among sources and types of environmental stress. It also produced a series of scientific assessment tools, such as a bioassessment index, generated only when regional-scale data are available. The most significant long-term benefit of the effort was the improved dialogue between regulators and dischargers on monitoring methods and results, which led to jointly agreed upon standardized methods and performance criteria for future monitoring in the region. The success of the 1994 regional monitoring project has formed the infrastructure for an expanded regional monitoring effort in summer 1998, which will include more participating organizations, more habitats sampled and more indicators measured.

Introduction

Monitoring is an essential part of environmental management. It provides decision-makers with information about which problems require management action and which are the highest priority problems. It also provides a feedback mechanism for assessing whether management actions have been effective in reducing or eliminating the problem.

Most monitoring is focussed on site-specific assessments of areas suspected to be of concern, but increasingly regional monitoring (monitoring of entire watersheds or groups of watersheds or monitoring of biogeographic regions) is being recognized as an important component of the management information system (NRC 1990a). Regional monitoring provides information about relative risk from different pollutant sources (e.g., wastewater discharges, storm water runoff). More importantly, regional-scale monitoring yields a larger perspective about cumulative impacts to ecosystem health, which is the bigger picture perspective environmental managers and the general public are seeking.

While managers have increasingly recognized the value of regional monitoring, funding sources to implement and sustain it have not been easy to identify. Unlike local monitoring in which the decisions are immediate and the parties potentially affected are readily identifiable, regional monitoring is used for longer term strategic planning without a clear "responsible party." Implementing regional efforts through large, centrally-funded state/federal programs has proven difficult. The U.S. Environmental Protection Agency (EPA) Environmental Monitoring and Assessment Program (EMAP) attempted to design and implement a national-level monitoring program to assess the Nation’s environmental resources by building a series of regional monitoring programs throughout the country. This showed promise but proved too costly and succumbed to changing agency leadership. NOAA Status and Trends maintains a national program for monitoring marine waters, but the sample density is too low to make estimates of condition within an individual region, and budget reductions are eroding the program’s sampling frequency. State programs are even more subject to fluctuating funding and political pressures, and local governments are usually too small to finance or carry out large-scale regional monitoring programs.

An alternative approach for achieving regional monitoring is to integrate the monitoring efforts of discharge permittees regulated under the National Pollutant Discharge Elimination System (NPDES) program. Most NPDES discharge permits contain requirements to monitor ambient receiving waters. Individually, these programs are small and localized, typically directed towards assessing environmental effects at the end of a discharge pipe. Cumulatively, the monitoring effort can be substantial. In the southern California near shore marine environment, cost estimates for NPDES-permit mandated monitoring exceed $10 million annually, three times the value of federal and state government monitoring efforts combined (NRC 1990b).

Pooling of numerous NPDES programs to achieve a regional monitoring framework presents several challenges. Most NPDES monitoring is spatially limited and permittees must be flexible and receptive to spatial expansion of their programs beyond the borders of their outfall influence in order to achieve regional coverage. The indicators measured, the techniques by which they are measured and the quality assurance used in generating the data often differ among programs. Data management systems typically differ among programs, making data-sharing difficult. While these challenges exist, overcoming them has a potentially large reward.

One location in which these challenges have been overcome and NPDES programs are being used to form the backbone of a regional monitoring network is the Southern California Bight (SCB). Here we describe the program being employed in that area and discuss some of the factors that led to its success.

The Southern California Bight Pilot Project

The Southern California Bight Pilot Project (SCBPP) was a cooperative effort among twelve public agencies (Table 1) in which routine ambient compliance monitoring was redirected towards cooperative regional monitoring during the summer of 1994. Coordination of local compliance monitoring yielded a $4 million program that sampled 261 sites, using standardized methods, along the continental shelf between Point Conception and the United States/Mexico border (Figure 1). Measurements taken included water quality, sediment contamination, sediment toxicity, benthic infaunal condition, fish assemblages, fish tissue contaminant concentrations and the presence of marine debris.

