Learning *from* **Innovations** *in*
Environmental Protection

RESEARCH PAPER NUMBER 18

ENVIRONMENTAL GOVERNANCE in WATERSHEDS

THE IMPORTANCE OF COLLABORATION TO INSTITUTIONAL PERFORMANCE

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OCTOBER 2000

Prepared for the

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Learning *from* Innovations *in* Environmental Protection:

THE RESEARCH PAPERS

This report is one in a series of independent evaluations of innovations in environmental management commissioned by the National Academy of Public Administration's Center for the Economy and the Environment. The entire series is available at the Academy's website, www.napawash.org, and will be available in print in late 2000.

The U.S. Congress initiated this study in FY 1998 when it asked the Academy to undertake an independent evaluation of some of the most promising innovations in environmental management. A panel of Academy Fellows and other experts is guiding the project. The panel selected the research topics and researchers, and encouraged the researchers to offer their own findings and recommendations. The reports in this series are the work products of the research teams; neither the Academy nor the project panel endorses their findings and recommendations. The panel will use the research reports as a foundation for its own report and recommendations to Congress and the U.S. Environmental Protection Agency later this year.

The overall project is under the direction of DeWitt John and Richard A. Minard, Jr. The U.S. Environmental Protection Agency has funded the project through contract number 68-W-98-211.

ABOUT THE ACADEMY

The National Academy of Public Administration is an independent, nonprofit organization chartered by Congress to improve governance at all levels: local, regional, state, national, and international. The Academy's membership consists of 480 Fellows with distinguished careers in public management as practitioners, scholars, and civic leaders. Since its establishment in 1967, the Academy has assisted hundreds of federal agencies, congressional committees, state and local governments, civic organizations, and institutions overseas.

The Center for the Economy and the Environment undertakes projects that help build the capacity of the nation, states, regions, and communities to produce stronger economies, healthier ecosystems, and safer living and working environments.

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Executive Summary

The National Academy of Public Administration commissioned this study to determine whether watershed management is a useful tool for improving environmental conditions in a watershed. Specifically, the study examined whether watershed management programs can help federal, state, and local governments to effectively address complex environmental problems such as nonpoint source (NPS) pollution and habitat loss and degradation. To address that question, our study examined the efforts to improve the management of six watersheds:

- Delaware Inland Bays (DE)
- Narragansett Bay (RI, MA)
- Salt Ponds (RI)
- Lake Tahoe (CA, NV)
- Tampa Bay (FL)
- Tillamook Bay (OR)

The watersheds differ in physical environment, causes and nature of problems, jurisdictional complexity, and management history. Delaware Inland Bays, Narragansett Bay, Tampa Bay, and Tillamook Bay are part of the National Estuary Program (NEP) in the Environmental Protection Agency (EPA). Lake Tahoe is a federal-state compact. Salt Ponds is a federally approved coastal zone management program

Our perspective on watershed management differs somewhat from other researchers, practitioners, and government officials who assume that no watershed is "managed" without having some form of centralized watershed program. Frequently, these programs give heavy emphasis to science, planning, and the preparation of detailed management plans using some sort of participatory planning process. Our view is that every watershed is "managed" by a wide range of governmental and nongovernmental actors whose decisions influence the health and integrity of ecological systems. Watershed management programs should therefore focus on getting

this portfolio of actors and programs to work together more effectively. When viewed from this perspective, watershed management is a form of intergovernmental management (IGM) that is inherently strategic in nature. Watershed management will not be an effective strategy for addressing all environmental problems.

Our study went beyond examining the development and implementation of the six watershed management programs. Instead, it took into account the inherently intergovernmental nature of complex environmental problems such as NPS pollution by examining the individual and collective efforts of federal, state, and local government programs that "manage" each watershed, which we term a watershed management effort. Essentially, we evaluated whether the planning and implementation activities of the six watershed management programs led to improvements in environmental conditions, enhanced the governance of a watershed, or added public value in other ways. However, we were also interested in whether the watershed management programs served as a catalyst for other state and local government actions that provided similar public benefits. The watershed management efforts were then assessed using criteria developed by the Academy: risk reduction and the potential for short and long-term gains (i.e., environmental outcomes); cost-effectiveness; predictability of the process; certainty of effect; accountability; equity; and adaptability. Due to the complexity of the governance arrangements and the implementation efforts, we developed six detailed case studies that provide the basis for the comparative analysis contained in this report.

Strategies for Achieving Environmental Improvements

We concluded that participatory planning was an important strategy. Every program used it with varying degrees of success. Participatory planning efforts often focused on developing a common understanding of environmental problems, formulating shared priorities and common policies, and identifying appropriate implementation actions. Planning efforts also served as the catalyst for a series of direct (e.g., restoration projects, or infrastructure investment) and indirect (e.g., public education, changes in decision making, or new research) implementation activities undertaken by individual agencies, or as a collaboration among governmental and nongovernmental organizations.

The other dominant strategy was collaboration. We found a wide range of collaborative activities at the operational, policy-making, and institutional level. Many of the notable accomplishments of each watershed management effort were also the direct result of such cooperation. We found that collaboration enhanced the management capacity of state and local institutions to solve environmental problems. In four cases, this included developing new collaborative organizations. Delaware Inland Bays created the Center for the Island Bays; Lake Tahoe, the Tahoe Regional Planning Agency; Tampa Bay, the Tampa Bay Estuary Program; and Tillamook Bay, the Tillamook County Performance Partnership. These new organizations undertook implementation activities, improved the capacity for collaboration, and monitored implementation. The Salt Ponds developed a shared set of state and local zoning policies that helped develop capacity in state and local institutions. Narragansett Bay established a new program in the state environmental agency that improved its capacity for planning, collaboration, and implementation. In each case, this institutional infrastructure provided the foundation for future watershed management efforts.

Improving Environmental Conditions

We also attempted to determine whether the watershed management efforts improved environmental conditions, as well as their potential for short and long-term gains. Unfortunately, data on environmental conditions and implementation activities was often lacking and there were methodological problems associated with linking specific activities with environmental changes. Therefore, our analysis focused on efforts that had a potential for improving the environment. Examples included the development of new regulations, installation of best management practices (BMPs), habitat restoration and protection, planning, infrastructure investment, public education, and research targeted at improving decisionmaking. The particular pattern of activity varied based on the configuration of problems and institutions in each watershed.

We concluded that regulations helped minimize and control future problems from NPS pollution and prevented habitat loss and degradation. However, regulation was more limited with respect to its ability to restore degraded environmental conditions. Thus, many of the watershed management efforts relied on a wide range of non-regulatory activities. Through such regulatory and nonregulatory activities, each watershed management effort had notable accomplishments. They included:

- Delaware Inland Bays
  - Implementation during the Hydrologic Unit Area (HUA) program and the Inland Bays Recovery Initiative
  - Planning efforts leading to the development of a water-use plan, a TMDL, and ongoing efforts to develop tributary strategies
  - $158 million in sewer infrastructure and $13 million in land acquisition
  - Restoration project at James Farm

- Lake Tahoe
  - Growth controls in regional plan
  - Devolution of permitting to local governments
  - Joint federal legislative agenda
  - Development of $900 million environmental improvement program
  - A presidential summit

- Narragansett Bay
  - Greenwich Bay Initiative, including a $130 million bond referendum in the City of Warwick
  - Designation of whole state as "no discharge zone" for recreational boating
  - Hazardous waste reduction program

- Salt Ponds
  - Formulated shared zoning policies that reflect a tradeoff among sewers and onsite sewage disposal systems
  - Developed local environmental ordinances
  - Prevented development on undeveloped barrier beaches

- Tampa Bay
  - Binding commitments to nutrient reductions in an interlocal agreement
  - Five-year action plan containing to exceed stated habitat restoration and nutrient-reduction goals—the latter by 60 percent
  - Developed nutrient management consortium
  - Coordinated monitoring programs

- Tillamook Bay
  - Implementation efforts for best management practices on agricultural lands; more than $17.8 million in BMPs in the Tillamook State Forest
  - Development of the Tillamook Coastal Watershed Resource Center
  - Establishment of the Tillamook County Performance Partnership

We used other evaluative criteria provided by the Academy to gain a further understanding of the relative strengths and weaknesses of these efforts.

Findings and Recommendations

Our analysis produced a series of observations and findings, which we organized into two sections. The first reports our findings about the watershed management efforts. The second explores various EPA programs to determine the extent to which they supported, enhanced, or facilitated the development and implementation of the six watershed management efforts.

Developing and Implementing Watershed Management Programs

We organized the first set of findings and recommendations around the four stages of the planning process that had a prominent role in each case. However, this does not imply that watershed management efforts followed a linear sequential process. Planning activities were iterative in nature and implementation often began well before a "plan" was completed. In some cases, planning was an implementation activity. In others, implementation activities were loosely related to the plan's recommendations, although the planning effort may have been the catalyst for the actions. That said, however, there were common threads in all the efforts.

PROBLEM DEFINITION: THE ECOLOGY OF GOVERNANCE

Our first set of findings concern the definition of environmental problems. In all cases, the physical and institutional environment in which a watershed management effort developed influenced the selection of issues and how problems were defined, as well as the suite of policy instruments for improving environmental conditions. While it was important to understand how ecological systems function, it was equally important to understand "the ecology of governance". That is, the tradeoffs among environmental problems, and how institutions that address those problems function and interact with one another. The strong influence these contextual factors had also suggests that implementation priorities should be set at the state and local level.

CHARACTERIZING PROBLEMS: "NESTING" SCIENCE AND AGENDA SETTING

Our second group of findings concerned the characterization of environmental problems and the efforts to select management actions. In particular, we were interested in the role that

science and public participation played in those processes. We concluded that science must be "nested" in decisionmaking, not external to it. Our analysis revealed a need for better information on environmental conditions and implementation efforts. State and local officials need technical and financial assistance to improve data collection and integrate data management systems. We also concluded that it was important to develop a well-managed planning and decisionmaking process and identified several important differences between collaborative decision making and the type of rational, scientific analysis required by the Clean Water Act's (CWA's) total maximum daily loading (TMDL) requirements.

IMPLEMENTATION: AN EXERCISE IN ADVANCED GOVERNANCE

The third group of findings concerned the administration of watershed management efforts and implementation activities. We concluded that there was no substitute for a well-managed program. Issues such as program leadership, staffing and recruitment, personnel management, budgeting, contracting, and grants management all influenced the planning and implementation process. The administration of a watershed management effort proved to be a complex endeavor requiring a formidable set of professional skills to manage activities and coordinate intergovernmental relationships. In short, effective watershed management is an exercise in advanced governance. We also concluded that adequate resources (both staff and money) and flexibility in spending influenced the effectiveness of implementation efforts by helping public officials plan and budget with confidence. They allow state and local priorities to drive watershed management efforts, rather than the priorities and grant restrictions contained in federal grant programs. Adequate resources and flexibility also helped programs make the transition from project-level implementation using a set of loosely connected discrete projects that claim to advance general goals to a more systematic program that addressed specific problems using a set of integrated projects targeted at achieving specific goals.

In terms of implementation activities, demonstration projects were often used to formulate policy and encourage the implementation of new BMPs. However, they were often used ineffectively. We also concluded that there was a tendency for implementation activities in the four NEPs to rely on individual projects that were often loosely connected or failed to systematically address specific problems. This was particularly true when there was heavy reliance on federal grant programs where changing federal priorities, cost-share requirements, and grant restrictions influenced the type of implementation projects that occurred.

The danger inherent in the project-based approach is that projects may never amount to more than what some respondents referred to as "random acts of environmental kindness." Individual projects may provide small benefits, but the projects are too limited in scope, scale, magnitude, number, or duration to result in significant long-term environmental improvements. We concluded that prerequisites for making the transition from a project-based approach to a more systematic program included: a stable and flexible source of implementation funding; a set of collective goals and priorities; and the ability to monitor progress.

We also concluded that there were often unrealistic expectations about what could be accomplished given current funding levels, the pervasive nature of NPS problems, and existing institutional constraints such as the lack of flexibility and collaboration between existing NPS programs. It is important for policymakers, practitioners, and the public to recognize that many NPS problems are the result of the "tyranny of small decisions." Therefore, it may take a long series of incremental improvements to address them.

EVALUATION: THE IMPORTANCE OF PERFORMANCE MONITORING

The final set of findings concerned monitoring and evaluating the effectiveness of implementation efforts. We concluded that performance measures and tracking systems played an important role in encouraging a systematic approach to addressing specific NPS problems (e.g., nutrient loadings from stormwater runoff). While it was important to have good monitoring data on environmental conditions, it was equally important to have a system that monitors and integrates data on implementation activities on an ongoing and frequent basis. Data on implementation activities can help develop and reinforce peer-pressure systems that occur at the political, professional, and interpersonal level. We also concluded that it was important that watershed management efforts developed shared definitions of problems, priorities, policies, and expectations for implementation. Social norms proved to be an important component of the peer-pressure systems and provided additional incentives for action and created informal sanctions to enforce collaborative agreements.

EPA's Role in Watershed Management Efforts

In the Lake Tahoe and Salt Ponds cases, EPA played a small role, although the state environmental agencies were actively involved. The agency had a larger role in the other four watersheds through the NEP, but its role, and that of its state counterparts, varied considerably. Specifically, we examined the relationship of three related water quality programs, EPA's Section 319 NPS Program, the Clean Water State Revolving Fund (CWSRF) programs, and the Section 305(b) Monitoring Program, to each watershed management effort. We also considered the role of several EPA reinvention efforts such as Project XLC and the National Environmental Performance Partnership System (NEPPS), although these programs generally had only a limited role. In addition, we explored two of EPA's action-forcing mechanisms, the National Pollution Discharge Elimination System (NPDES) permits for stormwater, and TMDLs. While not designed to specifically evaluate these programs at the federal or state level, our analysis did consider the role they played in supporting or enhancing the watershed management efforts.

NATIONAL ESTUARY PROGRAM

The four watersheds in the NEP engaged in activities that had the potential for improving environmental conditions, enhancing watershed governance, and adding other forms of public value. Three programs (Delaware Inland Bays, Tampa Bay, and Tillamook Bay) developed innovative collaborative organizations to oversee the implementation of their Comprehensive Conservation and Management Plans (CCMPs). Narragansett Bay became a program in the Rhode Island Department of Environmental Management (RIDEM) and acts as a surrogate planning staff. This improved RIDEM's planning capacity and ability to lead and participate in other collaborative and stakeholder based efforts.

The analysis also identified several important policy issues. One concerns the role of the federal government and EPA in implementing a CCMP. EPA currently takes an active role in an estuary program's planning process and has detailed requirements for the planning process and a CCMP's approval, but no similar set of implementation requirements. Moreover, EPA only provides a modest implementation grant to maintain and support a small core staff and program office. Another issue is when an estuary program should end. The original partners are no longer implementing the Narragansett Bay CCMP and other estuary programs are increasingly facing a similar situation. EPA has no requirements to develop a new CCMP or a substitute document and does not actively intervene in requiring estuary programs to develop specific goals or perfor-

mance measures or to improve environmental and programmatic monitoring when it is lacking. Our analysis also questioned whether EPA should continue funding implementation efforts when there is no dedicated source of state or local matching funding or full time equivalents (FTEs).

RELATED WATER QUALITY PROGRAMS

A number of related EPA water quality programs also had some potential to enhance the six watershed management efforts.

The importance of the EPA's Section 319 NPS Management Program varied across our cases. While some Section 319 funding was targeted at problems in each watershed, the program had a limited role in the Salt Ponds, Lake Tahoe, and Tampa Bay. Our respondents were critical of several aspects of the program, particularly of its funding of discrete projects rather than systematically addressing specific problems. Others complained that the priorities and grant award procedures changed frequently and when combined with the competitive aspect of the program made it difficult for grant applicants at the local level to plan and budget with confidence. Numerous respondents criticized the program's administration, which involves a review of the individual projects in annual state-agency work plans by EPA, as cumbersome and inefficient. Many state and local respondents also thought that EPA should provide them with more flexibility and control over funding decisions.

The CWSRF program had a limited role in the six efforts, despite the fact that it can be an important source of water pollution control funding. In terms of point sources, respondents in the Delaware Inland Bays reported a preference for seeking funding under USDA's Rural Utility Service rather than the CWSRF because the former has a 40-year payback period while the latter has a 20-year period. While the EPA promotes the use of the CWSRF as a major funding source for NPS projects, it generally was not a major source of funding in our case studies. Local officials typically reported that the cost of projects was often too small to warrant financing them and instead included the projects in local capital improvement programs (CIPs). Others noted the need for a return revenue stream, which simply does not exist in many cases. The CWSRF appears to be most useful in providing low-interest loans to landowners or business owners seeking to reduce nonpoint sources. Even then, state officials must process a large number of small loans. That, of course, has the potential to significantly increase the transaction costs associated with the program. Thus, we concluded that Congress and EPA should consider separating the CWSRF into two programs, one focused on point sources and one on nonpoint sources. Such specialization could improve customer service, allow for specialization that could reduce transaction costs, and better address the specific issues related to point and NPS projects.

The state Section 305(b) Monitoring Programs were relatively uninvolved in the watershed management efforts. There are many problems with the quality of existing water quality data that the reports are based upon. Many respondents also reported that they did not find the information contained in the reports to be particularly useful. Perhaps more troubling is that the program is oriented towards preparing information for EPA's consumption, rather than providing information in a form useful to state and local decisionmakers. While some data must be collected to comply with CWA requirements and other mandates, we believe that it is imperative that the program be oriented towards collecting data and presenting it in a manner useful to state and local decisionmakers.

EPA REINVENTION ACTIVITIES

Only one case, Tampa Bay, explored using Project XLC as a means of implementing part of its CCMP. It withdrew its application when it determined that the project offered no more

flexibility than existing programs. Moreover, the monitoring, reporting, and other administrative requirements would have increased transaction costs.

NEPPS also played a minor role in the four estuary program cases. Some respondents reported that NEPPS was limited by being only a small part of a state agency's overall budget and by the fact that most EPA funding is allocated to FTEs, which limited the flexibility to undertake new initiatives. Neither did respondents view performance partnership agreements (PPAs) or performance partnership grants (PPGs) as having the ability to significantly increase flexibility in NPS implementation funding. Some respondents also noted that NEPPS had an effect on the power structure within their state environmental agencies. NEPPS centralized budgeting at the upper levels of the agency, which gives top officials more control over the activities of individual programs. Thus, some lower-level managers worried that their funding will be reduced while EPA continues to hold them accountable for the same or increased levels of activity. Another potential danger is illustrated in Rhode Island where the estuary program is located in RIDEM. In this situation, EPA implementation funding could be included in NEPPS. The NBEP, which already has no state support, would then have to compete, possibly with other state watershed management initiatives, to regain its funding. On the other hand, what state officials liked about NEPPS was that they no longer had to worry about being audited and having EPA discover that funding from one program was diverted to another program.

EPA'S ACTION-FORCING MECHANISMS

While the base of experience with the NPDES program was too narrow to offer specific recommendations, we did make some observations. NPDES permits for stormwater in Tampa Bay appeared to improve the capacity for managing stormwater at the local level and helped develop new funding mechanisms. EPA requirements were also reported to have stimulated additional expenditures on stormwater improvements. However, the NPDES permit process and EPA's administration of the program was a source of frustration to many respondents.

The relationship with the TMDL program was much broader and more controversial. The vast majority of respondents reported that the TMDL approach was effective and appropriate for addressing point source discharges. However, the same respondents did not believe that the TMDL approach would be effective in addressing NPS problems. They were also concerned about the trend towards using a regulatory approach to address NPS problems, with almost all respondents believing that collaborative and voluntary approaches were more effective. Our data suggests reasons to doubt whether EPA's proposed TMDL regulations would be more effective in addressing NPS problems than current programs, particularly if similar political will and resources are exerted in TMDL efforts.

One problem with the TMDL approach is that it is inconsistent with the collaborative approach described in this report. Implementation research also suggests that the top-down approach embodied in the TMDL process is likely to be less effective in addressing NPS problems than the bottom-up approach exemplified by the collaborative process. Moreover, the overall costs of implementing the 20,000 TMDLs required by the proposed regulations could dwarf those of the construction grants program and CWSRF.

Additional challenges complicate the proposed TMDL efforts. On the technical side, water quality data is lacking and many computer models are sensitive to small changes in the numerous assumptions embedded in them. Many state water quality standards for NPS pollutants (e.g., nutrients) are qualitative and it is often unclear what numeric criteria should be used in the models. It was also clear that few respondents understood the technical side TMDLs or were conversant with their limitations. Others were critical of the whole process noting that it is

expensive, technically demanding, time consuming, and often unnecessary. Some suggested skipping the modeling and developing implementation plans since the limited range of policy options to address the problems is often known.

On the governance side, there are also significant challenges. Much of the technical work is contracted out and there is clearly a need to develop this capacity within state environmental agencies. Developing 20,000 TMDLs is going to require a huge increase in EPA and state staff. State agencies may have difficulty recruiting staff with the technical skills to undertake modeling, the policy skills to develop implementation plans, and the political skills to obtain "reasonable assurances" that TMDLs are implemented. EPA may also have trouble reallocating existing staff given the technical demands of TMDLs and will have to recruit new staff.

The proposed TMDL regulations may also outstrip the current capacity of the environmental governance system, particularly if state environmental agencies want to incorporate stakeholder involvement. Public agencies and NGOs may lack the slack resources necessary to effectively participate in these efforts. The proposed TMDL efforts also have the potential to generate significant political conflict that will increase the transaction costs associated with developing 20,000 implementation plans. The efforts also have the potential to destroy important sources of social capital inherent in collaborative management efforts.

Another potential problem is that the combination of tight time constraints, limited resources, poor data, nonexistent research on specific water bodies, the lack of customized computer models, limited implementation funding, variations in state and local capacity, political opposition suggest that it is unlikely that the TMDL approach will be effective in all 20,000 water bodies. Our concern is that the whole effort could quickly devolve into a "cookie-cutter" approach that focuses on simply satisfying EPA regulations and that implementation plans will not be implemented. While some may view the preparation of TMDLs as progress, it also has the potential to generate significant conflict and consume a vast amount of resources that could be allocated more effectively to address NPS problems.

These concerns combined with the rather limited base of state experience with developing and implementing TMDLs, particularly when compared to the scope of what is required in the proposed regulations, suggest that the adoption of the proposed regulations is inappropriate at this point in time. We believe a more humble approach is in order; one that recognizes little is known about where the TMDL approach will be effective given the wide range of pollutants, sources of problems, contextual situations, variability in state and local capacity, and differences in governance arrangements. Rather than being halfway through implementing the regulations before learning these lessons, we believe the EPA should take a more adaptive approach, one that emphasizes experimentation, learning, and capacity building.

Recommendations

Watershed management efforts can stimulate the individual and collaborative implementation activities necessary to improve environmental conditions. However, the federal approach to NPS pollution and habitat loss and degradation is fragmented. It does not encourage collaboration among federal agencies, or with state and local entities. Not only does it lack an overarching set of specific goals, it actually encourages discrete and loosely connected projects. Our analysis of these and other problems resulted in a series of recommended actions by the president, Congress, and EPA. The following sections contain selected recommendations while a complete list of recommendations can be found in the final report.

President

- The president should sign an executive order directing all federal agencies to participate in and cooperate with state and local watershed management efforts to the full extent allowed under current law. The order should allow federal agencies to enter into relationships with collaborative organizations for the express purpose of improving environmental conditions. It should also require that the goals, policies, and priorities of a state and local watershed management efforts should override those of a federal agency, to the maximum extent allowed by law. The executive order should ensure that the priorities of federal NPS grant programs should reflect the priorities of state and local governments. It should also direct agencies to support efforts to build the capacity of state and local governments to address environmental to the greatest extent allowed under current law.

- The president, Congress, and EPA should limit the use of the budget process and executive action (e.g., CWAP) to create new watershed management efforts that are not debated, have no enabling legislation, have unclear linkages to existing federal, state, and local programs, and require state and local government action by linking the program to existing federal funding.

Congress

- Congress and EPA should examine whether the current organization of EPA and its regional offices is an effective implementation structure with respect to addressing NPS water quality problems. Congress and EPA should consider adopting an organizational structure similar to the USDA's system of state and local offices.

- Congress should amend the CWA to clarify when water quality problems should be addressed subjectively and collaboratively (e.g., the NEP) and when they should be addressed objectively (e.g., TMDLs). The two approaches are inconsistent and are likely to be used in the same water bodies (e.g., waters are on state Section 303(d) lists).

- Congress should combine federal NPS control funding and create a flexible categorical grant program for state governments in accordance with previous recommendations on flexible categorical grants offered by the ACIR. The flexible categorical grant program should allow funding decisions to be driven primarily by state and local priorities.

- Congress should consider making changes to the IRS code such as tax credits and changes in depreciation schedules to encourage landowners to voluntarily install BMPs.

- Congress and EPA should create a modern version of the Conservation Corps in conjunction with either a program such as AmeriCorps or a university-based service-learning program. The effort should be designed to provide a source of volunteers to support environmental monitoring and habitat restoration efforts. In the absence of adopting the proposal, EPA should make even greater use of volunteers and volunteer organizations to support the development and implementation of watershed management programs

- Congress should revise the NEP and other federal watershed planning efforts to allocate planning and implementation funding over multiyear periods to improve the ability of the programs to plan and budget with confidence and to provide job security. EPA should make greater use of its ability to award grants over two-year project and budget periods.
- Congress should amend Section 320 of the Clean Water Act to eliminate the requirement that only water quality and living resource issues are addressed in order to provide the estuary programs with greater flexibility to address interrelated issues (e.g., land use, economic development, tourism, user conflicts).

Environmental Protection Agency

- EPA should require that all research reports be available on the Internet. The agency should provide financial or other incentives for programs like the NEP to make old technical reports and other work products available as well. To build information technology capacity of those programs, the work should not be contracted out.
- EPA should make greater use of staff details and IPAs in the NEP and other programs (e.g., Section 319, TMDLs, CWSRF) to improve the training of federal, state, and local officials involved in watershed management efforts. EPA should encourage the development of mentoring programs for staff involved in place-based management efforts to improve staff development.
- EPA should develop model state enabling legislation based on Chapter 163 of the Florida Statutes that enables the creation of an independent alliance of governmental entities. The agency should work with other organizations (e.g., ACIR, National Governors Association) to encourage states to adopt similar legislation to address environmental and other social problems.
- EPA should require that all policy-formulating demonstration projects that are funded result in a technical report that is available on the Internet. The reports should explicitly allow practitioners to replicate projects and provide the data necessary to make an informed judgment of a project's effectiveness in a particular contextual situation. EPA should require a long-term tracking system and diffusion strategy for all policy-implementing demonstrations. It should also periodically evaluate the effectiveness of these efforts.
- EPA should remove the Index of Watershed Indicators from the Internet until it no longer contains or provides misleading data. EPA should reconsider what the goal of this information is, who the client is, and whether it is even possible to provide the information in an accurate, meaningful, and useful way.

National Estuary Program

- EPA should no longer provide implementation funds to any estuary program that fails to consistently provide a dedicated source of implementation funding in the form of cash or FTEs to match federal implementation grants pursuant to Section 320.

- Congress should revise Section 320 of the CWA (i.e., the NEP) to include provisions that provide at least five years of implementation funding. EPA should change its policies and allow estuary programs with outdated CCMPs or programs lacking specific goals and performance measures to reconvene a management conference provided that they form a collaborative organization (as defined in this report) and develop an updated management plan that is strategic in focus, contains performance measures, and relies on a system to monitor environmental improvements and implementation activity.

- EPA should require estuary programs to use performance-monitoring systems that link environmental, programmatic, and social data in order to evaluate progress towards specific goals and targets. EPA should require the estuary programs that lack detailed performance measures and systems to track environmental and programmatic data to develop them.

- EPA should require all future estuary programs to be developed and implemented by collaborative organizations (as defined in this report) and require performance measures and a tracking system that links data on environmental conditions, implementation activities, and social conditions. The agency should amend the NEP's guidance for submitting a governor's nomination to ensure that nominations are submitted by a collaborative organization and that there is public participation in its development.

- The NEP should form a working group with the Association of National Estuary Programs to identify unnecessary and burdensome administrative requirements and reporting procedures and to identify ways to increase flexibility for individual estuary programs in the development and implementation of their CCMPs.

- Congress and EPA should consider whether it is appropriate to develop GPRA measures for a program like the NEP, which is designed to be context-specific and reflect differing state and local priorities, not a standard set of federal priorities. If EPA's position is that CCMP implementation is primarily a state and local responsibility then GPRA measures appear to be inappropriate. At a minimum, EPA should take the steps necessary to ensure that any GPRA performance measures that are adopted for the NEP will not create perverse incentives for estuary programs.

Section 319 Nonpoint Source Management Program

- The Section 319 program and other associated CWA reporting requirements should be revised to emphasize long-term gains and changes in specific problems rather than short-term accomplishments. The reporting requirements should also reflect the fact that gains will often occur as a result of a series of small projects yielding cumulative benefits. Such action should reduce the administrative costs associated with EPA's approval of annual work plans and increase funding available to state and local officials. Applicable goals and timelines in the CWA should be revised to reflect the fact that may take a decade or more to observe the outcomes of some NPS control efforts.

- EPA should revise the Section 319 program to reduce administrative costs, increase flexibility in the program's design and administration, and emphasize state and local priorities. It should authorize multi-year grant allocations and increase the range of

potential projects that can be funded. The emphasis of the revised program should be on systematically solving problems and not funding discrete unconnected projects. EPA headquarters officials should be removed from the review of annual work plans. EPA regional offices should switch their emphasis from reviewing the projects contained in annual work plans to holding states accountable for their ability to address specific environmental problems. States should be given greater latitude in setting priorities and funding projects if they adopt the aforementioned performance measures. States should also have the authority to delegate the authority to award Section 319 grants to regional entities providing they have adopted performance measures and have the ability to document progress towards addressing specific problems.

Clean Water State Revolving Fund

- Congress should amend the CWA to change the payback schedule in the CWSRF Program should be changed to 30 years for some types of communities to reduce user fees in small, rural, and low-income communities.
- Congress should create a separate CWSRF program designed specifically to provide low interest loans to business and landowners to install BMPs and conduct other NPS and habitat restoration projects. Congress should encourage states to devolve this program to other local or regional entities such as regional planning agencies, conservation districts, county governments, or banks. As an added incentive to participate in the program and to install BMPs (or become engaged in other activities), Congress should consider amending the IRS code to make all or part of the interest payments tax deductible for eligible landowners.

Section 305(b) Water Quality Monitoring Program

- Congress should create an environmental quality monitoring program to replace the Section 305(b) report. Its primary focus should be to provide information that is more useful to state and local decisionmakers. It should take full advantage of GIS, the Internet, GPS, and other new technology. It should also link environmental, social, and performance monitoring data. States should be given the flexibility to determine how the data system will be developed and organized in accordance with accepted federal data standards. States should be encouraged to use the most detailed spatial scale possible in order to serve the maximum number of users.
- Until the new monitoring system is in place, EPA should improve its preparation of the Section 305(b) reports. In recent years, the focus has been on putting the documents in a form that is more accessible to the general public. However, the documents need to provide a more detailed explanation about how the data was collected and what their limitations are. Future Section 305(b) reports should explain how the data was collected, what the quality of the data is, how many monitoring stations were used to make the judgments, and explain how the non-monitored waters were actually assessed. The documents should clearly articulate how the data from assessed waters was linked to specific pollutants and sources and the degree of certainty attached to these determina-

tions. Congress should also encourage the development of a real-time monitoring system and forgo the preparation of biennial reports.

- Congress should appropriate additional funding to support state water quality monitoring efforts and the Section 305(b) program.

Total Maximum Daily Loading Regulations

- EPA should postpone promulgating its proposed TMDL regulations. Congress should impose a temporary moratorium on new TMDL lawsuits pending the promulgation of new regulations. EPA and state environmental agencies should then begin an aggressive effort to experiment with the development of TMDLs and implementation plans such as those contained in the proposed regulations. The "experiments" should be done for: point and nonpoint sources; listed and non-listed waters (i.e., explore its ability to be used proactively); different pollutants; different scales (e.g., stream segments, sub-basins, and larger watersheds); qualitative and numeric state water quality standards; areas where social capital exists (e.g., areas with established watershed councils or programs) and does not exist; areas where data exists and does not exist; explore the usefulness of a variety of modeling procedures; and explore different approaches to developing implementation plans that include "reasonable assurances." EPA should then commission independent researchers to evaluate and compare these efforts to gain a better understanding of the strengths and weaknesses of the TMDL approach, where it is most useful, the costs of developing and implementing the TMDLs, and the capacity needs of state environmental agencies. The revised regulations should reflect those lessons. Congress should then amend the CWA and modify the applicability of the TMDL requirements based on these lessons.

- In formulating revised TMDL regulations, EPA should provide additional flexibility for waiving the requirements if state and local officials are engaged in collaborative efforts that address NPS problems provided that the efforts develop specific goals and take actions designed to systematically address these problems. The programs should also have a monitoring system to evaluate progress towards the performance measures. That would provide an incentive to state to expand watershed management efforts that address point and NPS pollution.

- EPA should require that all future estuary programs develop TMDLs for point sources of pollution as part of their planning process. While EPA is experimenting with TMDLs in the manner noted above, EPA should use estuary programs as laboratories to experiment with different types of TMDLs for point and NPS pollutants.

Glossary of Acronyms

ABM	Agency on Bay Management
ACIR	Advisory Committee on Intergovernmental Relations
ANEP	Association of National Estuary Programs
APC	Advisory Planning Commission
AWT	Advanced Waste Treatment
BBP	Buzzards Bay Project
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management, DOI
BMP	Best Management Practice
CAC	Citizen Advisory Committee
CAFO	Combined Animal Facility Operations
CARE	Comprehensive Agricultural Restoration Effort (DE)
CARL	Conservation and Recreational Land (FL)
CBW	Consensus Building Workshop
CCMP	Comprehensive Conservation and Management Plan
CDBG	Community Development Block Grant
CES	Cooperative Extension System
CIB	Center for the Inland Bays
CIP	Capital Improvement Program
CMB	Coastal Management Branch
CNPCP	Coastal Nonpoint Pollution Control Program (Section 6217 of CZARA)
COE	Army Corps of Engineers, United States
CRC	Coastal Resources Center, University of Rhode Island
CRMC	Coastal Resources Management Council
CSO	Combined Sewer Overflow
CTS	Coordinated Transit System
CWA	Clean Water Act
CWAP	Clean Water Action Plan
CWSRF	Clean Water State Revolving Fund
CZARA	1990 Coastal Zone Act Reauthorization Amendments
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DDA	Delaware Department of Agriculture
DEQ	Oregon Department of Environmental Quality
DIBEP	Delaware Inland Bays Estuary Program
DNREC	Department of Natural Resources and Environmental Control
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior, United States
DOT	Department of Transportation
EDCTC	Economic Development Council of Tillamook County
EIP	Environmental Improvement Program

EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPC	Environmental Protection Commission of Hillsborough County
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FTE	Full Time Equivalent
FWPCA	Federal Water Pollution Control Administration
FY	Fiscal Year
GBI	Greenwich Bay Initiative
GIS	Geographic Information System
GPRA	Government Performance and Results Act
GPS	Global Positioning System
HMP	Harbor Management Plan
HUA	Hydrologic Unit Area
HUC	Hydrologic Unit Code
HUD	Housing and Urban Development
IAD	Institutional Analysis and Development
IBRI	Inland Bays Recovery Initiative
IGM	Intergovernmental Management
ION	Interorganizational Network
IPA	Interpersonnel Agreement
IPES	Individual Parcel Evaluation System
IRS	Internal Revenue Service
LTBMU	Lake Tahoe Basin Management Unit
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
MSA	Metropolitan Statistical Area
MTBE	Methyl Tertiary-Butyl Ether
NASA	National Aeronautics and Space Administration
NBEP	Narragansett Bay Estuary Program
NBP	Narragansett Bay Project
NDEP	Nevada Department of Environmental Protection
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NEPPS	National Environmental Performance Partnership System
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPR	National Performance Review
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service, USDA
NSF	National Science Foundation
ODA	Oregon Department of Agriculture

ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OECA	Office of Enforcement and Compliance Assurance, EPA
ONRW	Outstanding Natural Resource Water
ORD	Office of Research and Development, EPA
OSDS	Onsite Sewage Disposal System
OWEB	Oregon Watershed Enhancement Board
OWOW	Office of Wetlands, Oceans, and Watersheds, EPA
PPA	Performance Partnership Agreement
PPG	Performance Partnership Grant
QA/QC	Quality Assurance/Quality Control
RAMP	Florida West Coast Regional Ambient Monitoring Program
RCWP	Rural Clean Water Program
RICRMP	Rhode Island Coastal Resources Management Program
RIDEM	Rhode Island Department of Environmental Management
RIDOP	Rhode Island Department of Administration, Division of Planning
SAMP	Salt Ponds Special Area Management Plan
SCAT	Sussex County Association of Towns
SCD	Soil Conservation District, Sussex County (DE)
SEZ	Stream Environment Zone
SGP	Sea Grant Program
SMA	Statistical Metropolitan Area
STAC	Science and Technical Advisory Committee
SWCD	Soil and Water Conservation District, Tillamook County
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management (plan)
TBCC	Tillamook Bay Community College
TBEP	Tampa Bay Estuary Program
TBNEP	Tillamook Bay National Estuary Program
TBRPC	Tampa Bay Regional Planning Council
TCCA	Tillamook County Creamery Association
TCPP	Tillamook County Performance Partnership
TCWRC	Tillamook Coastal Watershed Resource Center
TDR	Transferable Development Rights
TMDL	Total Maximum Daily Loading
TRPA	Tahoe Regional Planning Agency
URI	University of Rhode Island
USDA	United States Department of Agriculture
USFS	United States Forest Service, USDA
USFWS	United States Fish and Wildlife Service, DOI
USGS	United States Geological Survey
VMT	Vehicle Miles Traveled
WBI	Whole Basin Initiative (DE)
WQC	Water Quality Certification
WRAS	Watershed Restoration and Action Strategy
XLC	eXcellence and Leadership in Communities

CHAPTER 1

Introduction

The National Academy of Public Administration commissioned this study to determine if watershed management can help the existing collection of federal, state, and local government programs improve environmental conditions. To address this question, our study examined the watershed management efforts in six watersheds:

- Delaware Inland Bays (DE)
- Narragansett Bay (RI, MA)
- Salt Ponds (RI)
- Lake Tahoe (CA, NV)
- Tampa Bay (FL)
- Tillamook Bay (OR)

The watersheds differ in terms of their particular physical environment, the nature and causes of problems, jurisdictional complexity, and their history of watershed management efforts. Each watershed also had a specific government program designed to coordinate and enhance the efforts of the myriad of governmental and nongovernmental actors that "manage" the watershed:

- Delaware Inland Bays Estuary Program
- Narragansett Bay Estuary Program
- Salt Ponds Special Area Management Plan
- Tahoe Regional Planning Agency
- Tampa Bay Estuary Program
- Tillamook Bay National Estuary Program

The programs in Delaware Inland Bays, Narragansett Bay, Tampa Bay, and Tillamook Bay are part of the Environmental Protection Agency's National Estuary Program (NEP); Lake Tahoe is a federal-state compact; and Salt Ponds is a special area management Plan (SAMP) and part of the state's federally approved coastal zone management (CZM) program. Even though four programs were part of the NEP, there were some major differences in their efforts because of the nature of the problems, the mix of actors, the rules governing decisionmaking, and the policy tools and implementation structures used to improve environmental conditions.

Our analysis of the six watershed management efforts was guided by a perspective that differs somewhat from that of many researchers, practitioners, and government officials. The usual tendency is to assume that no watershed is "managed" without having some form of centralized watershed program that often emphasizes science, planning, and the preparation of detailed management plans using some sort of participatory planning process. Our view is that by definition, every watershed is currently "managed" in some way by a wide range of governmental and nongovernmental actors, whose decisions influence the health and integrity of ecological systems. Watershed management programs should therefore be an attempt to get that portfolio of actors and programs to work together more effectively to improve the governance of a watershed. As a result, the programs should focus considerable effort on building, managing and maintaining collaborative relationships that facilitate the direct (e.g., restoration projects, or infrastructure investment) and indirect (e.g., public education, changed decisionmaking, research) actions necessary to improve environmental conditions. Viewed from that perspective, watershed management is a form of intergovernmental management (IGM) that is inherently strategic in nature. Thus, it is simply one of many possible strategies and will not be effective in addressing all environmental problems.

The unit of analysis is broader than simply examining the development and implementation of the six watershed management programs. Instead, it reflects the inherently intergovernmental nature of complex environmental problems such as nonpoint source (NPS) and habitat loss and degradation by examining the individual and collective efforts of the pattern of federal, state, and local programs that "manage" each watershed, which we term a watershed management effort. We then examined the extent to which the watershed management program improved the capacity of the collection of actors to address problems and whether the program stimulated the direct and indirect actions necessary to improve environmental conditions or add other forms of public value. The complexity of the governance arrangements and implementation efforts in each watershed required developing detailed case studies that examined the:

- nature of the ecological system and the problems confronting practitioners
- history of previous watershed planning efforts
- institutional framework of programs that address problems due to NPS and habitat and loss and degradation
- planning process used to develop the management plan or regulatory program
- implementation structure used to oversee the program's implementation
- progress made to improve the governance of the watershed

Each watershed management effort was then assessed using evaluative criteria developed by the Academy. Our analysis is summarized in this report and is discussed in greater detail in the six supporting technical reports. This report also presents the results the comparative cross-case analysis of the watershed management efforts based on the following research questions:

- What strategies and activities were used to improve environmental conditions and enhance the governance of a watershed?
- Did the watershed management efforts improve environmental conditions or stimulate other direct and indirect activities that had some potential to improve environmental conditions or add other forms of public value?
- What role did various EPA programs identified by the Academy have in each watershed management effort?

Essentially, we evaluated whether the planning and implementation activities of the six watershed management programs led to improvements in environmental conditions, enhanced governance of a watershed, or added some other form of public value. We were also interested in whether the watershed management programs served as catalysts for other state and local government actions that provided similar public benefits.

We first examined the strategies used to improve environmental conditions, enhance the governance of a watershed, or add other forms of public value. We concluded that participatory planning was an important strategy. Every watershed used at least one participatory process with varying degrees of success. The efforts also served as catalysts for a series of implementation activities that included direct and indirect actions involving regulatory and nonregulatory activities. The other dominant strategy was collaboration. Our analysis revealed a wide range of collaborative activity at the operational, policymaking, and institutional level and many of the notable accomplishments of each watershed management effort were the direct result of collaborative activity. The importance of participatory planning and collaboration is likely due to the inherently intergovernmental in nature of problems such as NPS and habitat loss and degradation.[1] The other strategy was enhancing the capacity of state and local institutions to address environmental problems. Each watershed management effort demonstrated some success in this regard.

It proved to be more difficult to answer the second question directly and determine whether each watershed management effort improved environmental conditions. The lack of good environmental monitoring data, along with other methodological problems, made it difficult to link changes in environmental conditions to the activities of a watershed management effort. Therefore, much of our analysis focused on identifying those activities that offered some promise of improving environmental conditions, enhancing the governance of a watershed, or adding other forms of public value. These included actions taken individually or collaboratively such as the construction of sewers, installation of best management practices (BMPs), and habitat restoration projects that offered some promise of benefits resulting directly from the activity. It also included actions that provided benefits in an indirect fashion such as new planning efforts, regulatory requirements, or other policy changes designed to minimize the impacts of future activities. In addition, it included educational efforts targeted at changing behavior, as well research leading to the development of more effective policies or programs.

We concluded that each watershed management effort resulted in at least some direct and indirect activity that improved environmental conditions, enhanced watershed governance, or

added public value. The particular mix of regulatory and nonregulatory activities varied by watershed based on the unique configuration of problems and state and local institutions. We also examined the potential for short- and long-term gains associated with each watershed management effort. We then applied other evaluative criteria developed by the Academy to examine the cost-effectiveness, predictability of the process, certainty of effect, accountability, equity, adaptability, and capacity building of each program.

Our analysis of the first two research questions produced a set of findings and recommendations that were loosely organized around the four basic stages of the planning process that had a prominent role in the watershed management efforts. Hat is not, however, meant to imply that watershed management follows a linear sequential process. Planning activities tend to be iterative in nature and implementation efforts often begin well before a "plan" is completed. In some cases, participatory planning was an implementation activity. In other cases, implementation activities were loosely related to the recommendations in a management plan, although the planning effort may have been the catalyst for the actions.

The first group of findings concerns the definition of environmental problems. The physical and institutional environment in which a watershed management effort developed influenced the selection of issues, how problems were defined, and the collection of policy instruments for improving environmental conditions. The analysis suggests that while it was important to understand how ecological systems function, it was equally important to understand "the ecology of governance." That is, the tradeoffs among environmental problems and how institutions that address these problems function and interact with one another. The strong influence contextual factors have on watershed management efforts also suggests that implementation priorities should be set at the state and local level rather than at the federal level.

The second group of findings concerned efforts to characterize environmental problems in order to select management actions, as well as the role that science and public participation played in the processes. We concluded that science must be "nested" in a decisionmaking process. Scientific research is of little use to decisionmakers if the information provided is not salient to them. But we also found that scientific research will rarely tell decisionmakers what to do. Instead, scientific research provides information that informs decisionmakers. Our analysis revealed that better information on environmental conditions and implementation efforts was needed. State and local officials need technical and financial assistance to improve data collection and integrate data management systems. Watershed management efforts also gave high importance to public participation, but the role of public and stakeholder involvement varied. We also concluded that it was important to develop a well-managed planning and decisionmaking process and identified several important differences between collaborative decisionmaking and the type of rational, scientific analysis required by the CWA's TMDL requirements.

The third group of findings concerned the administration of watershed management efforts and implementation activities. We concluded that there was no substitute for a well-managed effort. Issues such as program leadership, staffing and recruitment, personnel management, budgeting, contracting, and grants management often emerged as factors that influenced the planning and implementation process. The administration of a watershed management effort proved to be a complex endeavor requiring a formidable set of professional skills to manage activities and coordinate intergovernmental relationships. In short, effective watershed management is an exercise in advanced governance. We also concluded that adequate resources (e.g., staff, money) and flexibility in spending influenced the effectiveness of implementation efforts by helping public officials plan and budget with confidence. This allowed state and local priorities to drive watershed management efforts rather than the priorities and

grant restrictions contained in federal grant programs. It also helped programs make the transition from project-level implementation (i.e., a set of loosely –connected discrete projects that advance general goals) to a more systematic program that addressed specific problems (i.e., a set of integrated projects targeted at achieving specific goals).