Four primary factors led to the success of the SCBPP: 1) cooperation between the regulator and the discharger communities, 2) a commitment to cost-neutrality for the dischargers who participate, 3) a participatory management structure and 4) the presence of a neutral local, scientific organization to serve as a facilitator. First, cooperation of the regulator and discharger communities was forged through their mutual participation in the Southern California Coastal Water Research Project (SCCWRP) Authority. SCCWRP is a non-profit, local, marine research agency that is jointly administered by the four largest NPDES wastewater dischargers in the SCB and the five NPDES regulating agencies that oversee those dischargers. The need for regional monitoring was mutually agreed to in discussions before the SCCWRP Commission. The SCCWRP Commission, composed of senior management representatives from each participating agency, became a formal organizational body to receive, review and respond to the results of the monitoring plans. A major strength of the SCCWRP Commission in this role is that the recipients of that information have the authority to implement management actions in response to the project results.

Second, in order for NPDES dischargers to actively participate in the monitoring effort, they needed to be relieved of some of the burden of conducting their existing monitoring requirements under their permits. It would have been a significant financial and resource burden for them to conduct both permit-required ambient monitoring and regional monitoring. Therefore, NPDES dischargers were provided the opportunity to exchange a portion of their routine NPDES permit-required monitoring effort for participation in the regional monitoring program. The regulatory agencies' intent in allowing this flexibility was to allow participation at minimal incremental cost (i.e., cost-neutrality). The dischargers were asked to sample a larger spatial area and increase the number of stations sampled, which was accomplished in three ways. The first was to focus all sampling effort in a single season (summer), allowing reallocation of effort from other seasons towards the program. The second was to reduce replication and use that effort to expand the number of sites. The third was to eliminate stations from routine monitoring efforts that have historically provided little information. Each of these changes in the ambient monitoring programs was publicly noticed, heard at public hearings (with no public objection), and approved by the regulatory agencies.

While the goal of this exchange was to retain the same level of permit-required effort for participating dischargers, most participants indicated that there was an increased level of effort for regional monitoring. The additional effort was an increased investment of staff time to develop standardized methods and participate in interlaboratory calibration exercises to document that standardization had been achieved. All participants, however, felt that the increased knowledge and staff education gained through participation offset the extra cost of the time invested.

The third factor contributing to the project's success was a participatory management structure. Each organization had the opportunity for influencing project direction through participation in three levels of project management. The first was the Steering Committee, which was responsible for formulating the monitoring objectives (the questions to be answered by the study) and the sampling design to achieve those objectives. The Steering Committee was supported by a series of Technical Committees, each representing a specialized field of interest (e.g., benthic infauna, fish, sediment toxicity). The members of the technical committees were bench scientists who conducted the day-to-day work in their specialized field. They prepared the detailed plans for all the monitoring elements (including methods manuals, QA plans and database structure), conducted intercalibration exercises and provided the technical input into the monitoring plans. Both the Steering Committee and the Technical Committees reported to the SCCWRP Commission, bridging the gap between the scientific, technical staff and management. The committee members' collective scientific ideas and plans were brought before their management representatives in the SCCWRP Commission for discussion at the senior management level. This structure facilitated management decision-making based on strong technical input and recommendations. The final outcome was a regional monitoring program developed through consensus and input by participants at all management levels.

Lastly, SCCWRP staff were available to serve as coordinators for the project. Other participating organizations could not undertake many project activities, such as statistical design, database management and report preparation, within available resources. SCCWRP's staff provided the technical expertise and manpower to conduct such tasks, when necessary. Since SCCWRP is jointly administered by regulators and dischargers, their staff provided non-partisan credibility in project development and interpretation of results.

Benefits of the Project

Implementing the SCBPP had four primary benefits, two of which were generic to regional monitoring and two of which were specific to the cooperative mechanism used to achieve the program. The first benefit was to provide a much-needed assessment of the overall condition of the SCB. Most previous monitoring in the SCB was compliance-based and focused on assessing conditions around a select set of discharge outfalls; cumulatively, this monitoring covered less than 2% of the area in the Bight. Redirecting that monitoring provided information about regional status (e.g., the percent of area in the entire SCB that was subject to contaminant influence), spatial patterns of human influence, relative risk of contaminants among various habitat types and relative risk among types of stressors (e.g., which chemicals are most prevalent in SCB sediments). These types of assessments are necessary for regional planning and cannot be obtained when sampling is locally focused.