In terms of implementation activities, demonstration projects were often used during a planning process to formulate policy and encourage the implementation of BMPs. Unfortunately, we found that demonstration projects were often used ineffectively. The analysis also concluded that there was a tendency for implementation activities to rely on individual projects that were often loosely connected or failed to systematically address problems. This appeared to be particularly true when there was heavy reliance on federal grant programs where changing federal priorities, cost-share requirements, and grant restrictions heavily influence the types of implementation projects that occur. The danger inherent in the project-based approach is that over the long-term, projects may never amount to more than what some respondents in Tillamook Bay referred to as "random acts of environmental kindness." Individual projects may offer benefits, but they focus on different problems in different subbasins and are too limited in scope, scale, magnitude, number, or duration to have a high potential for long-term improvements in environmental conditions. Instead, our analysis suggests that the greatest potential for long-term environmental improvements exists when efforts systematically address specific NPS problems in a targeted fashion. A prerequisite for making the transition from project-level implementation to a more systematic program is a stable and flexible source of federal or state implementation funding. We also concluded that in many cases there are unrealistic expectations about what could be accomplished by a watershed management effort given current funding levels, the pervasive nature of NPS problems, and existing institutional constraints such as the lack of flexibility and collaboration between existing NPS programs. It is important for policymakers, practitioners, and the public to recognize that many NPS problems are the result of the "tyranny of small decisions" and have developed incrementally over decades.[2] It may take equally long periods of time to address them.

The fourth set of findings concerned monitoring and evaluating the effectiveness of implementation efforts. We concluded that performance measures and tracking systems played an important role in encouraging a systematic-approach to addressing specific NPS problems. While it was important to have good monitoring data on environmental conditions, it was equally important to have a system that monitors and integrates data on federal, state, and local implementation activities on an ongoing and frequent basis. Data on implementation activities can help develop and reinforce peer-pressure systems that occur at the political, professional, and interpersonal level. We concluded that these peer pressure systems appeared to sustain commitments to collaborative activity and encouraged implementation efforts. We also concluded that it was important that watershed management effort developed shared definitions of problems, priorities, policies, and expectations for implementation activity. Social norms proved to be an important component of the peer-pressure systems and provided additional incentives for action and created informal sanctions to enforce collaborative agreements.

The final section of the report concerns the role EPA programs played in the development and implementation of the watershed management efforts. The NEP obviously had a critical role in the four respective cases. A number of related EPA water quality programs such as the Section 319 Nonpoint Source Program, the Clean Water State Revolving Fund (CWSRF) Programs, and the Section 305(b) Monitoring Program also had a significant potential to be involved in and enhance the six watershed management efforts. We concluded that each program was involved to varying degrees. While the study made no attempt to evaluate these programs at the federal or state level, our analysis of these programs and their relationship with

the six watershed management efforts resulted in some important observations that allowed us to offer some suggestions and recommendations for actions that can improve the ability of these programs to support local watershed management efforts.

We also examined the role of various EPA reinvention efforts such as Project XLC and the National Environmental Performance Partnership System (NEPPS), although these programs only played a limited role in isolated cases and the data were too limited to suggest specific recommendations. We also explored two of EPA's action forcing mechanisms, namely the National Pollution Discharge Elimination System (NPDES) permits for stormwater and construction sites and Total Maximum Daily Loadings (TMDLs). Based on the analysis of these relationships, we identified a number of problems and areas where these programs and their relationship to the watershed management efforts could be improved. The base of experience with the NPDES program was too narrow to offer specific recommendations while the relationship with the TMDL program was much broader. The analysis concluded that TMDLs can be a useful tool for addressing point source problems. However, we also concluded that TMDLs are likely to be less effective in addressing NPS problems and that the approach is fundamentally inconsistent with the collaborative watershed approach described in this report. The report concludes by examining some of the options confronting Congress and EPA with respect to addressing NPS problems, as well as improving the design and administration of the current system of federal programs addressing these problems.

Organization of the Report

The report begins with a short discussion of the methods used to collect and analyze the data. A detailed review of the literature and the study's research design can be found in Appendices A and B, respectively, which are on-line at napwash.org under the heading "Innovations in Environmental Protection." The next section provides an overview of the six watershed management efforts while a comprehensive discussion of the cases can be found in the accompanying technical reports. The report then analyzes the activities of the watershed management efforts in an attempt to determine the extent to which they improved environmental conditions, enhanced watershed governance, and added public value. Particular attention focused on the wide range of collaborative activities used to achieve many of these benefits. We also evaluated the overall performance of each watershed management effort using evaluative criteria developed by the Academy. The report then discusses the findings resulting from the cross-case analysis. The discussion is organized into two main sections. The first presents the findings and recommendations resulting from our analysis of the first two research questions. The findings are loosely organized around the four stages of the planning process that was prevalent in all of the cases. The second set of findings answers the third research question by examining the role that various EPA programs played in each watershed management effort. The final section of the report speculates about options confronting Congress and EPA with respect to addressing NPS problems and improving the current governance system.

Methods

This report employed a comparative case study research design. The criteria used to select the six cases and the study's data collection and analysis procedures are both described in detail in Appendix B. The report and its six supporting technical reports were developed using systematic and generally accepted methods of qualitative research. Qualitative approaches[3] are

often recommended when trying to understand how a process occurs or to examine complex relationships between decisionmaking processes, physical settings, community characteristics, stakeholders' interests, existing institutional arrangements, availability of resources, and the capacities of state, regional, and local actors.[4] As a result, qualitative approaches tend to be descriptive and focus on explaining why a process is, or is not, effective and how different contextual factors influence the success of that process.

Three distinct streams of research provide the theoretical foundation for guiding our inquiry, identifying potential cause and effect relationships, and making recommendations to the Academy. The first line of research is environmental policy research on place-based or community-based management programs, which includes the growing research on ecosystem-based management and watershed management as well as the literature on integrated environmental management, integrated CZM, and adaptive management. There is also great deal of environmental policy research in diverse areas such as collaborative decisionmaking, stakeholder involvement and public participation, and the role of science in the policy process that informed our assessment. Unfortunately, this literature often ignores or downplays the administrative and institutional challenges associated with developing and implementing watershed management programs.[5] Accordingly, the second stream of research is the developing literature on intergovernmental management (IGM) and networks, which is broadly defined here to include policy formation and implementation, interorganizational theory, policy networks, social networks, and federalism. The final line of research is the institutional analysis literature. In particular, the study draws upon the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom and her colleagues.[6] Of related interest is research on assessing implementation "success" and measuring institutional or network performance. A more detailed review of this literature can be found in Appendix A.

Data for the study was collected from several sources. Utilizing different data sources is important because it allows investigators to use a strategy of triangulation to improve the validity of our findings. Documents and archival records were an important source of data. A bibliography of these materials can be found in Appendix C of this report, which is on-line at napawash.org under the heading "Innovations in Environmental Protection." Field interviews with more than 200 individuals representing various organizations were the second source of data. A snowball sampling technique was used to identify the respondents. Given the sensitive nature of the data we collected (e.g., respondents were often critical of their own agency or program), interviews were confidential and steps were taken to protect the anonymity of the respondents.[7] The interviews were also recorded on tape and full or partial verbatim transcripts were prepared to ensure the accuracy of the data collected. Additional telephone interviews were conducted with individuals who could not be reached in the field while email and telephone inquires were used to clarify responses from the field interviews and to obtain additional information.

The final source of data was direct and participant observation. An attempt was made to schedule site visits such that we could attend various events and meetings and interact with participants in an informal basis. This occurred to some degree in all of the cases but was more pronounced in Delaware Inland Bays, Narragansett Bay, and the Salt Ponds. This was due to ongoing research in the case of the Delaware Inland Bays. Mark Imperial and Timothy Hennessey also had some involvement with various organizations and programs described in the case study. Mark Imperial worked for the University of Rhode Island's (URI's) Coastal Resources Center (CRC) from 1989 to 1991 and the Coastal Resources Management Council (CRMC) from 1991 to 1994. Imperial also worked as a consultant to the CRC on two projects,

including a project funded by EPA and the U.S. Agency for International Development (AID). This project examined the NEP to identify estuary programs that could be used as the basis of a training program for international coastal managers that was designed by the CRC.[8] Tim Hennessey has periodically worked with CRC staff on various projects, worked as a consultant to the Environmental Quality Study Commission on a project that evaluated RIDEM and issued its report in 1990.[9] This involvement and the steps taken to ensure the validity of this data and its analysis are described in Appendix B.

Systematic qualitative techniques (e.g., coding) were used to analyze these data. Codes were derived both inductively and deductively from the data and generated based on a start list derived from previous research. As coding continued, patterns emerged and codes were used to dimensionalize concepts. When coding the data, quotes and short vignettes were identified to add context to the case studies. As the analysis continued, tables, figures, matrices, and network displays were used to identify trends and make observations.[10] This analysis resulted in six technical reports that provide a detailed discussion of the findings proffered in this report:

- Rhode Island's Salt Ponds: Using a Special Area Management Plan to Improve Watershed Governance
- Narragansett Bay Estuary Program: Using a State Water Quality Agency to Implement a CCMP
- The Delaware Inland Bays National Estuary Program; Using a Nonprofit Organization to Implement a CCMP
- Tahoe Regional Planning Agency: The Evolution of Cooperation
- The Tampa Bay Estuary Program: Developing and Implementing an Interlocal Agreement
- The Tillamook Bay National Estuary Program: Using a Performance Partnership to Implement a CCMP

The information from these individual case studies was then compared and contrasted. This deepened our understanding of the individual cases and allowed us to determine the extent to which the findings might be generalized to other cases. The basic approach was one of synthesizing interpretations and looking for themes that cut across the cases.[11] We also followed the techniques recommended by Rose (1993) when drawing lessons from this analysis that might be applicable to other watershed management programs.[12]

To ensure the validity of the findings, the strategy of triangulation was used.[13] Triangulation uses independent measures derived from different data sources to support, or at least not contradict, a research finding. The analysis also explored potential rival explanations for the findings and their consistency with the data. Arguments and alternative explanations were compared with one another to identify logical inconsistencies.[14] The chain of events was then examined to help determine causality. In some cases, this involved developing detailed timelines. Potential threats to the validity of the findings were then analyzed.[15] In the case of Narragansett Bay and the Salt Ponds additional steps were taken to ensure the objectivity and validity of the findings reported in these reports.

Finally, in order to ensure the accuracy of the findings, each case study was reviewed by a selected sample of knowledgeable individuals, typically those individuals with a long history of

involvement with the watershed management effort. They also included program managers, representatives of key constituency groups, and individuals who could provide a neutral and balanced review of the case study findings. Various EPA officials also reviewed and commented on this report pursuant to an additional review process administered by the Academy. This report and the supporting technical reports frequently note specific EPA comments and our responses in either the text or accompanying endnotes.

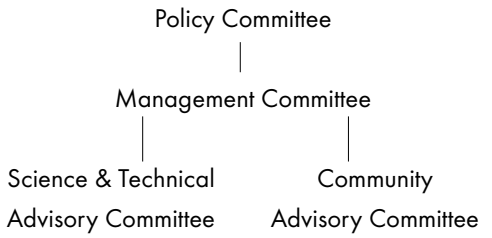
The Six Watershed Management Efforts

This report examined the efforts to improve environmental conditions in six watersheds: Narragansett Bay, Delaware Inland Bays, Tampa Bay, Tillamook Bay, Lake Tahoe, and Salt Ponds. As noted earlier, the programs in Delaware Inland Bays, Narragansett Bay, Tampa Bay, and Tillamook Bay are part of the NEP. This program comprises 28 efforts that entered in five tiers, allowing newer members to learn from the experiences of older ones. Narragansett Bay and Delaware Inland Bays were members of the original group of twelve estuary programs and are Tier I and Tier II programs, respectively. Tampa Bay and Tillamook Bay entered as Tier III and Tier IV programs, respectively.

The NEP is a voluntary program that emphasizes public and stakeholder involvement and provides significant financial resources to support a five-year planning process for the Tier I through Tier III programs while a four- and three-year process for the Tier IV and V programs, respectively.[16] Each estuary program is required to use a "management conference" that brings together all affected stakeholders and the general public in a committee structure (Figure 1) that then undertakes a structured planning process that relies on a consensus-based decisionmaking process (Figure 2). Historically, EPA allocated significantly more funding to an estuary program's planning efforts than implementation efforts. During the planning process, a significant proportion of these resources are allocated to public participation, research, and characterization efforts that support the development of a Comprehensive Conservation and Management Plan (CCMP), although the reduced planning timeframes have resulted in somewhat less emphasis on new scientific research.[17] Each CCMP is supposed to contain goals and targets for improving environmental quality and recommend voluntary actions or strategies for achieving these goals. The goal of an estuary program was not to develop a new program that would be implemented by a state environmental agency. Instead, the CCMP was to be implemented voluntarily by the management conference participants relying primarily on new or existing funding sources. EPA now provides approximately $300,000 per year to fund a core program staff that can monitor and support implementation efforts. These efforts and specific EPA requirements for developing and implementing a CCMP are discussed in detail in each case study.

The Lake Tahoe and Salt Ponds cases were somewhat different. The goal in both cases was to develop a regulatory program, not a voluntary one. Lake Tahoe's efforts were guided through the development of a federal-state compact that created a regional planning agency with broad regulatory authority, the Tahoe Regional Planning Agency (TRPA). The Salt Ponds effort resulted in the development of a Special Area Management Plan (SAMP) that was adopted as part of the state's federal coastal zone management (CZM) program approved by the National Oceanic and Atmospheric Administration (NOAA). The nature of EPA's involvement in these two programs was also different. TRPA is still implementing a Section 208 plan developed pursuant to the CWA and it has a close working relationships with the two state environmental agencies, particularly on the California side of the watershed. In the Salt Ponds, EPA provided

FIGURE 1: TYPICAL ESTUARY PROGRAM MANAGEMENT CONFERENCE STRUCTURE



some financial assistance during the planning process while the Rhode Island Department of Environmental Management's (RIDEM's) involvement has been mixed.[18]

An overview of each watershed governance effort is provided in the following sections followed by a short comparison of these efforts to provide some context for understanding the findings reported in the following sections of this report. The reader is advised to consult the detailed technical reports for greater discussion and explanation of the events and issues noted in the following summaries of the watershed management efforts.

Narragansett Bay

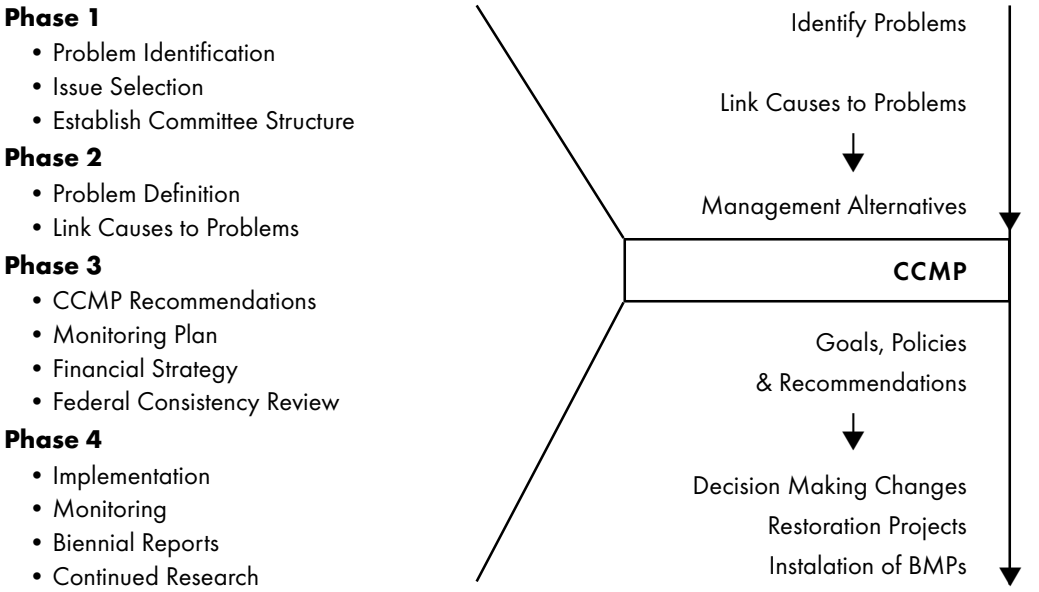
Narragansett Bay lies in the heart of Rhode Island and is the state's most prominent geographic feature. The Bay has a surface area of approximately 165 square miles and five major rivers form a drainage basin covering more than 1,600 square miles that includes the urban centers of Providence, Rhode Island and Fall River and Worcester, Massachusetts. Rhode Island is the most densely populated state in country. As a result, the watershed is heavily urbanized and nearly 2 million people live in the watershed's 100 cities and towns. However, while sixty percent of Narragansett Bay watershed is located within the state of Massachusetts, the watershed management efforts have focused primarily on the Rhode Island portion of the watershed.

Over the last two decades, the local economy has shifted from industrial and manufacturing to service and tourism. Much of the state's income is now derived from tourism and Narragansett Bay is the focal point for this activity. There is a large influx of summer tourists, more than 32,000 boats are registered in the state and over 100,000 people fish on the bay each year. Statewide, tourism related services are believed to have generated $1.5 billion in 1998. Culturally, there is a strong marine heritage. The bay is relatively deep with well-protected harbors that support many recreational and commercial port facilities including the Ports of Providence and Quonset Point. The region has a vibrant fishing industry with commercial fish and shellfish harvests estimated to be worth $31 million annually.

ENVIRONMENTAL PROBLEMS IN THE NARRAGANSETT BAY WATERSHED

While the trend over time has been towards improved water quality and protection of habitat, Narragansett Bay still experiences important water quality problems resulting from urbanization. Sewage treatment plants, combined sewer overflows (CSOs), failing onsite sewage disposal systems (OSDSs), and NPS pollution from stormwater runoff have caused many water quality problems. Significant portions of the bay are also closed to shellfishing. The most se-

FIGURE 2: THE NEP'S PLANNING PROCESS



MODIFIED FROM: Mark T. Imperial and Timothy M. Hennessey, "An Ecosystem-Based Approach to Managing Estuaries: An Assessment of the National Estuary Program," Coastal Management 24 (no. 1, 1996): 121.

verely impacted regions are in the upper bay (e.g., Providence and Blackstone Rivers and Mount Hope Bay) and Greenwich Bay. Many of the bay's tributaries and embayments are also affected by NPS pollution. While aggressive regulation of coastal and freshwater wetlands has curtailed the loss of this habitat, historically, the region has lost a significant amount of habitat, often as a result of decades of poorly planned development. Narragansett Bay is also home to a wide range of industrial activities that have left a legacy of contaminated sediments in many areas of the upper bay and its tributaries.

NARRAGANSETT BAY PROJECT

Since 1900, 27 major water quality planning efforts identified water quality problems in Narragansett Bay. However, the Narragansett Bay Project (NBP) was the first attempt to develop a collaborative watershed management plan for addressing the water quality problems in Narragansett Bay. In 1985, Narragansett Bay and three other estuaries began receiving approximately $1 million per year in federal funding to conduct research on the bay and its problems. The objective was to take an approach similar to that in Chesapeake Bay. The reauthorization of the Clean Water Act (CWA) in 1987 created a new national program, the NEP with the NBP established as a Tier I NEP. The NBP started the effort with a management conference structure similar to the one depicted in Figure 1. However, the policy, public education, and science and technical committees were eventually disbanded and merged into a large 45-member management committee with a smaller executive committee. While the NBP generally followed the NEP's planning process (Figure 2), these requirements were largely a moving target during the formative years of the NBP and the experiences, both positive and negative, of the original twelve estuary programs largely helped define the NEP's planning

process and provided important lessons for subsequent estuary programs.

More than $10 million was spent between 1985 and 1992 by EPA and the State of Rhode Island to support the activities and research that led to the creation of a Comprehensive Conservation and Management Plan (CCMP) for Narragansett Bay. The early years of the program were largely devoted to doing research on Narragansett Bay and its problems. The NBP emphasized scientific research and spent approximately 75 percent of its planning funds on over 110 scientific and policy-related research projects. The NBP focused on a wide range of issues including: impacts of toxic pollutants; impacts of nutrients and eutrophication; land-based impacts on water and habitat quality; health and abundance of living resources; fisheries management; health risk to consumers of seafood; and, environmental impacts on commercial and recreational uses of Narragansett Bay. Unlike our other case studies, no focal problem emerged to be placed on the policy agenda of state and local decisionmakers.

The planning process experienced a number of problems and a great deal of conflict surrounded the CCMP's approval. This is evidenced by the fact that when the draft CCMP was released for public review and comment in early 1992,[19] thirty-eight individuals and organizations including EPA headquarters and region I, U.S. Army Corps of Engineers (COE), Save the Bay, CRC, Coastal Resources Management Council (CRMC), Warwick, Rhode Island Marine Trades Association, Rhode Island Realtors Association, and other governmental and nongovernmental organizations submitted comments on the draft CCMP and its recommendations.[20] While many comments were positive and constructive, the scope and breadth of the criticism on the draft CCMP exceeded that of the other NEP case studies and revealed a number of critical issues that needed to be resolved.[21]

Respondents noted that some of these problems were the result of conflicting personalities and the history of conflict between some of the participants (e.g., RIDEM and CRMC). Other factors also offered a powerful explanation for these problems including: broad ambitious scope of the CCMP and the wide range of issues addressed; length of the planning process combined with imposition of deadlines; murky definition of consensus; problems managing the participatory decisionmaking process; CCMP's use of very detailed recommendations focusing on controversial issues; NBP staff advocating specific policy positions rather than being a neutral broker for consensus; decision to include the CCMP in the State Guide Plan. These factors are likely to have caused conflict regardless of the personalities and institutional histories of the various NBP participants.

The NBP staff and management conference participants were then involved in a prolonged effort to resolve these concerns. This was eventually accomplished and the CCMP was approved by the State Planning Council and became an element of the State Guide Plan in December 1992. EPA approved the CCMP in January 1993. The final CCMP even includes letters from EPA, EPA Environmental Research Laboratory in Narragansett, Natural Resource Conservation Service (NRCS), United States Geological Survey (USGS), RIDEM, Rhode Island Department of Administration's Division of Planning (RIDOP), CRMC, RI Department of Health, and the Town of North Smithfield, RI committing to certain actions designed to implement the CCMP.[22] No letters of commitment were received from agencies in Massachusetts.

The final version of the CCMP contains more than recommendations that collectively addressed almost every conceivable problem affecting the bays at the time. They include recommendations that coordinate existing policies and activities, develop new policies and plans, prepare legislation and new regulations, enforce laws and regulations, provide technical assistance and public education, make investments in environmental infrastructure, and to conduct monitoring and environmental assessments. The CCMP also contains 41 high-priority recom-

mendations that cluster around seven areas of action: reduce loadings of toxics, nutrients, and pathogens; promote and use comprehensive watershed management techniques; abate sources of nonpoint source pollution; protect, manage, and restore critical environmental resources; provide technical assistance and outreach to project partners and the public; implement a long-term monitoring plan; and, maintain a mechanism to oversee CCMP implementation. The CCMP's implementation was projected to cost over $392 million including the CSO and other capital improvements required by the CWA ($341 million). Even without the capital expenditures, the implementation of all of the new planning initiatives and regulatory changes was projected to cost Rhode Island over $30 million for the five-year timeframe covered by the CCMP. This occurred at a time when the state was mired in a deep recession and state agencies were faced with caps on their full time equivalents (FTEs).

NARRAGANSETT BAY ESTUARY PROGRAM

The CCMP's approval resulted in the replacement of the management conference with a smaller implementation committee and an advisory committee. The NBP was also established as a separate program within RIDEM. Early implementation efforts were hindered by several factors. First, staffing for the program virtually disappeared during the transition period and the program remained barely alive for several years. Second, many respondents noted that the process and the conflict surrounding the CCMP burned out many management conference participants. Third, the ambitious scope of the CCMP combined with its regulatory focus limited its usefulness by many actors. As a result of these and other problems, most respondents reported that the original NBP partners were no longer implementing the CCMP and that it no longer served as a policy document that guided agency decisionmaking.

In May 1995, the NBP embarked on an effort to reinvent itself. The rebirth coincided with the increase in financial support for CCMP implementation and the name of the program was changed to the Narragansett Bay Estuary Program (NBEP). The NBEP staff also placed renewed emphasis on partnerships and collaboration. Over the years, the NBP and NBEP have managed to achieve some notable accomplishments related to the CCMP's implementation, having implemented more than 60 discrete projects and leveraging approximately $2.2 million in competitive grants, non-federal matching funds, and in-kind services. At least some progress has been made towards each of the CCMP's 41 high-priority actions, although in many cases these actions are only loosely related to the specific recommendation or only partially implement the recommendation.[23] Some of the more notable accomplishments discussed in the technical report are the Hazardous waste reduction project, designation of the state's waters as a no-discharge zone, and the Greenwich Bay Initiative (GBI). The GBI included among other things a $130 million bond referendum by the city of Warwick to pay for the installation of sewers and other actions to improve water quality. These and other projects often involved collaboration among myriad governmental and nongovernmental actors. In addition to facilitating collaboration, the NBEP has served as a surrogate planning staff for RIDEM's water quality programs, thus improving the agency's problem-solving capacity. It has also improved RIDEM's ability to become engaged in collaborative activities initiated by other agencies and take a leadership role in organizing other activities.

While these successes are notable, problems remain. The CCMP is no longer being implemented by the original NBP partners and the priorities of these actors have long since changed evolved. The NBEP's implementation actions are only loosely-related to the CCMP's recommendations and the plan's goals are so general and broad that nearly any activity can be construed as advancing these goals.[24] There is no routine effort to monitor implementation or link

the actions to changes in environmental conditions. The NBEP and our respondents reported problems with the Implementation Committee's effectiveness.[25] They also noted problems with stakeholder involvement noting that it is limited primarily to special events such as the recent Narragansett Bay Summit 2000 and specific projects. Collectively, these issues create important accountability problems. Moreover, while there has been some "talk" of revising the CCMP or replacing it with another policy document, progress has been slow and less than encouraging. The NBEP has also had trouble moving its implementation efforts beyond the project-level. Accordingly, the NBEP consists primarily of the sum total of a collection of loosely-related projects rather than constituting a systematic program that is designed to address specific problems or provide an ongoing service. In part, this is due to the state's failure to provide any dedicated source of cash or FTE's to support CCMP implementation.

Delaware Inland Bays

The Delaware Inland Bays are located along the southeastern coast of the state; the bays and their tributaries cover about 32 square miles and drain a 300-square-mile watershed located entirely within Sussex County. The seaward side of the watershed is heavily developed with beachfront resort communities and a large number of tourists in the summer. As a result, there is heavy recreational use of the region's waterways and beaches. The inland portion of the watershed is more rural in character. It has a large agricultural community and is home to most of the watershed's year-round residents.

The Inland Bays are shallow with an average low-water depth of between three and eight feet. Freshwater enters the bay through its tributaries, surface runoff, and groundwater discharges. Nutrient-laden groundwater discharges are an important source of nutrients to the bays and the residence time for the discharges is estimated to be between 15 and 40 years, which means that nutrients entering the groundwater today might not enter the bays for up to 40 years. The tidal range is around three feet, but tidal flushing varies considerably throughout the watershed because of restricted connections. This natural variability gives rise to a rich biological environment dependent on tidal influence.

ENVIRONMENTAL PROBLEMS IN THE DELAWARE INLAND BAYS WATERSHED

Like many mid-Atlantic estuaries, the Inland Bays are affected by two fundamental problems: eutrophication due to excessive nutrients and habitat loss or modification due to development, erosion, sedimentation, and dredge and fill activities. The Inland Bays are highly eutrophic with nutrient loadings coming from septic systems, sewage treatment plants, stormwater runoff, and agriculture. Excessive nutrient loadings have caused nuisance algae blooms, fish kills, large daily swings in dissolved oxygen, loss of submerged aquatic vegetation (SAV), and phytoplankton blooms. Pfiesteria has also been detected, although not in its harmful life stages. Between 1938 and 1973, 2,074 of the 8,646 acres (24 percent) of tidal wetlands were destroyed as a result of logging, dredging, filling, and sedimentation. Dredging, the stabilization of the Indian River Inlet, and the construction of approximately 26 miles of dead-end lagoons and finger fill canals destroyed wetland areas and affected aquatic habitat. Beginning in 1816, public drainage ways known as tax ditches were also dug to drain wetland areas. While it is unclear how much wetland area was lost, there are currently 225 miles of ditches affecting some 35,000 acres of the watershed.

Problems are the result of two activities. The first is the rapid development and population growth in the watershed, fueled by improved highway access, low property taxes, and the instal-

lation of sewers. Growth in the Inland Bays watershed has consistently outpaced the national average with the population of Sussex County increasing by 63 percent between 1970 and 1998. The population is expected to increase by another 38 percent to 181,197 by 2020. Until the mid-1990s, most of the growth was in the beachfront areas. However, the number of new building permits in the county outside the watershed has begun to approximate those inside, with development within the watershed shifting inland away from beachfront areas as it begins to fill in. Impacts associated with the development activities include increased nutrient loadings from point and nonpoint loadings, habitat loss and degradation, and increased user conflicts.

The other major source of nutrients is the poultry industry. The modern broiler-hen industry originated in the Inland Bays watershed in 1923. Sussex County is now home to the region's multi-billion dollar industry that produces more than 600 million birds annually, with approximately 82 million chickens raised in the Inland Bays watershed. The disposal of chicken manure is therefore an important ecological problem. The cumulative nutrient loadings to farmland over the decades have impacted groundwater and surface waters. A 1997 report by the University of Delaware concluded that as a result of cumulative nutrient loadings, 92 percent of the fields in Sussex County are so soaked with phosphorus that they should receive no more fertilizer for years.

PREVIOUS WATERSHED GOVERNANCE EFFORTS

There is a rich history of planning efforts dating back to the 1960s that addressed these problems. The history is important because it shaped the development of the Delaware Inland Bays Estuary Program (DIBEP). In the 1960s, they were initiated primarily by state officials and led to the development of a Comprehensive Development Plan for Sussex County and a report to the governor. The 1970s focused primarily on planning efforts initiated by Section 303(e), Section 208, and Section 205 of the CWA as well as an update of Sussex County's land use plan. The 1980s saw a shift back to efforts driven by state and local officials and NGOs. The Inland Bays Study Group was formed in 1981 and included staff of the Department of Natural Resources and Environmental Control (DNREC) (i.e., state environmental agency) and other state and local agencies and the public. In 1983, the University of Delaware's Sea Grant Program issued a report examining the problems in the Inland Bays. In order to implement one of the report's main recommendations, the governor signed an Executive Order in 1983 creating the Governor's Task Force on the Inland Bays that issued its report in 1984. The governor then signed another Executive Order creating the Inland Bays Monitoring Committee to oversee the five-year implementation of the Task Force's report. Sussex County revised its land use plan again in 1988.

DELAWARE INLAND BAYS ESTUARY PROGRAM

The DIBEP built on the efforts of the Governor's Task Force and the Inland Bays Monitoring Committee. More than $2 million was spent between 1988 and 1995 by EPA and the state to support the activities and research that led to the creation of a CCMP for the Delaware Inland Bays. The DIBEP utilized a management conference structure and planning process similar to that of other estuary programs.

The DIBEP used a collaborative, consensus-based process to develop its CCMP and was effective in getting the general public involved in the planning process. The DIBEP also undertook two interrelated efforts to install BMPs and change DNREC's decisionmaking processes. The first was the Inland Bays Recovery Initiative (IBRI) that began in March 1990. The second was the Natural Resource Conservation Service's (NRCS's) Hydrologic Unit Area (HUA) Project

for the Inland Bays that provided over $2.5 million in federal funds between 1990 and 1998 to implement BMPs to address agricultural problems.

While most management conference participants supported the CCMP, the DIBEP experienced two major conflicts. The first involved the poultry industry, which used its political influence to force changes in the CCMP. The second involved EPA's tentative decision to disapprove the CCMP after a tortuous process that tried to ensure that the DIBEP complied with EPA's approval requirements. Of particular concern to EPA was the CCMP's monitoring and financing plans. In response, the management conference participants, including representatives from the poultry industry, united effectively to pressure EPA to approve the CCMP in 1995.[26] The final CCMP contains 17 action plans that address education and outreach, agricultural sources, industrial, municipal, OSDSs, land use, and, habitat protection. The action plans were also designed to achieve nine goals outlined at a March 1989 workshop.

Early in the planning process the DIBEP focused its attention on the implementation structure that would oversee the CCMP's implementation. After exploring several options, the Delaware General Assembly created the Center for the Inland Bays (CIB) in 1994 well after the draft CCMP had been developed. The CIB is a nonprofit organization administered by a board of directors comprised of the secretary of DNREC, the secretary of the Delaware Department of Agriculture (DDA), a representative of the Sussex Conservation District (SCD), a representative of the Sussex County Association of Towns (SCAT), the administrator of the Sussex County Council, the chairs of the Scientific and Technical Advisory Committee (STAC) and the Citizen Advisory Committee (CAC). In addition, the President Pro Tem and the Speaker of the House each designate one resident from Sussex County to serve on the board. The CIB is designed to serve as a neutral forum to oversee the implementation of the CCMP and to report annually on these activities.

Initial implementation efforts were hampered by the lack of stable resources, staff, and other issues related to the development of a new collaborative organization. In recent years, implementation efforts have improved as financial resources stabilized and the CIB's staff increased. The staff currently devotes its efforts to scientific research, education, and habitat restoration. The staff also facilitates communication among board members, coordinates the efforts of various board members, and monitors implementation activities. The CIB has played an important role in helping state and local officials address problems resulting from nuisance algae blooms and Pfiesteria. The CIB has also been engaged in several notable habitat restoration efforts (e.g., James Farm) and recently adopted a water use plan to begin addressing problems resulting from user conflicts.

The individual board members have also been engaged in a number of efforts that have the potential to improve environmental conditions. By 2001, Sussex County will have spent more than $158,169,000 over a 13-year period to expand sewer service areas and remove OSDSs. A recent agreement between Sussex County and DNREC will result in the removal of the point source discharge at Delaware Seashore State Park that will reduce the total nitrogen and phosphorus discharged to the Inland Bays by about 1 percent. Sussex County strengthened its land use policies when it revised its land use plan again in 1997 to explicitly reference CCMP goals. The Open Space Program administered by DNREC has preserved approximately 1,592 acres in the Inland Bays watershed at a cost of over $13 million, while the farmland preservation program administered by the DDA has preserved more than 37,594 acres in Sussex County. The HUA program and other efforts by NRCS, DNREC, and SCD have continued to install BMPs and conservation plans have been developed for 60,000 acres of farmland. The cost-share program created by the state in 1985 continue and are supplemented with other USDA and EPA Section 319 funding. In 1999, EPA

promulgated standards that would begin regulating some poultry growers while the Delaware General Assembly passed legislation to begin regulating the poultry industry.

While those successes are notable, problems remain. One is that the CCMP is becoming dated and it was not designed with the CIB in mind.[27] The priorities of many board members have changed since the CCMP was adopted. The focus is currently on developing pollution control strategies to implement the TMDL recommendations promulgated by DNREC in 1998 as a result of a lawsuit by the American Littoral Society and the Sierra Club. The TMDL recommends removing all point source discharges of nutrients, reducing nitrogen and phosphorus loads from NPS by 40 to 85 percent (from the baseline period of 1988 to 1990), and reducing the atmospheric deposition of nitrogen by 20 percent. DNREC and the CIB, with assistance from University of Delaware's Sea Grant Program (SGP) and the Cooperative Extension System (CES), have developed three tributary teams in an attempt to develop community-based strategies to implement the TMDL's recommendations. Many respondents were also dissatisfied with the CIB's mission of serving as a neutral, nonpartisan forum because it hinders its ability to address controversial issues such as nutrient loadings from agriculture and residential development. The CIB also lacks specific and measurable goals and targets and should improve its capacity to monitor environmental conditions and implementation efforts.

Tampa Bay

Tampa Bay is located along the Southwest coast of Florida and it is the largest open-water estuary in Florida spanning nearly 398 square miles. Four major rivers and 40 creeks and streams are the major sources of freshwater to Tampa Bay. The watershed is relatively flat and covers approximately 2,300 square miles including all or parts of Hillsborough, Pinellas, and Manatee counties.[28] The mild climate, the high quality of developable land, and the waterscapes, wildlife, and recreational opportunities offered in the region have led to explosive population growth. The region is home to more than 2 million people with population projected to increase 17 percent to 2.34 million by 2010.

ENVIRONMENTAL PROBLEMS IN THE TAMPA BAY WATERSHED

Like many urbanized watersheds, Tampa Bay has experienced a number of problems due to increased population and development that increased dramatically in the 1950s and went largely unchecked for decades. This caused significant deterioration in the bay's water quality, habitat, and natural resources. Water quality declined dramatically as a result of sewage and industrial point source discharges while stormwater runoff and other NPS caused additional declines in water quality. Excessive nutrient loadings were the most severe between the late 1960s and the early 1980s. As a result, 40 percent of the bay's seagrass beds have disappeared since 1950. Residential and industrial development, canals, and causeways have altered approximately half of the bay's original shoreline and dredging and development activities have degraded habitat. It is estimated that between 1950 and 1990, Tampa Bay witnessed a net loss of 5,128 acres (or 21 percent) of emergent wetlands.

PREVIOUS WATERSHED GOVERNANCE EFFORTS

Given the pervasiveness of these problems, it should not be surprising that there is a long history of efforts to improve water quality in Tampa Bay. The first major study of Tampa Bay and its water quality problems was done by the Federal Water Pollution Control Administration (FWPCA) in 1969. The study combined with grass-roots efforts in the early 1970s sparked

interest in efforts to upgrade sewage treatment plants and reduce nutrient loadings. By the late 1970s and early 1980s these efforts were well underway as indicated by the upgrades to the sewage treatment plants in Tampa and Clearwater and the reuse program in St. Petersburg. The legislature's Wilson-Grizzle and Grizzle-Figg initiatives further ensured that all sewage treatment facilities discharging to the bay would meet advanced waste treatment standards.

In 1983, the Florida Legislature created the Tampa Bay Management Study Commission to develop a comprehensive, unified management strategy for Tampa Bay. The product of these efforts was a landmark report entitled The Future of Tampa Bay. One outcome of the effort was the creation of the Agency on Bay Management (ABM) in 1985. The ABM is a standing committee of the Tampa Bay Regional Planning Council (TBRPC) that serves as a forum for sharing information and advising the TBRPC on issues affecting Tampa Bay. The priority problems and recommendations contained in the Future of Tampa Bay provided the starting point to identify priority projects for inclusion in the Surface Water Improvement and Management (SWIM) plan that was developed for Tampa Bay by the Southwest Florida Water Management District (SWFWMD). The Section 319 Nonpoint Source Management Program, the Clean Water State Revolving Fund Program, Florida's Conservation and Recreational Lands (CARL) and the Save Our Rivers land acquisition programs all give special priority to projects that benefit SWIM water bodies.

The governance arrangement for Tampa Bay is quite complex and includes various programs and activities implemented by the Florida Department of Environmental Protection (FDEP), the Environmental Protection Commission (EPC) of Hillsborough County (local agency delegated several EPA programs), SWFWMD, TBRPC, ABM, Hillsborough County, Pinellas County, Manatee County, and the cities of Tampa, St. Petersburg, and Clearwater. A 1994 survey estimated that, based on FY 94 – 95 budgets, more than $250 million is spent annually by federal, state, and local agencies on the restoration and management of Tampa Bay. The largest portion was spent by local governments with 68.3 percent or roughly $170 million spent on wastewater collection, treatment, and reuse. Local governments and SWFWMD spent approximately $35 million or 13.8 percent on stormwater management.[29]

TAMPA BAY ESTUARY PROGRAM

The Tampa Bay Estuary Program (TBEP) joined the NEP in 1991, building on previous watershed planning efforts. Since its inception, the TBEP has been a partnership of six local governments (Hillsborough County, Pinellas County, Manatee County, Tampa, St. Petersburg, and Clearwater) and three regulatory agencies (EPA, FDEP, and SWFWMD). Like other estuary programs, the TBEP utilized a management conference structure and planning process similar to the ones described in figures one and two. The planning process was relatively devoid of conflict and lasted approximately six years. One reason that the planning process was so long is the heavy emphasis the NEP placed on public participation and scientific research. The collaborative decisionmaking process used to build consensus on the goals and recommendations contained in the CCMP also prolonged the effort.[30]

EPA approved the CCMP in 1996. The plan contains 41 action plans that address water and sediment quality, habitat protection, fish and wildlife, dredging and dredged material management, and spill prevention and response. The action plans are designed to help achieve 11 goals, several of which are quantifiable and measurable. Of particular interest were the goals and actions designed to "hold the line" on nutrient loadings from future growth and economic development. The TBEP's modeling and research suggested that this should be adequate to achieve the CCMP's goal of returning seagrass coverage in the bay to 1950 levels,

the equivalent of an additional 12,350 acres of seagrass above 1992 levels. This requires capping nitrogen loadings at existing levels (i.e., the 1992 – 1994 average) and reducing future nitrogen loadings by roughly 17 tons per year or 84 tons per year by 2000. The partners also agreed to a common set of priority sites for habitat restoration and a restoration strategy that will "restore the balance" of different types of wetland habitat. The CCMP's target for habitat restoration is 100 acres every five years, which is equivalent to the current rate of activity.

Once agreement on the goals and substance of the CCMP was reached, the partners turned towards making the CCMP more than just a "plan" and moved beyond the NEP's "voluntary" implementation requirements. After much negotiation, the partners signed an interlocal agreement in 1998 that committed local governments to achieving the CCMP's goals and the regulatory partners agreed to increase flexibility and streamline their regulatory programs. The agreement also created a new collaborative organization known as the TBEP, an independent alliance of government entities pursuant to Chapter 163 of the Florida Statutes.

Progress to date has been impressive. Pursuant to the interlocal agreement, all parties submitted a detailed five-year action plans (1995 – 1999) that outline more than 200 actions to be undertaken during that period. On a parallel track, the TBEP established a nitrogen management consortium in 1996 that included public and private partners. It focused on developing the action plans necessary to meet the CCMP's nitrogen reduction goals. The 105 projects included in the nitrogen management action plan are expected to remove or prevent the discharge of approximately 120 tons of nitrogen per year with about half of the reductions coming from industry. Collectively, efforts are expected to exceed the CCMP's goal by 60 percent or 30 tons per year. In terms of habitat restoration, the TBEP partners should achieve or surpass many of the CCMP's goals. Between 1995 and 1999, SWFWMD, FDEP, local governments, and other TBEP partners are expected to complete 1,600 acres of habitat restoration including 250 acres of low-salinity habitat, well exceeding the five-year goal. Other notable accomplishments include the Florida Yards and Neighborhoods Program, Boaters Guide to Tampa Bay, the development of an effective STAC, and the development of a collaborative monitoring program that was later expanded to become the Florida West Coast Regional Ambient Monitoring Program (RAMP). In recognition of these efforts, EPA awarded the TBEP a bronze medal in 1998.

Tillamook Bay

The Tillamook Bay watershed is located along the northwestern coast of Oregon and covers 570 square miles. Tillamook Bay is part of a coastal, temperate rainforest ecosystem that receives about 90 inches of rain per year in the lower basin and up to 200 inches in the upper basin. Most of the rainfall occurs between October and May. The watershed topography is a mixture of extremes with gently to steeply sloping uplands and steeply carved canyons as well as flat and gently rolling flood plains. Elevations range from sea level to 3,461 feet. The uplands support a diverse range of habitats while the bay's salt marsh, mud flats, and eelgrass beds play important roles in the life cycles of salmonids and other species.

The entire watershed is contained in Tillamook County. The county is rural with a population of approximately 25,000, of which about 17,000 live in the watershed. The $16,725 per capita income of Tillamook County is well below Oregon's average of $21,000, which in turn is below the national average ($25,000). Like other coastal communities in Oregon, traditional resource-based industries such as fishing and timber have declined or been supplemented by tourism. In Tillamook County, the major industries continue to be agriculture, timber, fishing and tourism which gives rise to the county's slogan "the land of cheese, trees and ocean breeze."

Almost 89 percent of the watershed is forested and the timber industry accounts for 24 percent of the local economy. Revenue from timber sales in the Tillamook State Forest provide an important source of revenue for Tillamook County. In 1998, this amounted to approximately $8 million or 22 percent of the county's budget. The revenues are projected to increase dramatically in coming years as the state forest has finally recovered from a devastating series of forest fires in the 1930s, 1940s, and 1950s. However, the sedimentation resulting from the fires and the NPS pollution and habitat degradation from logging activities have been important environmental problems.

The other major industry is the 196 dairy farms that provide milk for the Tillamook County Creamery Association (TCCA). The TCCA is a vital part of the community with $128 million in revenues in 1995 and it provides more than $70 million annually to the local economy through payroll and other purchases. The TCCA's cheese factory and outlet store is also one of the biggest tourist destinations in the state, with more than 800,000 visitors a year. Unfortunately, the dairy industry also generates approximately 322,500 tons of manure annually. As a result, stormwater runoff has contributed directly to water quality problems from high fecal coliform levels. Interestingly, nutrient loadings are not a problem due to the high tidal range and the large volume of rainfall during the rainy season.

Historically, the fishing industry was important to the region's development and it remains an important part of the local culture and economy. In addition to various salmonids, Tillamook Bay supports other fishery resources such as bay clams, dungeness crabs, and oysters. The fishing industry has declined in its relative economic importance and commercial troll-caught coho salmon and recreational catches of salmon and steelhead have decreased since the late 1980s which contrasts with a shellfish industry is thriving and estimated to be worth $1.5 million a year.

ENVIRONMENTAL PROBLEMS IN THE TILLAMOOK BAY WATERSHED

Three primary issues affect the health of Tillamook Bay and its resources: bacterial contamination; sedimentation; and declining salmon and trout runs due to degradation of spawning and rearing habitat. Tillamook Bay has a long history of bacterial contamination primarily from the region's dairy farms and the failure of septic and wastewater treatment systems. The problems are most severe during the wet seasons (fall, winter, and early spring). Sedimentation is another important problem. While much of the sedimentation is from natural causes, it is exacerbated by human activities (e.g., poor forest practices, road construction, and development) and catastrophic events such as floods and forest fires. These problems are notable because Tillamook Bay is relatively shallow with an average depth of only 6.6 feet and over 50 percent of the area is covered in mudflat at low tide. Declines in the bay's coho salmon, steelhead trout and chum salmon stocks and subsequent listings pursuant to the Endangered Species Act (ESA) are of concern to area residents as well as federal, state, and local officials. While some declines are due to the mismanagement and over exploitation of stocks, significant declines have been linked to the destruction of spawning habitat due to human activities ranging from timber harvesting practices to commercial and residential development.

PREVIOUS WATERSHED GOVERNANCE EFFORTS

A number of planning efforts preceded the development of the Tillamook Bay National Estuary Program (TBNEP). Tillamook Bay was one of 21 watersheds in the United States Department of Agriculture's (USDA's) Rural Clean Water Program (RCWP). From 1981 to 1996, the federal government spent roughly $6 million to improve agricultural practices in the water-

shed. In 1987, Tillamook County established the Bay Sanitation Technical Advisory Committee to begin monitoring and addressing water quality problems in the rivers and bay. In 1989, Tillamook County began requiring agricultural building permits. In 1987 and 1990, state confined animal feeding operation (CAFO) requirements were strengthened while in 1992 Senate Bill 1010 was adopted and required basin plans for agricultural areas failing to meet federal or state water quality standards such as Tillamook Bay. Governor Kitzhaber's Oregon Plan for Salmon and Watersheds and the development of more than 80 citizen-led watershed councils in response to the ESA listing have focused attention and resources on these problems as well. Collectively, these efforts have led to significant investments in best management practices (BMPs) and other activities designed to address Tillamook Bay's NPS and habitat problems.

TILLAMOOK BAY NATIONAL ESTUARY PROGRAM

The TBNEP entered the NEP in 1993 and it built on previous watershed planning efforts such as the RCWP. Like other estuary programs, the TBNEP utilized a management conference structure and planning process similar to the ones described in figures one and two. Because it was a Tier IV program, the TBNEP was expected to use an expedited planning process lasting four rather than the customary five years. While the planning process was relatively free of conflict and the public was involved, it lasted longer than expected. This was due to a number of staffing problems that plagued the TBNEP throughout the planning process.[31] The planning effort started out focused on the bacterial contamination, sedimentation, and declining salmon and trout runs. However, a serious flooding event in February 1996 that caused in excess of $53 million in damages also helped prolong the process as it caused the participants to adopt flooding as an additional priority problem and forced the development of a new CCMP chapter. The members of the management conference then used a collaborative decisionmaking process to build consensus on the substance of the CCMP, which was approved by state and local officials in June 1999 and EPA in December 1999. The TBNEP's CCMP contains 21 policies and 63 recommended actions that outline a strategy to: restore fish, shellfish, and aquatic habitat; reduce sedimentation to the bay and rivers; improve water quality; reduce flood impacts; and, strengthen education and community institutions. The CCMP also contains quantifiable and measurable goals and targets.

Once agreement on the substance of the CCMP was reached, the TBNEP turned its efforts towards developing an organizational arrangement that would ensure that the CCMP was implemented. Two leaders of the Policy Committee became the "champions" for the idea of using a "Performance Partnership" to oversee the CCMP's implementation. The idea for the Performance Partnership was derived from Vice President Al Gore's National Performance Review (NPR). The Tillamook County Performance Partnership (TCPP) was established in July 1998 through a resolution of the Tillamook County Board of Commissioners. It is a collaborative organization with a two-tiered administrative structure and a staff of former TBNEP staff who are county employees. The TCPP includes numerous federal, state, and local government representatives as well as representatives from industry, NGOs, and the public. It is an attempt to "reinvent government" in Tillamook County and build upon the commitments in the Oregon Watershed MOU signed between Governor Kitzhaber and Vice President Gore that designated the state's watershed-based efforts as a reinvention lab. The hope was that the TCPP would allow policy makers and resource managers to coordinate the implementation of numerous resource management plans that currently exist throughout Tillamook County.

While TCPP is relatively new and is still evolving, its members have been engaged in numerous activities that advance the CCMP's goals and targets, including the investments pursuant

to various USDA programs such as the RCWP. The Oregon Department of Forestry (ODF) has also funded numerous projects in excess of $17.8 million since 1994. The TCPP members have had some success in leveraging funding from federal sources such as EPA's Section 319 Nonpoint Source Management Program. The TBNEP and the TCPP have also had some success in leveraging funding from state sources such as the Oregon Watershed Enhancement Board (OWEB). For example, the TBNEP received $43,000 from the OWEB to help fund the TBNEP's volunteer water quality monitoring program. In 1998, the TBNEP, the Economic Development Council of Tillamook County (EDCTC), the Tillamook County Soil and Water Conservation District (SWCD), and the Tillamook Bay Community College (TBCC) established a new Tillamook Coastal Watershed Resource Center (TCWRC) that is home to the GIS system developed by the TBNEP. The TCWRC will provide training to citizens and government officials involved in watershed management efforts. These actions give cause for being optimistic about the TCPP's future success. However, given the financial situation of Tillamook County, meeting the CCMP's goals and targets will certainly be challenging and require continued reliance on federal and state funding.

Lake Tahoe

The Lake Tahoe Basin straddles the California/Nevada border with approximately two-thirds of its land area in California and one-third in Nevada. Sculpted peaks surround the lake in every direction providing a striking visual boundary of the watershed. The watershed comprises 506 square miles of which 192 square miles (38 percent) are occupied by the surface of the lake. Most land in the basin is mountainous with slopes greater than 20 percent. This limits developable land to the relatively flat areas along the lake's shoreline, which includes many of the important wetland areas that serve as natural filters for sediment and nutrients.

Lake Tahoe is renowned for its clarity and crystalline blue waters. It is 22 miles long and 12 miles wide, which makes it the largest alpine lake in North America. It is the third deepest (1,645 feet) lake in the United States. The clarity of the water exceeds 70 feet its 40 trillion gallons of water could submerge the surface area of California with 14 inches of water. The enormous capacity combined with the small outflow create a 700-year residence time.[32] In addition, it is an Outstanding National Resource Water (ONRW) under the CWA.

ENVIRONMENTAL PROBLEMS IN THE LAKE TAHOE WATERSHED

The population of the Lake Tahoe basin increased by more than 500 percent since World War II as it evolved into a year-round tourist destination. Rapid development during the late 1950s and 1960s was fueled primarily by casino development, improved highway access and year-round snow removal, and the development of ski areas and other winter sports facilities triggered by the 1960 Winter Olympics. However, the steep slopes, erodible soils, and a short growing season make the Lake Tahoe basin extremely sensitive to human disturbance. Approximately 67,000 tons of sediment enters the lake every year, a 1,900 percent increase over natural levels. Over the past 30 years, increased sedimentation and nutrient loading have triggered algae growth that threatens the brilliant clarity of the water. When consistent measurements were first taken in 1968, the lake's clarity was measured at 100 feet. Currently, it is around 70 feet and research suggests the trend has to be reversed within the next 10 years to maintain current lake clarity.

Over the past four decades, a complex governance framework developed to address these problems. It consists of various federal (e.g., United States Forest Service - Lake Tahoe Basin

Management Unit, Natural Resource Conservation Service, EPA) and state (e.g., California State Water Resources Control Board and the Lahontan Regional Board, California Tahoe Conservancy, Nevada Department of Environmental Protection) agencies, portions of Washoe and Douglas Counties and Carson City in Nevada, and the City of South Lake Tahoe, and El Dorado and Placer Counties in California. The efforts to address the problems in Lake Tahoe were also a catalyst for the development of a number of NGOs such as the Lake Tahoe Transportation and Water Quality Coalition.

TAHOE REGIONAL PLANNING AGENCY

Early efforts addressing Lake Tahoe's problems focused on point sources and the construction of sewers to remove OSDSs. However, the installation of sewers appears to have served as a catalyst for increased development. In 1969, the Tahoe Regional Planning Agency (TRPA) was created via a federal-state compact between California, Nevada and Congress in order to minimize the impacts resulting from this development activity.[33] TRPA is a regional planning agency with broad regulatory authority to preserve environmental and recreational conditions in the basin. It has the authority to adopt regional environmental standards, issue land use permits, take enforcement action, and is charged with ensuring that federal and state and air quality standards are met. TRPA's staff work directly for a governing board comprised of seven delegates from California and seven from Nevada and a nonvoting presidential appointee.

In 1980, the Compact was revised, which resulted in a number of changes to TRPA. The amended compact re-emphasized the threatened resources of the lake and established a system of environmental threshold carrying capacities. TRPA was required to develop and enforce a new plan and associated implementing ordinances that allow it to achieve the environmental thresholds adopted by TRPA in 1982.

The development of the Regional Plan and the early history of TRPA were contentious. The development of the plan involved numerous scoping meetings with local and regional agencies and public participation. TRPA's Governing Board adopted the original Regional Plan in 1984 but it was met with several lawsuits from environmental and development interests. As a result of a federal court injunction, TRPA was unable to implement the plan. TRPA then undertook extensive efforts to resolve the conflicts using a consensus building workshop (CBW) to bring together the major stakeholders in the basin in an effort to reach agreement on points of conflict. As a result of this process, many conflicts were resolved and several of the Regional Plan's features including transferable development rights (TDRs) and the individual parcel evaluation system (IPES) were the product of tradeoffs and agreements reached during the process. TRPA's Governing Board approved the Regional Plan in 1987 and it includes: a land use plan for the integrated arrangement and criteria and standards for the uses of land, water, air, space, and other natural resources within the region; a transportation plan for the integrated development of a regional system of transportation; a recreation plan for the development, utilization, and management of the recreational resources of the region; and, a public services and facilities plan for the location, scale and provision of public services and facilities.

The Regional Plan guides decisionmaking regarding growth and development in the Tahoe Basin and it contains some of the most stringent growth controls in the country. TRPA is also required to evaluate the progress towards its thresholds every five years. According to the most recent threshold review released in 1996, fifteen of the thirty-four (44 percent) sub-elements within the nine major thresholds improved. Thirteen stayed the same (38 percent) and six declined (18 percent). None of the nine major thresholds was met entirely.

MOVEMENT FROM CONFLICT TO COLLABORATION

While the history of TRPA and the efforts to protect Lake Tahoe are riddled with conflict, the last decade has been a time of collaboration between governmental and NGOs and greater emphasis on nonregulatory strategies. The atmosphere of collaboration that currently exists in the Tahoe Basin was born of a very costly process of conflict and the gradual building of trust between diverse actors. One of the crucial events in this transition was the development of the Tahoe Transportation and Water Quality Coalition in 1989. Initially, the coalition was comprised of The League to Save Lake Tahoe, Lake Tahoe Gaming Alliance, and, The Tahoe-Sierra Preservation Council. All three actors had traditionally been in conflict with one another, which caused the local press to dub it "the unholy alliance." However, the three actors found an issue, transportation, that they were willing to work together on for different reasons: casino interests for economic reasons; the League for environmental reasons; and, the Tahoe-Sierra Preservation Council for quality of life reasons. The coalition has since expanded in membership and is also concerned with water quality issues. One of the products of these collaborative efforts is the preparation of the Joint Federal Legislation Agenda that is used to coordinate their efforts to lobby Congress and federal agencies.

There are other examples of increased collaboration and emphasis on nonregulatory approaches to addressing problems in the basin. TRPA has signed more than 30 MOUs with local governments, public utility districts, and other agencies to devolve permitting authority and streamline the regulatory process. To enhance restoration, TRPA encourages homeowners to install NPS controls through a BMP Retrofit Program. TRPA and other actors have worked together on a number of redevelopment projects (e.g., park avenue development project) to achieve environmental improvements while also achieving other benefits such as economic development and affordable housing. It coordinated the development of an Environmental Improvement Program (EIP) in 1998. The EIP consists of approximately 1,018 actions and projects by local, state and federal actors with an estimated cost of $908 million. Transportation has remained a difficult problem, but a Coordinated Transit System (CTS) is scheduled for implementation in the fall of 2000. The ultimate product of these collaborative efforts may be the Lake Tahoe Presidential Forum held in July 1997 and attended by President Clinton, Vice President Gore, two governors, four United States Senators, several congressman, four Cabinet-level Secretaries and Administrators and dozens of other high ranking federal and state officials. The forum focused national attention on the problems in Lake Tahoe and resulted in a doubling of federal funding over a two-year period and a federal commitment to help implement the EIP.

Rhode Island's Salt Ponds

The Salt Ponds are a string of nine brackish coastal lagoons separated from the ocean by a narrow strip of barrier islands. The watershed encompasses approximately 32 square miles and is contained within the municipalities of Narragansett, South Kingston, Charlestown, and Westerly. The ponds are shallow, poorly flushed, and the freshwater input is primarily from surface runoff and groundwater. That makes them valuable as fish and shellfish nurseries but also susceptible to eutrophication and bacterial loading. Historically, the ecology of the ponds was influenced by the stabilization of inlets, dredging of channels, the installation of OSDSs, and alterations of the quality and quantity of freshwater inflow due to development activities. The low, narrow barrier beaches also make the region particularly susceptible to coastal erosion and damage from winter storms (i.e., Nor'easters) and summer hurricanes. Meanwhile, the

long residence time of groundwater complicates the development of effective growth control policies and evaluation of existing policies.

ENVIRONMENTAL PROBLEMS IN THE SALT PONDS WATERSHED

Until a four-lane highway provided easy access to the area in the 1950s, the region remained relatively undeveloped. Between 1950 and 1980 residential development increased threefold. By the late 1970s, the Salt Ponds region began to experience a number of the environmental problems: loss of habitat and impacts due to development in and adjacent to critical habitat; declining fish and shellfish stocks; increased shellfish closures due to bacterial contamination; excessive nitrogen loadings and pathogens from OSDSs; increased sedimentation; stabilized breachways changed salinity regimes and caused sedimentation problems; storm damage; and, user conflicts. There was also a general belief among the public that government was not responsive and that agency decisionmaking was cumbersome, contradictory, and time-consuming

These problems and the proposed siting of a nuclear power plant along the shores of Ninigret Pond helped generate a growing awareness that additional management measures were needed to protect the Salt Ponds ecosystem. These concerns were expressed during public hearings on the development of the Coastal Resources Management Council's (CRMC's) Rhode Island Coastal Resources Management Program (RICRMP) (i.e., the state coastal zone management program). The public's general concern was that RICRMP would not adequately address the unique nature of the problems in the Salt Ponds watershed and that a more comprehensive approach was needed. The CRMC agreed and turned to the University of Rhode Island's (URI's) Coastal Resources Center (CRC) for assistance in developing a comprehensive management plan for the Salt Ponds watershed.

SALT PONDS SPECIAL AREA MANAGEMENT PLAN

From 1979 to 1984, federal funds received by the CRMC and the CRC were combined to support a research program that led to the formal adoption of the Salt Ponds Special Area Management Plan (SAMP) in 1984.[34] The CRC's planning process focused on building a constituency to support SAMP. The final SAMP met with limited opposition and most comments were supportive in nature. Concurrent with the process of adopting SAMP, the CRC worked with local officials to enact zoning changes that would implement the plan's policies. As a result, the local governments amended zoning ordinances to be consistent with the plan.[35] Local officials also prioritized sewer extensions and targeted infrastructure investment in a manner consistent with SAMP. A review of the comprehensive land use plans in each community also indicated that, for the most part, local policies are consistent with SAMP and in some instances recommend more restrictive policies.

At the state-level, the CRMC enforces many of the plan's requirements through its permit review process. New regulations included increased buffer zone and setback requirements, density requirements for large projects, and stormwater and erosion control requirements. SAMP also became a component of the State Guide Plan that required future decisions by federal, state, and local agencies to be consistent with the plan's policies and recommendations. RIDEM also adopted new requirements for the siting and design of OSDSs statewide as well as more-stringent requirements in the Salt Ponds region.

The resulting institutional arrangement governing the Salt Ponds watershed is complex. Municipalities review development projects in their towns and control decisions regarding infrastructure investment. The CRMC reviews all projects within 200 feet of the most-inland coastal feature (e.g., beach, bluff, coastal wetland, shoreline). The CRMC also reviews all subdivisions of six units or more, large commercial projects, and any development activity gener-

ating more than two acres of impervious surface in the watershed. RIDEM reviews any project that discharges pollutants to coastal or inland waters, alters or impacts freshwater wetlands, or requires an OSDS. Accordingly, the municipality, the CRMC, and one or more divisions within RIDEM review most large development projects in the watershed. In order to coordinate the development of large development projects, the CRMC, local governments, and sometimes RIDEM participate in an informal permit review process. The process has led to better designed development projects that minimize environmental impacts. The review process also helps improve communication among the CRMC, local officials, and developers. This helps to build trust and keeps the parties informed about changing policies.

Lessons learned during SAMP's implementation have led to other policy changes as well. The CRMC substantially revised RICRMP in 1990 and periodically ever since. The development of SAMP for the Salt Ponds also stimulated the development of a SAMP for the Narrow River watershed located adjacent to the Salt Ponds in 1986. SAMP also served as a catalyst for the development of the Harbor Management Program (HMP) that is implemented in conjunction with local municipalities.[36] SAMP also served as a catalyst for institutional changes at the local level. Municipalities stepped up efforts to extend sewers. Several towns adopted conservation ordinances to protect habitat areas and address erosion and stormwater problems. Conservation commissions were created to apply these ordinances and they routinely used the information contained in SAMP to justify their decisions. Communities prepared comprehensive land use plans that built upon SAMP's policies and recommendations. Accordingly, local governments now play an active role in managing the region's ecological resources.

In 1994, the CRMC received a grant from the National Oceanic and Atmospheric Administration (NOAA) to examine the implementation of SAMP. Because the Salt Ponds is fed primarily by groundwater, surface water quality data does not completely tell one whether SAMP's density policies are effective in managing nitrogen loading to groundwater. Surface water quality as defined by nitrogen and pathogen levels appeared to improve or stay the same in some areas while in others it declined. These conditions fluctuated from year to year making it difficult to discern clear trends. In order to gain a better understanding of whether SAMP's policies were "working" the CRC monitored groundwater quality at the same wells monitored during SAMP's development. While there is only one year of data, the study suggested that groundwater quality had improved or stayed the same in many areas while it had declined in few areas. The projected impacts at buildout levels were also mostly within an acceptable range.

Based on these results, the CRMC began an effort to revise the Salt Ponds and Narrow River SAMPs as one new inclusive SAMP. The effort resulted in some minor changes to the original zoning policies and other regulatory requirements contained in the plans. It also updated the technical information contained in the plans. These revisions were adopted in 1999 and met with little opposition at the public hearing.

Comparing the Six Watershed Management Efforts

While the six watershed governance efforts addressed problems stemming from NPS pollution and habitat loss and degradation, there were a number of important differences in their physical environment, institutional environment, planning process, and implementation activities (Table 1). These differences add richness to the cross-case analysis, increase the generalizability of the findings, and illustrate the important role that contextual conditions have in shaping the development of watershed governance efforts. A few of the differences are highlighted below; others are discussed in subsequent sections of the report.

Physical Environment

There are important differences in the physical environment that influenced the development of these watershed management efforts. The watersheds vary considerably in size. The Salt Ponds is the smallest, covering around 32 square miles and encompassing parts of only four municipalities. Tampa Bay is the largest, covering approximately 2,300 square miles. The physical systems are also quite different. Delaware Inland Bays and the Salt Ponds are both shallow, poorly flushed estuaries influenced by groundwater discharges with long residence times (15 to 40 years). Tillamook Bay is also a shallow estuary but as a result of large tidal fluctuations and heavy rainfall nutrients are not the major concern. Instead, pathogens and sedimentation are the important problems. Tillamook Bay also has spawning runs of several salmonids listed as endangered species. Narragansett Bay is a relatively deep estuary. While it is susceptible to nutrient loadings, it also has water quality problems stemming from this legacy of industry and development such as combined sewer overflows (CSOs), point source discharges, and contaminated sediments. In recent years, increasing suburban sprawl has begun to cause NPS water quality problems in many small embayments and tributaries. Tampa Bay is also an urbanized watershed. However, point sources are less of a concern due to previous efforts to address these problems. Today, the focus in Tampa Bay is primarily on nutrient loadings from stormwater and other nonpoint sources. Lake Tahoe's steep slopes and 700-year residence time for water makes it susceptible to nutrient loadings and declining lake clarity.

Given these differences, it not surprising that each watershed management effort identified different environmental problems. In fact, finding a focal problem(s) that could be placed on the policy agendas of state and local decisionmakers and to center collaborative efforts around appeared to be an important prerequisite for the development of an effective watershed management effort. All of the programs, with the exception of Narragansett Bay, had a central problem. In the Salt Ponds it was nutrient loadings to groundwater and surface waters primarily from development and OSDS. In the Delaware Inland Bays it was nutrient loadings to groundwater and surface water from development and agricultural activities. In Tillamook Bay it was pathogen loadings and restoring salmonid habitat. In Tampa Bay it was nutrient loadings from stormwater runoff and other nonpoint sources and habitat restoration. In Lake Tahoe it was declining lake clarity. Conversely, Narragansett Bay was never able to identify or agree upon a central problem and instead identified numerous problems of equal importance. This led to an ambitious CCMP that lacked focus and exceeded the implementation capacity of federal, state, and local participants. It also made it difficult to develop shared definitions of problems and to identify priorities for collective action. Thus, it was hard to elevate particular issues on the policy agenda and meant that the NBP/NBEP did not have a clear identity or mission.

Institutional Environment

The different physical environments combined with their locations gave rise to different levels of jurisdictional complexity. The lowest level of complexity is the Salt Ponds,[37] which involves portions of four local governments that have gradually improved their capacity for addressing environmental problems over time. However, the case study does involve two state environmental regulatory agencies. RIDEM implements EPA programs and the CRMC is the state's federally approved CZM program. The overlap in regulatory authority and the historic conflicts between the agencies are an important source of added complexity in the Salt Ponds and Narragansett Bay. The jurisdictional complexity of the Delaware Inland Bays and Tillamook Bay is also relatively low with both efforts contained in a single county with county government

TABLE 1: CHARACTERISTICS OF THE SIX CASE STUDIES

WATERSHED CHARACTERISTICS	DELAWARE INLAND BAYS	NARRAGANSETT BAY
Physical Environment		
Water body	Delaware Inland Bays (DE)	Narragansett Bay (RI, MA)
Size of watershed	300 sq. miles	1,600 sq. miles
Population	131,000a	2,000,000 in watershed
Focal problem(s)	Nutrient loading	None; Comprehensive in scope with a diverse range of problems
Sources/causes of problem(s)	Poultry farms, OSDSs, stormwater runoff, and sewage treatment plants	Diverse range of sources and causes of problems
Institutional Environment		
Jurisdictional complexity	Low	High
Previous planning activity	Several collaborative studies beginning with report to the governor in 1969	27 water quality studies dating back to 1900. No collaborative watershed-based programs
Planning Process		
Duration	1989 - 1995	1985 – 1993
Driving force to start process	State officials	Congress
Program	EPA's National Estuary Program	EPA's National Estuary Program
Hiring entity for staff	DNREC	New England Interstate Water Pollution Control Commission
Nature of conflict	High. Agricultural interests and EPA had problems with draft plan and threatened to disapprove it	High. Most key actors commented on plan; it took a while to resolve concerns
Nature of collaboration	Medium. Mostly at the committee level, DNREC's Inland Bays initiative, and NRCS HUA	Low. At the end of the process actors protected their turf
Implementation Activities		
Implementing organization(s)	Center for the Inland Bays (CIB)	RIDEM - NBEP
Organizational arrangement	Nonprofit Organization	NBEP is a program in RIDEM
Hiring entity for staff	CIB	RIDEM
Nature of conflict	Low	Low
Nature of collaboration	Mostly focuses on restoration, public education, and research	Collaboration with other actors limited to selected projects
Clear goals/policies	No/No	No/No
Key regulatory agencies	DNREC; Conservation District; local governments	RIDEM; CRMC; local governments
Key funder of BMPs, restoration, & infrastructure	NRCS, Conservation District, Sussex County	NRCS, Section 319, Section 140(b), RI Aquafund, open space bonds
Outcomes		
Environmental improvements	Medium	Low

Note: All assessments of "high," "medium," and "low" are based on comparisons among the six programs

a Measured at the county level

TABLE 1: CHARACTERISTICS OF THE SIX CASE STUDIES (continued)

WATERSHED CHARACTERISTICS	SALT PONDS	LAKE TAHOE
Physical Environment		
Water body	Salt Ponds (RI)	Lake Tahoe (CA, NV)
Size of watershed	32 sq. miles	501 sq. miles
Population	32,000	53,000
Focal problem(s)	Nutrient loading	Nutrients and sedimentation
Sources/causes of problem(s)	OSDSs, sewage treatment plants, and stormwater runoff	Erosion from development, stormwater runoff, and habitat destruction in the 1960s and 1970s
Institutional Environment		
Jurisdictional complexity	Low	High
Previous planning activity	First watershed plan	Planning efforts date back to 1960s and resulted in federal-state compact in 1969. Planning has continued
Planning Process		
Duration	1979 - 1984 (original); 1994 - 1999	1980 – 1987 (for main regulations)
Driving force to start process	Citizens, local officials	Citizens, NGOs, state officials
Program	NOAA – CZMA	Federal-State compact
Hiring entity for staff	CRC; CRMC	TRPA
Nature of conflict	Low	High. Environmental, property rights, and development interests
Nature of collaboration	Medium. Mostly CRMC and local governments. Little collaboration with RIDEM	Low. A consensus building process used to identify tradeoffs that formed the basis of new regulations
Implementation Activities		
Implementing organization(s)	CRMC and local government	TRPA
Organizational arrangement	Partnership based on shared regulations (i.e., zoning)	Regional Planning Council with politically appointed representatives
Hiring entity for staff	CRMC	TRPA
Nature of conflict	Low	Medium. Same as during planning but conflict has declined
Nature of collaboration	Low. Mostly through informal permit review process	MOUs devolve permitting to locals; $900 million EIP
Clear goals/policies	No/Yes. Zoning standards and regulations	Yes/Yes. Environmental thresholds and regulations
Key regulatory agencies	CRMC, RIDEM, Local government	TRPA, Lahontan Regional Water Quality Board
Key funder of BMPs, restoration, & infrastructure	None	Federal, state, local governments; USFS, California Tahoe Conservancy
Outcomes		
Environmental improvements	Medium	Medium

Note: All assessments of "high," "medium," and "low" are based on comparisons among the six programs

TABLE 1: CHARACTERISTICS OF THE SIX CASE STUDIES (continued)

WATERSHED CHARACTERISTICS	TAMPA BAY	TILLAMOOK BAY
Physical Environment		
Water body	Tampa Bay (FL)	Tillamook Bay (OR)
Size of watershed	2,300 sq. miles	570 sq. miles
Population	2,000,000	17,000
Focal problem(s)	Nutrient loading leads to loss of seagrass	Closed shellfish beds from bacterial contamination, sedimentation, & salmon listed as endangered species
Sources/causes of problem(s)	Stormwater runoff, sewage treatment plants, phosphate mining, and fertilizer production	Dairy farms, OSDSs, stormwater runoff, and forestry activities
Institutional Environment		
Jurisdictional complexity	Medium – High	Low – Medium
Previous planning activity	Activity dates back to the late 1960s. Two watershed plans developed during the 1980s.	Activity dates back to the late 1970s. Several efforts in 1980s. RCWP runs from 1981 – 1996
Planning Process		
Duration	1990 – 1996 for plan and until 1998 for implementing agreements	1993 – 1999
Driving force to start process	TBRPC, ABM, SWFWMD, FDEP	DEQ, ODF, Tillamook County
Program	EPA's National Estuary Program	EPA's National Estuary Program
Hiring entity for staff	TBRPC	Oregon State University
Nature of conflict	Low	Low
Nature of collaboration	High. Lot of activity focused on research, environmental monitoring, and public education.	Low. Limited by staff turnover. Mostly limited to research and public education
Implementation Activities		
Implementing organization(s)	TBEP	TCPP
Organizational arrangement	Independent alliance of government entities pursuant to FL statute	Intergovernmental partnership
Hiring entity for staff	TBEP	Tillamook County
Nature of conflict	Low	Low
Nature of collaboration	Habitat restoration, stormwater, public education, environmental monitoring	Habitat restoration projects and installing BMPs
Clear goals/policies	Yes/Yes. Goals and binding commitments for nutrient reductions	Yes/Yes. CCMP and TCPP have general goals but specific targets
Key regulatory agencies	FDEP, EPC, SWFWMD, and local governments	DEQ, ODA, and local government
Key funder of BMPs, restoration, & infrastructure	SWFWMD and local governments	ODF, NRCS, GWEB, Tillamook County
Outcomes		
Environmental improvements	High	Medium

Note: All assessments of "high," "medium," and "low" are based on comparisons among the six programs

being the main local actor because the other local governments have limited capacity for addressing environmental problems. However, the ESA listing of the salmon, the Oregon Plan for Salmon and Watersheds, and related watershed planning and habitat protection efforts by a wide range of state and local government actors add considerable jurisdictional complexity in Tillamook Bay. Tampa Bay, Lake Tahoe, and Narragansett Bay have more complicated institutional environments. Tampa Bay involved three county governments and three major cities that all have a high technical and financial capacity for addressing environmental problems. There are also three well-developed regulatory programs (e.g., FDEP, SWFWMD, and the EPC of Hillsborough County). SWFWMD also has taxing authority, which provides stable implementation funding. Lake Tahoe is a federal-state compact involving the federal government, two states, and a variety of county and local governments, which vary in their capacity for addressing environmental problems over time. Local governments have gradually improved their capacity for addressing environmental problems. In addition to TRPA, there are also two sets of state agencies that differ considerably in structure and capacity. Interestingly, while California generally took the lead during the early years of TRPA in pushing for environmental improvements, today Nevada may be more innovative. Narragansett Bay also covers two states and about 100 cities and towns that vary considerably in environmental problem-solving capacity. However, while around 60 percent of the watershed is in Massachusetts, the government actors in this portion of the watershed have not been involved in any significant way.[38]

Given these variations in physical environment, nature of the problems, jurisdictional complexity, and variations in the capacity of state and local institutions, it should not be surprising to learn that each watershed has a rather unique history of previous planning efforts. The history of these efforts is important because it often shaped the development of institutions, social capital (e.g., trust), and problem-solving capacity that was the foundation for subsequent planning efforts such as those examined in this study.[39]

In Narragansett Bay, the first efforts to address water quality problems date back to 1900 and there were 27 previous studies that examined water quality problems in the bay. However, the NBP/NBEP was the first attempt at developing a collaborative watershed management plan for Narragansett Bay. In Delaware Inland Bays, Lake Tahoe, and Tampa Bay the first watershed management efforts took place in the 1960s while the efforts in the Salt Ponds and Tillamook Bay began in the late-1970s. The five watershed efforts all illustrate a pattern of planning followed by implementation followed by additional planning and implementation activities. The cyclic nature of these efforts and their evolutionary and path dependent nature is important because they helped to identify new problems, redefine old problems, set priorities, develop new institutions, and improving the capacity of the actors to address problems. For example, the history in Tampa Bay reflects a gradual shift in emphasis from point to nonpoint source pollution and an improved capacity to address these water quality problems.

The histories also illustrate how various EPA and USDA programs improved watershed governance. Delaware Inland Bays and Lake Tahoe are examples of the role that the various CWA planning provisions (e.g., Section 303(e), Section 208, and Section 205) had in improving the governance of a watershed. In fact, Lake Tahoe is still implementing its Section 208 plan. Tampa Bay is also a model of how effective federal and state efforts have been in addressing point source discharges from sewage treatment plants (e.g., CWA's NPDES system). Meanwhile, various USDA programs played an important role in the Delaware Inland Bays, Lake Tahoe, Narragansett Bay, and Tillamook Bay cases by providing funding to implement BMPs to address NPS problems. Of particular interest were the USDA's Hydrologic Unit Area (HUA) programs in Delaware Inland Bays and Narragansett Bay and the RCWP in Tillamook Bay.

These programs also provided important sources of implementation funding in each watershed. In Lake Tahoe, the USDA Forest Service's (USFS) Lake Tahoe Basin Management Unit (LTBMU) manages 77 percent of the land in the basin and spends much money addressing NPS and habitat problems.

Planning Process

Each watershed management effort relied on some form of participatory planning. However, there were many differences in how the processes took place. Even the four NEPs experienced important differences. For example, Tillamook Bay experienced a number of staffing problems while Narragansett Bay had trouble developing an effective collaborative decisionmaking process. There were also differences across the efforts in the type and level of conflict associated with the planning processes. Delaware Inland Bays, Lake Tahoe, and Narragansett Bay experienced significant conflicts at the end of their processes that almost derailed the efforts. Conversely, the Salt Ponds, Tillamook Bay, and Tampa Bay had little conflict surrounding their approval process.

There were also examples of where more than one planning process was going on simultaneously within a watershed pursuant to different federal and state programs. Examples of federal programs include the HUA programs for Delaware Inland Bays and Narragansett Bay and the RCWP that overlapped with the NEP. All the watersheds also contained waters listed on state Section 303(d) lists and were subject to the CWA's TMDL requirements, although at the time of the study TMDLs were developed only for the Delaware Inland Bays and Tampa Bay while TMDLs were at various stages of development in Narragansett Bay, the Salt Ponds, and Tillamook Bay.[40] There are also other overlapping state-level watershed planning efforts. The work of the Governor's Task Force on the Inland Bays and Inland Bays Monitoring Committee overlapped with the DIBEP. Activities pursuant to the Oregon Plan for Salmon and Watersheds, the Tillamook Bay watershed council, Senate Bill 1010, and efforts to manage the Tillamook State Forest overlap with the TBNEP. In Tampa Bay, the SWIM plan implemented by SWFWMD and the ABM overlaps with the TBEP.

These overlapping watershed management efforts are a natural product of our federal system and illustrate the inherently intergovernmental nature of problems such as NPS and habitat loss and degradation. While these programs tend to be separate and distinct at the federal level with different personnel located in various agencies administering each program, at the watershed level the same personnel in state and local agencies tend to be involved with all of the federal programs. It was also the case that many federal and state officials were focused primarily on the interests of their specific programs, while other smaller state agencies, staff in federal (i.e., NRCS staff in regional offices/conservation districts) and state field offices, and local government officials were less concerned about specific programs. Those individuals focused on undertaking activities that satisfied a wider collection of collection of policies, programs, and legal requirements.[41] This often makes it difficult to identify which state or local government activities (or portions of an activity) should be attributed to a specific program.

Planning was also used as an implementation activity. The six cases provide several examples where additional planning activities were undertaken to implement a watershed management plan or improve the effectiveness of existing programs. TRPA's $900 million EIP is one example. In the Delaware Inland Bays, the CIB developed a water use plan and DNREC recently developed a TMDL for the watershed. DNREC and the CIB have also begun to work together to develop tributary strategies for the three subbasins in order to implement the TMDL's

recommendations. In the Salt Ponds, several local governments developed HMPs to address user conflicts and public access policies in SAMP. Narragansett Bay developed a marina-pumpout siting plan as part of its efforts to get the state designated as a no-discharge zone.

Implementation Activities

There are also major differences across the six watersheds in implementation structures and activities used to improve environmental conditions. Lake Tahoe and the Salt Ponds developed regulatory programs. TRPA regulates development using a centralized implementation structure, although in recent years it has begun to devolve permitting authority to local governments and other institutions. The Salt Ponds implementation structure is polycentric or "networked" in structure with regulatory authority is shared among RIDEM, CRMC, and local governments. There are also significant differences in how the four NEPs implement their CCMPs. Narragansett Bay's program is housed in RIDEM. Delaware Inland Bays is implemented through a collaborative organization known as the CIB, which is a nonprofit organization. Tillamook Bay developed the TCPP. It is a collaborative organization consisting of all major stakeholders. Tampa Bay has a more aggressive and formal approach. It created a new collaborative organization known as the TBEP, a partnership between six local governments and three regulatory agencies codified in an interlocal agreement.

A wide variety of implementation activities were also used to improve environmental conditions in the watersheds (Table 2). Some of the policy instruments used included:

- education
- installation of best management practices (BMPs)
- habitat restoration and protection
- planning
- infrastructure investment (e.g., sewer construction)
- regulations
- scientific research

These efforts suggest that regulation can help minimize and control future problems from NPS and habitat loss and degradation. However, the ability of regulation to stimulate the restoration of ecological systems when environmental conditions have deteriorated badly is more limited. This one reason the watershed management efforts all relied on a wide range of non-regulatory policy instruments. Some watershed management efforts made substantial investment in environmental infrastructure such as the construction of sewers (Delaware Inland Bays, Lake Tahoe, and Salt Ponds) while others emphasized stormwater retrofits (Tampa Bay), habitat restoration (Delaware Inland Bays, Lake Tahoe, Tampa Bay, and Tillamook Bay), and the installation of BMPs (Delaware Inland Bays, Lake Tahoe, and Tillamook Bay).[42] Alternatively, some emphasized the education of homeowners (e.g., Tampa Bay) and farmers (e.g., Delaware Inland Bays and Tillamook Bay) to address NPS problems. All the programs had some emphasis on land use planning, although the linkage to water quality management efforts was often limited. Several efforts (e.g., Delaware Inland Bays, Narragansett Bay, Salt Ponds,

and Tillamook Bay) also relied on some form of water use planning to address environmental problems and user conflicts. The implementation experiences suggest to us that regulations alone, particularly water quality regulations were insufficient to address effectively the problems of NPS and habitat loss and degradation. It also means that a wide range of implementation activities by federal, state, and local agencies may be required.

Collaboration in Watershed Management Efforts

Given the intergovernmental nature of problems such as NPS and habitat loss and degradation, it should not be surprising that collaboration emerged as an important strategy for improving environmental conditions and enhancing the governance of a watershed. Many of the implementation activities described in Table 2 were the result of collaboration and many of the notable accomplishments of each watershed management effort were collaborative in nature.

This should not be surprising when one considers the high potential for collaboration created by the polycentric structure of our federal system of government.

Collaboration is defined as "any joint activity by two or more agencies that is intended to increase public value by their working together rather than separately."[43] Typically, it involves an autonomous group of actors who use shared rules, norms, or organizational structures to act or make decisions related to an issue or problem.[44] No one actor has the ability to unilaterally take unilateral actions that compel other partners to act. Instead, the group makes a collective decision to which partners are bound, either as a result of formal (e.g., legal requirements) or informal (e.g., social norms and peer pressure) rules enforced by some form of formal (e.g., fine or loss of membership privileges) or informal (e.g., verbal comments) sanctions. Thus, collaboration is not synonymous with being engaged in a stakeholder process or using and advisory committee, even though the term is sometimes applied to those efforts.[45]

The analysis of the watershed management efforts revealed that collaborative activities occur at the operational, policymaking, and the institutional/capacity building level (Table 3).[46] The patterns of collaborative activity reflect several factors including institutional structures, the history of previous planning efforts, and the willingness of the actors to collaborate. The latter is in turn influenced by a variety of factors (e.g., incentives, past conflict, organization culture, etc.) including the capacity of different actors (e.g., human and financial resources, organizational capacity) to engage in collaborative activity.[47] The activities also illustrate how "watershed management" acts as an IGM strategy, as well as the wide range of opportunities for organizations to work together.

OPERATIONAL ACTIVITIES

Many collaborative activities occurred at the operational level.[48] Some were project-based and of limited duration. Implementing BMPs and undertaking habitat restoration projects was quite common. For example, a habitat restoration project might involve one organization providing the funding for land acquisition, another providing technical expertise, another doing the engineering or design work, another the construction or installation of the project, and another doing the maintenance and site management. If volunteers were used, another organization may recruit, organize, and manage the volunteers. The Delaware Inland Bays, Tampa Bay, and Tillamook Bay programs all emphasized this form of collaboration to varying degrees and is planned to implement the EIP for Lake Tahoe.

TABLE 2: EFFECTIVE USE OF POLICY TOOLS FOR ENVIRONMENTAL IMPROVEMENTS

	DIBEP	NBEP	SAMP	TBEP	TBNEP	TRPA
Education						
■ General public	X	X		X	X	
■ Homeowners				X		
■ Farmers	X				X	
■ Industry						
■ Decisionmakers			X	X	X	X
Best Management Practices						
■ Agriculture	X				X	
■ Forestry					X	X
■ Homeowners				X		X
Habitat Restoration/Protection						
■ Land acquisition	X[b]			X		X
■ Restoration projects	X[b]	X[b]	X[b]	X	X	X
■ Planning/Capacity building		X	X	X	X	X
Planning						
■ Specific Issue(s)						
■ Sub-geographic areas	X	X				X
■ Land use planning	X	X	X	X	X	X
■ Harbor management/Water use plans	X	X	X		X	X[a]
Infrastructure Investment						
■ Installing sewers	X		X			X
■ Stormwater retrofits			X	X		X
Regulation						
■ Growth controls			X			X
■ Stormwater and erosion control	X		X	X		X
■ Agriculture	X				X	
■ Forestry					X	X
Tax Expenditures						
Scientific Research	X	X	X	X	X	X

X = undertaken; X[a] = Planned; X[b] = Limited to individual projects rather than a systematic effort linked to clear goals, targets, or priorities

TABLE 3: COLLABORATIVE IMPLEMENTATION ACTIVITIES

TYPE OF COLLABORATION	DIBEP	NBEP	SAMP	TBEP	TBNEP	TRPA
Operational Level						
■ Restoration projects/BMPs	X	X		X	X	X[a]
■ Actor hiring staff to work in another's office					X	X
■ Develop/distribute educational materials	X			X		
■ Training of local officials					X	
■ Scientific/Technical research/guidance	X	X		X	X	
■ Actor collecting information for another actor	X		X	X	X	
■ Participating in other collaborative processes		X		X	X	X
■ Collaborating on joint grant proposals	X	X		X	X	
■ One actor issues another's permits			X			X
■ One actor helps enforce another's regulations			X			X
■ Regulator and actor collaborate to achieve environmental improvements			X	X[a]		X
Policymaking Level						
■ Identify priority sites for restoration/BMPs			X	X		X
■ Identify priority sites for infrastructure						
■ Adopt shared goals				X	X	X
■ Adopt shared policies			X	X		X
■ Memorandums of Understanding (MOUs)			X		X	X
■ Data collection/distribution (e.g., monitoring)				X	X[a]	
■ Report on joint implementation activities	X			X	X[a]	X
■ Create a forum to discus technical issues	X			X		X
■ Collaborative permit review process			X			
■ Frequent meetings to share information and coordinate activities	X			X	X	
Institutional/Capacity Building Level						
■ Create nonprofit organization	X					
■ Create intergovernmental organization				X	X	
■ Create federal-state compact						X
■ Develop shared regulations (e.g., zoning)			X			X
■ Incorporating collective choice policies into other constitutional level rules		X	X	X		X

X = undertaken; X[a] = Planned;

Another type of collaborative activity was for one agency to hire someone to work in another agency. In Tillamook Bay, the Oregon Department of Forestry (ODF) hired a fish biologist and a wildlife specialist from the Oregon Department of Fish and Wildlife (ODFW) to work entirely on habitat restoration in the Tillamook State Forest. This allowed the ODF to increase its restoration efforts and improved communication between the agencies. In the ODFW, a private timber company pays for a staff member to design and implement restoration projects in private forests. Project-level activities are not limited to BMPs or habitat restoration. Some cases used collaboration to develop or distribute educational materials. In Tampa Bay, several actors collaborated to produce and distribute 100,000 copies of a boater's guide. There are also examples of collaboration in scientific research and developing grant proposals.

Another common type of collaborative activity is when one actor collects information for another actor. In the Delaware Inland Bays, Salt Ponds, and Tillamook Bay, volunteer water quality monitoring programs collect information that is used to varying degrees by decisionmakers in other organizations. In Tampa Bay, local governments and regulatory agencies created a collaborative monitoring program. At the operational level, the programs share data and routinely swap samples to improve their quality assurance-quality control (QA/QC) procedures. In the Salt Ponds, the CRMC and RIDEM have worked together to ensure that the information submitted by permit applicants satisfies both agencies, which simplifies the process for applicants.

There are other examples of collaboration in regulatory programs as well. The CRMC worked with local building officials to get them to forward permit applicants to the agency and to report violators. RIDEM historically has relied on the CRMC to enforce its Section 401 Water Quality Certification under the CWA. Conversely, the CRMC relies on RIDEM's OSDS permit to satisfy that part of the agency's technical review. Recently, RIDEM began deferring its review of freshwater wetlands permits when an applicant was also subject to the CRMC's review of tidal wetlands. In Lake Tahoe, the Lahontan Regional Water Quality Board (California's state water quality agency) and the Nevada Department of Environmental Protection (NDEP) defer their review of many activities to TRPA. TRPA and the CRMC both meet with developers to discus ways that a project can be modified to address their concerns and minimize environmental impacts. TRPA has also delegated the authority to issue permits for some of the activities subject to its regulations to local governments.

POLICYMAKING ACTIVITIES

A wide range of collaborative activities occurred at the policymaking level (Table 3).[49] They tended to perform a steering function focusing on improving communication between and among the actors by coordinating actions and integrating policies so that each agency's decisionmaking processes advance collective goals. Typically, this occurs through the development of shared goals or policies contained in a formal document such as a watershed management plan. For example, Table 4 lists the goals and targets of the CCMP produced for Tillamook Bay. Tampa Bay developed measurable goals that commit the partners to meet specific nutrient reduction and habitat restoration goals. The Salt Ponds plan contains density policies that limit development and nutrient loadings in the watershed. Environmental thresholds and development restrictions have also been developed for Lake Tahoe.

In other cases, the partners agreed to new policies such as priority sites for habitat restoration or the installation of certain BMPs (e.g., Lake Tahoe, Salt Ponds, and Tampa Bay). In the Salt Ponds, the CRMC and local governments agreed on the areas that should be sewered to remove OSDSs as well as on areas that should not be sewered or have investments in infrastruc-

TABLE 4: GOALS AND TARGETS CONTAINED IN THE TBNEP'S WATERSHED MANAGEMENT PLAN

GOAL	TARGETS FOR IMPLEMENTATION
Critical Habitat Restore healthy stocks of salmonids, shellfish, and other aquatic species	■ Enhance 200 miles of forested riparian habitat to meet TBNEP standards by 2010 ■ Manage 90% of upland riparian zones to meet state forest HCP requirements ■ Enhance 100 miles of upland instream habitat by 2010 ■ Enhance 500 miles of continuous riparian habitat in the 0 – 500 ft elevation band to healthy condition by 2010 ■ Upgrade 50% of all tide gates by 2010 ■ Conserve and restore 750 acres of tidal wetland by 2010 ■ No decline in eelgrass beds due to degradation or loss ■ Achieve an improved climate for fisheries practices and regulatory actions ■ Achieve wild fish production and spawner escapement goals set by the Oregon Department of Fish and Wildlife for Tillamook Basin rivers
Erosion & Sedimentation Reduce sediments to meet salmonid habitat requirements and achieve water quality standards	■ Upgrade 1,400 miles of forest roads by 2010 on state and private lands ■ Decommission 50 miles of forest management road by 2010 ■ Conduct road maintenance activities on all 2,000 miles of forest management roads annually ■ Limit the amount of forested lands in clearcuts to no more than 1/8th of the total forest lands in the watershed ■ Conduct risk analysis on 95% of proposed high risk timber harvesting sites on slopes of 80% or greater ■ Manage 67% of the watershed's privately held, forested riparian areas under HCP standards ■ Assess 90% of upland county and state roads, both paved and unpaved, for their sediment contribution ■ Control erosion from all construction and development in urban areas by 2003
Water Quality 1) Achieve water quality standards for Bacteria in the rivers and the bay by 2010 2) Achieve in-stream temperatures and suspended sediment concentrations that meet salmonid habitat requirements by 2010	■ Achieve at least a 25% reduction in bacteria and sediment loads to rivers (apparent decreasing trends by 2005. Statistically significant results by 2010) ■ Achieve SB 1010 Plan compliance among 100% of livestock operations by 2010 ■ Achieve routine annual inspections of 100% of the CAFOs by 2004 ■ Achieve at least a 25% reduction every 4 years in the number of days that the rivers are not in compliance with water quality standards for bacteria ■ Achieve total compliance with NPDES permits for wastewater facilities by 2002 ■ Reevaluate commercial shellfish harvest area classifications and closure criteria on an annual basis
Flooding No goal, only targets	■ Develop a hydrologic model by 2000 ■ Complete 20 projects within 2 years of developing the hydrologic model that: 1) reduce runoff rate in uplands; 2) alleviate drainage problems in lowlands; 3) increase floodplain storage in lowlands; and 4) improve the capacity to withstand or benefit from flood events. ■ Raise at least 55 houses to at least 3 ft above the 100-year flood elevation by 2010 ■ Construct 18 cow pads in flood prone areas to protect livestock by 2000 ■ Increase the percentage of compensated damages from flood events

ture in order to limit development. Some of the cases used MOUs to formalize the shared policies and to guide collaborative efforts at the operational level. Lake Tahoe used MOUs to delegate permitting authority to local governments while the CRMC and RIDEM used an MOU to coordinate their review of wetlands permits. Members of the TCPP signed MOUs committing the partners to its goals. Oregon and ten federal agencies signed an MOU to provide the state with flexibility to address environmental problems at the watershed level.