A second benefit of the SCBPP was a series of technical tools that could only be developed with regional data sets. For example, the project produced iron-normalization curves for the SCB, allowing distinction between natural and anthropogenic contributions of metals in sediments (Schiff and Weisberg 1998); developing such curves requires considerable data from sites far from human influence, which were not available when monitoring was focused on assessing conditions near points of human discharge. Similarly, the SCBPP data led to the development of the Benthic Response Index (BRI), a first attempt at marine biocriteria for Southern California (Bergen *et al*. 1998), which also requires considerable data from a variety of habitats.

A third benefit, which resulted from participation by the multiple organizations, was the development of a series of methods manuals containing standardized field, laboratory and data management approaches that increased comparability of data among participants, even after the SCBPP was

completed. The methods manuals were necessary to overcome differences in collection and processing techniques among programs and were accompanied by a series of intercalibration exercises to ensure data comparability. These manuals were produced by gleaning the most effective techniques from the procedures used by each participant. Intercalibration exercises provided the opportunity for cross-training and methodological improvement by all participants. In several cases, particularly for chemical measurements, it was not possible to agree on a uniform set of methods because of differences in instrumentation among participants. In these cases, performance-based criteria were established, with the intercalibration exercises serving as a means for ensuring adherence to the criteria.

For data management, the approach to comparability focused on standardized data transfer protocols. These protocols detailed the information to be submitted with each sample collection or processing element, the units and allowable values for each parameter and the order in which that information was to be submitted. Use of standardized data transfer protocols allowed each participating organization to retain their existing data management system, yet output the data in a manner that allowed sharing among organizations.

A fourth benefit of the project was an improved dialogue between regulators and dischargers on the goals of monitoring, the methods used to achieve it and the ways in which monitoring data should be interpreted. When these kinds of issues are discussed in the context of regulators asking dischargers how to cooperatively build a regional program, the discussions take on a more positive tone than when dischargers initiate the discussion with disagreement about methods required in the permit for their facility. One concern during the dialogue may be agreeing to employ the least precise or least expensive approach being used amongst the dischargers. However, we had the opposite experience. Many of the methods required in existing permits were outdated (e.g., requiring PCB aroclors rather than PCB congeners) and the open discussion that ensued from the cooperative project provided a forum for dischargers suggesting improved methods. By focusing first on which questions should be answered by a regional monitoring program, we were able to identify the methods that were appropriate to addressing those questions.

The Next Steps

Based on the success of the cooperative regional-scale monitoring begun during the SCBPP, the regulatory agencies are again willing to provide permit monitoring flexibility to more dischargers to conduct a similar effort in 1998. Whereas the offer for participation in the SCBPP was limited to the largest dischargers who were members of SCCWRP, the offer for participation in the 1998 Southern California Bight Regional Monitoring Project (Bight '98) was made to all NPDES permitted dischargers. Fifty organizations, including all of the participants from the 1994 SCBPP, have agreed to participate (Table 2).

The inclusion of new participants provides several benefits. The additional resources brought by new participants expands the number of habitats and indicators that can be sampled. Sampling for Bight '98 will include all of the areas sampled in 1994, plus a new focus on near shore habitats (bays, harbors and beaches) and offshore islands. More than 400 sites will be sampled for all of the parameters that were measured in 1994. The program will also add a shoreline microbiology component in which bacterial indicators will be measured to assess beach quality. While local health agencies are not under the jurisdiction of NPDES permitting agencies, the opportunity to redirect the large amounts of permit-required bacterial monitoring into a unified framework led to their participation in the project.