The shared goals, priorities, and policies can also be more informal and take the form of shared norms and expectations that result from the social interactions between collaborators.

Informal social norms operate to varying degrees in all of the watershed management efforts. In most of the cases, the social norms are positive, creating a peer pressure system that encourages implementation and provides informal sanctions for violating social agreements. The peer pressure occurs at the political, professional, and interpersonal level and can provide an important stimulus for change.

Collaborative activities at the policymaking level are not limited to the development of shared goals, policies, and social norms. It can also involve synthesizing information in a manner that adds value for decisionmakers. For example, Tampa Bay collects the data produced by all of the environmental monitoring programs, synthesizes the information, puts it in a form understandable to decisionmakers, and reports on the progress towards collective goals. It also has a five-year work plan process that allows the program to monitor the implementation actions of its partners, linking them with progress towards the CCMP's specific and measurable goals. Such activity is not limited to collecting environmental data. Delaware Inland Bays, Tampa Bay, and Tillamook Bay routinely report on implementation activities and the progress towards specific goals and targets and have taken steps to distribute this information to the public.[51] Lake Tahoe and Tillamook Bay both reported that they were exploring the development of a monitoring system that would be available over the Internet and would include information on both implementation actions and associated changes in environmental conditions. EPA requires each estuary program to conduct a biennial review providing information on implementation efforts. TRPA conducts a threshold evaluation every five years to assess its progress towards environmental thresholds.

The efforts to report on the progress of individual partners towards the specific goals and targets of a watershed management effort is important because it improves accountability and serves to develop and reinforce the peer pressure mechanisms that create incentives for the partners to continue implementation activities. The specific goals and targets can also become the basis for structuring future collaborative efforts once the specific recommendations in a CCMP have become dated and supplanted by other priorities. The reporting processes also stimulate policy-oriented learning that can serve as a catalyst for policy change. For example, after two threshold evaluations producing less than satisfactory results, TRPA developed the EIP to address the problem of declining lake clarity and improve progress towards other thresholds.

Other collaborative activities at the policymaking level include meetings and routine interactions designed to improve coordination and communication between agencies and to stimulate, legitimize, and enhance collaborative activity at the operational level. This activity can take many forms. Delaware Inland Bays and Tampa Bay had STACs that are now forums for scientists and technical specialists working in governments and NGOs. They help identify technical and information needs and collaboratively set research priorities. They also offer technical advice to agencies. Lake Tahoe's APC serves a similar function. In the Salt Ponds, CRMC developed an informal permit review process where the agency meets with local officials, developers, and, on occasion, RIDEM at the project design phase to discuss projects and applicable regulations. Collaborative organizations developed to implement the plans for Delaware Inland Bays, Lake Tahoe, Tampa Bay, and Tillamook Bay also meet on a regular basis, improving communication, coordinating actions, and finding opportunities for collaboration at the policymaking and operational levels.

INSTITUTIONAL/CAPACITY-BUILDING ACTIVITIES

Every case involved at least one collaborative activity related to developing new institutions or building capacity to address environmental problems.[52] In Delaware Inland Bays, Lake Tahoe,

Tampa Bay Tillamook Bay that involved creating new, collaborative organizations. A collaborative organization is defined here as an organization comprising other organizations, one that has rules for membership and parameters for action. Membership creates certain duties, obligations, and expectations, which are expressed formally (e.g., statute, MOU, interlocal agreement) or informally (e.g., social norms). Failure to comply with the rules and norms can result in sanctions that are formal (e.g., loss of membership privileges) of informally (e.g., peer pressure, verbal comments, etc.). Frequently, the function of the collaborative organization was to encourage, guide, or constrain the individual and collective activities at the policymaking and operational level by its members. For example, in Lake Tahoe and the Salt Ponds local governments gave up some control over zoning and land use decisions while in Tampa Bay, local governments had to commit to public expenditures. The development of collaborative organizations also improved the capacity for problem solving and provided institutional infrastructure that future planning efforts can build upon. In some cases, the collaborative organizations become involved in other planning efforts to address problems in the watershed.

The Delaware Inland Bays resulted in the CIB, which is charged with overseeing the plan's implementation. It is a nonprofit organization chartered by the state legislature with a board of directors drawn from various organizations and public representatives. The CIB focuses on education, research, and restoration activities. Through STAC and the research it sponsors, the CIB has improved the capacity for addressing water quality problems. The CIB serves as a forum where different governmental actors and stakeholders can discuss issues, coordinate programs, and find opportunities for collaboration among the actors involved in managing the region's environmental problems. For example, the CIB worked with DNREC to organize three tributary teams to develop the pollution control strategies that will implement the TMDL recommendations. The CIB also increased the capacity of actors to educate the public. The CIB also sponsored numerous opportunities for the public to get involved with civic institutions whether it be through participating in habitat restoration projects, volunteer water quality monitoring, or efforts to develop the water use plan and tributary strategies.

Tampa Bay developed an interlocal agreement that committed its partners to implement the CCMP and created an independent alliance of government agencies pursuant to Chapter 163 of the Florida Statutes known as the TBEP. The TBEP is engaged in a broad range of activities and has more clearly defined goals than the CIB. During the development of the CCMP, the partners created a new collaborative program that coordinates the region's environmental monitoring programs. The program has since been expanded and is now called RAMP. The partners also formed the nitrogen management consortium, a partnership between local government and industry to achieve the nitrogen reduction goals. Some local governments have also incorporated implementation activities into their capital improvement programs (CIPs) to ensure implementation funding is allocated during the annual budget process.

Tillamook Bay resulted in the TCPP, a collaborative organization consisting of governmental and nongovernmental partners. Although, it has no clearly defined legal status and is in the early stages of development, the partners have agreed to a common set of goals and targets and have made progress despite the fact that EPA only recently approved its CCMP. The planning effort also resulted in the Tillamook Coastal Watershed Resource Center (TCWRC), which will further help local governments develop the capacity to address environmental problems at the watershed level.

Lake Tahoe developed a different institutional mechanism through a federal-state compact known as TRPA, a regional planning agency that improved the capacity for state and local governments to manage watershed development. Its policies serve as the zoning regulations for

the county and local governments and as supplemental water quality regulations for the states. Accordingly, TRPA, local governments, and the state water quality agencies all rely on the same set of regulations and policies. The development of TRPA and the associated political conflict also spawned the development of a number of NGOs that provided additional institutional infrastructure and helped monitor TRPA activities, encouraged the development of new programs, and stimulated collaboration.

The Salt Ponds SAMP serves as a shared set of regulations. During its development, local governments agreed to amend their zoning ordinances to be consistent with the plan's density and zoning requirements.[53] The local governments incorporated these policies into their comprehensive plans while SAMP is an element of the State Guide Plan, the repository of state policies. The Salt Ponds effort also led to changes in other CRMC regulations statewide and the development of improved local capacity for addressing environmental problems.

Narragansett Bay has engaged in less collaborative activity at the institutional level than the other watersheds. However, RIDOP did adopt the CCMP as an element of the State Guide Plan. Theoretically, that could produce changes in decisionmaking at the state and local level, although our investigation uncovered no evidence that suggests this occurred or was likely to occur. The implementation of the CCMP did result in the creation of a new program within RIDEM, improving the agency's planning capacity and ability to encourage, organize, and participate in collaborative activities. It also improved RIDEM's ability to obtain competitive federal grants and enhanced the agency's decisionmaking (e.g., improved RIDEM's ability to allocate grants pursuant to the Section 319 NPS program).

Value Added by Collaboration

Collaboration should only be used when value will be added as a result of organizations working together rather than working separately.[54] Many of the environmental improvements that resulted from collaboration would not have been possible or would have cost more, taken longer, and occurred less frequently if the actors did not work together.[55] The activities also provided other important sources of public value:

- improved efficiency/program effectiveness
- increased job satisfaction
- leveraged new resources
- additional social capital
- increased civil society

Many of these benefits are intangible and hard to measure. However, for many of our respondents, these were the most significant benefits of the watershed management efforts and the strongest rational for utilizing the "watershed approach."

Collaborative activities can reduce costs and increase the effectiveness of implementation efforts in various ways. The habitat restoration plan developed by Tampa Bay is good example. It redirected projects occurring in the watershed around a common set of priorities that should lead to greater environmental improvements from current expenditures. The use of volunteers in habitat restoration and water quality monitoring is another way that a watershed management effort can accomplish more with less.

Collaboration can also improve the job satisfaction of agency staff. Many respondents noted that they enjoyed collaborative activities because they can use skills other than those needed in their regular jobs. Many respondents also enjoyed the personal relationships built during these activities. Satisfaction also appears to be derived from the additional environmental improvements that can be achieved and how the efforts can break down the political and bureaucratic barriers between agencies that frequently are a source of frustration for many respondents. It is possible that increased job satisfaction and the corresponding increase in motivation can help improve the effectiveness of existing programs as well.

Many watershed management efforts were effective in leveraging additional resources. This included having staff in one agency assist with efforts that are normally the responsibility of another agency. As noted in Table 5 and elsewhere in the report, the watershed management efforts were often able to leverage financial resources from various federal, state, and local sources. The collaborative efforts can also leverage the policy networks of different actors in order to lobby more effectively. The best example may be the Joint Federal Legislation Agenda.

Collaborative activity can also develop social capital and encourage a civil society. Ongoing interactions can improve interpersonal and institutional relationships leading to the development of trust at the interpersonal and institutional level. This social capital is important because it provides the foundation for future collaborative efforts. The development of new collaborative organizations and new policies is another source of social capital that future efforts can build upon. For example, the development of new policies such as the habitat restoration plan in Tampa Bay allowed the state's land acquisition programs and SWFWMD to link funding decisions to these collective policies. Watershed management efforts can also foster a civil society by encouraging civic involvement in government institutions and volunteerism. This can be particularly important in rural areas like Delaware Inland Bays and Tillamook Bay where local governments rely heavily on volunteer involvement.

While the benefits can be significant, collaboration can also result in problems and costs. Collaborative efforts will almost always increase transaction costs associated with coordinating these activities. Managing these efforts can be difficult and requires a comprehensive set of skills. Volunteer efforts can increase the costs associated with recruiting volunteers and organizing and coordinating these activities. While some individuals enjoy the team-based environment associated with collaborative activities, others dislike this work environment. For these individuals, collaboration can reduce job satisfaction and motivation. Moreover, while these activities can develop trust, they can also cause conflict and distrust. For example, the efforts in Narragansett Bay caused a great deal of conflict that caused many of the original NBP partners to become disengaged and limited the CCMP's implementation.

Using Collaboration as an Implementation Strategy

Based on the analysis of these collaborative activities, we identified several lessons about using collaboration as a strategy for improving environmental conditions, enhancing watershed governance, and adding other forms of public value.[56] The first is that collaboration requires finding common problems or issues that advance the mutual interest of collaborators. This means it tends to be strategic in nature. It also requires that collaborators can agree to disagree in other areas where there is not agreement and are willing to respect these differences if long-term working relationships are to be established. In several cases, actors who were in conflict in other policy areas managed to find ways to work together to address problems – therefore a history of conflict is surmountable. Collaboration may also involve linking environ-

TABLE 5: TCPP'S STRATEGIES, FIVE-YEAR LOCAL ACTIONS, AND IMPLEMENTATION ACTIVITIES

STRATEGY	LOCAL ACTION	LEVERAGED SOURCES
Improve Degraded Roads	1) Complete road surveys and improve 360 miles of road built to salvage Tillamook Burn ■ Implement OPSW using Road Inventory Protocol on all forest lands ($16,000/year) ■ Bring roads up to present day standards ($18 million/year)	■ Since 1994, the ODF has surveyed 1133 miles ($120,000 – 70% federal, 30% state) ■ Since 1994, the ODF closed 7 miles of road ($200,000) ■ Since 1994, the ODF improved 469 miles of road ($15,077,000) ■ Since 1994, the FEMA ($2,623,000 – 75% federal, 25% state)
Restore Riparian Zones	1) ODF, BLM, watershed councils, and private landowners will stabilize 200 miles of streambanks ($ 1 million/yr.) 2) SWCD, TCCA, and others will install 130 miles of streamside fencing, off-channel watering facilities on 75 farms, and replant 130 miles degraded streambanks ($2.5 million)	■ Since 1996, the USFWS and others converted 7,571 ft of alder to mixed conifer and released 6 miles of conifer from competition ($118,175) (1) ■ Since 1991, the TCCA and SWCD fenced 53 miles of streambank, built 3 cattle bridges, and 100 alternative watering sites ($214,000) (2)
Enhance In-Stream Conditions	1) ODFW will work with land owners to install in-stream and off channel habitat structures 2) SWCD will install 90 stream barbs treating 18 miles of eroding streambanks ($900,000) 3) ODFW, watershed councils, and DEQ will place hatchery carcasses in streams to increase productivity ($5,000 per year)	■ Since 1996, the ODF completed 24 in-stream restoration projects ($1,262,561 - $644,220 federal, $563,934 state, $54,407 private) (1) ■ Since 1996, the SWCD constructed 34 barbs protecting 4,200 ft of streambank ($95,000) (2)
Improve Floodplain Conditions	1) Develop structural flood mitigation requirements 2) Reopen, unclog, and maintain sloughs and where necessary modify river segments ($2,250,000) 3) Projects based on COE Reconnaissance Study and FEMA's Project Impact	■ COE (Reconnaissance Study) ($100,000) (1 & 2) ■ FEMA (Project Impact) ($250,000) (3) ■ Installation of cow pads ■ Houses raised
Apply State of the Art Technology	GIS Development and Unified Watershed Assessments: 1) Sustain TCWRC ($900,000 over 3 years) 2) TCWRC should develop Tillamook County land use information system and GIS repository ($400,000 per year) 3) TCWRC maintain a real time and interactive tracking system	■ Tillamook County Economic Development Council ($35,000) (1) ■ Tillamook Bay Community College (faculty and staff) ($10,000) (1) ■ TBNEP (hardware) ($42,500) (1) ■ GWEB ($10,000) (1) ■ TBNEP (software) ($250,000) (2)

Note: Costs in local-actions category are estimates that have been generated. Costs in leveraged sources indicate the commitments and expenditures and their timeframes.
Source: Trenholm, Mark, *Summary of the Tillamook County Performance Partnership* (Eugene, OR: University of Oregon, RARE Program, July 1998).

mental problems to other policy areas (e.g., transportation, economic development, affordable housing) in order to build support and get other organizations involved.

Another lesson is that because collaboration is limited to issues of mutual interest, it may be less effective in addressing controversial issues. It may also mean that collaboration will be ineffective in addressing some of the most important environmental problems affecting a watershed. Delaware Inland Bays is an excellent example of where the actors found areas to work

together (e.g., research, education, and habitat restoration) but there was limited collaboration in issues revolving around residential development and NPS loadings from agriculture as they were more controversial. While the CIB provides a neutral forum for discussing these issues and often plays a constructive role in working to resolve these problems, other strategies such as legislative action (e.g., Delaware General Assembly recently passed a law to regulate agricultural activity) and unilateral action (e.g., EPA adopted CAFO regulations) are necessary. Thus, collaboration will not effectively address all environmental problems.

Another lesson is that since collaboration is typically a voluntary activity, there have to be incentives for organizations and the individuals within them to collaborate. Incentives can operate at three levels. At the interorganizational level, the history of existing relationships, political pressure, and organizational resources (e.g., budget, staff) can influence an organization's willingness to collaborate with other organizations. Asymmetries of power, information, and resources can also create incentives (or disincentives). For example, participation may provide an opportunity to influence another organization or gain needed information or resources. However, the asymmetries can create options for organizations to exit a collaborative process and control the group (e.g., TMDL lawsuits, using political power or legal authority). Such "exit" options can disrupt interorganizational relationships and increase transaction costs associated with collaboration.

At the intraorganizational level there needs to be incentives for collaboration and a "culture of collaboration" that supports and rewards organizational subunits for these activities. Many of our respondents suggested that this is often a problem in state environmental agencies that sometime do not support or reward collaborative activity. Many respondents also suggested that EPA's relationship with state environmental agencies tends to be programmatic in focus. For example, EPA's liaison to the NEP may be unfamiliar with the requirements of other related programs such as Section 319 and TMDLs. Most of our respondents from state environmental agencies also noted that there was little interaction among EPA staff working in the different programs. State environmental agencies also reported that interactions among staff were also limited, although the amount of interaction varied considerable across the states. It was also common for respondents in state environmental agencies to report that a "culture of collaboration" was often lacking with staff primarily concerned about their ability to satisfy specific EPA programmatic requirements rather than broader environmental or agency goals. While the performance partnership agreements (PPAs) and performance partnership grants (PPGs) appeared to help increase interactions, they did not resolve all of the institutional barriers to collaboration.

Organizations are also some measure of the individuals that work within them. Some individuals will be drawn to collaborative activities because it increases job satisfaction while others resist participating because they dislike these activities. Accordingly, motivational factors such as increased workload and higher stress coupled with no corresponding increase in pay or recognition by upper management can serve as disincentives to participating in collaborative activities. Previous histories of interpersonal relationships (e.g., trust, personal dislikes, etc.) can also serve as incentives or disincentives to cooperation.

Even where there are positive incentives, organizations must have the capacity to collaborate. This requires slack resources (e.g., financial, technical, staff, etc.) that can be devoted to activities. If no organization can do more then send staff to a meeting, then it is unlikely that the group will accomplish much. The more successful collaborative efforts proved to be those that had staff to support the group's work. For example, the staff of the CIB, TBEP, and TCPP provides slack resources to support and organize collaborative activities. The creation of the

NBEP and its functioning as a surrogate planning staff for RIDEM also provides slack resources to apply for grants, participate in stakeholder and collaborative efforts organized by other actors, and organize collaborative efforts for other actors. Conversely, the lack of staff resources in various federal and state agencies has limited their ability to fully participate in and support the more than 80 watershed councils created in Oregon. The lack of slack staff resources in various RIDEM programs is also reported as the reason why the agency participates only sporadically in the informal permit review process created to implement SAMP. It also appeared that stable funding and staffing levels was important. However, it was also important that there was flexibility associated with these funds otherwise the priorities of the funder drove collaborative efforts.

It was also clear that collaborative activity often occurred in a nested fashion, with a collaborative organization developing shared policies that guided operational activities.[57] An example from Tampa Bay illustrates the point. The actors first engaged in a collaborative planning process that resulted in a watershed management plan and developed shared goals for nutrient reductions. While these activities were going on, the actors developed a new collaborative organization. Membership in the collaborative organization requires certain actions designed to accomplish shared goals. The collaborative organization then monitors individual and collaborative activities to examine progress towards the goals. It also coordinates operational activities and develops shared policies.

This short and oversimplified example illustrates how collaborative activities can be nested within one another and how one type of collaborative activity can lead to other activities. Different actors or individuals within an organization may be involved in the activities at each level. Politicians and agency heads may be involved at the institutional level, line managers at the policymaking level, and line staff at the operational level. However, the activities need not occur in a "nested" fashion and may be unconnected. For example, the Delaware Inland Bays created the CIB, but it had no measurable goals or clearly defined policies such as those developed in Tampa Bay and Tillamook Bay. Instead, it merely recommends a series of specific actions and is engaged in a wide variety of collaborative activities at the operational level. In Narragansett Bay, the effort never achieved much more than operational level collaboration. The lesson suggested is that the development of nested arrangements such as the one in Tampa Bay increased the likelihood of generating a wider scope of collaborative activity with a higher potential for systematically addressing problems. Moreover, the development of a collaborative organization with a set of measurable goals provides the accountability and policy direction that can serve to guide the activities of a collaborative organization long after a CCMP's recommendations have stopped guiding agency decisionmaking.

The results reported in Table 3 also illustrate the intergovernmental nature of problems such as NPS pollution and habitat loss and degradation. The polycentric structure of our federal system and the incremental development of a complex environmental governance system over the last 30 years resulted in numerous programs at the federal, state, and local level that address these problems. The opportunities for collaboration will be even greater in institutionally rich environments with well-developed government agencies and NGOs.[58] One reason that Tampa Bay is engaged in a wide range of collaborative activities is that it is located in an institutionally rich environment with overlapping programs. The local governments and regulatory agencies have a high capacity for solving environmental problems, as well as slack resources and stable implementation funding. There were also existing collaborative organizations to facilitate and coordinate collaborative activities prior to the creation of the TBEP. Conversely, Delaware Inland Bays lacked much of this institutional infrastructure. There is

little overlap among government programs and limited local capacity to address environmental problems other than those related to environmental infrastructure (e.g., sewers and public water). This may explain the more limited range of collaborative activities in this case.

Effectiveness of the Six Watershed Management Efforts

Each watershed management effort demonstrated some ability to improve environmental conditions, enhance watershed governance, or add other forms of public value. However, the quality of the data on environmental conditions and implementation efforts varied a great deal. There were also methodological problems associated with linking changes in environmental conditions to the activities of the watershed management efforts. This section summaries the results of our evaluation of the watershed management efforts and discusses some of the methodological problems associated with evaluating these efforts.

Changes in Environmental Conditions

One way to evaluate a watershed management program is in terms of risk reduction, which is defined here as the ability to improve environmental conditions whether it is through direct or indirect actions. Of the six cases, the efforts to protect water quality in Tampa Bay are perhaps the most significant success story. Just 30 years ago, Tampa Bay was so polluted that many considered it beyond salvage with the worst conditions occurring in the late 1970s and 1980s. The turning point was the $100 million upgrade of Tampa's sewage treatment plant and the passage of state legislation that required all sewage treatment plants discharging to the bay to be at advanced waste treatment (AWT). These efforts combined with other regional planning efforts, the development of stringent state stormwater regulations, and aggressive state land acquisition programs improved water quality despite population growth and increased commercial and industrial activity. Today, the main problem facing state and local decisionmakers are nutrient loadings from NPS rather than point sources.

In Delaware Inland Bays, Narragansett Bay, Salt Ponds, and Tillamook Bay results were mixed and varied within each watershed as well as by pollutant. The evidence for Delaware Inland Bays indicates that nutrient loadings exceed desirable levels. In Narragansett Bay, while there have been improvements in some areas of the bay, important problems remain in other areas. Water quality in the Salt Ponds has improved slightly with significant improvements in some areas but declines in some small embayments. In Tillamook Bay there was some reduction in fecal coliform loadings in portions of the watershed.

Lake Tahoe may have the most sophisticated system of monitoring progress towards its environmental thresholds. The results of the latest threshold evaluation in 1996 are mixed. Fifteen of the 34 (44 percent) sub-elements within nine major thresholds improved, 13 stayed the same (38 percent), and six declined (18 percent). None of the nine thresholds was met entirely (Table 6). Of particular interest is that fact that lake clarity has continued to decline; research suggests that the trend must be reversed in the next ten years in order to maintain the current 70-foot level.

Problems Linking Environmental Outcomes to Specific Programs

The aforementioned changes in environmental conditions, particularly in Lake Tahoe, may appear troubling to those who measure a watershed management effort's "success" as the ability

TABLE 6: SUMMARY RESULTS OF 1996 THRESHOLD REVIEW BY THE TRPA

THRESHOLD	1991 EVALUATION	1996 EVALUATION	TREND
Air Quality			
CO	N	A	+
O3	N	N	+
Particulate	N	N	+
Visibility	A	N	=
U.S. 50 Traffic Volume	N	A	+
Wood Smoke	N	N	=
Vehicle Miles Traveled	N	N	–
Atmospheric Nutrient Loading	A	A	+
Water Quality/Soil Conservation			
Turbidity (shallow)	A	A	=
Clarity (winter)	N	N	–
Phytoplankton PPr	N	N	–
Tributary Water Quality	N	N	=
Runoff Water Quality	N	N	=
Groundwater	N	N	+
Other Lakes	U	A	=
Impervious Coverage	N	N	=
Naturally Functioning SEZs	N	N	+
Vegetation			
Relative Abundance and Pattern	N	N	+
Uncommon Plant Communities	A	A	+
Sensitive vegetation	N	N	=
Fisheries			
Lake habitat	N	N	=
Stream habitat	N	N	+
In-stream flows	A	A	=
Wildlife			
Special interest species	N	N	+
Habitats of special significance	A	N	–
Scenic resources			
Travel route ratings	N	N	+
Scenic quality ratings	N	N	–
Public recreation area scenic quality ratings	Not in Effect	A	=
Community design	U	N	+
Noise			
Single event (aircraft)	U	N	+
Single event (other)	A	A	=
Community noise	N	N	=
Recreation			
High-quality recreation experience	U	U	=
Capacity available to the general public	A	A	–

Positive Trend (+), Negative Trend (–), No Trend (=) N = Nonattainment, U = Unknown, A = Attainment

Source: TRPA. *Summary and Draft 1996 Evaluation Report: Environmental Threshold Carrying Capacities and the Regional Plan Package for the Lake Tahoe Region*, (Zephyr Cove, NV: TRPA, 1996).

to demonstrate measurable improvements in environmental conditions. By that measure, Lake Tahoe would be an abject failure. While changes in environmental conditions may be the "ultimate" measure, its application is problematic and can lead to faulty judgments due to the methodological problems that confound the identification of the cause and effect relationships implied by the measure.

The first problem is disaggregating the effects of federal, state, and local programs that address these problems. Judging the success of a watershed management effort by the changes in environmental conditions assumes that these activities are the main factor influencing the changes in conditions. To do so in Lake Tahoe or any of the watersheds neglects the fact that the decisions and actions of numerous federal, state, and local agencies, which may or may not be involved in the watershed management effort, influence changes in environmental conditions. It is difficult, if not impossible, to disaggregate the partial effects of the different programs. Knowing that lake clarity is declining only tells one that the collective set of programs and implementation activities are insufficient to achieve the desired goal. Disaggregation is further confounded by the prevalence of collaborative activities. Even if it were possible to separate the effects, the measure may subject a watershed management effort to unfair criticism. The watershed efforts we examined mostly originated because state and local officials thought that the current collection of government programs was not working effectively. Because state and local officials may lack the authority to correct problems, it is questionable whether a watershed management effort should be blamed for failing to correct problems in existing programs.

A second problem results from the lack of a comparison case. If one were available, judgments of success might change. What if there were no TRPA? Lake Tahoe would certainly have had more residential and commercial development and it is likely that lake clarity would have declined further. Thus, regardless of the conditions in Lake Tahoe today, it is reasonable to conclude that they are better than they otherwise would have been. In this instance, the lack of a comparison case causes one to underestimate the TRPA's impacts. However, the lack of a comparison case can also lead one to overestimate a program's effectiveness. For example, in Tampa Bay, it is difficult to determine how much additional NPS control and habitat restoration occurred because there was already a great deal of funding and activity in place prior to the TBEP.[59] Thus, the lack of a comparison case could lead one to attribute existing activity to the TBEP and therefore overestimate the program's impacts.

Related problems concern the influence that time has on judgments about a watershed management effort's effectiveness. When a watershed is examined over a long period of time it is often easy to identify changes in pollution sources such as increased population or increased industrial activity. For example, in Delaware Inland Bays the population increased 63 percent between 1970 and 1998 while poultry production increased by about 100 percent. It is often more difficult to measure the corresponding increase in pollutants. This limits our understanding about how effective existing programs have been in offsetting environmental impacts. However, if environmental conditions remain at a steady state while pollution sources increase, this actually reflects an improvement because pollution reductions offset increased loadings. Viewed from this perspective, water quality improvements in Tampa Bay are more remarkable because they occurred despite a tremendous growth in population and commercial and industrial activity.

The results of actions taken to improve environmental conditions will also be observed at different points in time. Some activities such as installing stormwater detention pond may have an immediate and noticeable effect on environmental conditions. However, the effects of other

implementation activities may not be witnessed until some point in the future. Growth controls and regulatory policies designed to mitigate the cumulative and secondary impacts of development in Lake Tahoe and the Salt Ponds are designed to minimize impacts of development that has yet to occur. The benefits of restoration projects taken today to improve salmon habitat are not likely to be witnessed for years and perhaps even decades given the life-cycle of the species. The full impacts of planting trees along a streambank to reduce water temperature may not be observed for decades until the trees have matured.

Likewise, the impact of some development activities may be felt for decades or be displaced to some future point because of the nature of the ecological system. In all likelihood, the continued decline in lake clarity in Lake Tahoe is not the result of ongoing development activity as much as it is due to the impacts of development activity during the 1960s and 1970s. The long-residence time of groundwater in the Delaware Inland Bays and Salt Ponds means that the effect of an activity that results in nutrient loadings to groundwater, or for that matter actions taken to reduce current loadings, may not be witnessed for decades. Accordingly, the surface water quality observed today in the Delaware Inland Bays and Salt Ponds is partially the result of surface runoff and nutrient discharges to groundwater that occurred decades ago. Similarly, the long residence time in Lake Tahoe creates the need for immediate action to stop the continued declines in lake clarity because it may not be possible to reverse the declines in our lifetimes, no matter how much money is spent.

The effectiveness of a particular policy or action may also vary over time. Several examples illustrate the point. The efforts to reduce nutrient loadings in Tampa Bay appear to be working effectively today and are largely designed to offset continued residential or commercial development and maintain the status quo. However, no actions have been taken to address the underlying trends associated with increased development. While the participants have been able to identify the projects necessary to achieve the required nutrient reductions over the short-term, they are the easiest reductions to achieve. The real test of the policies lies ahead as nutrient reductions become harder and more expensive to achieve. Another common problem in the NPS area is that the effectiveness of many BMPs, stormwater projects, and habitat restoration projects relies on continued maintenance over time. Without it, their effectiveness may decline. Many of our respondents reported that the lack of maintenance and decreasing performance of BMPs over time is an important issue that sometimes is not effectively addressed.

Another problem with focusing on changes in environmental conditions inside a watershed is that it ignores the environmental impacts that may displaced outside of the watershed as a result. The best example is in Lake Tahoe, which exports all of its sewage to other watersheds where it has caused water quality problems. TRPA's recent ban on some types of two-stroke engines (e.g., wave runners and jet skis) has caused the residents in other watersheds to fear that users will seek out other lakes, exacerbating their problems. Similarly, there is reason to believe that the Salt Ponds growth controls shifted residential development to areas outside of the watershed. Similar problems could occur if a TMDL for a particular stream segment, subbasin, or watershed resulted in changes to an incentive structure that displaced pollutant loading to other waterbodies. Thus, over the long-term there might simply be a displacement of water quality problems to other waterbodies. These interconnections and tradeoffs and the equity issues they raise are poorly understood.

Another problem with focusing on changes in environmental conditions is the selection of the specific measure to use since there is no agreement on how to measure "environmental health."[60] One option would be to use state water quality standards. However, many of the applicable standards in the NPS area are actually narrative criteria. Moreover, there can be

important tradeoffs among environmental problems that will lead efforts to sacrifice reductions in one parameter in order to increase reductions in other parameters. The tradeoff most clearly demonstrated in these cases involved sewers and OSDSs. In Delaware Inland Bays and Lake Tahoe, public officials were concerned about nutrient loadings from OSDSs so they emphasized efforts to install sewers. In both cases, this reduced nutrient loadings from OSDSs but also contributed to increased development that caused other sources of nutrients (e.g., stormwater runoff), additional habitat loss and degradation, and increased user conflicts. In the Salt Ponds, public officials recognized the tradeoffs and only sewered small portions of the watershed choosing to forgo additional nutrient reductions in order to minimize the other problems resulting from the installation of sewers. The fact that these tradeoffs exist points to one advantage of the watershed approach because it allows public officials to balance these tradeoffs by examining a collection of problems and possible solutions in a holistic fashion. The tradeoffs also illustrate a flaw in the CWA's TMDL requirements because they emphasize addressing single pollutants and recommending immediate actions to reduce pollutant levels. Thus, a TMDL for the Salt Ponds watershed may ultimately suggest that the whole watershed be sewered to achieve the necessary nutrient reductions, even though it might exacerbate the loss of habitat and cause undesirable social consequences. Other conflicts between the two approaches are discussed in subsequent sections of the report.

Even without these methodological problems, the data on environmental conditions and implementation activities made it difficult to identify cause and effect relationships. The quality of environmental data varied considerably with Lake Tahoe and Tampa Bay being the most comprehensive. The respondents in the other cases were largely critical of the quality of existing environmental data and raised questions about the adequacy of the data used by state environmental agencies in their Section 305(b) reports and Section 303(d) lists. Many respondents noted that there are not enough monitoring sites with enough parameters measured frequently enough over long periods of time to discern clear trends. These problems are exacerbated by the natural variations due to such things as rainfall patterns. It can also be difficult to discern between natural variations and those due to human influence.[61] Although, many respondents noted that volunteer water quality monitoring programs often helped to improve the information available to decisionmakers.

The methodological problems are exacerbated by the lack of understanding about ecological systems. For example, the Salt Ponds may be the most heavily researched shallow lagoon system in the world, but how the groundwater system functions and the optimum nitrogen loading levels are unclear. The groundwater monitoring data needed to monitor implementation efforts are largely unavailable. When the CRMC obtained funding to conduct a groundwater study, the data provided nothing more than an educated guess as to how effective the policies were. The natural variations in the Salt Ponds ecosystem and the long residence time for groundwater make it difficult to determine what effect the management policies actually had and when these effects should be observed. Even if it were possible to determine that the policies were not working, it would not be clear whether the density overlays or RIDEM's OSDS regulations should be modified. All of the cases face comparable levels of uncertainty. Not surprisingly, many respondents relied on the "educated guesses" of technical specialists and university researchers to determine whether environmental conditions were getting better or worse.

Our analysis also indicated that various types of computer modeling were used to try and understand these systems. However, many respondents were critical of those efforts, pointing out data limitations, the poor quality of models, and the lack of understanding of how ecological systems function. The models often required information on inputs or causes of environmental

problems that did not exist. There is much variation in the sources of point and NPS pollution and the impacts will vary within a watershed. The impact of a BMP can vary based on its location, proximity to surface waters, the technology used, and the nature of the activity. There is also tremendous variation in the size and scope of pollution sources. Since these data are lacking, officials make generalizations and assumptions to include in the models. While a large margin for error may surround these assumptions, small differences can sometimes have large impacts in computer models. These limitations caused many respondents to conclude that while the models can be excellent planning tools, they should not be used as the basis for regulatory requirements.

Indirect Measures of Effectiveness

Given the lack of good environmental data and the aforementioned methodological problems, our analysis focused primarily on identifying activities the resulted from a watershed management effort that had some promise of improving environmental conditions, enhancing watershed governance, or adding other forms of public value. They included actions taken individually or collaboratively such as the construction of sewers, installation of BMPs, and habitat restoration projects that provided some promise of improvements resulting directly from the activity. It also includes actions that should lead to benefits in a more indirect fashion. This would include new planning efforts, regulatory requirements, or other policy changes designed to minimize the impacts of future activities. It also includes education efforts targeted at changing the behavior of the public, decisionmakers, landowners, or business owners to reduce their impacts on the environment, as well as research that improves agency decisionmaking.

When viewed from this perspective, the watershed management efforts were much more effective. Some of the major accomplishments of each watershed management effort are summarized in Table 7 and are described in more detail in the supporting technical reports. Each watershed management effort had at least a few notable accomplishments. Moreover, all of the programs managed to develop an improved capacity for managing future environmental problems, often through the development of new institutions. However, it was also clear that each watershed management effort faced its own particular set of future challenges:

- The original NBP partners are no longer implementing the CCMP; the plan has vague, immeasurable goals; the priorities of actors have changed since the CCMP; and there have been problems with the implementation committee and stakeholder involvement.
- In the Delaware Inland Bays, the CIB has not been fully effective in dealing with problems from development and agriculture. The CCMP has become dated and tributary strategies for implementing the TMDL are changing agency priorities.
- Tillamook Bay faces a shortage of funding for local government implementation activities due to the financial demands placed on local officials by a devastating series of floods. The TCPP is new and the program will also face challenges as it continues to develop and mature as an organization.
- While progress has been made in obtaining funding for Lake Tahoe's EIP, it is unclear where local governments will get their share of the implementation funding and whether federal and state officials will abide by their commitments. It is still unclear what is causing declining lake clarity, which raises the possibility that the EIP could be ineffective.

TABLE 7: SELECTED ACCOMPLISHMENTS AND FUTURE CHALLENGES

CASE STUDY	ACCOMPLISHMENTS	CHALLENGES
Delaware Inland Bays	■ Hydrologic Unit Area (HUA) program ■ Inland Bays Recovery Initiative ■ Water Use Plan ■ TMDL and tributary strategies ■ $158 million in sewer infrastructure ■ $13 million in land aquisition ■ Restoration project at James Farm ■ Awareess of atmospheric nitrogen loadings and research on Pfiesteria ■ Creation of CIB & state budget line item	■ Center for the Inland Bays (CIB) is still a relatively new organization ■ Agricultural nutrient loadings are still a major problem ■ Revised compreensive plans in 1988 and 1997 but development continues ■ CCMP is becoming out of date ■ Development of tributary strategies is changing agency priorities ■ Collection of projects not a program
Lake Tahoe	■ Growth controls in the Regional Plan ■ Devolution of permitting to local governments over time ■ Joint lobying agenda with agencies and NGOs ■ $900 Million Environmental Improvement Program ■ Presidential Summit	■ Unclear if funding for EIP will be obtained, particularly local government's share ■ Unclear what is causing declining lake clarity
Narragansett Bay	■ Greenwich Bay Initiative ■ Designation of state as "no-discharge zone" for recreational boating ■ Hazardous Waste Reduction Project ■ Improved planning capacity in RIDEM	■ Collection of projects not a program ■ State provides no implementation funding ■ CCMP is no longer being implemented by the NBP partners
Salt Ponds	■ Shared zoning policies that balanced tradeoffs among sewers and OSDSs and addressed cumulative impacts ■ Local governments have an active role in environmental protection and growth management ■ Prevented development of undeveloped barrier beaches	■ Lack of funding to do habitat restoration ■ Habitat restoration is a collection of projects not a program ■ Greater collaboration with RIDEM is needed
Tampa Bay	■ Interlocal agreement ■ Nutrient Management Consortium ■ Efforts to coordinate monitoring programs ■ State land acquisition programs ■ Stable implementation funding ■ Estimation of atmospheric nitrogen loadings	■ Lack of linkage with land use planning ■ Need to address localized water quality problems ■ Need to bring in other local government and instustry partners
Tillamook Bay	■ Tillamook County Performance Partnership (TCPP) ■ Funding for BMPs in state forests ■ Development of the Tillamook Coastal Watershed Resource Center	■ Limited financial resouces at the county level ■ TCPP is developing as an organization ■ Flooding events distract public attention and resources from other NPS problems

- In the Salt Ponds there has been limited success in the area of habitat restoration since the CRMC and other state agencies lack any dedicated funding source for these activities. It is unclear if density controls and denitrification OSDSs will be able to adequately reduce nitrogen loading is some small isolated embayments.

- In Tampa Bay there is still little linkage between land use and water quality management programs. The partners will also need to bring in other local government and industry. They also need to focus more attention on addressing the problems of specific subwatersheds, which are not addressed in the current nitrogen reduction strategy.

We concluded that watershed management efforts could improve environmental conditions, enhance watershed governance, and lead to other forms of public value. At the same time, there are limits on what can be accomplished and it is unreasonable to expect that a watershed management effort will be able to solve all of the environmental or governance problems in a watershed.

Potential for Short- and Long-Term Gains

We also examined the likelihood for additional environmental improvements over the short- (three to five years) and long-term (five to 20 years). Much uncertainty surrounds these judgments. In one case, Tillamook Bay, the watershed management effort is only in the early stages of implementation and our judgments are speculative. In other cases (Lake Tahoe and the Salt Ponds), the implementation structures and lead agencies are well developed with strong track records on which to base judgments.

There is great deal of variation in the potential for short- and long-term gains among the six watershed management efforts (Table 8). Narragansett Bay and to a lesser extent Delaware Inland Bay share similar problems. Implementation efforts often consist of a set of discrete projects that are only loosely connected. While the individual projects may have environmental benefits, they are in many cases too limited in scope, scale, magnitude, duration, and number to significantly change the problem they were designed to address. The respondents in Tillamook Bay referred to this problem as the tendency to become engaged in "random acts of environmental kindness" rather than systematically addressing specific environmental problems and using specific goals and targets to measure the progress towards these goals. The problems are in part due to the lack of a stable and sizable source of dedicated implementation funding and the fact that their specific CCMPs are not oriented towards specific goals and targets in the same way as Tampa Bay and Tillamook Bay.

We are more optimistic about the prospects of short- and long-term gains in the Delaware Inland Bays. There is a commitment from state agencies, the General Assembly and local officials as evidenced by participation in CIB activities and the creation of a state line item to support such activities. This has not occurred on an ongoing basis in Narragansett Bay. The development of the CIB as a collaborative organization also has the capability to develop a set of measurable goals and restoration priorities that could help move the effort from being a collection of projects to a systematic program. There are also some sources of state funding (e.g., land acquisition program, state NPS program) that could support such an effort. The development of tributary strategies also has the capability of facilitating this transition. We were less optimistic that this activity could occur in Rhode Island given the current budgetary situation, lack of political support, and limited participation of original NBP partners. Instead, it appears it might be more effective to build a new initiative from scratch.

Lake Tahoe and the Salt Ponds also had similarities. Both efforts have well-developed regulatory programs with growth controls and regulatory requirements that will limit additional environmental impacts over the short- and long-term. This should prevent these systems from deteriorating badly. However, the effectiveness of the regulatory approach has its limits as indicated by the continued decline in lake clarity in Lake Tahoe and the excessive nitrogen loadings in some small embayments in the Salt Ponds. Additional environmental improvements in both watersheds are likely to require additional restoration efforts. The progress on the EIP, the scope of previous restoration efforts, and the availability of funding and financial commitments for the EIP give us more reason to be optimistic about the potential for long-term gains in that watershed.

TABLE 8: POTENTIAL FOR SHORT- AND LONG-TERM GAINS

CASE STUDY	POTENTIAL FOR SHORT-TERM GAINS	POTENTIAL FOR LONG-TERM GAINS
Delaware Inland Bays	M - L Rationale: Making investments in sewers and developing capacity and new agricultural regulations. Little significant action to slow development or agricultural loadings. Having trouble moving beyond a collection of projects to being a systematic program.	L – H Rationale: CIB has the potential to develop goals and there are funding sources for land acquisition. County government is in a positive financial position and revenue sources could be developed to pay for habitat restoration. Needs to address development and agriculture problems in some way.
Lake Tahoe	M Rationale: Growth policies will prevent serious declines and progress towards EIP continues	H – L Rationale: Growth policies will prevent significant deterioration. If signficant restoration actions do not begin in the next 10 years such as those described in the EIP, lake clarity will continue to decline and the current 70 feet of clarity will be unachievable.
Narragansett Bay	L Rationale: Plan is not being implemented by orginal NBP partners. Priorities of the partners have changed. Having trouble moving beyond a collection of projects to being a systematic program.	L Rationale: Even less potential for significant long-term gains. Effort will remain nothing more than being a collection of projects. New CCMP or some other policy document or planning initiative may be needed.
Salt Ponds	M Rationale: Growth policies and regulations should prvent further degredation. No funding for restoration efforts.	M Rationale: Growth controls should prevent problems from getting much worse. Needs to develop program to fund restoration projects for significant improvements
Tampa Bay	H Rationale: On track to achieve nutrient reuction targets	H – M Rationale: Stable funding and curret experience suggests that progress may continue. Progress wll require incorporating new partners, addressing land use issues, and focusing on specific problems in subbasins
Tillamook Bay	M Rationale: Progress is promssing. Funding to install projects on state forest lands exists. Some NRCS and 319 funding for other areas. Lack of local government funding. Systemmatic program on forest land more project oriented elsewhere. Flooding issues distract from CCMP priorities.	H – L Rationale: Depends on the developmet of the TCPP, whether stable funding sources can be found for areas other than state forests, and if federal and state agencies provide necessary flexibility in priorities. Salmon and flooding issues have the capability of displacing priorities of CCMP over the long-term.

H = High; M = Medium; L = Low; N = None; I = Not stated but implied;
Note: All judgments about H, M, and L are based on a comparison to the other programs in this study

The efforts in Tampa Bay have a high potential for short-term gains as the partners have already committed to the nutrient reduction and habitat restoration efforts necessary to achieve their goals over the first five-year evaluation period. Stable funding and high-level political commitments are also reasons to be optimistic about success. The question is whether Tampa Bay will maintain these commitments and continue finding the nutrient reductions necessary to offset continued development. This will also require bringing in new local government and industry partners into their framework of collaborative agreements. In addition, there will need to be greater attention to land use issues and the specific problems of subbasins that are not addressed under the current set of nitrogen reduction goals.

There is more uncertainty with respect to Tillamook Bay due to its limited implementation experience. The political commitments and the presence of stable implementation funding for projects in the state forest are reason to be optimistic about the potential for short- and long-term gains. The lack of stable funding for other implementation activities, the financial problems at the local level caused by flooding events, and the fact that the TCPP is a new and unproven organization are reason to raise questions about the future. However, we believe that the progress to date justifies being optimistic.

Other Measures of Institutional Performance

The performance of the watershed management efforts was also evaluated using criteria developed by the Academy. These included: cost-effectiveness; predictability of the process; certainty of effect; accountability; equity; adaptability; and, capacity building (Table 9). The purpose of using a variety of evaluative criteria is to gain a better understanding of the relative strengths and weaknesses of the six governance efforts and to identify other potential concerns and issues that might result from using watershed management as a strategy for improving environmental conditions or enhancing watershed governance.[63] Accordingly, we do not expect each watershed management effort to score high on every criterion – actually we expect a good deal of variation. The following sections summarize our cross-case analysis while a detailed analysis of each case study can be found in the supporting case studies.

COST-EFFECTIVENESS

The cost-effectiveness of the watershed management efforts varied across the cases. The wide range of intangible costs and benefits complicated the analysis of the cost-effectiveness of the watershed management efforts. The four NEPs used a costly planning process with a heavy investment in science and public participation. In the Delaware Inland Bays, EPA even required that the effort allocate funding to scientific research above what DIBEP officials wanted to spend. As a result, the judgments about cost effectiveness contained in Table 9 largely relate to how useful these activities were to the development of a CCMP and future implementation efforts. The level of conflict experienced during the planning process also influenced our judgments because it increased transaction costs. We concluded that Tampa Bay and Tillamook Bay faired better than Narragansett and Delaware Inland Bays in the application of this criterion. The planning process for Lake Tahoe and the Salt Ponds was less costly. Of the two, we concluded that the Salt Ponds was more cost-effective because of the level of conflict in Lake Tahoe.

In terms of implementation, Lake Tahoe and the Salt Ponds developed effective regulatory programs and each program has improved the efficiency of these programs over time. The collaborative organizations developed for the Delaware Inland Bays, Tampa Bay, and Tillamook Bay appear to be keeping transaction costs down and all three programs have had varying success in leveraging implementation funding from other federal, state, and local programs that exceeds EPA's implementation grants. Narragansett Bay has had some ability to leverage additional implementation funding but has been unable to obtain any dedicated state funding or FTEs to match for EPA's implementation grants. The original NBP partners are not implementing the CCMP so it appears less cost-effective in this regard as well.

PREDICTABILITY OF THE PROCESS

Institutional performance was also evaluated in terms of the predictability of the process. Our analysis focused on answering two related questions: the ability of the planning process to

produce the intended result; and whether a program creates predictable conditions or requirements that allow public officials to plan and budget with confidence. The NEP has a rather predictable process that leads to the development of a CCMP. However, there was some variation in the four watershed management efforts. There was less predictability in Delaware Inland Bays and Narragansett Bay because EPA was developing its guidance requirements based, in part, on their experience. Accordingly, EPA's requirements were largely a moving target during the early years of the NEP. This uncertainty appeared to be one cause of the conflict between the Delaware Inland Bays and EPA over the CCMP's approval. The planning process was more predictable for Tampa Bay and Tillamook Bay. However, in these cases the high predictability and the NEP's emphasis on planning requirements may have been counterproductive. Respondents in Tampa Bay suggested that they should have skipped all of the work that went into developing the CCMP and went from the CCMP's goals straight to the development of the interlocal agreement because that is the key policy document now. It is possible, though, that they could not have developed the agreement without the social capital that resulted from efforts to develop the CCMP. Respondents in Tillamook Bay were frustrated by EPA's approval requirements because it slowed implementation efforts and the TCPP's development. The lesson appears to be that while EPA's requirements provide flexibility, they are geared towards producing detailed plans and lack an emphasis on implementation.

In terms of implementation, we concluded that the development of a collaborative organization combined with measurable goals and targets improved the ability to plan and budget with confidence. It also facilitated making the transition from being a collection of projects to a program that systematically addresses a specific problem or provides an ongoing service. This also improves the ability to plan and budget with confidence and improves the accountability of the efforts. Tampa Bay and Tillamook Bay function better in this regard than do Delaware Inland Bays and Narragansett Bay. Another limitation is the heavy reliance on federal funding and the lack of stable and flexible implementation sources. Delaware Inland Bays, Narragansett Bay, and Tillamook Bay rely heavily on federal funding, which limits their abilities to plan and budget with confidence. It also meant that implementation activities were constrained and oriented towards the changing priorities of federal grant programs, their cost-share requirements, and other grant restrictions rather than focusing on undertaking the activities described in specific CCMP recommendations.

Lake Tahoe and the Salt Ponds had less-predictable planning processes and did not follow a predefined planning process. They did have a predefined goal – the development of a regulatory program. In Lake Tahoe, the first attempt at a Regional Plan met with conflict while in the Salt Ponds the plan was widely supported. In terms of implementation, it is easy for public officials in both efforts to budget with confidence with respect to regulatory activities. However, there is less certainty with regards to nonregulatory efforts since both programs lack a stable source of implementation funding for restoration projects.

CERTAINTY OF EFFECT

One measure of success in any planning effort is whether the "plan" is actually implemented. This required us to make two distinct judgments. First, we determined whether the action plans recommended in the watershed management plans were implemented or were likely to be implemented. Second, if the recommended actions were not implemented, we determined whether the participants were engaged in a substitute set of activities designed to achieve the plan's goals. Lake Tahoe and the Salt Ponds clearly performed well on that criterion because they implement their plan through a regulatory process. Tampa Bay's interlocal agree-

TABLE 9: OTHER MEASURES OF INSTITUTIONAL PERFORMANCE

PERFORMANCE CRITERIA	DIBEP	NBEP	SAMP	TBEP	TBNEP	TRPA
Cost-effectiveness						
■ Planning	L - M	L	H	M	M	L - M
■ Implementation	M	L	H	H	M	H
Predictability of the Process						
■ Process produces intended result	L	L	M	H	H	M
■ Budget with confidence	L – M	L	M - H	H	H	M - H
Certainty of Effect						
■ Certainty plan implemented as written	L	L	H	M	M	H
■ Certainty of a substitute set of actions	L - M	L	NA	H	H	NA
■ Legal/binding commitments			X	X		X
■ Membership in collaborative organization	X			X	X	X
■ Peer pressure mechanisms	X			X	X	
Accountability						
■ Bureaucratic	H	L	M	H	H	H
■ Legal	M	L	H	H	M	H
■ Professional	H	L	M	H	M	H
■ Political	M	L	H	M	M	H
Adaptability						
■ Measurable environmental goals				X	X	X
■ Measurable programmatic goals			X	X	X	X
■ Monitoring environmental conditions	X		X	X	X	X
■ Monitoring programmatic activity	X		X	X	X[a]	X
■ Ability to adapt goals, policies, & benchmarks			X	U	U	
■ Ability to improve program administration	X		X	U	U	X
Capacity Building						
■ Collaborative organization	X			X	X	X
■ Policy integration			X	X	X	X
■ Communication/information sharing	X		X	X	X	X
■ Local government problem-solving capacity	X		X	X	X	X
■ State agency problem-solving capacity	X	X	X	X	X	X
■ Research	X			X		X
■ Monitoring	X		X	X	X	X
■ Education	X			X		
■ Restoration	X			X	X	X

H = High; M = Medium; L = Low; N = None; I = Not stated but implied;
X = Activity occurred; X[a] = Activity is planned; NA = Not applicable; U = Unclear
Note: All judgments about H, M, and L are based on a comparison to the other programs in this study

ment provides a high certainty that the goals of the CCMP will be met. However, some of the goals may be achieved through a set of substitute activities.

Tillamook Bay's collaborative organization is relatively new and still developing. However, the commitments made by joining the organization and the development of peer pressure mechanisms suggested to us that there was some certainty that actions will be taken to achieve the targets specified in Table 4. Delaware Inland Bay's collaborative organization and peer pressure also increased the certainty that its CCMP will be implemented. However, the lack of clear goals and targets for activities such as habitat restoration limits the effectiveness of the peer pressure mechanism. Moreover, the development of the TMDL, regulatory actions in agriculture, and other emerging problems such as Pfiesteria has shifted priorities for the actors. The conflict surrounding the Narragansett Bay CCMP, the lack of implementation funding, the daunting scope of the plan (more than 500 recommendations), and the fact that many of the NBP partners reported that the CCMP is no longer being implemented implies that there is a low certainty that the plan or its recommendations will be implemented. Most of the activity that has occurred towards implementing the plan's 41 high-priority recommendations only partially implements recommendations or is loosely related to them. The CCMP also has such general goals that any activity that does not degrade environmental conditions could be said to be advancing the plan's goals. Thus, they are not useful in determining whether the plan is being "implemented."

ACCOUNTABILITY

A wide range of accountability mechanisms was used in our cases with varying degrees of effectiveness (Table 10).[64] They differed in terms of their level of formality, directness, durability, and coerciveness.[65] A number of crosscutting mechanisms were used.[66] Lake Tahoe, Tampa Bay, and Tillamook Bay all had clear and measurable goals or policies and regularly monitored (or plan to monitor) implementation activities and linked these actions to changes in environmental conditions. Lake Tahoe and the Salt Ponds had regulations that were easily monitored by the public and interest groups with decisions for major projects requiring a hearing before the respective boards and councils. All watershed management efforts were subject to various sunshine requirements. Tampa Bay has sunset provisions that created an incentive for evaluating implementation efforts. Lake Tahoe and Tampa Bay have provisions that require them to report on environmental conditions and their progress towards goals. Delaware Inland Bays, Tampa Bay, and Tillamook Bay regularly report on their implementation activities, as well as that of other partners, and on progress towards specific CCMP goals, targets, and recommendations above and beyond what is required by EPA's biennial review process.[67]

The six programs rely on four additional types of accountability mechanisms. Bureaucratic mechanisms are based on superior-subordinate relationships where those at the top of the hierarchy control expectations. In all cases, staff was accountable to a program director. In Delaware Inland Bays, Lake Tahoe, Tampa Bay, and Tillamook Bay the director was also accountable to a collaborative organization. That added capacity for collective action and reduced the opportunities for rent seeking that could occur if collaborators relied on staff in one agency. It also forced the staff to remain neutral in disputes among partners. The staff could then broker agreements and resolve disputes and assist in building and maintaining relationships.

Legal accountability is primarily based on lawmaker-law executor or principal-agent relationships.[68] All four NEPs have a fiduciary relationship with EPA. In return for federal funding, the estuary programs must be engaged in certain activities. EPA can monitor and influence the

TABLE 10: ACCOUNTABILITY MECHANISMS

ACCOUNTABILITY MECHANISMS	DIBEP	NBEP	SAMP	TBEP	TBNEP	TRPA
Bureaucratic Accountability						
■ Staff works for collaborative organization	X			X	X	X
■ Staff accountable to agency director	X	X	X	X	X	X
Legal Accountability						
■ Approval of annual work plan/budget	X	X		X	X	
■ EPA's biennial review process	X	X		X	X	
■ NOAA's Section 312 Evaluations			X			
■ Statute/Regulations subject to judicial system			X			X
■ NEPA Environmental Impact Statements (EIS)			X			X
■ CZMA's federal consistency provisions		X	X			
■ Controls placed by other statutes	X		X	X	X	X
Professional Accountability						
■ Policy comm. defers to management comm.				X	X[e]	X
■ Management committee defers to STAC	X			X		
Political Accountability						
■ Citizens advisory committee	X			X	X	
■ Public hearing on budget				X		X
■ Sunshine requirements	X	X	X	X	X	X
■ Public notice/comment	X		X	X	X	X
■ Reporting/monitoring requirements	X			X	X[a]	X
■ Distribution/posting of minutes	X[b]			X	X	
Cross-Cutting Mechanisms						
■ Sunset provisions				X		
■ Peer pressure/social norms or expectations	X			X	X	
■ Each actor reports on its activities	X			X	X	
■ Measurable goals or policies			X	X	X	X
■ Binding regulations/requirements			X	X		X
■ Permit review process is participatory/open			X			X
■ Monitoring environmental conditions and implementation activities and monitoring progress towards specific goals				X	Xa	X
■ Monitoring implementation activities of partners and progress towards specific goals and recommendations	X			X	Xa	X
■ Incorporation of policies into other documents subject to other accountability mechanisms		X	X	X	Xd	X

X = undertaken; X[a] = Planned; X[b] = sporadic; X[d] = only some actors; X[e] = only during the planning process

activities of the efforts when it reviews and approves annual work plans. All four estuary programs must go through a biennial review process that requires them to report on implementation activities and to provide other information that allows EPA to monitor their efforts, suggest changes, and withdraw funding support. The Salt Ponds is subject to a more elaborate review process by NOAA pursuant the CZMA's Section 312 evaluation process, although it occurs less frequently. In Tampa Bay, each partner is required to submit a five-year work plan containing the projects necessary to fulfill their obligations. Lake Tahoe and the Salt Ponds are both subject to the Environmental Impact Statement (EIS) provisions of the National Environmental Policy Act (NEPA) when they make major changes to their programs. Other statutes can also place constraints on the activities of a watershed management effort. Lake Tahoe is subject to the provisions of a federal-state compact. The Salt Ponds is subject to provisions contained in the CRMC's enabling statute and the CZMA. Tillamook Bay is subject to the requirements of the Endangered Species Act (ESA) and other programs at the federal and state level undertaken in response to these requirements. Tampa Bay's partners are subject to NPDES general permits for stormwater. Delaware Inland Bays is subject to a TMDL. All these processes provide important mechanisms for holding watershed efforts accountable to different policies, governments, and constituencies.

Professional mechanisms are often used when government agencies address difficult or complex problems and are based on lay person-expert relationships. In these situations, public officials or decisionmakers "defer" to skilled or expert professional staff to provide advice and appropriate solutions to problems.[69] Some watershed management efforts relied on a tiered committee structure such as the one depicted in Figure 1. In some cases, policymakers deferred to managers for advice (e.g., Lake Tahoe and Tampa Bay) while in other cases a STAC allowed policymakers and managers to defer to technical experts (e.g., Delaware Inland Bays and Tampa Bay). One important finding was that it was important to develop a well-managed committee structure. Problems often occurred when the high-level policy committee did not provide enough oversight of the other committees (e.g., Narragansett Bay and Tillamook Bay).

Political accountability is the result of pressure placed on public officials as a result of democratic processes. It is based on a constituent-representative relationship. If "deference" characterizes professional accountability, "responsiveness" is the core of political accountability.[70] The cases utilized a variety of mechanisms to enhance political accountability. All of them have some combination of requirements such as public meetings and opportunities for public comment. Delaware Inland Bays, Tampa Bay, and Tillamook Bay have CACs. Some programs (e.g., Delaware Inland Bays) post their minutes on the Internet while others (e.g., Tampa Bay and Tillamook Bay) distribute the minutes to those who request them. Delaware Inland Bays, Lake Tahoe, and Tampa Bay regularly report on progress while Tillamook Bay plans to do so.

The central question surrounding political accountability is whom does a watershed management effort represent. It can include the general public, elected officials, agency heads, agency clients, interest groups, or future generations of citizens. It is even more complicated when a collaborative organization is involved.[71] The presence of conflicting constituency interests appears to be the source of much discord. Historically, this was an obstacle to collaboration in Lake Tahoe when the property rights, casino owners, and environmental interests were at "war" with one another. In recent years, the groups have found opportunities to work together. The conflicts between RIDEM and the CRMC were obstacles to collaboration in Narragansett Bay and the Salt Ponds. Such conflicts are rooted, in part, in the fact that the two agencies were created to protect different constituency groups.[72] The conflicting expectations of constituency groups can also be the source of some public dissatisfaction with collaborative organizations.

The CIB and the TBEP serve as neutral forums, not taking stands on controversial issues. However, some would like to see the CIB and the TBEP do so. In the Delaware Inland Bays, the CIB's neutrality also means that the organization has not been effective in addressing the two main problems in the watershed. While these collaborative organizations likely would be ineffective if they took positions on controversial issues, it nonetheless means that some constituency groups will be disaffected because the organization is not oriented solely towards advancing their interests. This example also illustrates some of the limitations of the collaborative approach in addressing all environmental problems and the importance of using other strategies in these win-lose situations.

Another source of variation was the presence of organized interest groups. There were well-organized and politically powerful groups representing both the environment and development interests in Lake Tahoe, Narragansett Bay, Salt Ponds, and Tampa Bay. They helped improve political accountability through their political influence. In Delaware Inland Bays and Tillamook Bay, there was a much more asymmetric relationship with the agricultural interests being well organized and politically powerful but environmental groups either did not exist or lacked the same influence. As a result, near the end of the planning process in the Delaware Inland Bays the agricultural interests were able to "water the plan down" by exerting political pressure because there was no counter-balancing political pressure. This did not happen in Tillamook Bay because the agricultural industry supported and actively participated in the CCMP's development.

Based on this analysis, we concluded that developing effective accountability mechanisms was a crucial component in watershed management efforts, particularly when collaborative organizations were used. Accountability also appears to be a two-edged sword. On the one hand, accountability mechanisms reduce strategic behavior (e.g., rent seeking, turf guarding, shirking) by developing monitoring and enforcement mechanisms, whether it is formal sanctions or informal social norms and peer pressure mechanisms. However, excessive emphasis on monitoring, enforcement, and other mechanisms can create powerful disincentives to collaboration since collaborators may be unwilling to join the effort if they fear reprisals and criticism. Thus, developing effective accountability mechanisms is a tricky endeavor and is unlikely to be achieved through a single "standardized" approach.

EQUITY

Each case raised different types of equity issues due to the unique combination of contextual factors (Table 11). Overall, the issues were considered relatively minor with respect the overall performance of the watershed management effort. In fact, many of the programs went to great lengths to minimize equity problems. This led us to conclude that equity issues are often the source of political conflict and serve as obstacles to collaboration. Equity issues also influenced the design of collaborative organizations and the policies and management strategies taken to address watershed problems. For example, the TDR and IPES provisions in Lake Tahoe were the result of compromises designed to minimize equity problems. The equity issues also identified some of the limitations of the watershed approach that are often discounted or ignored.

One set of issues revolved around the concept of redistributional equity and whether watershed management efforts were structured around differential abilities to pay. Tillamook Bay raised questions about whether it is "fair" to structure federal grant program like Section 319 such that "low-income" counties have to compete with "wealthy" counties for limited grant monies. Tillamook County has a large low-income population, a limited tax base, and has suffered through a devastating series of floods that have strained local finances. While it has

TABLE 11: EQUITY ISSUES RESULTING FROM WATERSHED MANAGEMENT

	ISSUES RAISED
Delaware Inland Bays	■ Farmers inside the watershed having higher standards than those outside ■ Restricting residential development inside the watershed would mean a loss of tax revenues that fund social services outside the watershed ■ Watershed represented by only one of five members on the county council ■ Farmers be subsidized for installing BMPs
Lake Tahoe	■ Exported some problems like sewage and two-stroke engines to other watersheds ■ Loss of affordable housing ■ Market mechanisms (e.g., Transferable development rights) appear limited mostly to the wealthy and big business
Narragansett Bay	■ Including CCMP in State Guide Plan and local governments were not part of the process ■ CCMP has recommendations for a variety of agencies but RIDEM has largely monopolized EPA's implementation funding ■ EPA providing implementation funds and the state providing no hard match
Salt Ponds	■ Transaction costs to attend informal permit review meetings is higher for RIDEM
Tampa Bay	■ Prioritizing environmental infrastructure investment in the watershed even though parts of other communities are located outside of the watershed ■ When to start measuring progress from since local governments already had projects underway before plan was approved ■ Allows trading but would it be appropriate for one local government to spend its tax dollars on a project in another community
Tillamook Bay	■ Federal matching requirements often place an unfair burden on rural communities with high low income populations

trouble satisfying federal matching requirements, it must still compete with other communities for the federal grants necessary to implement their CCMP. Conversely, in Tampa Bay the interlocal agreement built in some flexibility to recognize the differences in local financial situations. Another issue concerned the use of EPA's Clean Water State Revolving Fund (CWSRF) program to finance sewer construction. In the Delaware Inland Bays, local officials indicated their preference for utilizing federal funding sources other than the CWSRF because of longer repayment schedules that reduce user fees for the region's sizable low-income population.

Another set of issues concerned the concept of fiscal equivalence and whether those who benefit from a service should bear the burden of financing it and those who derive greater benefits are expected to pay more. Narragansett Bay raised this issue. Even though Rhode Island has never provided a "hard" match for the grant and never dedicated funding to implement the CCMP, EPA continues to provide implementation funding to Narragansett Bay. This raised questions about whether the federal government should bear the burden of financing implementation efforts that benefit the tax payers of Rhode Island when the same tax payers do not share the burden. The second issue, raised in Delaware Inland Bays and Tillamook Bay, is whether federal or state funding should be used to provide financial assistance to farmers or other land owners to install BMPs. Many land owners argue that their actions should be subsidized since the actions are designed to produce "public" benefits while critics think they should not receive financial assistance.

The final set of observations involved considerations about the equality of the process, the equality of the results, and differential access to decisionmaking processes. A number of issues were raised across the cases. In Narragansett Bay, the CCMP met with a great deal of oppo-

sition from local officials, who were not involved in the planning process, even though the adoption of the CCMP as an element of the State Guide Plan could have affected local governments. Tampa Bay raised questions about the equality of results. Its interlocal agreement requires some cities and counties to target significant investment in the Tampa Bay watershed even though their tourism centers are located outside the watershed. Thus, some homeowners and businesses benefit and others do not and yet all are paying taxes to fund these investments. This could be a potential long-term obstacle to implementation efforts.

Delaware Inland Bays raised other issues. Efforts to restrict development inside the watershed would result in a significant loss of tax revenue that is paying for social services in poor areas of the surrounding county. At the same time, efforts to restrict growth are hampered by the fact that the watershed is only represented by one of the five County Council members causing many respondents to complain that their interests are not represented. Another issue concerned the early proposals to regulate farmers in the watershed. Some respondents questioned whether it would be fair to increase the costs and burdens on poultry growers in the Delaware Inland Bays watershed but not on other growers elsewhere on the Delmarva Peninsula. This example illustrates why this particular problem may best be viewed as an industry problem rather than a watershed problem. Farmers inside and outside of the watershed are producing the same amount of "bad stuff" and it is questionable whether farmers in one watershed should bear higher operating costs because the environmental conditions there are viewed as more important than those in other watersheds.

Lake Tahoe raised other issues. Pumping sewage outside the watershed means displacing problems to other watersheds. Lake Tahoe benefits; other watersheds bear the costs. The strict nature of the growth controls in Lake Tahoe and the use of transferable development rights (TDRs) created other equity issues. Development restrictions have led to the gentrification and the loss of affordable housing. It has also led to criticisms that the regulations do not apply to the rich since the TDR provisions allow them to buy their way out of TRPA's restrictions.

These issues offer a hint of the complex equity issues that the actors in our cases grappled with in the watershed management efforts. They also provide a glimpse of some of the problems and issues that can result from using a watershed as a unit of analysis for government intervention. The examples also note how efforts to address environmental problems are often connected to other social issues. The power of the watershed approach is that it allows participants to address these larger issues in one venue and find a politically acceptable balance.

ADAPTABILITY

The analysis also examined whether the watershed management efforts were engaged in the kind of policy-oriented learning[73] that allowed the actors to adapt to changing conditions and improve the administration of their programs.[74] In general, the level of adaptability varied a great deal across the cases (Table 9). An important factor that enhanced or constrained the ability to adapt appeared to be the presence of clear environmental and programmatic goals. Without them, there was no baseline set of principles to allow adaptation. It also appeared to be important that there was some ability to monitor environmental conditions and programmatic activity with enough specificity to make judgments about the effectiveness of watershed management efforts.

Narragansett Bay demonstrated almost no ability to achieve the kind of adaptation implied by this criterion. There were no clear and specific goals in the CCMP. Neither are NBP partners implementing the CCMP or its recommendations.[75] There was also no ability to monitor environmental conditions above that in baseline programs (e.g., Section 305(b)) and the NBEP

made no effort to monitor the behavior of other agencies. The only type of adaptation that occurred was the search for implementation funding to sustain the effort – in other words the focus was on survival. These changes and the flexibility demonstrated in the NBEP do not reflect the type of adaptation implied by the measure because they are not advancing a specific goal or objective other than survival.

Delaware Inland Bays lacked clear and measurable goals to guide some activities such as habitat restoration but it has used volunteer monitoring data and other efforts to gather information on environmental conditions. It also monitors the implementation activities of other actors. While the performance monitoring activities could be more effective, these efforts, combined with the presence of a collaborative organization, created some ability for the actors to adapt and modify their priorities over time. There is no reason that the CIB could not be used as a forum for developing measurable goals and targets that could be used to guide its operation in the future. In fact, we believe it is a prerequisite for its long-term effectiveness. As the CIB developed, the effectiveness of implementation efforts improved. This suggested to us that there was some capacity to improve the administration of the program and improve the design and operation of the organization.

Tampa Bay and Tillamook Bay appear to have a higher capacity for adaptation. Both have clear and measurable goals for environmental and programmatic activities. Tampa Bay has a well-developed system for monitoring both environmental conditions and programmatic activity. Tillamook Bay has plans for a similar system. There is also evidence that both programs are improving the administration of their collaborative organizations as they develop. The bigger question is whether they will be able to adapt and modify their goals and measures. In Tampa Bay, the high transaction costs associated with negotiating the interlocal agreement may create an unwillingness to revisit its core features, at least in the foreseeable future. Tillamook Bay does not have the same degree of formality. Its problem may be that it becomes too adaptive and becomes side-tracked by emerging issues and has trouble maintaining a sustained effort to address the targets outlined in Tables 4 and 5.

Lake Tahoe and the Salt Ponds also demonstrate some ability to adapt. Lake Tahoe has clear environmental and programmatic goals and a well-developed system for monitoring progress towards them. The problem is that the policies are already among the most stringent growth controls in the country and any attempt to make them stronger will result in a long and controversial process. Instead, Lake Tahoe focused on developing new programs to improve the progress towards its thresholds. The Salt Ponds is more adaptive with respect to modifying policies and regulations but has less data upon which to base these decisions. Over time, the CRMC has refined its regulations and adopted a substantially revised SAMP in 1999. Both agencies also demonstrated a capacity to improve the administration and effectiveness of their regulatory programs over time.

A related observation is the strong role that collaborative organizations and NGOs played in developing the type of policy-oriented learning necessary to stimulate policy changes and improve the administration of a watershed management program. Many respondents cited this "learning" as being one of the great benefits of the watershed approach and observed that forums for ongoing communication such as collaborative organizations and STACs played an important role. Moreover, the learning occurred by decisionmakers as well as members of NGOs and other volunteers involved in these efforts.[76] This knowledge helped the participants understand the problems they are addressing and design improved management strategies by learning about how individual policies and programs work and interact with related policies and programs.

CAPACITY BUILDING

The final criterion we used to examine the performance of these watershed management efforts was whether they built capacity to address environmental problems.[77] The previous discussions noted a number of ways that the six programs improved the capacity to:

- provide services
- make decisions
- allocate resources
- select and develop the necessary administrative and institutional arrangements
- attract the necessary inputs such as financial resources
- perform policy, resource, and program management
- perform their duties and accomplish their goals
- identify problems, develop and evaluate policy options, and operate government programs
- survive and flourish.[78]

The development of a collaborative organization appeared to be a particularly effective way to develop the capacity to address environmental problems in a watershed. They provided the resources to facilitate and manage collaborative activities. They also tended to fill niches missing in current institutional arrangements. For example, Tampa Bay had a collaborative organization, the ABM, which allowed the TBEP to focus its efforts on coordinating stormwater and habitat restoration projects, needs that were not addressed by the ABM. In Delaware Inland Bays, the CIB filled important needs in the areas of research, education, and habitat restoration and created a forum for agencies to communicate on a regular basis. Those examples illustrate how collaborative organizations can become the institutional infrastructure that subsequent efforts build upon.

In addition to these examples, previous sections of this report noted other ways that the watershed management efforts improved the capacity of existing state and local institutions. That led us to conclude that capacity building was an important strategy for improving watershed governance. In fact, there are numerous examples of where implementation activities improved the environmental problem-solving capacity in state and local institutions.

Findings and Recommendations

Our analysis produced a number of findings and recommendations that are organized into two sections. The first section discusses the findings that emanated from our analysis of the first two research questions. Our discussion is loosely organized around four stages of the planning process that had a prominent role in each watershed management effort. However, the organization of these findings should not be construed as implying that the watershed management efforts follow (or should follow) a linear sequential process. The planning activities tended to be iterative in nature with implementation beginning before a "plan" was completed. In some cases, participatory planning was used as an implementation activity. In other instances, imple-

mentation activities were loosely related to a plan's recommendations, although the planning effort was the catalyst for these actions.

The second section answers the study's third research question by examining the relationship of various EPA programs to the watershed management efforts. Our analysis begins with a discussion of the NEP. However, we also found that other EPA water quality programs were involved to varying degrees. These included EPA's Section 319 NPS Program, Clean Water State Revolving Fund (CWSRF) program, and the Section 305(b) Monitoring Program. We also examined the role of two EPA reinvention efforts, Project XLC and the National Environmental Performance Partnership System (NEPPS), but these programs had only a limited role. We also explored two action-forcing mechanisms; namely the National Pollution Discharge Elimination System (NPDES) permits for stormwater and construction sites and TMDLs.

Our analysis of these relationships led to a number of findings that support a series of recommendations to Congress and EPA designed to address the problems we identified in these and other sections of this report. We believe that these recommended actions would improve the effectiveness of watershed management efforts sponsored by EPA and other federal, state, and local government agencies. We also believe that the recommended actions will enhance EPA's ability to support collaborative watershed management efforts.

Developing and Implementing Watershed Management Programs

Our analysis in previous sections of the report concluded that watershed management efforts could improve environmental conditions. Watershed management can also be a useful form of intergovernmental management (IGM) in that it can enhance watershed governance and add other forms of public value. We also concluded that collaboration could be a useful strategy for achieving these benefits. It was also clear that there was no one "best" way to manage a watershed. Each watershed management effort relied on a variety of policy instruments that were regulatory and nonregulatory in nature. The following sections describe the study's principal findings and recommendations related to the processes used to develop and implement a watershed management effort.

PROBLEM DEFINITION: THE ECOLOGY OF GOVERNANCE

The first group of findings concerned the efforts to define environmental problems. We concluded that while it was important to understand how an ecological system functioned, it was equally important to understand "the ecology of governance."[79] That is, a watershed's unique contextual setting, the tradeoffs among problems, and how the institutions that address the problems function and interact with one another. Our analysis also revealed that the problems addressed by watershed management efforts often had a strong normative or value-laden component. Collectively, our findings illustrate the changing nature of federalism and raise questions about what level of government is appropriate for defining and addressing problems such as NPS pollution and habitat loss and degradation. The strong influence that contextual factors had on each watershed management effort suggested to us that state and local governments should have the lead role in defining watershed problems, setting priorities, and undertaking the actions necessary to improve environmental conditions.

Understand the ecology of the governance system. Each watershed management effort invested considerable resources in characterizing and understanding ecological problems. However, watershed management is as much a problem of "governance" involving multiple

organizations at different levels of government as it is a question of science or designing effective policies. While it was important to understand how ecological systems function, it was equally important to understand "the ecology of governance."[80] Understanding that allows practitioners to identify points of policy intervention and opportunities for collaboration that add public value.

Context Matters. One of the more robust findings was that each watershed management effort operated in a unique physical, social, and institutional setting. We concluded that a number of contextual factors had a strong influence on the development and implementation of each watershed management effort:

- size and configuration of the watershed
- region's socio-economic and cultural environment
- nature of the problems
- capacity of the institutions
- history of previous planning efforts and various organizations

As the size of the watershed increased, the jurisdictional complexity, scope of issues, and diversity of stakeholder interests also increased. The configuration of a watershed was also important. For example, the mountains surrounding Lake Tahoe and the highway that traverses the northern edge of the Salt Ponds watershed created a sense of place, while the large size of the Narragansett Bay and Tampa Bay watersheds made it difficult for many residents to identify with the concept of a watershed. In the Delaware Inland Bays, the differences that existed between the agricultural and development interests are exacerbated by the watershed's configuration with most of the residential and commercial development located across the bays from the agricultural operations.

The socio-economic and cultural environment in each watershed was also important. The rural (Delaware Inland Bays and Tillamook Bay) or urbanized (Narragansett Bay and Lake Tahoe) nature of a watershed influenced some aspects of the programs (public participation activities). Each watershed had a particular pattern of land ownership and sources of problems such as NPS pollution and habitat loss and degradation. The particular mix of economic conditions and potential sources of implementation funding was also important. For example, the devastating floods and small tax base made Tillamook County heavily reliant on federal and state funding.

The capacity of existing institutions also influenced the development of watershed management efforts. For example, where there was already high state and local capacity (Tampa Bay), the efforts focused on improving the capacity of existing programs, adding new programs to existing agencies, and building on the existing set of institutions. Where capacity at the state and local level was lacking (Delaware Inland Bays), the efforts often focused on building new institutions. The case studies also illustrate how the history of planning efforts and relationships between organizations influenced the development of a watershed management effort. For example, the Delaware Inland Bays, Tampa Bay, and Tillamook Bay built directly on previous watershed planning efforts while the history of conflict between RIDEM and CRMC explains some of the problems experienced in Narragansett Bay and the Salt Ponds.

It is important to recognize and understand the tradeoffs among problems. We also concluded that while it was important to understand contextual factors, it was also important to understand the potential tradeoffs between and among environmental and other social problems. Unfortunately, it appeared that practitioners often had trouble identifying tradeoffs, perhaps because they were not looking for them. The tradeoffs most evident in our cases involved those between sewers and OSDSs. In Lake Tahoe, sewers were installed to remove OSDSs and the sewage was exported out of the watershed, which reduced nutrient loadings. However, it also opened up areas of the watershed to development (i.e., areas that could not support an OSDS) often at greater densities than otherwise would have occurred. In the Delaware Inland Bays, an aggressive effort is underway to install sewers to remove OSDSs. However, the installation of sewers appears to have expanded and increased the rate of residential and commercial development. While nutrient loadings to groundwater from OSDSs have declined, stormwater runoff, sedimentation from construction activities, user conflicts, and habitat loss increased, all of which are changing the quality of life and local culture. Conversely, public officials in the Salt Ponds recognized these tradeoffs and recommended sewering only portions of the watershed.[81] Tradeoffs also occur among environmental media. For example, the use of methyl tertiary-butyl ether (MTBE) as a gasoline additive appears to have improved air quality but it also contaminated groundwater in places such as Lake Tahoe. Local officials recognized these tradeoffs years ago and have been urging federal and state officials to ban its use.

We also observed tradeoffs between environmental and social problems. The increase in property tax revenue to Sussex County from growth inside the Delaware Inland Bays watershed subsidizes social services in other rural and low-income areas of the county. Thus, limiting growth will require increasing property taxes if the county government wants to expand services. Another example is the tight growth restrictions in Lake Tahoe led to the gentrification of the watershed and created affordable housing problems. Forging linkages between environmental and social problems also created incentives for collaboration. In Lake Tahoe, the efforts to link environmental issues to other issues such as transportation and economic development led to greater collaboration among agencies and interest groups that historically were in conflict. Tillamook Bay linked flooding and water quality problems to build support for the TCPP.

Understanding the relationships between environmental and social problems is important because it helps practitioners evaluate the full consequences of proposed policies. It can also help them to identify opportunities for collaboration and can help build coalitions. Conversely, it can also help practitioners identify potential sources of political opposition. Indeed, one of the strengths of the watershed approach is that it allows these tradeoffs to be identified and provides a forum for public officials to balance these issues. Conversely, a weakness with the TMDL approach is that it focuses on single water quality parameters and identifying actions to address specific environmental problems in isolation from other environmental and social problems. While this can sometimes be effective, the TMDL approach can lead practitioners to ignore the important tradeoffs among environmental problems and to recommend policy solutions (e.g., sewering) that have undesirable social consequences (e.g., increased NPS runoff, lost habitat, changes in the quality of life and local culture). Moreover, the TMDL provisions do not allow environmental priorities to be balanced against other social priorities.

Our analysis suggests that it is important that collaborative watershed management efforts focus on both environmental and related social problems. It can encourage the participants to examine the tradeoffs among problems and to design public policies that do not have unintended consequences. This can minimize conflict and generate increased political support. Moreover, linking environmental and other social problems can help to better identify oppor-

tunities for collaboration and develop broader coalitions that generate additional political support. For example, Lake Tahoe contains several examples of where seemingly disparate issues such as transportation, tourism and economic development, and environmental protection were effectively linked to build coalitions that worked together in a collaborative fashion. Meanwhile, the linkage between water quality, flooding, and declining salmon runs helped build a coalition to support the efforts in Tillamook Bay.

The problem this creates for EPA is that it is often accused of "mission creep" if it proposes addressing larger, interrelated issues.[82] It also creates problems since the agency's mission is not to balance competing environmental and social issues but to protect the environment and public health. For example, the CWA directs estuary programs to address water quality and living resource issues. It does not require them to address related issues such as land use or the impacts of these proposals on other social issues. Moreover, given the structure of our federal system, there should be limits on how much EPA can or should be willing to make these tradeoffs. This is one reason that this report recommends the use of collaborative organizations for watershed management. It is also the cause for our recommendations that any watershed management program administered by EPA should be required to address water quality and living resource issues as well as related issues such as land use and the impacts on other social issues (e.g., affordable housing, economic development, tourism, user conflicts, changes in quality of life, impacts on local culture, etc.).

It is important to understand the institutional ecosystem. In addition to understanding contextual conditions and tradeoffs among problems, we concluded that it is important for practitioners to understand the institutional ecosystem.[83] That is, the institutions addressing the collection of problems being considered and how these institutions interact with one another. This requires knowing how government and the industries and activities causing problems are organized so that successful policy interventions and effective implementation structures can be developed. Each case study describes the unique and often complex institutional framework that "manages" each watershed. We also found that few respondents understood how the whole portfolio of federal, state, and local institutions interacted with one another. As a result, opportunities for policy intervention were missed, potential opportunities for collaboration were ignored, and potential sources of implementation resources were not exploited. One good example is the relative lack of emphasis on forging partnerships with the state departments of transportation even though they often have resources to support implementation efforts and their infrastructure decisions have a profound affect on the influence of development activity in a watershed and by extension water quality, habitat, and other environmental problems.

The failure to understand how industry was organized also leads to missed opportunities. For example, in addressing nutrient loadings from the poultry industry in the Delaware Inland Bays, the focus has traditionally been on working with the individual growers and the farmers applying the manure as fertilizer instead of working with the major integrators that control all aspects of the production process. Conversely, public officials in Tillamook Bay took advantage of how the industry was organized and worked with the TCCA, a dairy cooperative, which ended up paying a lower price for milk to dairy farmers that failed to use appropriate conservation measures. This incentive led to the adoption of a wide range of conservation measures in the watershed. A similar approach could work in Delaware. The efforts in Delaware have treated NPS pollution from poultry growers as an "end-of-pipe" problem by focusing on the disposal of manure. However, greater long-term nutrient reductions at less cost may be achieved through changes in the production process that lead to reductions in the nutrient content of

manure. It is important for practitioners to understand industry organization and the production process because it can change the way problems are framed which in turn can expand the range of potential policy solutions and policy instruments. It can also help determine whether a problem is best addressed at the watershed level or perhaps should be addressed at some other level (i.e., federal, state, local).

Some problems are not watershed problems and some policies should be implemented at other levels of government. We also concluded that not all problems are "watershed" problems in that the watershed may not be the best unit of analysis to address every environmental problem. The decision on whether to address a problem at the "watershed" level is a complicated one and requires looking at both the nature of the problem and the actions proposed. To be a "watershed" problem, we believe the contextual conditions should make the problem unique in some way such that the combination of actions taken to address the problem in one watershed will be different from those in another watershed. For example, Lake Tahoe, Salt Ponds, Tampa Bay, and Tillamook Bay all have an approach to addressing specific problems that is tailored to the unique contextual conditions of each watershed.

Another determining factor is whether a watershed represents a closed system with respect to the problem in question. Problems related to carrying capacity (e.g., residential and commercial development) and cumulative impacts are good examples of problems that are effectively addressed at the watershed level. Lake Tahoe and Salt Ponds effectively managed cumulative impacts from residential and commercial development by developing carrying capacities for the watersheds. Tampa Bay addressed cumulative nitrogen loadings at the watershed level. However, there is significant atmospheric deposition of nitrogen, some of which comes from outside of the watershed. This example illustrates that the watershed is really is not a closed system with respect to nutrient loadings and that future efforts to limit nutrient loadings may require action at some other level (e.g., federal, state, airshed, etc.).

The nature of the policy solution and the structure and capacity of the institutional ecosystem will also determine whether a problem is best addressed at the watershed level. If the impacts of an activity are identical in different watersheds and the same policy can be used in different watersheds, there is reason to question why the policy should be implemented at the watershed level. For example, several policies developed for the Salt Ponds SAMP were applied statewide to all shoreline development. This example illustrates a potential benefit of watershed management efforts in that the policies and programs developed for application in a watershed can often be diffused and applied elsewhere.

Equity considerations may also enter into the decision on whether a problem should be addressed at the watershed level. There should be some justification for treating a class of actors (e.g., industry, homeowners, farmers, etc.) in a watershed different from similar actors in other watersheds if public officials are to impose differential costs and legal requirements on them because of their geographic location. Public officials will have to justify why farmers in the Delaware Inland Bays should be subject to operating costs and legal requirements in excess of those for similar farmers engaged in identical activities in another watershed. These equity issues also explain the agricultural industry's opposition to the efforts in the Delaware Inland Bays and are a reason why the focus has shifted to regulating poultry growers at the federal and state level in Delaware.

A final consideration is whether the existing institutional framework has the capacity to address problems at the watershed level. The best example of this situation is the inability to limit residential and commercial development in the Delaware Inland Bays watershed. While this

arguably is a watershed-level problem, there is no institution other than the county government that can address the problem and impose the necessary growth controls. However, a number of factors make it unlikely that the county will take the steps necessary to develop and impose these controls. Collectively, these findings suggest several recommendations to Congress and EPA.

RECOMMENDATIONS

- EPA's Office of Research and Development (ORD) and the National Science Foundation (NSF) should revise its funding priorities under the Star partnership to fund research on the potential tradeoffs among environmental problems in different environmental media, as well as the interactions between institutions addressing the problems.
- Congress should amend Section 320 of the Clean Water Act to eliminate the requirement that only water quality and living resource issues are addressed in order to provide the estuary programs with greater flexibility to address interrelated issues (e.g., land use, economic development, tourism, user conflicts, etc.).[84]
- When formulating future CAFO regulations, EPA should explore alternative approaches to addressing NPS problems by taking advantage of the way that industries and production activities are organized, rather than focusing primarily on regulating individual farmers.
- EPA should work with the poultry integrators to identify ways to create incentives for the adoption of conservation practices and to identify ways that nutrients can be reduced through changes in the production process.

Watershed problems are value-laden and priorities should be set at the state and local level. Defining problems is a central element of public policymaking.[85] "The very notion of problem definition suggests a constructionist (rather than an objectivist) view; that is, problems do not exist 'out there'; they are not objective entities in their own right."[86] Instead, decisionmakers make a conscious choice about how to formulate or "frame" a problem[87] and these decisions, along with the selection of policy instruments, are influenced by understandings of the ecology of the governance system. It is also important to recognize that the definition of problems will change over time as some problems are reduced or eliminated while "new" problems emerge on the public agenda as a result of scientific research, changes in local conditions, and shifts in value preferences. This observation is perhaps best illustrated in Tampa Bay where watershed management efforts evolved from efforts to address point source discharges from sewage treatment plants to addressing nutrient loadings from NPS sources such as stormwater runoff. It is also reflected in EPA's shift in emphasis from point source to NPS problems over the past decade.

Environmental problems are often value-laden. Our analysis revealed that most of the environmental problems addressed by watershed management efforts lacked a definitive formulation, could be represented in different ways, and had subjective goals. For example, there is no objective or "scientific" reason why Tampa Bay used 1950 as a goal for seagrass coverage. Rather, the goal was the product of a subjective or "political" process that tried to reconcile different values and perspectives about what should be done to address the problems.[88] The political process also had to reconcile the different perceptions and tolerances of risk. Some actors (e.g., farmers) are inherently risk-adverse because actions taken to address a problem affect them directly. Con-

versely, others (e.g., environmentalists) may be risk takers because they do not bare the costs of the proposed policy change directly.[89] In short, when actors first become involved in a watershed management effort they often define problems in different ways. Problems will be novel to some and routine for others. Some problems will be viewed as worthy of attention; others will not. When there are multiple causes of problems, participants are likely to emphasize different causes. Actors at different levels of government and individuals with different professional training will also view problems differently.[90] Accordingly, a central challenge for any watershed management effort is to develop an effective decisionmaking process that can reconcile these differences and develop a shared definition of the problems, goals, and actions necessary to address the problems.

It is important to develop a shared understanding of problems and the actions necessary to address them. The watershed management efforts we examined had varying degrees of success in developing a shared definition of the problems, goals, and actions necessary to address the problems. Narragansett Bay never developed these shared values or norms and consequently the effort lacked focus and suffered from a great deal of conflict.[91] The conflict in Lake Tahoe during the early years of the program often revolved around different perspectives about what should be done to address problems, which limited collaboration. However, once a shared agreement could be reached on actions, collaboration improved dramatically. Conversely, Delaware Inland Bays, Salt Ponds, Tampa Bay, and Tillamook all demonstrate the benefits that result from the development of shared norms and expectations.[92]

These norms were often the product of the participatory planning or decisionmaking processes that were used with varying degrees of success in each watershed. The central challenge for practitioners is to determine who should be involved in the efforts to develop such shared values, norms, and expectations. The structure of our federal system suggests that a wide range of federal, state, and local agencies and NGOs could be involved. However, our analysis suggested that while it was important to be inclusive, this desire should be tempered by the reality that the watershed management effort should:

- be strategic
- find problems where common agreement on actions can be reached
- work directly with potential collaborators rather than representatives of a group of collaborators even though this adds to the complexity of the process

It is also possible that the drive for inclusiveness can paralyze an effort and make it difficult to reach agreement. This tension between inclusiveness and being strategic reflects an underlying tension between the participatory planning model which emphasizes broad stakeholder involvement and is often comprehensive in scope and the collaborative model which includes only the collaborators (i.e., partners) and is strategic in orientation. Our findings suggest the following recommendations.

RECOMMENDATIONS

- Congress should amend the CWA to clarify when water quality problems should be addressed subjectively and collaboratively (e.g., the NEP) and when they should be addressed objectively (e.g., TMDLs). The two approaches are inconsistent and are likely

to be used in the same water bodies (e.g., waters are on state Section 303(d) lists).[93]

- Congress should clarify whether narrative water quality criteria that are qualitative and subjective in nature should be subject to the CWA's TMDL provisions that assume quantitative, objective standards. EPA should modify the proposed regulations such that TMDLs will be developed only for waters that violate narrative criteria when scientific consensus on numeric standards exists and specific standards have been developed for the water body in question.

CHARACTERIZING PROBLEMS: "NESTING" SCIENCE AND AGENDA SETTING

The second group of findings concerned efforts to characterize environmental problems and the role that science and public participation played in each watershed management effort. We concluded that to be effective science must be "nested" in a decisionmaking process. That is, scientific research should be designed to provide salient information to decisionmakers. We also found that science rarely told decisionmakers what to do. Instead, scientific information was one form of information used by decisionmakers in a political process. Our analysis also revealed that decisionmakers needed better information on environmental conditions and implementation efforts. State and local officials also reported that they need better technical and increased financial assistance to improve data collection and integration of these data systems. Watershed management efforts also gave high importance to public participation, but the role of public and stakeholder involvement varied. We also concluded that it was important to develop a well-managed planning and decisionmaking process and identified important differences between the collaborative model and the rational, scientific model implied by the CWA's TMDL requirements.