While we originally focused on NPDES permittees, expansion of the program led to participation by other new types of groups. One is researchers associated with universities or federal laboratories. Whereas addition of new dischargers to the program added resources for sampling more sites, addition of researchers added the expertise for adding more types of measurements. Most dischargers have field sampling and routine analytical capabilities, but do not have research capability. In contrast, most researchers have the abilities to add new types of measurements, but do not have the resources to sample at many sites or to gather the more routine chemical and biological parameters which may be an important part of interpreting the newer measures. Partnership between these groups leads to a more cost-effective program for everyone.

The second new type of participants is volunteer monitoring organizations, which currently are focusing primarily on the shoreline microbiology portion of the study. For the volunteers, the collaborative nature of the program provides the unique opportunity for technical interaction and integration with their professional counterparts, including participation in the intercalibration exercises and database development activities. For Bight '98, volunteer efforts will contribute more data, thereby improving the precision of our estimates. Connection with the volunteer programs will also provide a ready outlet for the project's reports and a public education vehicle.

Conclusion

The approach of integrating NPDES discharger monitoring into a regional monitoring design, as implemented in Southern California, will not necessarily work in all areas of the country. Its success requires a cooperative relationship between regulators and dischargers, which does not exist everywhere. It also requires a high density of NPDES permitted facilities to achieve an acceptable sample density. Fortunately, the areas of the country that are most in need of regional monitoring, those where cumulative impacts are likely to be important management considerations, are generally areas where numerous permitted facilities are located. Therefore, perhaps a similar approach, as the one we successfully implemented in the Southern California Bight, could be attempted in other areas and result in similar successes.

References

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Table 1. Participants in the Southern California Bight Pilot Project 1994

California State Water Resources Control Board	Santa Ana Regional Water Quality Control Board
City of Los Angeles, Bureau of Sanitation	Santa Monica Bay Restoration Project
City of San Diego, Department of Water Utilities	Southern California Coastal Water Research Project
County Sanitation Districts of Los Angeles County	U.S. Environmental Protection Agency, Office of Research and Development
County Sanitation Districts of Orange County	U.S. Environmental Protection Agency, Region IX
Los Angeles Regional Water Quality Control Board	
San Diego Regional Water Quality Control Board	

Table 2. Participants in the Southern California Bight Regional Monitoring Program 1998

Algalita Marine Research Foundation

Aliso Water Management Authority

Aquatic Bioassay and Consulting Laboratories

Center for Environmental Cooperation (CEC)

Central Coast Regional Water Quality Control Board

Channel Islands National Marine Sanctuary

Chevron USA Products Company

City of Long Beach

City of Los Angeles Environmental Monitoring Division

City of Los Angeles Stormwater Division

City of Oceanside

City of Oxnard

City of San Diego

City of Santa Barbara

City of Ventura

Columbia Analytical Services

Encina Wastewater Authority

Goleta Sanitation District

National Fisheries Institute of Mexico (SEMARNAP)

Orange County Environmental Health Division

Orange County Public Facilities and Resources

Orange County Sanitation District

San Diego County Dept. of Environmental Health

San Diego Interagency Water Quality Panel

San Diego Regional Water Quality Control Board

San Elijo Joint Powers Authority

Santa Ana Regional Water Quality Control Board

Santa Barbara County Health Service

Santa Monica Bay Restoration Project

Secretaria de Marina (Mexican Navy)

Southeast Regional Reclamation Authority

Southern California Coastal Water Research Project

Southern California Edison

Southern California Marine Institute

State Water Resources Control Board

Surfrider Foundation

University of California, Santa Barbara

University of Southern California, Wrigley Institute

Granite Canyon Marine Pollution Studies Lab Instituto de Investigacione, Oceanologicas (UABC) Los Angeles Department of Water and Power Los Angeles County Dept. of Beaches and Harbors Los Angeles County Dept. of Health Services Los Angeles Regional Water Quality Control Board Los Angeles County Sanitation Districts Marine Corps Base - Camp Pendleton	for Environmental Studies (WIES) U.S. EPA Region IX U.S. EPA Office of Research and Development U.S. Geological Survey U.S. Navy, Space and Naval Warfare Systems Center, San Diego