Science should be "nested" in the decisionmaking process but rarely will it tell you what to do. Most of the problems addressed by watershed management efforts involved questions of "trans-science" in that they could be formulated in scientific terms but could not be answered entirely by science.[94] To answer a trans-science question, decisionmakers must make a cognitive judgment about what the problem is and what a satisfactory solution will be. Scientific research often provided useful information, but it rarely answered a question for decisionmakers.[95] We concluded that the four estuary programs, and many public officials, placed too much emphasis on science, perhaps in the belief that research will direct policymaking or that watershed management necessarily requires a great deal of scientific research.[96] However, scientific research is not oriented towards "proving" things – the scientific method can only disprove things. Thus, research often plays the important role of eliminating and evaluating the efficacy of competing policy options and can frame important issues and debates. While this information will help decisionmakers, it rarely makes decisions for them. We also found that many of the actions undertaken to improve environmental conditions or enhance watershed governance were typically not based directly on the scientific research funded during the planning process. That suggests to us that the NEP's emphasis on scientific research, particularly in the early Tier I and II estuary programs, may be misguided.

The NEP has a heavy emphasis on scientific research. All four estuary programs in this study emphasized scientific research and characterization efforts as a result of the CWA and EPA requirements. In fact, the Delaware Inland Bays wanted to de-emphasize science but EPA insisted on numerous research studies. Based on our interviews, it also appears that many EPA

officials and staff working for the estuary programs viewed scientific research as a core mission of the NEP and continue to emphasize research projects during the implementation process. In fact, to EPA's credit much of this research has been valuable in its own right, having advanced the scientific understanding of such issues as the relationship between nutrient loadings and sea grass loss, the atmospheric deposition of nitrogen to surface waters, and Pfiesteria. The research sponsored by the NEP has also filled a void because historically most oceanographic research focused in offshore areas, not inshore estuarine systems. Despite those successes, EPA could do a better job of making this research available to other watershed management efforts.

While much high-quality scientific research has been sponsored by these watershed management efforts, it was also clear that little of that information was used directly to develop policies. In part, this is due the lack of a complete understanding about how ecological systems function and the inherently complex, interconnected nature of the systems. In other cases, the problems were due to the tendency for the watershed management efforts to fund "cutting edge" research rather than the policy-relevant research decisionmakers needed. That failure may also due to the fact that research was often funded before decisionmakers determined the right research questions. In some cases (Delaware Inland Bays, Tampa Bay), previous planning efforts helped focus the research agenda. In other cases (Narragansett Bay, Tillamook Bay), the research agenda evolved over the planning process. To help improve the use of these research findings, we believe EPA should take additional steps to ensure that a research agenda is clearly articulated before the planning process begins and should make the changes to the governor's nomination procedures noted in subsequent recommendations.[97]

For science to be useful it must be "nested" in decisionmaking. To be effective and influence decisionmaking, scientific research has to be "nested" or incorporated into the decisionmaking process of a watershed management effort. Watershed management efforts tried to do this in different ways and achieved varying degrees of success. In the Salt Ponds, the planning staff went to great lengths to target their limited research funding on the central questions surrounding the development of SAMP. In Tampa Bay, STAC identified the types of research projects that would answer the questions surrounding the development of the program's goals. The Delaware Inland Bays also used a STAC. Both of these efforts also benefited from the fact that the previous planning efforts identified areas where research was needed.

In the other cases, the failure to "nest" science within a decisionmaking process caused problems. Narragansett Bay was largely designed to be research project during the formative years of the program with little attempt to link decisions about research to the information needs of decisionmakers. Staffing turnovers in Tillamook Bay resulted in changing priorities and an unfocused research agenda. The Oregon DEQ was also uninvolved during the formative years of the program and this resulted in some poor funding decisions. In Lake Tahoe, most research was done by nearby universities, but the lack of communication between researchers and decisionmakers limited the usefulness of the research.

These findings suggest that it is important for a watershed management effort to establish a clear research agenda at the onset of the planning process. This was done in the Delaware Inland Bays and Tampa Bay where previous watershed planning efforts crystallized the issues and identified the questions that needed to be answered. Our analysis also revealed the importance of involving the technical specialists in EPA, state EPA, and other resource management agencies involved in the process of making decisions about research funding. The development of an effective STAC (or a similar advisory body) can serve this function. This involvement also helps ensure that research informs the technical staff in these agencies. Accordingly, scientific

research may not provide information directly of use to decisionmakers but it may educate technical specialists and let them provide better advice to decisionmakers.

We also concluded that from a programmatic standpoint, combining funding for both scientific research and planning had a detrimental affect on the NEP. Many EPA and estuary program staff we interviewed viewed one of the main missions of the NEP as conducting scientific research to better understand environmental problems and form management actions. For example, one EPA staff member pointed to Tampa Bay's research on the role of the atmospheric deposition of nitrogen as one of the program's main accomplishments. This emphasis on scientific research continues during the implementation process with all four estuary programs reporting that they are continuing research efforts. While this research is important and improves the understanding of the watersheds and their problems, the estuary programs have a fixed amount of financial and staff resources that can be allocated to implementation efforts. Research efforts therefore take away from other implementation activities that focus on reducing environmental problems and improving watershed governance. The concerns that these findings raise is that estuary programs often appear to be oriented more towards characterization and problem "finding" rather than implementation and problem "solving." Moreover, if the major purpose of the NEP is to conduct research, then it is questionable whether it is maximizing the benefits that can be obtained from this funding since there did not appear to be any concerted effort by EPA to ensure that the research it funds in one watershed is transferable to other watersheds. This would maximize the benefits resulting from these expenditures during the planning and implementation process. We believe that separating the planning and research funding might help EPA to better emphasize implementation and problem-solving while at the same time maximizing what is learned from the research efforts.[98]

Science plays different roles at different stages of the policy process. We also concluded that role of science and other types of time and place information varied at each stage of the planning process.[99] Scientific research appeared to play an important role in identifying issues, expanding issues into "problems", and getting them elevated on the policy agenda.[100] An excellent example from one of our cases was the discovery of Pfiesteria in the Delaware Inland Bays watershed and its linkage to earlier fish kills. This elevated the issue of nutrient loadings on the public agenda and is one reason that the Delaware General Assembly enacted legislation during the 1999 session to regulate nutrient loadings from the poultry industry.[101] Time and place information (discussed in the next section) that examines the changes in environmental conditions can also determine whether issues are elevated on the policy agendas.

In evaluating and selecting management actions, scientific research appears to be somewhat less useful, but it often helps frame problems and identify cause and effect relationships. In Tampa Bay, research on the relationships between nutrient loadings and seagrass loss even led to a series of nutrient goals that were linked to a set of seagrass restoration goals. However, this example was the exception, not the rule. In the Delaware Inland Bays and Salt Ponds, the nature of the ecological system limited the ability to find these relationships. Instead, our analysis suggested that time and place information such as the effectiveness of particular BMPs or data on implementation activities often played the more important role. Other types of information were also important such as public opinion, political support, budgetary realities, and tradeoffs with other issues and priorities. In other words, the decisions of a watershed management effort were often tempered by the realities of politics.

During the implementation and evaluation stage, time and place information such as environmental and programmatic monitoring appeared to play the most important role. As noted in a subsequent section, this data helped reinforce the peer pressure systems that developed as

a result of creating a collaborative organization. Time and place information also helped identify the adequacy of current policies and poor performance can lead to changes in policies or programs as was demonstrated in Lake Tahoe with the EIP resulting from lack of progress towards the environmental thresholds. The lack of satisfactory progress demonstrated by time and place information or the results of new scientific research that identified new problems or concerns can also lead to new planning initiatives. These "cycles" of planning were observed in Delaware Inland Bays, Tampa Bay, and Tillamook Bay.

It is important to provide information in a form useful to decisionmakers. Understanding the different roles that this information plays at different states of the planning process is important because it helps practitioners make efficient use of their limited research funding and allows "science" to be effectively incorporated into decisionmaking. However, we also concluded that it was important to provide the information in a form useful to decisionmakers and the public. Three general levels of information appeared to be important. Information targeted at the general public lies at one end of the spectrum while detailed technical reports targeted at an audience of specialists sits at the other. In the middle lies information targeted at decisionmakers. The Internet has meant an explosion in both the volume and availability of information targeted at the general public and has stimulated the diffusion of technical reports (As we discuss in more detail later, however, EPA and the watershed management efforts could all make better use of the Internet). What was often missing is detailed technical information in a form understandable and useful to decisionmakers. This "mid-level" information is important because it minimizes information asymmetries among scientists, agency officials, interest groups, and the public, can cause conflict.[102] It is also crucial to facilitating the type of policy-oriented learning that can lead to policy changes.[103] While our case studies generally did a good job of providing this "mid-level" information, many respondents were critical of EPA and their guidance materials as being too general (This is discussed in a subsequent section on the NEP). This suggested to us that some EPA officials underestimate the information needs of state and local decisionmakers.

Scientific information can also be politicized. Another interesting finding concerns the way scientific information can be politicized. The best example was in the Delaware Inland Bays where scientific information related to nutrient loadings from agricultural operations became politicized as a result of several interrelated factors. Beginning in the late 1980s, EPA and DNREC gradually increased their attention on nutrient loadings from poultry operations. As a result, the industry became concerned that the watershed management effort would be used to provide the justification for a new regulatory program, which did occur. Because the industry was a major employer and revenue generator, it could exert pressure on public officials. There were also NGOs (e.g., Farm Bureau and Delmarva Poultry Industry, Inc.) that were well positioned to hire their own technical experts to challenge research findings. The industry and its employees were also effective in lobbying the governor and members of the General Assembly.

The nature of the problem also made it easy for the industry to question the results of the scientific research. The groundwater system is poorly understood, is expensive to monitor, and has a long residence time. This makes it difficult to establish causal connections.[104] The water quality data fluctuates based on natural factors like rainfall. There is also variation in the sources of nutrients. For example, the impact of OSDSs varies based on their locations, proximity to surface waters, technology used, and the household use pattern. There is also variation in the size and scope of poultry operations and in how farmers apply fertilizer to the fields. Since no study has measured all of these individual pollution sources, researchers make generalizations

and assumptions to calculate nutrient loadings. All of this uncertainty makes it easy to question research findings and to challenge the results of computer models and the assumptions embedded within them.

This example illustrates the limits of "science" and how easily it can be politicized, particularly when regulation of a "politically" powerful industry is involved. It also illustrates the high degree of uncertainty that surrounds many water quality models and the development of TMDLs. Therefore, before EPA and state environmental agencies consider whether to link regulations to the results of a TMDL, they should consider how easy it would be to challenge and "politicize" the results of this analysis. Moreover, even if EPA and state environmental agencies prevail in such challenges, the conflicts will exacerbate the transaction costs associated with developing the TMDLs and formulating an implementation plan. Collectively, these findings suggested the following recommendations.

RECOMMENDATIONS

- EPA should separate the planning and scientific research funding it awards in the NEP or other place-based efforts. The agency should target the funding it awards for scientific research on studies that generate policy-relevant information that will be useful to other watershed management efforts.
- Congress, ORD, and the NSF should expand the funding available for research to support watershed management efforts.
- EPA should require that all of the research funded in the NEP is consistent with a well-developed research agenda that focuses on answering a limited number of policy-relevant questions. In the future, the NEP should require a more detailed research agenda be included in a governor's nomination package and require that it is included in the management conference agreement.[105]
- EPA should continue to emphasize the development of STACs to support estuary programs and other place-based efforts. The agency should consider encouraging STACs for watersheds without an associated planning process. The objective would be to develop a forum to discuss technical issues and provide assistance to state and local decisionmakers, who could also be part of these committees.[106] Providing some seed money for research projects or holding symposiums focusing on a watershed's problems may be enough to stimulate the development of STAC and might spur a full-blown watershed management effort.
- EPA should require that all research reports be available on the Internet. The agency should provide financial or other incentives (i.e., grant restrictions) to get programs like the NEP to make old technical reports and other work products available as well. To build information technology capacity of those programs, the work should not be contracted out.

More time and place information is needed. While scientific information can be useful, watershed management efforts rely heavily on time and place information such as local, social, and physical environmental characteristics, environmental monitoring data, and the nature and extent of specific environmental problems, and the performance of various policy instru-

ments (e.g., BMPs) in these settings.[107] Unfortunately, we concluded that despite the heavy public investment in these watersheds, there was still a general lack of adequate data on environmental conditions such as water quality. The general lack of good water quality data raised questions about the quality of the data used in Section 305(b) reports and Section 303(d) lists. The lack of data may also explain why many respondents questioned the usefulness of the information in the Section 305(b) reports.

Need better water quality and environmental monitoring data. Respondents in all of the cases reported information needs and many noted problems such as the lack of an adequate number of monitoring sites or parameters, as well as the fact that important time-series data was often missing. The lack of data combined with natural variations in the water quality parameters often made it difficult to evaluate changes in water quality and confounded efforts to link changes in observed environmental conditions to particular sources. Volunteer water quality monitoring helped to some degree in Narragansett Bay, the Salt Ponds, Tampa Bay, and Tillamook Bay, but some respondents noted that state environmental agencies were often reluctant to use the data, particularly in regulatory or rulemaking decisions. Conversely, some state officials we interviewed noted that they were concerned about the lack of adequate quality assurance/quality control (QA/QC) and were concerned that their rule-making activities could be challenged if they used these data because of the failure to maintain a chain of custody. It is unclear to what extent these concerns were justified. However, in at least two cases (Salt Ponds and Delaware Inland Bays) these data are analyzed by internationally recognized oceanographic institutions and is of equal quality to that collected by state agencies. Interestingly, the two watersheds with the best environmental data, Lake Tahoe and Tampa Bay, were also the ones where actors other than state agencies collected the data. Moreover, in both cases the monitoring programs were not "centralized" but rather used "networked" arrangements where one actor coordinated data collection and added value by putting it in a form useful to decisionmakers.

Given the need for additional data, the civil society implications associated with the volunteer activities, and ability to leverage this volunteer time for public advantage, Congress and EPA should consider a serious effort to stimulate the creation of additional volunteer monitoring efforts. They might be particularly helpful in addressing the information needs described throughout this report. They could also provide EPA and state agencies with the information needed to develop the 20,000 TMDLs that will be necessary as a result of EPA's proposed rules.

Need to integrate with other data systems. We also concluded that there is a need to integrate existing data systems and link data on environmental outcomes with information on implementation activities. We identified several efforts to accomplish this data integration. Tampa Bay has a system for collecting and reporting both types of information. Tillamook Bay plans to develop a reporting system linked to a geographic information system (GIS). Delaware's Whole Basin Initiative, an intraorganizational watershed initiative, is effectively linking a wide range of environmental program data and GIS data at the watershed scale. However, many respondents noted that integrating these data and reporting systems remains a challenge for public officials. These data are often dispersed among various agencies and organizations. There was also little linkage of land use and water quality data. For example, most of the watershed management efforts lacked basic demographic data such as how many people live in the watershed or what the median income level was.

Greater investment in information technology is needed. Our discussions with state and local officials also suggested that the major limitation to data integration is not resistance to collaboration, but a lack of capacity. Some state and local agencies lack basic access to information technology while others are at the cutting edge. For example, some state and local officials have limited access to email and have trouble maintaining a website (e.g., Narragansett Bay and Salt Ponds) while others maintain sophisticated sites (e.g., Lake Tahoe and Tampa Bay). We believe that over the long term, effective watershed management requires integrating data management systems to provide better time and place information to decisionmakers. The development of GIS systems appears to offer a powerful tool that can be used to link environmental, programmatic, and social data at various geographic scales. However, access and use of GIS systems varied across the cases and some of the coverages that did exist were at scales that were not useful to decisionmakers. For example, many GIS coverages were at scales of 1:24,000, which is of limited use to those making individual permit decisions.

EPA's Index of Watershed Indicators is flawed. We also found that no respondents reported finding the information available on EPA's Surf Your Watershed and its Index of Watershed Indicators websites to be useful. We believe this has to do with problems related to scale and to the methodology used to construct the information. One problem is that the data is grouped according to eight-digit USGS Hydrologic Unit Codes (HUCs), primarily because it was the only set of codes for which there was national data (and it reduced the number of watersheds EPA had to track). However, these boundaries were generally not the ones used by the watershed management efforts we examined. We believe that this is likely to be the case in most instances and EPA is encouraged to use smaller scale HUC codes when they exist.

The Index of Watershed Indicators is more troubling because it reports data in misleading ways. The database combines data that is collected at different scales and combines it on a single scale, which makes much of the data suspect. This is analogous to using census block or track data and generalizing it to a statistical metropolitan area (SMA) or state level. Conversely, it is similar to taking general population statistics collected at the state level and assuming every neighborhood in the state has the same characteristics. The website does a poor job of explaining these problems or potential biases associated with index construction. Some of the potential problems include the way rural areas were treated, the combination of unrelated variables into a single conceptual measure, and the fact that many of the reported measures are inherently linked to the common mediating variable of population size and density. Thus, it did not surprise us when the indicators did a poor job of describing the watersheds we examined. For example, the indicators describe Tillamook Bay as having "less serious water quality problems and low vulnerability" even though TMDLs are required, salmon is listed as an endangered species, and a substantial portion of the bay is closed to shellfishing due to bacterial loadings from the dairy industry and other human activities. Moreover, the high-medium-low categories that are used in the individual categories do not allow enough variance so every item looks to be of equal importance. For example, agriculture looks equal to other sources when it is the major industrial source and the two main pollutants, bacteria and sediment, are not among those included in the list of important pollutants.

In our view, it is unlikely researchers or practitioners will use this information because of the data limitations and would be more interested in the underlying information used to construct the indices. Thus, the main "user" is likely to be the general public, which gets a misleading perspective of a watershed's problems. For example, the information on Tillamook Bay suggests that water quality and environmental problems are better than they actually are. The site

also misleads the public because it does not contain information about many of the issues that are of concern to state and local decisionmakers in the watershed. Collectively, these observations lead to the following recommendations.

RECOMMENDATIONS

- EPA should remove the Index of Watershed Indicators from the Internet until it no longer contains or provides misleading data. EPA should reconsider what the goal of this information is, who the client is, and whether it is even possible to provide the information in an accurate, meaningful, and useful way.
- Information in the Surf the Watershed database should be linked to smaller HUCs and allow the codes to be linked to produce accurate information for a watershed.
- Congress should provide flexible categorical grants to state environmental agencies and other innovative local entities to support data integration, build information management capacity, encourage innovative approaches to linking data systems, and explore the power of technology to improve monitoring and reporting. The goal should be to test and experiment with models for linking and managing data so that a national environmental monitoring program could be developed to enhance learning.

The role of public and stakeholder involvement varied. The watershed management efforts all relied on public participation and stakeholder involvement. We concluded that while the programs often devoted considerable resources to public participation, the efforts often met with varying degrees of success. It was also unclear whether these activities influenced their ability to develop a successful watershed management effort.

A wide range of public involvement and education activities was used with mixed success. All of the cases used a wide range of public involvement and education techniques. The four estuary programs spent a sizable portion of their planning funds on public participation activities. CACs were the major vehicle for public involvement and were used with varying degrees of effectiveness. Two watersheds (Delaware Inland Bays and Tampa Bay) also incorporated a CAC into their implementation structures although respondents reported that they have had trouble finding a mission for them. The watershed management efforts also used a wide range of accountability mechanisms and provided opportunities for public input during the development of the management plans with the public in the Delaware Inland Bays, Salt Ponds, and Tillamook Bay having the greatest influence. The respondents also suggested that the regulatory programs for Lake Tahoe and the Salt Ponds were generally open. However, a frequent criticism by our respondents was that the permit programs and decisionmaking processes of EPA and state environmental agencies were closed to public scrutiny. Our analysis supports these criticisms and we recommend that these decisionmaking processes be opened up. It also appeared that the general public's involvement was not enough to counter established interest groups. There was also reason to question whether low-income and minority groups were adequately represented when compared to upper-income groups.[108]

Tampa Bay had perhaps the most prolific set of public education efforts and undertook a concerted effort to educate homeowners about what could be done to improve NPS. In Delaware Inland Bays, the partners focused on an educational effort targeted at developing individualized conservation plans or WE C.A.R.E. (Comprehensive Agricultural Resource Effort)

plans.[109] The program provided a comprehensive document that included information and planning for all natural resources on a farm including cropland, nutrients, and forestry. The WE C.A.R.E. concept was also developed as a marketing tool to build support for conservation efforts in the agricultural community and involved a lot of one-on-one contact with farmers.[110] However, those examples are the exception, not the rule. Most public education activities were not designed to produce behavioral changes or were too small in scope or duration to improve environmental conditions. Instead, the efforts typically focused on providing general information (i.e., public relations) that was of questionable value with respect to improving environmental conditions.

The watershed management efforts also used the Internet to varying degrees and the quality of web sites varied a great deal. In some cases there was no website (i.e., Salt Ponds) while other watersheds maintained sophisticated sites (i.e., Lake Tahoe). We believe that all the watersheds could make greater use of this technology with the biggest obstacles being the resources (e.g., money, equipment, staff, and expertise) needed to update and maintain the sites. The heavy reliance on contractors also limited the frequency that websites were updated.

EPA makes a heavy investment in public participation with a rather limited return to environmental improvements. Despite the sizable investment in public participation in the four estuary programs, it is questionable whether there was an adequate return on this investment. It appears that the watershed management efforts tended to treat public involvement and education as an "end" rather than as a "means to an end" and it was often unclear what strategy was guiding these activities. In other instances, the watershed management efforts did a poor job of recognizing the challenges created by their own particular contextual circumstances. We concluded that a standardized approach to public participation was unlikely to be effective. Our analysis also suggested that watershed management efforts often underestimate the staff time needed to effectively implement many activities, which limited their effectiveness. We believe that EPA should provide estuary programs with additional guidance materials in developing and implementing public participation activities beyond what is currently available.[111] Practitioners are advised to focus their efforts on a few activities and do them well rather than becoming overextended.

Most stakeholder groups were well represented. The watershed management efforts all used some form of participatory planning and relied on heavy involvement of stakeholder groups such as federal, state, and local officials, environmental and industry special interest groups, and researchers. For the most part, all affected stakeholder groups were represented and there were few examples where respondents felt that they lacked an opportunity to participate, although they may have questioned the influence that they had on the process. There were some instances where the exclusion of certain stakeholders had an adverse impact. Narragansett Bay's exclusion of local governments caused some opposition to the final CCMP. There were also examples where certain stakeholders were put on a lower level committee and this caused problems. In Narragansett Bay, the CRMC and RIDOP were not placed on the high-level executive committee until late in the planning process while in Delaware Inland Bays the Department of Agriculture was not included on the high-level committee. In both instances, this caused problems. There was also the tendency to exclude the state DOT from the process even though they generate a significant amount of stormwater, have restoration funding, and make infrastructure decisions that affect future growth. While the exclusion of the DOTs resulted in no discernable conflicts, we believe it explains why there little collaborative activity was reported with these agencies. As a result, opportunities for collaboration were missed.

However, the exclusion of stakeholder groups or their placement on the "wrong" committee did not always have a negative impact on the watershed management effort – sometimes it appeared to be a key to an effort's effectiveness. Tampa Bay was largely a partnership between six local governments and various federal, state, and local regulatory agencies. Other local governments were excluded from the process and industry was represented on lower-level committees. These organizations were excluded because the partners wanted to develop agreement on nutrient reduction goals amongst themselves first and feared industry would disrupt the process. Once the partners reached agreement, they turned their efforts towards working with industry to voluntarily achieve their share of the necessary nutrient reductions. Because local governments had committed to actions, many respondents suggested that it was easier to obtain industry's voluntary participation. In the future, the partners hope to include additional local governments and industries in these efforts.

These results suggest that there is no best way to encourage stakeholder involvement. Our analysis raised questions about the conventional wisdom that an egalitarian process should always be used. Rather, we suggest that practitioners should give careful consideration to whether a particular stakeholder should be involved and where in the committee structure it should participate. The results also suggest that watershed management efforts may experience problems when asymmetries of power among interest groups exist. For example, in Delaware Inland Bays the agricultural groups were able to force the changes they wanted at the end of the process because the environmental groups were not powerful enough to stop them. The more desirable situation appeared to be when the interest groups on different sides of an issue had balanced power and representation. In Lake Tahoe, a symmetrical relationship prevented one group of stakeholders for exerting too much control over the outcome of the process. We also concluded that problems may occur when opportunities exist for stakeholders to exit the collaborative process and control the outcomes.

There is a tension between the two planning models used by these programs. We also concluded that there are really two different planning models being used, ones that are different in subtle, but significant ways. The "stakeholder" planning model emphasizes broad stakeholder involvement using a participatory decisionmaking process in which participants offer advice and help an organization set goals and determine implementation actions. The "collaborative" model is used as a mechanism for developing a shared set of goals and actions for a group of actors. The collaborative model does not involve representatives of a stakeholder group, but works directly with "partners" that make collective decisions, although nothing precludes the collaborative organization from using advisory committees. The relationship of staff in the models is also different. In the stakeholder model, the committee advises staff, who prepare a plan that advances the interests of their organization. In the collaborative model, staff work for and support the collaborative organization, maintain a neutral position, and act based on the direction provided by the organization.

One EPA staff member commenting on this report suggested that these distinctions are fairly minor and do not warrant the emphasis we give them. That belief may, in part, be due to the careless way terms like "collaboration" are used. Creating an advisory committee that provides input to an agency, which has the power to make a decision that affects group members (e.g., TMDL) is not collaboration. The failure of many practitioners to understand the subtle differences between the models and how nuances such as decisionmaking and access rules influence these efforts is the cause of many of the problems they experience and can lead to the development of ineffective governance arrangements and management plans.

Problems resulted when stakeholders become empowered to make decisions (in effect becoming a collaborative organization) but were not accountable for implementing their decisions. For example, in Narragansett Bay what was really a 45-member stakeholder advisory committee became empowered to make decisions that were supposed to be binding on state and local agencies. This was an important source of the conflict that surrounded the CCMP. During the implementation process, the NBP/NBEP developed a program within RIDEM and relies on an implementation committee with a small group of "stakeholders" to advise the program. Conversely, the CCMP actually recommended creating a Narragansett Bay planning section within RIDEM that would provide staff support for the implementation committee, one that consisted of the NBP partners who would make decisions and decide how to allocate staff. We have no idea if the proposed institutional structure would have been more effective but it is highly likely that the nature of NBEP staff activities would have been different. Other problems resulted when a stakeholder process was used to develop a plan that was then implemented by a collaborative organization. For example, the Delaware Inland Bays used a stakeholder process to develop its CCMP but then created a new collaborative organization (CIB) to implement the plan. Since the CCMP was not developed by the CIB, the partners had to become engaged in subsequent efforts to define the priorities and activities of the organization. The most effective processes appeared to result when the practitioners relied on either a stakeholder model (Salt Ponds and Lake Tahoe) or a collaborative model (Tampa Bay and Tillamook Bay) and did not mix and match the two (Delaware Inland Bays and Narragansett Bay).

While little research has focused on the differences between the two models, the experiences of the six watershed management efforts and the findings reported here and elsewhere in the report suggest some important differences. The stakeholder model may be better when addressing win-lose situations than the collaborative model. While a stakeholder model can be either synoptic or strategic in nature, the collaborative model is probably best used only in the latter situation. The stakeholder model typically focuses on ensuring all interest groups are "represented" while the collaborative model requires only the involvement of the collaborators (i.e., partners). We believe a greater understanding of the differences between these planning models and their administration should help practitioners to develop more effective programs.

Main benefits of public participation appear to be encouraging a civil society. We also concluded that an important benefit resulting from the public participation activities is that they encourage a civil society and can create new social capital (e.g., CIB, TBEP, and TCPP) that can represent and protect the public's interests. It was also clear that watershed management efforts could serve as the catalyst for the creation of new NGOs (e.g., Lake Tahoe, Tampa Bay, and Salt Ponds). They also provide opportunities for volunteerism and civil involvement in local governance institutions that is important, particularly in rural areas or where there is limited local government capacity. Volunteer efforts can also be a useful way to build support for a watershed management effort, to educate the public, and to leverage significant resources that can improve environmental conditions. The James Farm habitat restoration project in the Delaware Inland Bays is an excellent example where this occurred. Accordingly, we believe that Congress and EPA should consider making greater use of programs such as AmeriCorps or other university-based service learning programs to encourage additional civil involvement in watershed management efforts. Collectively, our findings suggest the following recommendations.

RECOMMENDATIONS

- Congress and EPA should create a modern version of the Conservation Corps in conjunction with either a program such as AmeriCorps or a university-based service-learning program. The effort should be designed to provide a source of volunteers to support environmental monitoring and habitat restoration efforts. In the absence of adopting the proposal, EPA should make even greater use of volunteers and volunteer organizations to support the development and implementation of watershed management programs

- EPA should develop NEP guidance for the development of public participation programs that emphasize "ends" not means and promote activities that have the potential to cause behavioral changes that can lead to direct or indirect environmental improvements. The guidance should be designed such that it would be useful to other state and local watershed management efforts.

- Congress should revise the CWA requirements that structure the NEP's planning process to provide greater flexibility in administering the planning process, the decisionmaking process utilized, and the end product of the planning effort. Congress should continue requiring that affected stakeholders have an opportunity to provide input to the decisionmaking process but should not require that they are involved directly in making resource management decisions.

- EPA should revise its NEP guidance document on how to structure the planning process in order to clarify the variations in the "stakeholder" and "collaborative" planning models that are currently being used by estuary programs.

- Congress, ORD, and the NSF should provide funding to support research examining the differences between the stakeholder and collaborative models. EPA and NSF should revise the funding guidance for Star partnership grants to encourage such research as well.

It is important to develop a well-managed collaborative process. The previous findings illustrate the complexity associated with effectively incorporating science and public involvement into a decisionmaking process that lets various actors from federal, state, and local agencies and other NGOs define and select management actions.[112] There was considerable variation in the decisionmaking processes used and we concluded that the decisions were rarely the result of some rational calculation of costs and benefits. Rather, the approach to defining problems and selecting management actions appeared to be the product of a modified version of a "garbage-can" model.[113]

Collaborative decisionmaking is not rational, scientific analysis. The "garbage can" model provides a simplified model of how decisionmaking occurs in a multiactor or group setting.[114] It suggests that problems will arise and disappear, change shape or significance, and be combined or separated over time. Participants will move in and out of situations where choices are made and look for opportunities to promote their ideas. Some participants will advocate parochial solutions drawn from a standard "toolkit" while entrepreneurs will advocate and win approval for innovative solutions that involve new ways of responding to problems. Thus, decisionmaking looks more like "organized anarchy" where a collection of problems, issues and opinions look for

situations where they can get noticed, solutions look for problems to solve, and decisionmakers look for work.[115]

Pay attention to the rules governing decisionmaking. The implication is that determining and enforcing the rules of the game is often more important than the careful scientific analysis of problems and policy options. Collaborative decisionmaking inherently involves strategic interactions governed by a set of rules; it isn't a form of rational, synoptic scientific analysis that tries to maximize a single defined goal or policy objective[116] as implied by the CWA's TMDL requirements. Accordingly, it is important for practitioners to give careful consideration to the factors that influence how the "garbage-can" or collaborative decisionmaking process functions. These include the:

- issue(s) addressed
- access structure
- decision structure
- legal status of resulting decisions

Because collaboration tends to be strategic in nature, the selection of a focal issue will help structure the overall effort.[117] With the exception of Narragansett Bay, all of the cases had a clear focal issue. In Narragansett Bay, the lack of a focal issue contributed to the problems the watershed management efforts experienced during the planning process. We also believe that practitioners need to pay attention to access structures, the rules that determine which individuals or stakeholders have standing and are allowed to participate in decisionmaking.[118] In some cases (Tampa Bay and Tillamook Bay), public officials spent some effort to clarify the rules while others (Narragansett Bay) did not. Practitioners also need to consider the decision structures or the rules that determine how decisions are made (e.g., majority-rule, consensus).[119] Many of the early problems in Lake Tahoe revolved around TRPA's decision rules and in other watersheds it was unclear what "consensus" required, which caused problems. The legal status of a group's decision also appeared to be important.[120] The strategic interactions in Lake Tahoe and Salt Ponds were different from those in the four estuary programs because they focused on developing binding regulations rather than voluntary management plans. Similarly, the process used to develop the "binding" interlocal agreement in Tampa Bay differed from that used to develop the watershed's non-binding CCMP. Other factors also influenced the interactions such as the personalities of participants and the history of institutional relationships. It is also possible that some groups will be unwilling to participate given a particular rule structure. For example, an environmental group may not want to participate in a collaborative, consensus-based process because they view compromise as watering down the organization's mission while industry may be afraid of being co-opted.[121]

Practitioners are advised to pay attention to the selection of rules early in the process and to be careful when changing the rules during the process. While rules are often determined informally and exist as social norms, we believe that developing an effective collaborative organization will require moving beyond personal relationships and institutionalizing them. It is also important that there is leadership at all levels. We also concluded that stakeholder representatives should be opinion leaders.[122] For example, Tillamook Bay illustrates how the involvement and support from opinion leaders in the dairy industry helped the process while Delaware

Inland Bays illustrates how the absence of opinion leaders from the poultry industry hindered the process.

Collaborative decisionmaking can provide advantages, but can also create high transaction costs. As noted earlier in the report, collaboration can result in a number of benefits such as the development of shared definitions of problems, norms and expectations for implementation, as well as increased political support, improved information exchange,[123] and enhanced interpersonal and interorganizational relationships. While these benefits can be significant, collaboration will increase transaction costs.[124] Coordination costs will also increase as a result of these interactions.[125] Asymmetries of information, power, or other resources will allow some actors to obtain benefits at the expense of others, which will increase strategic costs. Since collaborative activities often recommend new policies, programs, changes in interorganizational relationships, or distribution of power, it is reasonable to expect conflicts over turf[126] that can increase strategic costs.[127] Some of the common threats[128] to an agency's turf include:

- threats to job security or career enhancement[129]
- challenge to professional expertise[130]
- loss of policy direction[131]
- undermining traditional priorities[132]
- anxiety over accountability[133]

Organizations are also some measure of the people who work within them. Individual attitudes and personalities will influence collaborative activities.[134] Both interpersonal and institutional trust or distrust affected the degree to which collaboration occurred. It was also clear that while many while some respondents reported higher job satisfaction and improved motivation as a result of collaborative activities, others reported disliking these activities. Our data also suggested that some struggles were a reflection of "personalities and egos" in the sense that participants were concerned with the perception of "winning" or "losing."[135]

Two additional types of strategic behaviors were also observed. Free riding occurred when participants benefited from the group's efforts without contributing to them. The level of participation by individual partners in collaborative organizations often varied. Some partners were active participants and devoted resources to the efforts while others did little more than attend meetings and share the credit for its accomplishments. The more troubling behavior we observed was rent seeking. Rent seeking occurred when the results of collaborative decisionmaking are used to produce unearned benefits for some participants.[136] There are a number of ways that rent-seeking behavior occurred. Agencies or interest groups might support policies or recommendations that advanced their own individual interests. In Narragansett Bay, industry leaders often supported particular CCMP proposals because the new requirements might be a burden to some of their weaker competitors. There were also examples of where government agencies recommended new initiatives that they would only undertake if some other agency provided the funding. Rent-seeking behavior becomes an important problem when it becomes difficult to discern the true motives and preferences of the individuals engaged in these bargaining processes.

Important to minimize social-psychological problems. Because collaboration is a group decisionmaking process, practitioners should recognize that the individuals involved in these processes might encounter common social-psychological problems:

- stereotyping[137]
- cognitive bolstering[138]
- defensive avoidance[139]
- escalation of commitment[140]

While these are primarily individual problems, they can become amplified in group settings. There was some evidence that these problems were present in all of our cases. Moreover, in order for an effective collaborative process to develop, it appeared to be particularly important for the members of the group to avoid stereotyping and to respect the differences in perspective, philosophy, or mission.

Perhaps more problematic is the problem of groupthink.[141] Groupthink occurs when the pressures for group conformity or consensus are so extreme that a group acts as if it had only one mind and reflects the tendency for a group to seek and enforce unanimity; dissent is suppressed and conformity is encouraged.[142] That can rob the group of its critical and evaluative capacities. In the Delaware Inland Bays and Narragansett Bay, groupthink appeared to contribute to some of the problems and conflicts that occurred at the end of the processes.[143] Practitioners should also realize that while participants tend to feel better about decisions in a collaborative, consensus-based process, other techniques such as nominal group technique, dialectical inquiry (i.e., role playing), and the use of a devil's advocate tend to produce more information and a greater range of policy choices. Thus, a variety of group decisionmaking techniques should be utilized to ensure that a wider range of information, opinions, and policy options are considered. While the NEP does provide technical assistance in the form of consensus building and multiparty decisionmaking workshops to try and minimize group dysfunction, additional guidance in written form would also benefit estuary programs as well as practitioners working in other watershed management efforts.

The collaborative approach is very different than the rational model implied by TMDLs. We also concluded that the collaborative model is fundamentally different than the rational, scientific approach required by the CWA's TMDL requirements. Collaborative decisionmaking is inherently a "political" process. The specific regulatory standards developed for the Lake Tahoe and Salt Ponds, the numerical goals and targets contained in the Tampa Bay and Tillamook Bay CCMPs, and the goals and specific recommendations contained in the Delaware Inland Bays and Narragansett Bay plans were all the result of a "political" process involving extensive discussions, bargaining, and negotiation. Moreover, the failure of NBP partners to implement the CCMP provides an example of what can happen when practitioners ignore or downplay the importance of "politics" and getting issues elevated on the agendas of state and local decisionmakers. This observation also appears to be the cause of much frustration for many respondents who feel that "politics" has no role in environmental decisionmaking and that environmental problems are intrinsically different than all other social problems.

The reality is that our political institutions make no such allowance for treating environmental issues differently than other social issues. Therefore, watershed management efforts should

be grounded in the practical realities of the political environment and be strategic in nature. It is also important that staff have the political skills necessary to broker agreements and manage intergovernmental relationships. Practitioners should also recognize that collaborative processes will be costly and time-consuming and that the product of these efforts may reflect compromise solutions that are sub-optimal in performance.

These factors and others discussed elsewhere in the report suggest that the collaborative "watershed approach" is different from the approach to problem solving contained in the CWA's TMDL requirements. The TMDL process is based on a rational planning model that assumes the problem and the goal (i.e., water quality standard) are well defined and that there is adequate data to evaluate the extent to which pollutants need to be reduced. Politics does not enter into decisions about the loadings cap. In fact, the whole process is predicated on the belief that the loadings cap and the state water quality standards are beyond challenge and that politics will not intrude in setting the cap. Although, the regulations certainly contemplate and anticipate that politics will intrude on the waste load allocation and development of the proposed implementation plans. This is very different than the collaborative watershed approach that allows both goals (i.e., equivalent of the loadings cap) and implementation activities (i.e., equivalent of the wasteload allocation and implementation plan) are both decided by a political process. In setting goals in the collaborative model, participants often balance competing issues and priorities and make tradeoffs while the TMDL process focuses only on maximizing one objective – there is no balancing between competing goals or priorities or examination of tradeoffs with other social issues. The TMDL process is discussed in more detail in a later section of the report. Collectively, these findings lead to the following recommendations.

RECOMMENDATIONS

- EPA should develop written guidance for the NEP on how to effectively administer collaborative, multiparty decisionmaking and build consensus that includes strategies for minimizing the potential for groupthink and other common social-psychological problems to have adverse affect on group decisionmaking. The guidance should be developed such that it can be useful to practitioners involved in other watershed management efforts.

Implementation: An Exercise in Advanced Governance

The third group of findings is concerned with administering and implementing a watershed management program. We concluded that there was no substitute for a well-managed program. Issues like program leadership, staffing and recruitment, personnel management, budgeting, contracting, and grants management were important factors that influenced the effectiveness of a watershed management effort. Our analysis also suggested that administering a watershed management effort is a complex endeavor that can require a formidable set of professional skills. In short, effective watershed management appeared to be an exercise in advanced governance. We also concluded that adequate resources (e.g., staff, money, etc.), and flexibility in utilizing them, influenced the effectiveness of implementation efforts by allowing public officials to plan and budget with confidence. This stability and flexibility also allowed state and local priorities to drive implementation efforts rather than the priorities, grant restrictions, and cost-share requirements contained in federal grant programs.

In terms of implementation efforts, demonstration projects were often used during the planning process to formulate policy and encourage the implementation and diffusion of BMPs. Unfortunately, we also found that demonstration projects were often used ineffectively. The analysis also concluded that there was a tendency for implementation efforts to consist of individual projects that were often only loosely connected or failed to address a specific NPS problem. This appeared to be particularly true when there was heavy reliance on federal grant programs. In many cases, it was questionable whether these "random acts of environmental kindness" had much long-term potential to improve environmental conditions because they were too limited in scope, duration, and number. Instead, the greatest improvements resulted from efforts to systematically address NPS problems in a targeted fashion. We also concluded that there were frequently unrealistic expectations about what could be accomplished by a watershed management effort given current funding levels, the pervasive nature of NPS problems, and the lack of flexibility and coordination in existing federal NPS programs. We therefore concluded that it is important for policymakers, practitioners, and the public to recognize that most current NPS problems are the result of the "tyranny of small decisions" and developed incrementally over decades.[144] Addressing these problems is likely to require a series of long-term incremental efforts that produces a set of cumulative benefits.

Watershed management is a complicated administrative endeavor and requires advanced governance. We concluded that that there was no substitute for a well-managed program. Our interviews revealed a formidable set of professional skills that the director and staff in a watershed management effort needed to have to administer an effective program. The multiyear planning efforts often involved annual budgets that were upwards of a million or more dollars. Issues related to staffing and recruitment, personnel management, budgeting, contracting, and grants management were important factors. For example, Tillamook Bay had trouble managing a number of staffing problems while Narragansett Bay had to find creative ways to overcome the state's poor contracting and civil service systems. The reliance on participatory decisionmaking meant that the director and staff needed to have good interpersonal and facilitation skills and be able to resolve disputes and broker agreements. They also needed good political skills to encourage collaboration and to try and avoid conflicts such as those experienced in Narragansett Bay, Lake Tahoe, and Delaware Inland Bays. At the same time, the director needed to have the leadership and the argument and persuasion skills[145] necessary to get the actors to collaborate, take actions that were not required, and to steer individual agency efforts towards collective goals. Designing effective policy solutions required not only understanding how ecological systems functioned but also the ecology of the governance system. The watershed management efforts all relied on a wide variety of policy instruments and collaborative activities to improve environmental conditions and add other forms of public value. Accordingly, the director of these efforts had to have a solid understanding of what was required to successfully implement these activities. In short, we concluded that administering a watershed management effort was a complicated administrative endeavor that required some formal training in areas like policy analysis, planning, and public administration as well as a background in environmental sciences.

Unfortunately, our interview data suggests that the director and staff were more likely to have formal training in the physical sciences. Tillamook Bay is the best example of where the lack of a public administration background caused major problems during the planning process and hindered the effort's effectiveness. These problems appeared to be more pronounced in smaller efforts such as the watershed councils used to implement the Oregon Plan for Salmon

and Watersheds. These efforts relied on volunteers and entry-level staff that frequently lacked the necessary knowledge and skills and were overworked and underpaid. Because there are few university graduate programs designed to develop this set of skills, most of the staff we interviewed were forced to develop these skills on the job. This led us to conclude that techniques such as job rotation, mentoring programs, and interpersonnel agreements (IPAs) should be expanded to improve the professional development of the staff. We also concluded that it is better to err on the side of hiring a director with a solid background in planning, policy analysis, and public administration s than someone that lacks these skills but has a strong scientific background. It was also clear that the most significant constraint on the ability to significantly expand the number of watershed management efforts around the country might be the lack of individuals with the skills necessary to effectively administer the programs.

EPA sometimes ignored administrative problems until they became serious. Our analysis also revealed that the administrative problems experienced in Narragansett Bay and Tillamook Bay could have been lessened had EPA been more proactive and provided the necessary leadership and technical assistance. In both cases, EPA chose to ignore or downplay problems in favor of letting let state and local officials deal with them. EPA's lack of intervention was curious considering that it was often willing to intervene and influence other aspects of the planning process. For example, in Delaware Inland Bays, EPA forced the program to fund more science than it wanted while Tampa Bay was encouraged to develop quantifiable environmental and programmatic goals. Some respondents suggested that the agency wanted to avoid becoming enmeshed in conflicts. Others suggested that agency liaisons to estuary programs often have a limited understanding of how state and local institutions functioned and they also tended to be technical specialists with a limited background in how to deal with administrative problems related to staffing, recruitment, budgeting, and personnel management. Regardless, EPA should be more proactive in preventing these problems. If it is reluctant to intervene directly, then it should consider hiring management consultants to work with the programs.

The NEP's design causes administrative challenges. The structure and design of the NEP can also lead to administrative challenges. The planning and implementation grants are awarded using a series of one-year cooperative agreements. While EPA has the ability to issue grants for two-year periods, it did not do so widely in our cases. The annual contracts mean that staffs work off insecure or temporary grant funds, often referred to as soft money. This creates job insecurity and high staff turnover, particularly at the end of the planning process. Unfortunately, this is the time when staff continuity may be most important. Several respondents also noted that several aspects of the NEP created the potential for staff burnout or the loss of job satisfaction. These included:

- fast pace of the planning process
- EPA's emphasis on benchmarks and deadlines that often fail to match the realities of a dynamic planning process and a heavy reliance on collaboration
- labor-intensive nature of managing a decisionmaking process that relies on a complex committee structure
- EPA's reporting and procedural requirements that require information and reports primarily for the agency's consumption and do not aid the program's efforts

- low pay or benefits compared to some of their federal counterparts
- lack of job security

Staff turnover is of particular concern because many of the staffs are small and the institutional memory often resides in a limited number of individuals. Turnover is often compounded by the failure to document some aspects of the watershed management efforts. As a result, later employees may have trouble reconstructing how data was actually collected, analyzed, and stored at a future date (e.g., Tillamook Bay).[146] Other respondents complained that the structure of the NEP and its administration emphasized "process" (e.g., specific planning requirements, reporting requirements) over results.[147] Others reported that the "politics" involved in these efforts was a source of some frustration and disillusionment, particularly for scientists and other technical staff who reported feeling uncomfortable in a political settings. This problem appeared to be more acute in regulatory efforts such as Lake Tahoe and the Salt Ponds. These frustrations can also lead to staffing problems.

Implementation can require building new organizations. Four of the cases also involved developing a new collaborative organization and overcoming the challenges associated with this activity.[148] Several of the respondents closely involved in the activities suggested that EPA and other participants often failed to appreciate the complexity of the challenges and noted the need for guidance in how to develop and institutionalize a collaborative organization. In this regard, Florida's enabling legislation that guided the development of the interlocal agreement may serve as a model for other states. Many respondents also reported that they underestimated the amount of time that would have to be devoted to issues related to organizing, coordinating, and administering collaborative activities. For example, the range of collaborative activities in Delaware Inland Bays expanded dramatically when the staff expanded from one to three but the new staff quickly became overextended creating the need for additional staff. Our review also reveals that as the watershed management efforts mature the nature of the organizational challenges may change, but does not diminish. Newer programs (Delaware Inland Bays and Tillamook Bay) are focused on issues such as staffing, refining the organization's mission, and securing the resources necessary to survive. More mature efforts (Salt Ponds and Lake Tahoe) are exploring ways to streamline their programs or expand their missions.

Watershed management0 is an exercise in advanced governance. These findings led us to conclude that watershed management is often an exercise in advanced governance. In all cases, the efforts created administrative and governance challenges that exceeded those associated with implementing existing programs. We also concluded that the emphasis of the watershed management efforts is likely to change in different settings. In well-developed institutional settings, organizations are likely to exist that have the capacity to address most problems. Watershed management efforts may focus on improving the capacity of existing organizations, fine-tuning programs, creating new programs in existing organizations and improving coordination and integration. For example, Narragansett Bay improved the planning capacity of the state environmental agency, while Lake Tahoe and Tampa Bay resulted in new programs administered within existing agencies. The opportunities for collaboration also appeared to increase in these settings because there were:

- overlapping programs at different levels of government
- high functional specialization of government programs
- higher internal management capacity
- stable budgetary resources
- slack resources
- well developed special interest groups

However, to take advantage of the collaborative capacity present in these institutional settings, the watershed management effort might have to improve the capacity for organizing and managing collaborative activities. The creation of new collaborative organizations often accomplished that objective.

In less-developed institutional settings, watershed management efforts appeared to have a different focus. Organizations may not exist that have the resources, capacity, or legal authority necessary to address some problems. The lack of overlap among government programs may mean that there are few institutionalized interactions among organizations and fewer opportunities for collaboration. Thus, the watershed management efforts may focus on building new institutions and creating opportunities for interaction that directly or indirectly created future opportunities for collaboration. These goals were also achieved by creating new collaborative organizations as was demonstrated in the Delaware Inland Bays and Tillamook Bay. However, since the capacity of existing institutions was less developed, it was also unlikely that the watershed management effort filled all of the institutional needs that existed. For example, while the CIB created opportunities for interactions and improved the local capacity for research, education, and habitat restoration, the effort was less effective in addressing the problems associated with agriculture and residential and commercial development.

These findings suggest that Congress, practitioners, and the public often have unrealistic expectations for what will be accomplished from a watershed management effort. Many assume that a "watershed management" will somehow solve all of the problems that existing institutions are unable to solve. Our analysis suggests that is unlikely to occur. What these efforts can do is stimulate incremental improvements in the governance system and enhance the capacity for actors to address some problems. When resources are lacking, the efforts may have trouble moving beyond the project level (Delaware Inland Bays and Narragansett Bay) while more sophisticated efforts will try to make the transition to systematically addressing specific problems or providing an ongoing service (Tampa Bay and Tillamook Bay).

When the watershed management efforts are viewed in historic terms, this evolutionary process of institution building becomes more apparent. Watershed governance improved as a result of a series of incremental efforts, rather than through the creation of one centralized watershed management program. Accordingly, practitioners should be strategic, focus on problems that are "manageable", and look for opportunities where value can be added as a result of these activities. It also suggests that the "cycles" of planning should not be viewed as a sign of failure but instead can be symptomatic of a healthy process of institution building. Unfortunately, as noted in a subsequent section of the report, the NEP has taken a more static view, only recently beginning to address issues such as when an estuary program should end and how to revise CCMPs that are no longer being utilized. This is unfortunate because the presence of

an estuary program beyond the point in time that a CCMP is a useful document may create a disincentive for other actors to start a new planning effort. Collectively, our findings suggest the following recommendations.

RECOMMENDATIONS

- EPA should encourage the NEP and other place-based management efforts to hire program directors with previous management and policy analysis training or experience, rather than those having a scientific or technical background.
- EPA should make greater use of staff details and IPAs in the NEP and other programs (e.g., Section 319, TMDLs, CWSRF) to improve the training of federal, state, and local officials involved in watershed management efforts. EPA should encourage the development of mentoring programs for staff involved in place-based management efforts to improve staff development.
- Congress should revise the NEP and other federal watershed planning efforts to allocate planning and implementation funding over multiyear periods to improve the ability of the programs to plan and budget with confidence and to provide job security. EPA should make greater use of its ability to award grants over two-year project and budget periods.
- EPA should develop model state enabling legislation based on Chapter 163 of the Florida Statutes that enables the creation of an independent alliance of governmental entities. The agency should work with other organizations (e.g., ACIR, National Governors Association) to encourage states to adopt similar legislation to address environmental and other social problems.

It is important to have stable and flexible implementation resources and realistic expectations. A common finding in implementation studies is the important role that resources play in the successful implementation of public policies.[149] This study is no exception. None of the watersheds experienced a shortage of planning funds. If anything, the four estuary programs had a disproportionate allocation of resources for planning compared to those available for implementation. In fact, many respondents were critical of the NEP's design noting that it emphasizes "process" over "results." This is likely due to this disproportionate allocation of funding, the emphasis on detailed requirements for the development and approval of a CCMP but relatively few implementation requirements, the lack of any discussion of implementation requirements in the CWA, and the belief among EPA staff that implementation is primarily the responsibility of state and local officials. In part, this is understandable because the NEP was based on President Reagan's "new-federalism" as were other CWA policy changes (e.g., CWSRF) and assumed that implementation would primarily be the responsibility of state and local officials. But if so, it is unclear why EPA takes an active role in controlling the process used to develop a CCMP and its contents when there are no corresponding intervention or requirements for actually implementing the plans.

The design of the NEP emphasizes planning and not implementation. Originally, the NEP was designed to provide to state and local officials with the resources necessary to improve their capacity for determining how to address watershed problems. It was not intended to result in a "new

program" but rather the plans were to be implemented through existing programs using either new or existing funding sources.[150] Over time, it has become apparent that the "leveraging" strategy often had limitations and that some funding is necessary for a core staff that can monitor implementation and support collaborative activities.

The original approach to CCMP implementation did not work for several reasons and the original estuary programs were adversely affected. Many EPA and state officials simply believed that the Congress would amend the CWA in the early 1990s (when is was scheduled for reauthorization) to include a new grant program to support CCMP implementation. Thus, early estuary programs like Narragansett Bay made virtually no attempt to develop a CCMP that could be implemented within existing budgetary realities.[151]

The "leveraging" strategy also worked better in theory than in practice. Many respondents noted that few EPA programs prioritize their grant awards based on the provisions of a CCMP. Estuary programs have to compete for this funding with other programs and the proliferation of watershed management efforts has made it an increasingly competitive process. Leveraging other funding to pay for implementation also means that its availability and the priorities of other agencies grant programs combined with their grant restrictions and cost-share requirements will drive implementation efforts. It also became apparent that some sort of organization was required to organize, coordinate, and monitor implementation activities in order to improve the capacity for collaboration and to provide the slack resources necessary to effectively employ a leveraging strategy.

To address these problems, every yearly appropriations bill includes language allowing EPA to spend a portion of the NEP funds in support of implementation efforts. An annual implementation grant of approximately $300,000 is now provided to each estuary program to maintain a core staff, implement a few small projects, and coordinate and monitor implementation activities. But the costs of implementing a CCMP greatly exceed that amount. Accordingly, the four estuary programs rely on other federal, state, and local programs for their resources. The efforts have experienced varying degrees of success in leveraging funding, although it was sometimes difficult to determine what proportion of the resources were really "new" and represented additional implementation activity and what proportion of the funds was really nothing more than shifting or reallocating existing expenditures. If the NBEP did not exist within RIDEM, the agency would still have received much of the $2.2 million in funds that it has been able to leverage, although the funding would undoubtedly have gone to different types of projects. In Tampa Bay, the effort has been able to leverage a great deal of funding to support implementation efforts. SWFWMD has taxing authority, local governments have stormwater utility districts, and the state has aggressive land acquisition programs that provide funding for implementation efforts. If the TBEP did not exist, much of this funding would be spent anyway, although on projects that were oriented towards other priorities. In Tillamook Bay, a similar situation exists with the ODF which has a stable stream of revenue from timber sales that allows it to undertake a wide range of implementation activities regardless of whether the CCMP or its priorities exist.

It was clear from our analysis that the stability of the revenue streams in Tampa Bay and Tillamook Bay was important because it provided the public officials with the flexibility to plan and budget with confidence and allowed the collective priorities at the watershed level to drive implementation efforts and the allocation of this funding. It also helped these officials make the difficult transition from having implementation efforts consist of a collection of loosely connected projects to being a systematic program that addresses specific problems or provides an ongoing service.

Conversely, Narragansett Bay, Delaware Inland Bays, and the non-forested portion of the Tillamook Bay lack similar revenue streams and are heavily reliant on federal or state grant programs to implement their CCMPs. While the efforts have been effective in obtaining funding, implementation efforts often consist of discrete projects that are often only loosely connected and the priorities, cost-share requirements, and grant restrictions embedded in these grant programs constrain and shape implementation efforts. Since the provisions and requirements of grant programs can change frequently, public officials cannot plan and budget with much confidence. The grant money is also dispersed among numerous federal agencies with different time schedules and grant restrictions which increases the transaction costs associated with locating and applying for these funds. Moreover, because a significant proportion of the implementation efforts were "soft" money, there tends to be a heavy emphasis on contracting out the activities instead of building organizational capacity. Respondents in Delaware Inland Bays, Narragansett Bay, and Tillamook Bay also reported problems in satisfying matching requirements.

We concluded that the flexibility and stability in these resources was also just as important as the amount of funding available. It helped practitioners to develop more realistic goals, targets, and watershed management plans and allowed them plan and budget with confidence. It also allowed practitioners to build and maintain the capacity for collaboration and other implementation activities. This finding was consistent with the findings of other evaluations for the USDA's Rural Clean Water Program (RCWP) in Tillamook Bay[152] and a review of the HUA project for the Delaware Inland Bays.[153]

Importance of slack resources to allow collaboration. We also concluded that slack resources were a critical factor that determined whether the watershed management efforts became engaged in a wide range of collaborative activities. The development of new collaborative organizations typically provided some of these resources. For example, the expansion of staff in the Delaware Inland Bays increased the amount of collaboration that occurred. However, it is also important that the partners in the collaborative organizations have slack resources that allow them to participate in collaborative activities. If no one has time to do more than attend meetings, little can be accomplished beyond improving communication and building interpersonal relationships. For example, state and local agencies in Tampa Bay had the slack resources to become engaged in a wide range of collaborative activities. Conversely, some respondents in state agencies indicated that they lacked the resources necessary to fully participate in these efforts. The lack of slack resources in RIDEM limited its ability to participate in collaborative activities in Narragansett Bay and Salt Ponds. The lack of slack resources in the local governments in Delaware Inland Bays and Tillamook Bay limited their involvement. In Tillamook Bay the proliferation of more than 80 watershed councils created problems for federal and state agencies. For example, staff cutbacks at the NRCS resulted in staffing having to cover larger geographic areas with more watershed efforts. This reduced the amount of assistance that could be offered and increased the amount of nonproductive travel time. Other state agency staff we interviewed in Oregon identified similar problems. Several respondents also noted that the way FTEs were allocated and budgeted provided an obstacle to collaboration since staff members were technically prohibited from helping other agencies implement their programs. While some respondents suggested that NEPPS reduced these problems (Delaware Inland Bays) other respondents (Tillamook Bay) indicated that problems still existed.

Political expectations should reflect the available implementation resources. Numerous respondents noted that the expectations of political officials and the public often failed to match the realities of NPS problems and the resources available to address them. Many respondents were critical of politicians and agency officials that asked watershed management efforts to demonstrate "success" in quicker timeframes (often two to four years) than is possible and suggested that the emphasis on developing "plans" and implementing "projects" reflected the desire to undertake visible activities. However, NPS problems result from the cumulative and secondary impacts of incremental decisions that occurred over decades (i.e., "tyranny of small decisions"). Many respondents suggested that current NPS programs should be changed to reflect a systematic approach that emphasizes long-run results by creating a series of cumulative benefits. They also wished politicians would understand that it may take decades to view the full effectiveness of current implementation efforts. For example, it may take several decades for trees planted along a tributary to Tillamook Bay to generate the shading necessary to reduce water temperatures and the fill effect of the efforts to reduce nutrient loadings to groundwater in the Delaware Inland Bays and Salt Ponds may not be observed for many years due to the long residence time of groundwater.

Many respondents also saw a clear disconnect between the CWA requirements and the resources available to achieve these goals. Numerous respondents suggested that the efforts to remove the impaired waters and threatened waters from state Section 303(d) lists are likely to dwarf those that occurred to address point source problems. Many respondents suggested that these efforts are likely to take a similar length of time (i.e., two decades or more) and require resources that equal or surpass those allocated through the construction grant program. Moreover, because the efforts involve implementing numerous small projects rather than large infrastructure projects (e.g., sewage treatment plants), the demands on staff time will be greater. However, current federal NPS programs do not reflect these realities. This led some respondents to criticize EPA, state environmental agencies, and other public officials for failing to be honest with the public about how quickly progress is likely to occur.

Random acts of environmental kindness. A related finding concerns the structure of federal NPS control programs (e.g., Section 319) and their troubling tendency to focus on discrete projects and short-term results. They also have timeframes and other grant restrictions that limit the type of projects that can be funded and often act as "green pork" in that there are distributional concerns embedded within the grant programs. For example, the USDA's programs include restrictions that target funding to smaller and lower-income farmers in order to maximize the number of farmers benefiting from the program. The respondents also reported that EPA and state environmental agencies try to spread the Section 319 money around within a state. Another problem is the frequently changing priorities of these grant programs that some respondents referred to as a "flavor of the month" mentality on the part of those programs.

These factors make it difficult for a watershed management effort relying on this implementation funding to undertake a sustained effort to solve specific nonpoint source problems. It also means that these changing priorities, grant restrictions, and cost-share requirements drive implementation efforts more than the collective priorities contained in a watershed management plans. While the individual projects may be well designed, provide environmental improvements, and garner public or political support, the danger is that when viewed over the long-term and in the aggregate, the projects will amount to nothing more than what respondents in Tillamook Bay referred to as "random acts of environmental kindness."[154] In other words, the collection projects was too limited in number, scope, scale, duration, or magnitude and targeted in a systematic manner so that there were significant changes in the underlying

problems the projects were designed to address. In many cases, that is due to the lack of stable and flexible implementation resources to fund a systematic effort or the failure to develop specific and measurable goals and priorities that can shape collective actions over time. It is also partly due to the structure of current federal grant programs such as Section 319 that emphasize funding discrete projects rather than problem solving and the fact that politicians and environmental interest groups appear to be satisfied with project-level activities and are not demanding more systematic efforts to address specific problems. Thus, examples such as Tampa Bay remain the exception rather than the rule.

The complexity of ecological systems creates other problems that result in these random acts of environmental kindness. For example, there are countless efforts underway to address the water quality and habitat problems affecting the salmon populations in the Tillamook Bay watershed. While there is a good understanding of the variables that influence the health of salmon populations in general terms, detailed information about each breeding stock does not exist. The danger is that the restoration efforts will focus on obvious problems like high water temperature when the limiting factor is really something else.[155] Thus, while restoration efforts may be effective in reducing water temperature, they may not improve salmon stocks. Another example is the lack of specific understanding about what is causing the continued decline in clarity in Lake Tahoe. Accordingly, if the actors are able to secure the $900 million and implement all of the projects in the EIP, it is still possible that the efforts might fail to stop the decline in lake clarity, even though other environmental improvements will occur.

Our fear is that many watershed efforts such as those in Delaware Inland Bays and Narragansett Bay (and portions of the Tillamook Bay watershed as well) will result in being nothing more than a collection of loosely-connected projects that fail to systematically address specific problems. A similar concern exists with respect to the implementation of the Section 319 program. It is important that Congress, EPA, and environmental interest groups recognize the limitations inherent in the project-based approach to addressing NPS and habitat degradation problems, and begin taking the steps necessary to begin making the difficult and challenging transition to program's based on systematically addressing specific problems.

An emphasis on regulation is unlikely to overcome these problems. We also concluded that an increased emphasis on regulatory approaches was unlikely to offset the problems created by the lack of flexible and stable implementation resources to the grant applicants (i.e., local watershed management program) at the local level.[156] The efforts in Lake Tahoe and Salt Ponds perhaps best illustrate this finding. Despite aggressive and comprehensive regulatory programs, both efforts have been forced to rely on other policy instruments and are seeking funding sources to do the type of restoration work necessary to address the problems that have not been addressed. The development of the EIP in Lake Tahoe is one such example while in recent years the Rhode Island General Assembly has debated several habitat restoration bills, one of which would increase the CRMC's role in habitat restoration. The clear lesson was that while regulation is a very useful policy instrument, effective watershed management requires a much wider range of instruments that includes nonregulatory activities. It was also interesting to observe that none of the watershed management efforts emphasized the use of tax expenditures. The lack of attention to this policy instrument was criticized by several respondents who suggested that the use of tax credits, changes in depreciation schedules, and other changes in the Internal Revenue Service (IRS) code could provide incentives for land owners to voluntarily adopt BMPs. It should be noted that during last year's budget battle there was an attempt to use tax expenditures to create incentives to address the problems resulting from the poultry industry, but it was defeated. Collectively, our findings lead to the following recommendations.

RECOMMENDATIONS

- Congress and EPA should recognize that there is no one "best" way to address NPS problems and continue using a mixture of regulatory and nonregulatory approaches using a variety of policy instruments that recognize the strong role state and local governments have in addressing the problems.
- Congress should consider making the resources available to address NPS problems commensurate with the scope and magnitude of the problem. Effective NPS control at the state and local level will require a significant public investment and to build the capacity to prevent damage from new land use activities at the state and local level. These programs should focus on systematically addressing specific NPS problems in a geographic area and be oriented towards long-term rather than short-term improvements.
- Congress should combine federal NPS control funding and create a flexible categorical grant program for state governments in accordance with previous recommendations on flexible categorical grants offered by the ACIR. The flexible categorical grant program should allow funding decisions to be driven primarily by state and local priorities.
- The Section 319 program and other associated CWA reporting requirements should be revised to emphasize long-term gains and changes in specific problems rather than short-term accomplishments. The reporting requirements should also reflect the fact that gains will often occur as a result of a series of small projects yielding cumulative benefits. Such action should reduce the administrative costs associated with EPA's approval of annual work plans and increase funding available to state and local officials. Applicable goals and timelines in the CWA should be revised to reflect the fact that may take a decade or more to observe the outcomes of some NPS control efforts.
- Congress should consider making changes to the IRS code such as tax credits and changes in depreciation schedules to encourage landowners to voluntarily install BMPs.

Many programs used demonstration projects ineffectively and failed to develop effective diffusion processes. Demonstration projects were often used as implementation activities.[157] The NEP encourages such activities during the planning process and many of the activities funded by the Section 319 NPS program are self-described demonstration projects. Several respondents who worked for EPA even referred to the NEP in those terms.

A demonstration project involves the use of an innovation operating at or near full scale in a realistic environment for the purpose of either formulating or implementing practices, policies, or programs. Policy-formulating demonstrations focus on developing or testing new policies, programs, or practices (e.g., BMPs) or trying to adopt a practice for use in a particular watershed's setting.[158] For example, the Delaware Inland Bays funded several projects designed to explore the feasibility of transplanting seagrass while others examined BMPs that could be used to address nutrient loadings from poultry growing operations. Policy-implementing demonstrations are used to encourage the wide-scale adoption of practices, policies, or programs and obtain information about: (1) the costs of adopting and using an innovation; (2) reliability of the innovation; (3) demand for the innovation; and (4) the feasibility of implementing the innovation.[159] The objective is to build evidence to encourage the adoption of innovations. For example, the Florida Yards and Neighborhoods Program and RAMP tested new programs

that began as demonstration projects in Tampa Bay and were subsequently diffused to other regions in the state. Narragansett Bay's Land Management Project was designed to promote the adoption of conservation ordinances by local governments. The principle difference between the two types of demonstration projects is that policy-implementing demonstrations are designed to have a diffusion component that focuses on spreading their adoption. While there was widespread use of demonstration projects, we concluded that they were often used ineffectively and failed to promote effective diffusion.

Poor evaluation of the effectiveness of demonstration projects. One problem we observed was that the evaluation component of the demonstration projects was often weak or nonexistent. In most cases there was little documentation associated with a demonstration project beyond a short summary or a description of a project in a public outreach document (e.g., fact sheet, newsletter, website). For example, EPA often requires a report for action plan demonstration projects that includes a description of the project, its cost, and lessons learned. However, the level of detail was often too limited to allow the projects to be replicated and the reports were not widely available for distribution. Many project descriptions also tend to be described as "success stories," but had little supporting documentation.

Clearly, there are many ways to evaluate the effectiveness of a demonstration project. An information success would reduce the uncertainty associated with an innovation to the point that a potential adopter can make an informed decision.[160] Our analysis suggests that the lack of this information is particularly important when dealing adopters who are risk adverse (e.g., farmers) or question the practice. Unfortunately, several respondents reported a general lack of this type of information for many common BMPs. An application success results when an innovation works well in a local setting. A common problem reported by many respondents was the lack of information on the effectiveness of BMPs recommended by agencies such as EPA[161] given the wide variation of physical settings. Information and application successes are largely independent measures and one can be achieved without the other.[162] Diffusion success occurs when an innovation passes into general use as a result of a demonstration project and government intervention is no longer needed.[163] An information or application success does not guarantee a diffusion success.

Unfortunately, few of the demonstration projects appeared to systematically evaluate these projects or describe them in the requisite detail to allow an adopter to replicate the project or make informed judgments about whether to adopt the innovation. Rather than demonstrate a policy or technology, the term "demonstration" was often applied loosely to projects that were better characterized as discrete and limited implementation activities.[164] The write-ups that did exist tend to suffer from a "pro success bias" in that they focus on describing success stories and ignore failures even though you can learn equally well from both. We believe that a tremendous amount of knowledge and experience that has been gained by practitioners as a result of the demonstration projects is being lost and is not accumulating because of the failure to properly document efforts. It also has probably led practitioners to duplicate efforts and repeat failures.

Failure to develop an effective diffusion process. The problems are exacerbated by the failure of EPA and state environmental agencies to emphasize the diffusion of the innovations to other potential adopters when funding demonstration projects. In some cases, this is do to the structure of the federal grant programs. One problem with the Section 319 NPS program is that it emphasizes discrete projects that end after a prescribed period of time. The design of the program is not well suited to creating a diffusion process that lasts several years and uses a demonstration

project and other incentives to encourage the voluntary adoption of an innovation. The NRCS's NPS programs are more amenable to this approach because they have a delivery system (i.e., local field offices) and incentives (i.e., cost-share funding) designed to encourage the voluntary BMP implementation.

In part, the failure to develop effective diffusion processes is the product of a lack of research on demonstration projects and on how the diffusion process works in addressing environmental issues. However, there is a broad base of research on the diffusion of innovations in other policy areas that practitioners can use.[165] For example, extant research suggests that five general attributes of individuals appear to influence innovation adoption:

- Relative advantage of an innovation, which is often measured in economic terms although social prestige, convenience, and satisfaction are also important factors.
- Degree to which an innovation is perceived as compatible with the existing values, past experiences, and needs of potential adopters.
- Degree to which an innovation is perceived as complex, difficult to understand, and hard to use.
- Degree to which an innovation may be experimented with on a limited basis (trialability).
- Degree to which the outputs or outcomes of an innovation's adoption can be observed by others.[166]

The innovation process in organizations is even more complicated[167] and is influenced by such factors as the characteristics of leaders (e.g., attitude towards change) and the internal (e.g., degree of centralization, complexity, formalization, interconnectedness, organizational slack, and size) and external characteristics (e.g., system openness) of organizations.[168] Interestingly, many of the same variables appeared to influence the likelihood that an organization will participate in collaborative activities. This suggests that "innovators" may be more likely to be engaged in collaborative activities.[169] Other variables include: the type of innovation-decision (e.g., optimal, collective, authoritative); the number of people involved in decisionmaking processes; the nature of the communication channels such as interpersonal communication and the mass media; the nature of the social system in which the innovation is diffusing (e.g., societal norms and values); the degree to which the communication network structure is interconnected; and, the extent of promotional efforts by change agents.[170]

Our analysis also confirms the frequent finding that opinion leaders play an important role in the diffusion process.[171] The earlier observation that it was important to have stakeholder groups represented by opinion leaders is reinforced by the role that these actors play in stimulating the diffusion of innovations. For example, the strong support for the watershed management effort in Tillamook Bay by opinion leaders in the TCCA facilitated the spread of innovative waste management practices among dairy farmers. Conversely, the lack of involvement and support by opinion leaders (e.g., the poultry integrators) in the Delaware Inland Bays created an obstacle to adopting practices to address nutrient loadings from poultry growers. Change agents, frequently NRCS or conservation district staff, also played an important role by sponsoring demonstrations that increased the observability of an innovation[172] and then facilitated the flow of innovations from a change agency (e.g., NRCS) to an audience of clients

(e.g., farmers) by working with the clients directly and providing incentives for the innovation's adoption (e.g., cost-share funds).[173] Another strategy change agents employed was to work through opinion leaders in order to close the communication gap with their clients.[174]

A final problem we observed was one that is widely recognized by diffusion scholars – the pro-innovation bias.[175] The pro innovation bias is the implication that all innovations should be diffused and adopted by all members of a social system. There appeared to be a general tendency for the watershed management efforts to focus on recommending new "innovative" policies or practices with less consideration given to the potential problems associated implementing the innovations.[176] As several respondents observed, this bias often neglects a fundamental aspect of change in that it can be adaptive or disruptive.[177] Moreover, some respondents noted that they were continually being asked to adopt "new" innovations to address the same problem, which raised questions for them about the accuracy of the advice they were given at any point in time. It was also clear that many of our respondents had little understanding the reasons for nonadoption, often assuming nefarious reasons by "stereotyping" industry or farmers as "anti-environmental" or being interested only in making a "profit." That can lead practitioners to under-emphasize the reasons for rejecting an innovation, ignoring the possibility it may simply be a "bad" idea.[178] Collectively, these findings and observations lead to the following recommendations.

RECOMMENDATIONS

- EPA and the NRCS should develop joint guidance for state and local officials that provides strategies for effectively developing and implementing demonstration projects. The guidance should emphasize the evaluation of demonstration projects, dissemination information, and providing the information necessary to replicate projects. The guidance should also emphasize using demonstration projects as part of a strategy of diffusing the innovations such that there is greater adoption of BMPs at less cost to tax payers.

- EPA should require that all policy-formulating demonstration projects that are funded result in a technical report that is available on the Internet. The reports should explicitly allow practitioners to replicate projects and provide the data necessary to make an informed judgment of a project's effectiveness in a particular contextual situation. EPA should require a long-term tracking system and diffusion strategy for all policy-implementing demonstrations. It should also periodically evaluate the effectiveness of these efforts.

- ORD and the NSF should revise the funding guidance for Star partnership grants to encourage research on the use of demonstration projects to better understand the collaborative processes, the role of change agents, the role of opinion leaders, the variables that influence adoption, and the communication networks that influence the diffusion process.

EVALUATION: THE IMPORTANCE OF PERFORMANCE MONITORING

The final set of findings concerned monitoring and evaluating the effectiveness of implementation efforts. We concluded that performance measures and tracking systems played an important role in encouraging a systematic approach to addressing specific NPS problems. While it was important to have good monitoring data on environmental conditions, it was equally important to monitor and integrate data on federal, state, and local implementation

activities. We believe that the data on implementation activities helped develop and reinforce peer-pressure systems at the political, professional, and interpersonal level. We concluded that the peer pressure systems helped sustain commitments and encouraged implementation efforts. We also concluded that it was important that a watershed management effort developed shared definitions of problems, priorities, policies, and expectations for implementation activity. Social norms were an important component of the peer-pressure systems and provided additional incentives for action and created informal sanctions to enforce collaborative agreements.

Performance measures encouraged a systematic approach to addressing NPS problems. Several watersheds made effective use of performance measures. Lake Tahoe developed a series of environmental thresholds. TRPA gathers data and reports progress towards those thresholds every five years. It also monitors programmatic activities and actively monitors the delegation of permitting activities to local governments through MOUs. Collectively, those data have allowed TRPA to improve the administration of its regulatory programs and stimulated the development of new programs to address problems where progress was not being made. Tampa Bay has a well-developed set of environmental and programmatic goals. It has a well-developed environmental monitoring system that allows decisionmakers and public to track the progress towards environmental goals. Each partner is also required to submit a five-year work plan with its implementation activities so that decisionmakers and public can monitor progress towards the programmatic goals. Tillamook Bay is only in the early stages of implementation, but it has specific implementation targets designed to achieve environmental goals and the TCPP plans to develop a tracking system to monitor implementation activities, combine this information with available environmental data, and make it accessible on the Internet.

The experience in the Delaware Inland Bays and Salt Ponds was mixed. The CIB monitors programmatic efforts on an annual basis and produces an annual "report card" on its progress towards implementing the CCMP. However, given the lack of specificity in the CCMP the monitoring is subjective in nature and the CIB does not track implementation activities in a systematic manner. There have also been problems in monitoring environmental conditions. These data are either lacking or are dispersed among different organizations and the CIB has not made an effort to synthesize or add value to these efforts. The Salt Ponds has an implied set of performance measures, the shared zoning standards. The CRMC and RIDEM have well-developed permit tracking systems that have improved the administration of their respective programs, but there has been no attempt to link these data or combine it with data at the local level. In terms of environmental monitoring, both the CRMC and RIDEM are heavily dependent on information obtained from volunteer water quality monitoring programs but data on groundwater quality is lacking. Narragansett Bay has no clear goals or performance measures and does not actively monitor environmental conditions or implementation activities.

We concluded that the development of performance measures and tracking systems was important. It encouraged the watershed management efforts to be systematic in their approach to addressing NPS problems such as nutrient loadings and habitat restoration. They provide useful information to decisionmakers. Performance measures also help improve the accountability to the general public.

This experience led to several observations. Despite the large federal investment in watersheds, the environmental monitoring data is inadequate. Lake Tahoe and Tampa Bay have the most comprehensive data and both lack important sources of information. For example, more information on the water quality in the tributaries to Lake Tahoe and Tampa Bay is needed. In

addition, there was little information on groundwater quality in the two cases where it played a critical role. We concluded that volunteer monitoring programs provided useful information for decisionmakers in the Delaware Inland Bays, Salt Ponds, and Tillamook Bay. In some cases, university researchers maintained their own environmental monitoring sites. For example, the CRMC relies on shoreline erosion data collected by a university researcher. However, the general lack of information raised important questions about the quality of the information used by EPA and state environmental agencies in Section 305(b) reports and Section 303(d) lists. It was also clear that many state and local officials lack the resources necessary to integrate existing data systems or take advantage GIS, the Internet, GPS, and other technology that could be used to link environmental, social, and performance monitoring data. We also concluded that practitioners should avoid falling into the trap of thinking that the "best" monitoring program will be highly centralized or administered at the state level. Both Lake Tahoe and Tampa Bay rely on polycentric or networked arrangements and Tampa Bay's monitoring efforts rely on data collected by local governments.

The NEP's emphasis on performance management. To EPA's credit, it has emphasized performance measurement in the newer estuary programs. We believe that is one reason why Tampa Bay and Tillamook Bay used performance measures more effectively than Delaware Inland Bays and Narragansett Bay. EPA's biennial review process also encourages estuary programs to develop systems to monitor and track implementation activities in order to reduce the amount of time required to develop these reports. We found EPA's efforts to develop performance measures for the Government Performance and Results Act (GPRA) more troubling. One proposed performance measure for habitat restoration had a goal of restoring 50,000 acres of habitat. The other measured how many action items in the CCMPs were implemented. The problem with the first measure is that the importance of the problem varies by watershed, however, EPA's emphasis on the measure will create an incentive for each estuary program to emphasize restoration since that is how Congress and EPA will "judge" their efforts.

We believe the second measure may also create problems. The definition of what constitutes an "action item" is complex, varies considerably among programs, and can easily be manipulated. Neither does the percentage of action items implemented mean anything when measured in the aggregate. The action items vary in scope and complexity. It would be inappropriate for Congress or EPA to give the same amount of "credit" to an estuary program that achieved a complex set of nutrient reductions costing millions of dollars as a program that hosted a public event. Some CCMPs have a short shelf-life (e.g., Narragansett Bay) and changes in local priorities are sometimes created by other EPA programs (e.g., TMDL in Delaware Inland Bays) that change the focus of implementation efforts away from what is recommended in a CCMP. These activities would not be captured by the proposed measure; nor would other implementation activities that were not specified in a CCMP. Even more troubling is the fact that the measure might create perverse incentive for new estuary programs to include easily achieved action items and targets so that Congress and EPA will look favorably on their efforts.

We believe it is questionable whether GPRA performance measures are appropriate for a program such as the NEP, where there is substantial variation in the activities of individual programs and the variation reflects important contextual differences. Moreover, EPA's position, as reflected in its comments on the draft report, is that "it is up to states and locals to decide how and what to implement and fund: EPA should not be prescriptive in terms of implementation." If that is the case, then developing one or more GPRA measures would be inappropriate because it would articulate a desired course of action for all estuary programs.

We should also note that many respondents were generally critical of EPA's programmatic reporting requirements in various programs. They criticized EPA's reliance on standardized measures (e.g., number of permits, number of enforcement actions, fines levied, etc.) and suggested that it was often more concerned with the numbers than what the numbers meant. Some respondents were critical of the measures and reporting processes because they produced information that was primarily for EPA's consumption. Others disliked the lack of trust towards state environmental agencies since much of the data is collected so that EPA can monitor state environmental agencies. One example frequently used to illustrate these points was enforcement measures where a low number of violations could indicate either high compliance or lack of enforcement – two very different situations. That context is often lost in EPA's reporting requirements and states did not need to produce a report for EPA to know which set of conditions exists. Many respondents were also critical of the requirements because they consumed the limited resources available to states to conduct performance monitoring. Several respondents also noted that EPA has been less than enthusiastic in supporting state efforts to improve performance monitoring and in integrating data systems. We believe that EPA should be more supportive of the efforts of state environmental agencies and work more closely with them to develop performance measures that satisfy their mutual needs. Collectively, our findings suggest the following recommendations.

RECOMMENDATIONS

- Congress and EPA should consider whether it is appropriate to develop GPRA measures for a program like the NEP, which is designed to be context-specific and reflect differing state and local priorities, not a standard set of federal priorities. At a minimum, EPA should take the steps necessary to ensure that any GPRA performance measures that are adopted for the NEP will not create perverse incentives for estuary programs.

- EPA should require estuary programs to use performance-monitoring systems that link environmental, programmatic, and social data in order to evaluate progress towards specific goals and targets. EPA should require the estuary programs that lack detailed performance measures and systems to track environmental and programmatic data to develop them.

- Congress and EPA should provide greater financial and technical support to state and local governments to monitor environmental conditions and integrate data systems. EPA should support state efforts to develop their own performance measures rather than encourage states to adopt common EPA measures.

- Congress and EPA should decrease their emphasis on reporting requirements designed primarily to produce information for EPA's consumption and focus on providing information in a form that is more useful to state and local decisionmakers.

Social norms and peer pressure can encourage implementation and help enforce voluntary agreements. We also concluded that social norms played an important role in the development of collaborative organizations and encouraged implementation activities. Social norms including the shared definition of problems, priorities, and necessary actions were often a by-product of the participatory decisionmaking processes. In order to maintain and modify

these norms, we concluded that it is also important to develop an ongoing interaction process that allows collaborators to monitor one another's behavior, whether it is through the creation of a new collaborative organization or some other process.

The development of social norms appears to have occurred in varying degrees in all of the cases. In the Salt Ponds, the norms were so strong that many respondents assumed that local officials were "required" to implement the recommendations contained in SAMP, even though that was not the case. However, while strong norms developed between the CRMC, local officials, the URI, and other NGOs, RIDEM never shared the norms, which helps explain why its implementation of some SAMP provisions (e.g., informal permit review process) has been mixed. In Delaware Inland Bays, Tampa Bay and Tillamook Bay, social norms reinforced the goals of the collaborative organizations and created expectations for a certain level of implementation activity. In Lake Tahoe, recent collaborative efforts such as the production of the unified lobbying agenda and the development and implementation of the EIP reflect the social norms that developed among organizations. Accordingly, social norms created peer pressure at the individual, professional, and political level that encouraged implementation activities.

Our interviews with participants in the collaborative organizations created in the Delaware Inland Bays, Tampa Bay, and Tillamook Bay revealed that "peer pressure" was important because it motivated the partners to undertake actions that would fulfill the "commitments" and "obligations" that were expressed either formally (e.g., goals contained in a CCMP) or informally as social norms. The development of social norms also created a mechanism to help enforce formal and informal agreements between collaborators because it allowed the use of social sanctions that were verbal (e.g., sarcastic comments) or non-verbal (e.g., looks of disapproval) in nature. Social sanctions also help to develop and reinforce peer pressure systems.

While social norms will not be sufficient in all cases, they can be particularly useful in situations where there is no legal authority to compel others to act. They helped to ensure that the local governments did not deviate from the provisions of SAMP and helped ensure that the partners in the CIB and TCPP took actions. Even in Tampa Bay where the partners signed a "binding" interlocal agreement, there is no legal way a signatory can be compelled to implement the agreement. Instead, it is social norms and peer pressure that encourage the actors to adhere to the agreement combined with the threat of formal (e.g., being removed as a partner) or informal (e.g., verbal and nonverbal) sanctions. It is also important to note that many of the collaborative activities noted in Table 3 were the product of social agreements and understandings that were not specified in any formal written document. Therefore, social agreements and the development of norms and rules allowed the activities to proceed in an orderly fashion. Undertaking these activities also created opportunities for interaction that led to the development of additional norms that may encourage that these activities occur again in the future. Accordingly, the development of social norms takes place in an evolutionary context.

While the development of social norms alone will not be sufficient in all cases, they do provide important incentives and create peer pressure that encourages implementation and help to enforce collaborative agreements. They are therefore likely to be an important component of a collaborative organization. Because the norms are the product of personal relationships and can disappear when personnel changes, practitioners are advised to institutionalize them whenever possible. Collectively, our findings suggest the following recommendation.

RECOMMENDATION

- EPA's ORD and NSF should revise the Star partnership funding priorities to encourage research examining the role that social norms and peer pressure mechanisms play in the development and implementation of watershed management efforts.

Role of EPA and its Programs

The final section of this report examines the role that EPA programs played in the six watershed management efforts. Overall, EPA had less involvement in the Lake Tahoe and Salt Ponds cases. The agency had a larger role in the other four watersheds because they participated in the NEP. However, the role of other EPA programs (and their state counterparts) varied considerably. Specifically, we examined the relationship of EPA's Section 319 NPS Program, the CWSRF programs, and the Section 305(b) Monitoring Program to each watershed management effort. We also considered the role of various EPA reinvention efforts such as Project XLC and NEPPS, although their influence was limited. We also explored two of EPA's action forcing mechanisms; namely NPDES permits for stormwater and construction sites and TMDLs. Based on our analysis, we identified areas where these programs and their relationship to watershed management efforts could be improved.

EPA'S RELATIONSHIP WITH STATES AND WATERSHED EFFORTS

EPA's overall relationship with states varied across our cases by program and regional office.[179] A frequent complaint of many non-EPA respondents was that EPA did not trust state or local programs or industry. It also appeared that some EPA programs did not trust one another based on the responses of EPA respondents. This might also help explain why many respondents noted a general lack of collaboration among EPA programs. There appeared to be more collaboration among the state environmental programs, but numerous respondents also provided examples of a similar lack of collaboration. This is a significant obstacle to the effective use of the "watershed approach" since it necessarily involves having EPA and state environmental agencies working collaboratively with other agencies and NGOs.

EPA lacks a culture of collaboration. Many of our respondents suggested that EPA lacks a culture of collaboration. Many EPA and state environmental agency staff also had a limited knowledge of other programs within their agency. This becomes a problem when an EPA staff liaison working with watershed management efforts cannot answer simple questions about related programs such as the Section 319 program. Others were critical of EPA's lack of collaboration claiming that the agency did not take advantage of the tremendous amount of capacity and technical expertise that has developed at the state and local level over the past two decades. Thus, staff details and IPAs are one way to improve the culture of collaboration while at the same time accomplishing other tasks such as staff training and development.

Emphasis on process and changing priorities. Many respondents were also critical of EPA for emphasizing "process" rather than "results." Others were critical of reporting requirements that appeared to be designed to produce information for EPA's consumption rather than information useful to other state and local decisionmakers. Another frequent criticism of our re-

spondents is that EPA's priorities and programs change frequently, in what respondents referred to as a "flavor of the month mentality." Other respondents criticized efforts such as the Clean Water Action Plan (CWAP) that require state officials to spend time "repackaging" existing programs or "jumping through hoops" so that they satisfy new grant requirements that divert resources from other efforts. Many respondents used the preparation of state watershed strategies as an example and in most cases (Rhode Island being the exception) reported that it wasted staff time and simply repackaged existing programs. Others suggested that EPA was too focused on creating new programs and should focus more attention on improving core regulatory programs. As one state environmental agency official observed, "there are too many irons in the fire. There are too many things all going on simultaneously and nothing ever gets done."

Other concerns expressed by our respondents were that states were sometimes treated differently. In the NEP, EPA waived many of the planning requirements for the Puget Sound Water Quality Authority because it already had an established process in place.[180] The Delaware Inland Bays also had an established process, and hoped EPA would waive some of the characterization requirements so it could focus on implementation. Instead, the agency required additional scientific research and almost did not approve the CCMP because it failed to meet all of EPA's requirements.[181] This is just one example where states were held to different standards. Sometimes these differences appeared to be the result of the disparate ways in which regional offices administer programs.[182] In other cases, respondents believed it was the result of "politics." EPA's comments to the draft of this report suggest that it was sometimes due to staff perceptions of the "quality" of the programs.

Other respondents complained that EPA sometimes held itself to a lower standard than it did the states. An example from Florida provides an illustration. Florida took over the delegation of the point source discharge component of the NPDES program in 1995. According to one high-level state official, when they entered the program "there were all of these hidden surprises. Here EPA has been running the program for years. We get it and all of a sudden there is a 90 percent non-compliance rate because EPA let all of these things slide for all of these years. We are the bad guy . . . so we are not going to get in that trap again [reference to taking over the stormwater portion of the NPDES program]." While that may exaggerate the situation, our interviews with other respondents suggested that there were examples of cases where EPA held the FDEP (and the EPC in Hillsborough County) to a higher standard. Collectively, these findings suggested the following recommendations.

RECOMMENDATIONS

- EPA should make greater use of IPAs to increase the professional development of its staff while providing greater support to state and local place-based efforts.
- EPA should breakdown the barriers among and between its programs, develop opportunities for collaboration, and provide all staff who interact with other federal, state, and local officials with training on the requirements of related programs within the agency.

NATIONAL ESTUARY PROGRAM

As noted earlier, the Delaware Inland Bays, Narragansett Bay, Tampa Bay, and Tillamook Bay cases are all part of the NEP. This section summarizes some of the earlier findings and identifies other issues that were not addressed.

The NEP emphasizes planning not implementation. One of the frequent criticisms that respondents had about the NEP was that there was too much emphasis on planning and not enough on implementation. This emphasis is illustrated by:

- The heavy reliance on scientific research and public participation.
- The disproportionate amount of funding for planning activities when compared to implementation activities.
- Detailed planning and CCMP approval requirements but no corresponding implementation requirements.
- The CWA's silence with respect to implementation matters.

One EPA headquarters official even described the CCMP as "the ultimate product of our funding" and noted that EPA wants plans to contain detailed information about the watershed's problems and specific action plans. Some EPA staff we interviewed also appeared to view their main mission as ensuring that the estuary programs produced high-quality plans. At the same time, the agency views implementation as being primarily the responsibility of state and local officials. EPA has also been unwilling to take a strong role in intervening to improve implementation by requiring the development of new CCMPs, the development of detailed goals and performance measures when lacking, or the development of monitoring and tracking systems if they are lacking. Moreover, while the biennial review process is promising in helping address some of these problems, the data suggests that EPA could be more aggressive in using this mechanism to intervene to improve implementation efforts.

EPA's role in CCMP implementation is certainly debatable, depending on one's view of federalism and the proper relationship between the federal and state governments. EPA's implementation of the NEP is consistent with the "new federalism" approach embodied in this section of the CWA. We believe that state and local government should carry a large share of the burden for implementing these plans. Moreover, given the context specific nature of problems such as NPS pollution and habitat loss and degradation, we believe that state and local priorities should largely drive these efforts rather than those of federal grant programs. What we find curious is why both the CWA and the NEP have detailed requirements for the planning process but are largely silent on implementation matters. If implementation is responsibility of state and local officials and EPA only has a supportive role, why does it actively intervene and control the planning process and a CCMP's contents. If implementation is a state and local responsibility, then why do they lack the freedom to structure the planning process and a CCMP's contents in any way they see fit. After all, why should federal officials determine what is contained in a plan used by state and local officials? Moreover, given the contextual differences, why should all plans have to contain the same information?

We concluded that the heavy emphasis on planning at the expense of implementation in Section 320 of the CWA, EPA's guidance documents, and administration of the NEP is inappropriate. We uncovered no data that led us to conclude that the quality of the CCMP was an indicator of a watershed management effort's ultimate success. Nothing also led us to believe that a high-quality plan was a prerequisite for implementation success. Accordingly, EPA officials should not view a CCMP as the ultimate product of their funding and their main mission should not be to ensure that estuary programs develop high-quality plans. The problem that creates is that important implementation questions are often not addressed until late in the

planning process and sometimes the CCMPs are not designed to specifically guide the decisionmaking of the collaborative organization that were created. Instead, we believe the entire NEP process should be oriented towards implementation not planning. The ultimate product of the NEP process should therefore be the development of an effective institutional arrangement, which in many cases will be a collaborative organization, that will result in a set of shared policies and priorities that are specific and measurable and address a limited set of specific problems. There also needs to be some form of performance monitoring and regular interaction among the partners to enhance accountability, create peer pressure, and provide the actors with an ability to adapt and change priorities. If this effort is to be effective, the actors also need to commit resources and there has to be a stable source of funding to allow the partners to systematically address specific problems. The CCMP and other documents should therefore be strategic in nature and be designed to guide the collaborative organization's decisionmaking.

Estuary programs need to link environmental issues with other related policy issues. We also concluded that the estuary programs generally did a poor job of linking land use and water quality issues and did not emphasize linking environmental issues to other social issues to build coalitions and support. Perhaps this is because the CWA and EPA guidance emphasize water quality and living resources. Some respondents suggested that it was because water quality specialists rather than land use planners (e.g., Delaware Inland Bays) drove the planning efforts. It could also be because the land use issues were controversial and the participants wanted to avoid becoming enmeshed in these issues (e.g., Delaware Inland Bays and Tampa Bay). We also believe that the efforts were driven by the desire to be synoptic and comprehensive, rather than strategic. Narragansett Bay is the best illustration of how this desire resulted in an unwieldy CCMP. Accordingly, practitioners should enter the planning effort with the understanding that it is unlikely to address every problem in the watershed.

Another frequent criticism of the NEP's planning process was that estuary programs were required to develop documents and reports that were primarily for EPA's consumption and often failed to assist in the development of a CCMP. Some respondents pointed to the federal consistency report and associated requirements as an example of unnecessary requirements. The requirements are designed to ensure that other federal programs are consistent with the plans. Estuary programs are also supposed to review federal activities through the E.O. 12372 process, although we found no evidence that this was actually occurring. The requirements included in the CWA are also unclear and given the way CCMPs are largely implemented (e.g., individual projects) it is unclear what the purpose of the process is and the provision does not appear to have any authority to prevent federal actions from superceding those in the CCMP. For example, in Tillamook Bay the actions taken under the Endangered Species Act will clearly supercede any actions recommended in the CCMP.

Others pointed to the need to develop a Base Program Analysis report.[183] This EPA guidance requires estuary programs to conduct an institutional inventory, analyze the strengths and weaknesses of the programs, and prepare a written report.[184] Several respondents pointed to the base program analysis report as an example of a "hoop" they had to jump through and that it was largely developed for EPA's use rather than their own. In other cases, it was developed near the end of the process and the information did not inform the development of the CCMP recommendations. While the principles behind the base program analysis and much of the guidance can be useful, there appears to be problems with execution. We believe several changes could improve the usefulness of the guidance. It should be oriented towards identifying poten-

tial collaborators, finding opportunities for collaboration, and exploring tradeoffs among problems. Therefore, while the guidance is now largely oriented towards environmental programs it also needs to include other NGOs and agencies involved in related policy issues. It should also be oriented towards getting management conference participants to undertake a process not to have estuary program staff develop a document. A resource inventory can also be useful and can educate participants about the functions and roles of programs but the guidance could be expanded to include more information on how to analyze institutional arrangements and identify their strengths and weaknesses.

Another frequent complaint was that the process for moving from a draft CCMP to a final CCMP was too long, sometimes taking more than a year. The CCMP undergoes two reviews by EPA staff, the second of which can take up to 120 days and sometimes the CCMP has to go out to public notice two times. Thus, once the CCMP was "done" from the perspective of the management conference participants, estuary program staff often had months of work left to complete all of the necessary documents required to obtain final EPA approval. This was a source of great frustration to many respondents and slowed the transition from planning to implementation.

Implementation structures should be developed during the planning process. There is also a tendency for the estuary programs to focus first on developing a plan and then to turn their attention towards developing an implementation structure. Both processes should occur simultaneously such that a plan is developed for use by an implementation structure. Delaware Inland Bays experienced problems when the CCMP was not well suited for use by the CIB and had to refine its priorities. Similarly, Tillamook Bay had to narrow down and modify its goals and targets when it created the TCPP. Some respondents in Tampa Bay suggested that the development of the CCMP was a wasted step, suggesting instead that they should moved straight from the detailed goals to the interlocal agreement, which is now the main policy document.

More can be learned from the estuary programs. Despite those criticisms, most respondents generally felt that EPA played a valuable role and provided the resources, guidance, and technical assistance necessary to allow them to develop successful programs. Looking across the four programs, it appears that EPA's administration of the NEP has improved as it learned from the experiences of early estuary programs. Thus, it did not surprise us that the planning process in Tampa Bay and Tillamook Bay went more smoothly. The diversity of experiences we observed also suggested that much can be learned from these efforts and transferred to other watershed management efforts at the state and local level.

The report has already noted some ways that the NEP can encourage additional learning and assist other state and local watershed management efforts. The estuary programs can make greater use of the Internet to disseminate research and technical reports. The demonstration projects that are funded could be better documented so that other public officials can replicate the projects and make informed judgments about whether they should adopt innovations. EPA is currently revising its ten-year old guidance manual, Saving the Bays and Estuaries: A Primer for Establishing and Managing Estuary Programs.

Our hope is that the revised primer will address many of the issues in this report, incorporate the broad base of experience and lessons learned from both planning and implementation, and will tie together the detailed planning requirements in a manner that illustrates not just how to develop and implement a plan, but also the underlying philosophy of watershed management. It is a critical guidance document because it is important for management conference

participants to have a broad overview of the NEP and its requirements. We also hope that the guidance document will be designed to be useful to other watershed management efforts around the country. EPA should also develop other guidance documents for issues raised in this report (e.g., collaboration, developing implementation structures, and conducting demonstration projects) that could be used in other watershed management efforts. EPA could also do a better job reporting on the progress of various estuary programs, perhaps by making the results of the biennial reviews more widely available, and using the process to enhance public accountability.

Several EPA officials we interviewed even referred to the NEP as a "demonstration" or an "experiment." However, we found little evidence that EPA has used the watershed management efforts to experiment with different ways to administer other EPA programs (The NEP has experimented with its own program to a limited degree). Respondents in several programs noted that EPA has been less than supportive when it comes to approving a CCMP that is critical of EPA programs or administration policies. This is unfortunate because the agency could be using the NEP to identify and experiment with changes in EPA programs on a limited basis. In Tillamook Bay, Oregon's watershed management efforts were designated as a "reinvention lab" pursuant to the NPR. The Reinvention Lab designation was intended to ensure a focus on outcomes and increased local flexibility rather than on inputs and mandated processes from the federal level.[185] However, we were unable to identify any examples of where the estuary program was granted flexibility by EPA or treated differently than other estuary programs. State and local officials were also unable to identify any examples of where EPA offered to experiment or provide this flexibility. As a result, important opportunities for policy-oriented learning were lost.

EPA can provide better technical assistance. A number of respondents also noted that EPA could provide estuary programs with better technical assistance and guidance. Previous sections have noted needs such as data integration or improved use of the Internet (e.g., websites, distribute technical reports, etc.). Some were critical of the fact that EPA provides much general information, but little mid-level information targeted at decisionmakers. Others criticized EPA bias towards high profile projects such as the Surf Your Watershed database, rather than lower profile technical assistance and support (e.g., maintaining a list server for grant funding, availability of management consultants, more interaction with federal officials and other watershed managers). The respondents almost unanimously pointed to the annual program managers meetings as being the single best opportunity for exchanging ideas. Most respondents suggested that the frequency of the meetings should be increased or that smaller issue oriented or regional meetings be used to stimulate additional information exchange. Others suggested increased interactions with other state and local watershed efforts outside of the NEP.

When does an estuary program end and when should it terminate implementation funding? Our analysis of the four estuary programs raised two related policy questions: under what conditions should an estuary program end; and under what conditions should EPA terminate implementation funding? These questions are important because the intention of Congress was never to develop estuary programs that would last forever. Yet, NEP appears to be doing just that. An example from Narragansett Bay illustrates these issues.

Narragansett Bay illustrates why the issue requires attention. The NBEP is housed in RIDEM and is in its seventh year of implementation. The original partners no longer implement the plan. The priorities of many actors have changed dramatically and most NBEP staff "implementation" activities are typically only loosely related to the CCMP's recommendations. While

"discussions" have been underway about developing a new CCMP or surrogate policy document, it has been an issue for some time and there are no commitments or timelines for this to occur. The state of Rhode Island has never contributed any dedicated funding or FTEs to support implementation efforts, a strong indicator of the priority the program has with the state. The current budgetary and political climate do not indicate that resources at the state level would be forthcoming for this effort and current EPA appropriations appears too small to support an effort. Even if EPA funding were available, it is questionable why EPA would support an effort to develop a CCMP if the state will not provide implementation funding. Collectively, this does not give us reason to be optimistic that an effort to develop a new CCMP will occur soon.

EPA's response to these findings was less than encouraging. Its position is that without the NBEP even less would be accomplished. While this may be true, it is also likely to be true that EPA could give $300,000 to any of the principal actors (e.g., RIDEM, CRMC, RIDOP, Save the Bay, CRC, etc.) with the directive that they undertake collaborative activities, apply for grant funds, and participate in ad support other collaborative and stakeholder activities that affect Narragansett Bay and would receive some visible accomplishments. Other respondents suggested that EPA is satisfied as long as an estuary program is visible, contributes to the "picture of the NEP as a whole", and the program does not show a total disregard for the NEP requirements or misuse EPA resources.[186] This view is similar to those that referred to the NEP as "green pork" and noted that the program provides a lot of visibility for EPA at a relatively low cost.

We believe this is a poor basis for funding implementation efforts and argue that the status quo is counterproductive. It creates no incentives for an estuary program to revise its CCMP if it becomes outdated; develop specific goals if they are lacking; create a collaborative organization to improve or expand the scope of collaborative activity; or to find a dedicated source of implementation funding. All of these changes may be necessary to improve the long-term effectiveness.[187] The failure to let an estuary program end when it has surpassed its useful life span also inhibits the cycles of planning that proved to be useful in the other watersheds.[188]

There was also little reason to be optimistic that these policy issues will be addressed in a timely fashion. EPA's comments on our draft report stated it has begun "talking" about the issues and recently raised them at a recent annual meeting of estuary program officials. However, our ongoing research on the NEP suggests that EPA has been "discussing" and "talking about" these issues for some time.[189] There was also no indication during our interviews or the comments on this report that a policy change was imminent or that a timeline for these changes has been established. Meanwhile, the issues increase in importance with every passing day as other Tier I and II programs begin facing similar problems (e.g., Delaware Inland Bays) and some CCMP's (e.g., NBP's)[190] become increasingly irrelevant.

The NEP's future is unclear. Our interviews with EPA officials suggest that there might be the potential to double the size of the program if the resources were available. However, there was no indication that the NEP would be expanded anytime soon. Instead of addressing these and other issues, the status quo prevails. Other respondents suggested that some EPA officials are now more concerned with TMDLs and the CWAP.

Nevertheless, the questions of program termination and EPA's role in the implementation process must be addressed. If they are not going to end, then some form of additional planning (e.g., development of a new CCMP) will be necessary to provide focus to the efforts. Some respondents and comments on the report suggested that the biennial review process might serve this purpose or that the development of annual work plans serves this purpose. We do not agree. Neither is the equivalent of the management conference process and both processes

should reflect the actions taken to address specific goals not be used to set new goals. These policy issues also raise important questions and EPA should not be looking for temporary "quick fixes" to address them.

Rather, these policy decisions should be addressed as part of a broader effort to determine what the long-term role of the NEP is as well as EPA's role in implementation efforts. If the NEP was designed to serve as a demonstration program, then perhaps it has outlived its usefulness. Perhaps it is time to start phasing out the older estuary programs and let state and local officials determine whether they want to continue the efforts or start new efforts. If the NEP's purpose is to continue encouraging the protection of nationally significant estuaries, then EPA should open up another governor's nomination process and allow some of the original estuary programs to develop new CCMPs. If EPA and the federal government has no significant role in implementation, then perhaps the NEP should not have detailed planning requirements, should adopt strict matching requirements, and cease funding implementation efforts when states do not allocate dedicated funding or FTEs to support these efforts. Conversely, if EPA and the federal government have an important role in protecting nationally significant estuaries, then perhaps it is time for EPA to intervene in implementation efforts and require new plans, specific goals, and performance monitoring. Moreover, Congress should drastically increase the level of resources available to support implementation.

In either case, Congress and EPA need to address these policy issues. Early Tier I and II estuary programs were largely experiments that provided important lessons. Unfortunately, EPA appears to be forgoing an opportunity to allow early estuary programs the opportunity to correct past mistakes and continue these "experiments." In the not too distant future, a significant number of estuary programs are going to find themselves in a situation similar to the NBEP. Thus, we believe it is incumbent upon Congress and EPA to address the issues raised in this report. Otherwise, accountability problems will increase, constituency involvement may wane, and these problems could erode the political support that the NEP and individual estuary programs have today. Collectively, these findings suggested the following recommendations.

RECOMMENDATIONS

- EPA should require the NEP to revise and update all of its guidance documents to reflect the broad base of experience among the 28 estuary programs. The agency should develop the guidance manuals such that they are also useful to practitioners working in watershed management efforts at the federal, state, or local level.

- Congress should revise Section 320 of the CWA (i.e., the NEP) to include provisions that provide at least five years of implementation funding. EPA should change its policies and allow estuary programs with outdated CCMPs or programs lacking specific goals and performance measures to reconvene a management conference provided that they form a collaborative organization (as defined in this report) and develop an updated management plan that is strategic in focus, contains performance measures, and relies on a system to monitor environmental improvements and implementation activity.

- EPA should no longer provide implementation funds to any estuary program that fails to consistently provide a dedicated source of implementation funding in the form of cash or FTEs to match federal implementation grants pursuant to Section 320.

- EPA should require all future estuary programs to be developed and implemented by collaborative organizations (as defined in this report) and require performance measures and a tracking system that links data on environmental conditions, implementation activities, and social conditions. The agency should amend the NEP's guidance for submitting a governor's nomination to ensure that nominations are submitted by a collaborative organization, not merely through jointly submitted applications, and that there is public participation in its development.

- EPA should modify the NEP's base program analysis guidance document to encourage management conference participants to become engaged in a process that examines the interconnections among programs, tradeoffs among environmental and other social problems, and to find opportunities for collaboration among governmental and nongovernmental organizations. The current guidance is oriented more towards developing a report for EPA that contains a inventory of programs and only partially addresses the issues raised in this report.

- The NEP should form a working group with the Association of National Estuary Programs to identify unnecessary and burdensome administrative requirements and reporting procedures and to identify ways to increase flexibility for individual estuary programs in the development and implementation of their CCMPs.

- EPA should develop a list server that provides estuary programs and other watershed management practitioners with information on federal and foundation grant programs.

- EPA should make the consensus building and multi-party stakeholder process technical assistance efforts developed for the NEP available to other state and local watershed management efforts.

- EPA should encourage the NEP to make managerial consultants available to estuary programs and other state and local watershed management efforts to help them address administrative problems in such areas as human resource management, organizational development, grants management, financing, and budgeting and to enhance organizational and staff development.

- EPA should require the NEP to provide estuary programs with technical and financial assistance necessary to improve the use of the Internet as a tool for diffusing technical information and for public education. EPA should require that all previous and future reports and publications by estuary programs and EPA grant programs be made available over the Internet.

- Congress should significantly amend Section 320 of the CWA in a manner consistent with other recommendations in this report. It should encourage the use of a collaborative process but leave the choice of a specific planning process and decision rules to those involved in the process. It should also clarify what roles EPA and Congress have in a CCMP's implementation and require that all new estuary programs use a collaborative organization of some form to develop and implement their CCMPs.

RELATED EPA WATER QUALITY PROGRAMS

Other EPA water quality programs were involved to varying degrees with the case studies. Three programs with a high potential to support and enhance these watershed management efforts were: Section 319 Nonpoint Source (NPS) Management Program; the Clean Water State Revolving Fund (CWSRF) Program; and the Section 305(b) Monitoring Program. While this study was not designed to evaluate these programs at either the federal or state level, our comparative analysis resulted in several observations about the roles that they played in the six watershed management efforts. The following sections summarize some of the observations and findings as well as the suggestions and recommendations for ways to enhance the ability of these programs to support watershed management efforts.

Section 319 NPS Management Program. The importance of EPA's Section 319 NPS Program varied across our cases. While some Section 319 funding was targeted at problems in each watershed, the program had a limited role in the Salt Ponds, Lake Tahoe, and Tampa Bay. In Narragansett Bay, it played a role in the GBI, although funding from other sources was often more significant to the effort's overall success. However, even though much of the state is located in the Narragansett Bay watershed, RIDEM did not use the Section 319 funding to systematically implement the CCMP's recommendations. The Section 319 program had a stronger relationship to the efforts in Delaware Inland Bays and Tillamook Bay. In Delaware Inland Bays, the program funded numerous projects that addressed NPS problems. However, other efforts such as NRCS programs and state cost-share funding arguably had a stronger role in implementing the CCMP. In Tillamook Bay, the program provides an important source of implementation funding for the TCPP. However, ODF funding for projects in the state forests and NRCS funding for agricultural lands is also important.

We also noted in previous sections of the report that many respondents reported that the Section 319 program is inefficient and does not effectively address local NPS problems. Some viewed the requirements for updating state plans as being of limited value because the selection and approval of projects was rarely based on the specific recommendations contained in the state plans. Our research also suggested that state plans were prepared primarily for EPA's consumption because other state and local officials, many of which were applicants for Section 319 funding, did not report using the plans in any way (some had never even seen the state plan). Many respondents were critical of the process by which annual project grants were awarded, claiming the process was inefficient and that the involvement of EPA headquarters and regional staff increased the program's overall administrative costs[191] thus reducing the funding available for NPS projects. Other respondents noted that the program's priorities and annual award procedures change frequently. Some questioned why state officials could not set priorities, given the unique and contextual nature of NPS problems. They also noted that the program's grant restrictions often limit the types of NPS projects that can be implemented. The program also relies heavily on demonstration projects that suffer from many of the problems we have already noted. The capacity of states to implement the program varied considerably. Respondents in Rhode Island reported that the lack of staff and problems with the state's contracting procedures made it difficult to allocate the grants in an effective and efficient manner. Respondents in Florida reported that the design of the program is inappropriate considering the state's other aggressive NPS programs. Respondents in Oregon complained that an increasing proportion of the program's funds were being diverted to cover staff costs within the agency while respondents in Delaware reported that the program has continued to emphasize using the funding to pay for on-the-ground projects. That suggests to us that the program should better

reflect these wide variations in state capacity and also take increased steps to improve the capacity for state and local governments to address NPS and habitat problems.

Our analysis suggests that the current administration of the Section 319 program is inefficient and does not encourage a systematic approach to addressing specific NPS problems at the local or watershed level.[192] The revised EPA guidance (May 1996)[193] and the increased funding (e.g., $100 to $200 million in FY 2000) combined with proposals for increased funding (e.g., President's FY 2001 request of $250 million) will certainly help in making the transition from a federal program based on a collection of loosely related projects to a program that systematically addresses specific NPS projects. Moreover, recent upgrades to Section 319 programs to include watershed restoration action strategies (WRAS) and linking incremental funding to these strategies will also help make this transition. However, some states reported problems in managing increased funding and our data did not suggest that the states were ready to make the transition. Thus, the increased funding appears to simply be funding more loosely connected projects.

We believe that Congress should consider modifying the Section 319 program to create more flexibility, allowing state and local needs and priorities to drive funding decisions. It is questionable why EPA is concerned about specific projects. One possibility for providing greater flexibility would be to switch EPA's emphasis from individual projects to results. Instead of reviewing individual projects contained in the work plan and setting priorities for the allocation of funding, EPA would merely examine a state's ability to make progress towards addressing specific environmental problems. This could not only improve flexibility, but could also significantly reduce the administrative costs associated with the review of annual work plans. There is also no reason that state environmental agencies could not delegate their authority to award grants and monitor progress to other regional authorities (e.g., watershed management efforts, conservation districts, county governments, regional planning agencies). This would further ensure that funding decisions reflected state and local priorities and provide a greater ability to plan and budget with confidence.

Another limitation of the Section 319 program is EPA's organizational structure. Unlike the USDA's organizational structure, which includes offices in most of the 3,000 conservation districts around the United States, EPA administers the program through its 10 regional offices and the state water quality agencies.[194] As noted by one EPA official commenting on this report: "leadership for any single project is usually provided by one or two agencies with a historical local presence." It might be more effective to place control over funding decisions with these agencies that provide leadership (e.g., conservation districts) or change EPA's organizational structure to play a stronger leadership role in addressing these problems at the local level. In a related observation, some respondents questioned whether EPA and state environmental agencies were the appropriate change agents in the NPS area because of the agencies have frequently been involved in past conflicts with many agencies and many respondents reported a general distrust that exists with other state and local governments agencies and industry. This history of conflicts could complicate efforts to garner the voluntary implementation of NPS controls. These problems could be avoided by delegating decisionmaking authority in a manner noted above.

Some respondents also identified a potential conflict of interest that could be a source of inefficiency that is created by the structure of the current funding system. EPA or state environmental agencies often regulate the projects awarded funding (e.g., stormwater detention pond, restoration project, construction of an artificial wetland). Often the permit review is done by a different program within the state environmental agency whose review may delay the project or result in changes that sometimes increase project costs with no corresponding environmental

benefits.[195] Collectively, our analysis of the relationship of the Section 319 program suggested the following recommendations.

RECOMMENDATIONS

- EPA should revise the Section 319 program to reduce administrative costs, increase flexibility in the program's design and administration, and emphasize state and local priorities. It should authorize multi-year grant allocations and increase the range of potential projects that can be funded. The emphasis of the revised program should be on systematically solving problems and not funding discrete unconnected projects. EPA headquarters officials should be removed from the review of annual work plans. EPA regional offices should switch their emphasis from reviewing the projects contained in annual work plans to holding states accountable for their ability to address specific environmental problems rather than simply completing projects. States should be given greater latitude in setting priorities and funding projects if they adopt the aforementioned performance measures. States should also have the authority to delegate the authority to award Section 319 grants to regional entities providing they have adopted performance measures and have the ability to document progress towards addressing specific problems.
- Congress should remove the current grant restrictions in various EPA and USDA programs that treat the funding as "green pork" or advance other social agendas, and should set clear priorities for improving environmental conditions.
- Congress should explore the feasibility of combining the funding from existing federal NPS programs and creating a flexible categorical grant program in accordance with previous recommendations by the ACIR that allows state and local priorities drive funding decisions.

Clean Water State Revolving Fund. The CWSRF program had only a limited relationship with the six watershed management efforts even though it is an important source of potential funding for addressing water quality problems from point and nonpoint sources. In terms of point sources, there was little involvement of the CWSRF program despite the fact that the funding often supports efforts to address point source problems from municipal wastewater treatment facilities. Moreover, respondents in the Delaware Inland Bays reported a preference for seeking funding under USDA's Rural Utility Service rather than the CWSRF program because the former has a 40-year payback period and the latter a 20-year period.[196] The longer payback period results in lower user fees and made repayment schedules more manageable for local officials in Sussex County.[197] These findings are consistent with previous research that identified potential equity problems associated with the CWSRF program that make it more difficult for poor, rural, and low-income communities to receive loans.[198] Recognizing these problems, EPA has proposed amending the CWA to extend the payback period to 30 years and offering negative interest rate loans (i.e., partial grants) to impoverished communities. The CWSRF program is also highly complex and few respondents reported understanding how it worked including some individuals that were involved in the process of awarding loans.

EPA is currently promoting the use of the CWSRF program as a major funding source for NPS projects and has recently developed public education materials and guidance. EPA has established a goal of allocating 10 percent of annual financial assistance will be devoted to NPS

projects. The CWSRF has also funded a broad array of NPS projects:

- 41 percent of the projects have been for agricultural BMPs with loans going to individual farmers.
- 38 percent of projects have replaced failing OSDSs with improved OSDSs or decentralized loans to homeowners.
- 14 percent have helped fund the removal and clean up of leaking underground storage tanks

While notable accomplishments, information provided by EPA suggests that there have been problems in using the CWSRF to fund NPS projects. Currently, states are loaning only 6 percent of annual financial assistance and only 25 states have funded these projects. In comments on this report, EPA said that nearly $247 million had been spent on estuary or NPS projects in our case study states, though it is unclear what comprises an estuary project, but may include point source expenditures. While this may sound significant, a simple calculation dividing that amount by the land area of those states (418,718 sq. miles)[199] reveals an average expenditure of $590 per square mile. This suggests that the expenditures may have actually had little potential for large-scale reductions in NPS pollution statewide, albeit individual projects may have significant NPS reductions.[200] It also illustrates just how costly NPS improvements are likely to be were federal, state, and local governments to seriously address these problems.

One of the watersheds with the strongest relationships between the CWSRF program and a watershed management effort was in the Delaware Inland Bays. Respondents reported that the CWSRF program provided over $2 million in low interest (3 percent) loans to poultry growers and farmers in the last 5 years for installing BMPs. Respondents in other states reported considering using the CWSRF to pay for NPS controls (e.g., upgraded OSDSs and sewer connections to remove failing OSDSs) but also noted that more guidance and lessons from other states would be helpful in developing such an effort. This suggests that either the current guidance is inadequate or that its distribution has been ineffective. Local officials frequently reported that the CWSRF program was not a viable option for funding NPS or habitat restoration projects. The rationale was typically that project costs were typically small enough to include them in CIPs, noting that it would be unwise to finance the projects and incur interest costs. Respondents also indicated that the big limitation on using CWSRF funding to address NPS problems is that there needs to be a return revenue stream and this does not exist for many policy instruments. Thus, some CWSRF financing agencies are reluctant to fund these activities in order to maintain the integrity of the fund. That may be part of the reason why EPA has recently proposed including a voluntary 19 percent grant set-aside for NPS projects in the CWSRF.

The limited role the CWSRF program played in the six cases suggests that there may be limited potential for using the program, as it is currently structured, for addressing NPS problems. This can be seen by both the failure to meet the 10-percent funding goal, limited state utilization of the CWSRF for these purposes, and EPA proposals for amending the CWA to allow NPS grant options. It appears to be most useful in providing low interest loans to landowners or business owners and less useful for providing implementation funding to state or local government programs.[201] When used for addressing NPS problems, this also means that state officials will have to process a large number of small loans compared to the funding of point source projects that has a limited number of larger loans. This has the potential to significantly alter the transaction costs associated with administering the CWSRF. At least 11 states have

utilized innovative partnerships with banks and counties to provide the large number of small NPS loans. EPA needs to develop greater guidance for states considering whether to utilize these partnerships. Moreover, while these individual partnerships may be effective, they may not be transferable across individual state CWSRF programs because there is tremendous variability in the structures, administration, and cross-subsidization policies of these programs that are still largely oriented towards funding point source projects.[202] Our concern is that EPA is trying to fund two very different types of projects with the same program, which only complicated the administration of the program. We believe Congress and EPA should consider separating the CWSRF into two programs, one focused on point sources and one focused on nonpoint sources. That could:

- Reduce the complexity of the CWSRF and its administration.
- Facilitate the development of policies that address the aforementioned equity issues.
- Allow each point and NPS programs to accomplish specific objectives instead of using one program to implement a wide range of issues and policies that are quite different in nature.
- Reduce the transaction costs associated for administering a NPS loan program with a large number of small loans with presumably shorter repayment periods.

It may also improve the administration of the programs. The applicants are often very different so separating the programs could actually improve customer service. Moreover, it could reduce administrative costs at the state level because the program could easily be devolved to other entities such as conservation districts, county governments, regional planning agencies, or banks depending on the state. This could both increase the visibility and usefulness of these programs while reducing the transaction costs associated with administering these programs. Collectively, these observations and findings suggest the following recommendations.

RECOMMENDATIONS

- Congress should amend the CWA to change the payback schedule in the CWSRF Program should be changed to 30 years for some types of communities to reduce user fees in small, rural, and low-income communities, which EPA has proposed in the administration's bill to reauthorize the CWA.
- Congress should create a separate CWSRF program designed specifically to provide low interest loans to business and landowners to install BMPs and conduct other NPS and habitat restoration projects. Congress should encourage states to devolve this program to other local or regional entities such as regional planning agencies, conservation districts, county governments, or banks. As an added incentive to participate in the program and to install BMPs (or become engaged in other activities), Congress should consider amending the IRS code to make all or part of the interest payments tax deductible for eligible landowners.
- EPA should examine the various uses of the CWSRF program in financing NPS pollution and habitat protection programs and develop additional technical guidance for states that are interested in using this financing tool.

- EPA should take steps to develop additional guidance materials (e.g., use of partnerships with banks and counties) and improve the dissemination of existing guidance materials and provide technical assistance directly to state and local officials interested in using the CWSRF to address NPS problems

- EPA should work more closely with other federal, state, and local officials to expand the integration of the CWSRF program with the USDA's Rural Utility Service and the Housing and Urban Development's (HUD's) Community Development Block Grant (CDBG) Program to establish a single funding application that coordinates project selection, maximizes the efficiency of these programs, and addresses the particular funding problems faced by small, rural, and low-income communities.

Section 305(b) Water Quality Monitoring Program. We concluded that the state Section 305(b) Monitoring Programs were relatively uninvolved in the watershed management efforts. In previous sections of the report, we noted that a number of respondents complained about the quality of existing water quality data and reported that they did not find the information contained in the Section 305(b) reports to be useful. Our analysis of these reports also concluded that they sometimes present information in misleading and overly simplified ways and that they need to do a better job of describing the quality of the data that is reported. Perhaps more troubling is that the program is oriented towards preparing information for EPA's consumption rather than providing information in a form useful to watershed managers. While some data must be collected to comply with CWA requirements and other mandates, we believe it imperative for the reasons noted in this report that the program be oriented towards collecting data that will be used by other state and local decisionmakers. Collectively, the findings reported here and elsewhere in the report suggest the following recommendations.

RECOMMENDATIONS

- Congress should create an environmental-quality monitoring program to replace the Section 305(b) report. Its primary focus should be to provide information that is more useful to state and local decisionmakers, and not preparing reports to Congress. It should take full advantage of GIS, the Internet, GPS, and other new technology. It should also link environmental, social, and performance monitoring data. States should be given the flexibility to determine how the data system will be developed and organized in accordance with accepted federal data standards. States should be encouraged to use the most detailed spatial scale possible in order to serve the maximum number of users.

- Until the new monitoring system is in place, EPA should improve its preparation of the Section 305(b) reports. In recent years the focus has been on putting the documents in a form that is more accessible to the general public. However, the documents need to provide a more detailed explanation about how the data was collected and what its limitations are. The presentation of information is also misleading because many non-assessed waters have a high probability of being in conformance with state standards. Future Section 305(b) reports should explain how the data was collected, what the quality of the data is, how many monitoring stations were used to make the judgments, and explain how the non-monitored waters were actually assessed. The documents should clearly articulate how the data from assessed waters was linked to specific pollutants and sources and the degree of certainty attached to these determinations.

Congress should also encourage the development of a real-time monitoring system and forgo the preparation of biennial reports.

- Congress should consider whether amendments to the CWA could help to alleviate the concerns of state water quality officials who would like to make greater use of volunteer water quality monitoring data in both Section 305(b) reports and other rule-making activities but are concerned about issues such as "chain of custody" and legal challenges to the use of the data in rule-making processes.

- Congress should consider creating a new program that would provide seed money to expand volunteer monitoring efforts that fill data needs for the Section 305(b) reports or CWA programs. The Sea Grant Program and Cooperative Extension System should play an important role in organizing the groups, doing the analysis, and performing the requisite QA/QC. Other university programs could also be involved to create additional service learning opportunities. Agencies such as the Corporation for National Service and programs such as AmeriCorps could also organize these groups.[203]

- Congress should appropriate additional funding to support state water quality monitoring efforts and the Section 305(b) program.

EPA REINVENTION ACTIVITIES

Our analysis revealed two EPA reinvention activities, namely Project XLC and the National Environmental Performance Partnership System (NEPPS), that had some relationship with the watershed management efforts described in this report.

Project XLC. Project XLC was created in 1995 with the objective of giving the regulated community the opportunity to demonstrate "eXcellence and Leadership" and the flexibility to replace the requirements of the current regulatory system with an alternative strategy developed by the local community. The TBEP proposed to implement portions of their CCMP covered by the interlocal agreement as an XLC project. However, the TBEP ended up withdrawing its application. As one respondent put it: "When we were considering how to do this cooperative approach, we thought we could use Project XLC as a way of getting industry and governments involved. Then it became obvious that the paperwork and legal aspects were way beyond what we wanted. . . . We asked EPA what they could do through XLC that they couldn't do otherwise and they said nothing." Accordingly, the TBEP determined that they could not achieve any additional flexibility that could not already be achieved through existing programs. Moreover, the monitoring, reporting, and other administrative requirements of Project XLC would have created unnecessary costs. Thus, there was no "real" incentive to participate. This was the only program that considered participating in Project XLC.

National Environmental Performance Partnership System. NEPPS played a minor role in the four estuary program case studies. However, due to the nature of our research protocol the research team contacted only state environmental agencies involved in NEPPS, so we cannot report on the perceptions of federal officials. The impression we got from analyzing the data was that NEPPS had not fulfilled the promise of lower performance monitoring costs, which many state environmental agency officials viewed as being a desirable set of conditions. Instead, some state officials suggested they were equivalent while others felt they had increased.

Other concerns reported by respondents were that EPA was trying to exert too much control over the substance of performance measures, that some EPA programs did not care about NEPPS, and that its management of specific water quality programs and their reporting requirements did not change significantly. The effectiveness of NEPPS also appeared to be tempered by the nature of the relationships between the regional offices and the states. Some state environmental agency officials described EPA as being distrustful and too concerned with micromanaging their programs. Other respondents reported that a limitation of NEPPS was that only a small portion of the agency's overall operating budget was affected and most of the funds are allocated to FTE's so the flexibility associated with using the funds to undertake new initiatives was limited. Thus, respondents did not view PPAs or PPGs as being an effective option for increasing the flexibility in NPS implementation funding noted elsewhere in the report. What the respondents liked was that they no longer had to worry about being audited and having EPA discover that funding for one program was being diverted to other programs.

Our limited data suggested a potential obstacle to the effectiveness of NEPPS, which possibly has a direct bearing on the NEPs. In most cases, EPA funds were administered on a program-by-program basis at the lower levels of the agency in a decentralized manner. NEPPS centralizes budgeting at the upper levels of a state environmental agency. This has been a source of tension and concern because some low-level managers reported being worried that their funding would be reallocated while they were still being held accountable for the same results. Another potential danger in a state like Rhode Island where the estuary program was located in the state environmental agency was that its funding could be included in NEPPS and then it would have to compete, possibly with other state watershed management initiatives, to get back its original implementation funding.

EPA'S ACTION FORCING MECHANISMS

Two of EPA's action forcing mechanisms, namely the National Pollution Discharge Elimination Permits (NPDES) for stormwater and construction sites and the Total Maximum Daily Loading (TMDL), also had the potential to be actively involved in and enhance the six watershed management efforts we examined.

National Pollutant Discharge Elimination System. EPA's NPDES permits for stormwater only had a strong role only in Tampa Bay's watershed management efforts. Some respondents suggested that the requirements stimulated the development of improved capacity for managing stormwater at the local level (e.g., expanded engineering departments) and in developing funding mechanisms (e.g., stormwater utilities). EPA requirements were also reported to have stimulated additional expenditures on stormwater improvements. At the same time, the NPDES permit process and EPA's administration of the program was a source of great frustration to many local officials. Moreover, many of the activities require additional permits from the FDEP and many local officials reported being frustrated by the delays associated with getting permits. Others reported being frustrated by EPA's administration of the NPDES program and the lack of flexibility and other requirements that increased project costs without producing additional environmental benefits. Accordingly, the NPDES program increased the level of conflict between local governments and regulators, which in turn complicated the negotiation of the TBEP's interlocal agreement.

Total Maximum Daily Loadings. The most controversial EPA program was the CWA's requirements pertaining to TMDLs. They are used only when waters are not meeting current

state water quality standards and are listed on a state's Section 303(d) list. Under current regulations, a TMDL consists of: a total loadings cap for a single pollutant that is consistent with the water quality standards for that waterbody and the pollutant in question; and an allocation of the loadings cap among the key sources of the pollutant. Ultimately, both are set and approved by the state environmental agencies and approved by EPA. The determination of the loadings cap and specific criteria used when a narrative water quality standard (e.g., nutrients) has been violated is "primarily science-based."[204] Computer spreadsheets and models are then typically employed to estimate the loadings cap and to determine the required wasteload reductions, although they are not required.[205] The wasteload allocation provides some opportunity for stakeholder involvement and the consideration of other social and political data by the state environmental agency. The allocation for point sources is then translated into regulatory requirements contained in NPDES permits. EPA's proposed TMDL regulations go further and add requirements for an implementation plan that must include "reasonable assurances" that it is implemented. EPA also encourages states to tie TMDLs to a larger watershed assessment and restoration strategy.

Respondents had strong feelings about the TMDL process and reservations about using it to address NPS problems. Our respondents had strong feelings about the TMDL process. In fact, many respondents raised the issue of TMDLs during our interviews without being prompted to do so. Most respondents suggested that TMDLs can be a valuable planning tool and have been effective in helping set NPDES permits for point source discharges. However, almost every respondent other than EPA officials and a few state environmental staff thought the TMDL approach would be ineffective in addressing NPS problems. It was not uncommon for respondents to use TMDLs as an example of what they feel is wrong with EPA's approach to addressing NPS and other environmental problems. Moreover, the vast majority of respondents had strong reservations about any proposal that would result in using TMDLs as the basis for regulating NPS pollution.

We tend to agree and concluded that TMDLs would be an ineffective tool for addressing many NPS problems. EPA officials commenting on this report disagreed and argued that TMDLs are a useful tool for addressing NPS problems and argued that the regulatory approach can be an effective tool for stimulating restoration efforts in degraded waters.[206] Our data does not support those conclusions and actually suggests the opposite.[207] Therefore, we believe this is an important area for additional research and are concerned about what appears to be a gradual evolution within EPA towards a regulatory approach for addressing NPS problems.

The data from the six case studies suggests that a regulatory approach is more effective in preventing future NPS problems and is less effective in ameliorating existing NPS problems. That is not to say that a regulatory approach cannot be configured to accomplish these ends or that there are examples where this occurs. Rather, the data simply suggests that a collaborative approach may be more effective than similar efforts that are regulatory in focus (e.g., TMDLs, Section 6217) when the objective is to restore degraded systems. The heavy reliance on nonregulatory approaches also suggests that a regulatory approach in and if itself will be insufficient for addressing most NPS problems.

Some believe TMDLs are necessary to force action at the state and local level. While some EPA officials and representatives of environmental groups suggested that TMDLs are necessary to force action, that clearly was not the case in any of our case studies. In fact, a close inspection of all six watersheds revealed a wide range of activities that was not the result of any EPA program. Many state and local officials even reported that they feel constrained in undertaking innova-

tive actions because of EPA or state environmental agency requirements, restrictions on how federal funding can be used, and political conflicts that prevented more aggressive actions from occurring. We have no reason to believe that the TMDL approach would be any more effective given these and other constraints noted in the report and believe that it is highly likely it would exacerbate political conflict given the proposed requirements for "reasonable assurances" that implementation plans will be put in place.

While there is little evidence to suggest the approach will be any more effective than the voluntary or collaborative watershed-based efforts, EPA has made TMDLs a top-priority within the agency, possibly to the detriment of other water quality programs. Partly, that is due to the CWA requirements that have been ignored by many states and a wide range of lawsuits that have force EPA to act. Many environmental groups are also lobbying EPA to begin aggressively use the TMDL provisions to force states to address both point and NPS water quality problems.

Trend towards EPA's increased use of regulation as a tool for addressing NPS problems. EPA's comments on this report noted that there is a widely held misconception that EPA is beginning to regulate NPS pollution, a belief expressed by many of our respondents. It may indeed be a misconception, but many state and local officials are justifiably concerned.[208] For a number of years Congress and EPA have been gradually increasing the emphasis on regulatory approaches for addressing NPS problems. The revisions to the CWA in 1987 contained revisions to the NPDES program that contained permits to address erosion and sediment control problems from construction sites and to permit stormwater runoff from industries and municipalities. The 1990 Coastal Zone Act Reauthorization Amendments (CZARA) created the Section 6217 Coastal Nonpoint Pollution Control Program (CNPCP), a regulatory approach to addressing NPS problems in the coastal zone.[209] Section 319(b) of the CWA even states: "State programs should include an appropriate mix of regulatory and nonregulatory approaches." EPA's recent emphasis on fully utilizing the CWA's TMDL provisions as a result of lawsuits and pressure by environmental interest groups is another reason for these concerns.

Moreover, TMDLs can be used as the basis for regulating some nonpoint sources directly and EPA's suggestion that this does not occur is misleading. Municipal NPDES general stormwater permits and the proposed NPDES permits for certain animal feeding operations (CAFOs), aquaculture operations, and forest roads would both be subject to the provisions of a NPS TMDL.[210] The proposed regulations also state: "However, if monitoring shows that voluntary measures are not the resulting in the progress towards the attainment and maintenance of water quality standards envisioned when the TMDL was approved, the State, Territory, or authorized Tribe may need to establish a regulatory approach."[211] They also contain requirements for what must be included in an implementation plan which must include "reasonable assurances" that the wasteload and load allocations will be implemented and notes that this includes local ordinances and state regulations among other things.[212] EPA also would have the authority to impose TMDLs and implementation plans if it chooses to do so and can sanction states for noncompliance with the proposed regulations. In our view, there is some justification for those that are concerned that EPA will increasingly use TMDLs to compel or encourage state environmental agencies to regulate NPS pollution. It is also clear that EPA lacks some of the legal authority that would be necessary to "regulate" all of the nonpoint sources (e.g., local land use issues) that would be subject to a TMDLs wasteload allocation. Thus, it is unclear what the full ramifications of the proposed regulations as they pertain to the implementation plans and "reasonable standards" will be.

It is likely that EPA will continue expanding its use of the NPDES permits which will certainly have the potential to increase regulation of local governments and certain industries (e.g., agriculture, forestry). EPA may also chose to use its ability to approve/disapprove implementation plans, impose sanctions on states, and use the judicial system as points of leverage to compel states to develop additional regulatory authorities and local government to develop new ordinances. EPA comments on this report also reflect this emphasis on regulatory approaches to addressing NPS problems. One comment noted that the current EPA policy is that "more states need to assure that they have adequate authorities to ensure needed implementation where voluntary approaches fail." Another comment stated: "the discussion fails to note the essentiality of strong regulatory and enforcement elements to any watershed program." Therefore, we believe our respondents were justifiably concerned about EPA's growing emphasis on regulatory approaches to addressing NPS problems.

The role of TMDLs varied across the cases. All of the watersheds in this study included waters on Section 303(d) lists. However, TMDLs were developed only in two of the watersheds (Delaware Inland Bays and Tampa Bay) at the time of the study while subsequent TMDL efforts are at varying stages of completion in Narragansett Bay and Tillamook Bay. In Delaware Inland Bays and Tampa Bay, a TMDL was not explicitly developed as part of the watershed management effort. Moreover, the TMDL did not assist the watershed management efforts (DIBEP and TBEP). Rather, the watershed management effort assisted in developing the TMDL and their equivalents of the implementation plan. In both Narragansett Bay and Tillamook Bay there was little relationship between the watershed management efforts and the TMDL efforts. Efforts have recently begun to develop a TMDL for bacteria in a portion of the Salt Ponds.

The TMDL for the Delaware Inland Bays was developed three years into the implementation process as a result of a lawsuit. (Those efforts are described in the case study.) The CIB assisted in developing the TMDL in several ways. The water quality model and the data collected during the planning process were used to develop the TMDL. Although the data were 10-years old, it was still the best available and the judge was unwilling to grant an extension to the deadlines to collect additional data. Once the TMDL was promulgated, the CIB collaborated with DNREC to begin developing tributary strategies for the three sub-basins that will eventually identify the implementation actions necessary to implement the TMDL's recommendations. The consequence of the TMDL effort is that its priorities have begun to replace those in the CCMP, which was a concern for some respondents because the former is more limited in scope. Many respondents also raised questions about whether it will be possible to achieve some TMDL recommendations. For example, all point source discharges have to be removed, which will require a significant capital investment and set aside of public lands. It is unclear how nutrient loadings from atmospheric deposition will be reduced. There are no BMPs that can achieve the required nutrient reductions to groundwater from agriculture. In addition, given the important role of groundwater, there is much uncertainty embedded within the TMDL. It may take decades to observe actual changes in surface water quality.

While the Delaware Inland Bays represents a TMDL effort as envisioned in the CWA, Tampa Bay's experience was different and reflects one way the process might work if their was more flexibility in the proposed TMDL regulations. Instead of developing a TMDL for Tampa Bay, the FDEP simply approved the CCMP's nutrient loading targets as a TMDL and the interlocal agreement and nutrient management consortium as the pollution control strategy. However, the watershed management effort did not set out to develop a TMDL. Neither were the nutrient reduction targets specifically designed to satisfy state water quality standards. Sev-

eral respondents even questioned whether Tampa Bay's efforts truly satisfied CWA requirements. Many local officials also reported that if the intention had been to develop a TMDL, then they probably would have ended up with less aggressive nutrient reduction targets in the CCMP because they would have been concerned about how the targets would have been used in EPA's regulatory programs.

In both cases, the actions necessary to implement the TMDL's recommendations include a variety of policy instruments that are regulatory and nonregulatory in nature. Many of the actions will require actions by a wide range of federal, state, and local programs and it is doubtful whether changes to EPA or state regulatory programs (e.g., NPDES permits, wetlands permits, OSDS permits) alone would be sufficient to achieve the required water quality improvements. The wide range of implementation activities used in Delaware Inland Bays and Tampa Bay suggest that actions such as local zoning changes, capital investment by state and local agencies, installation of BMPs by all land owners, and changes in other federal, state, or local regulatory and nonregulatory programs would have to occur to implement NPS TMDLs. It is unclear how EPA and state environmental agencies will develop implementation plans that have "reasonable assurances" that these types of actions will occur. While some actions can be required as a result of NPDES permits and the development of new permits, others would require an unprecedented expansion of EPA's authority. The structure of our federal system raises serious questions about the efficacy of any such proposal and it is unlikely that such authority will be forthcoming.

The role of TMDLs in the other watersheds. The other cases reveal how the efforts to develop TMDLs were largely isolated and unconnected from the watershed management efforts. The respondents in Narragansett Bay reported virtually no interaction between the two efforts. The relationship in Oregon was somewhat greater, perhaps because the state was one of the first states required to develop TMDLs and its efforts are more developed. However, there was no effort to develop a TMDL in conjunction with any of the previous watershed management efforts in Tillamook Bay even though it contained waters on the Section 303(d) list. The Oregon DEQ also failed to use the estuary program as a vehicle for developing the water quality model and data it needed to develop a TMDL.

Lake Tahoe and Salt Ponds also have listed waters and little to know relationship with TMDL efforts. However, both have nutrient loading limits and pollution control strategies that are embedded in their regulatory programs. EPA's approval of Tampa Bay's efforts as a TMDL raised questions for us about whether the same strategy could be employed in Lake Tahoe and the Salt Ponds. If the efforts in both watersheds do not satisfy the TMDL requirements, it is unclear what the TMDL approach would add to current efforts. Speculating about how the TMDL process might apply in these setting can help illuminate some of the issues, problems, and limitations of the TMDL approach.

Developing a TMDL typically entails the use of a water quality model to set a loading cap. If no customized model has been developed for a watershed (e.g., Delaware Inland Bays) there are a number of readily available models that can be modified for use in a watershed.[213] It is unlikely that computer models typically used to develop TMDLs will resolve the uncertainty that currently exists in both watersheds or will produce estimates that are better than the ones currently in use. That would require new research, data collection, and modeling that typically are not part of doing a TMDL. The TMDL would then produce a set of recommendations for nutrient reductions to achieve the nutrient water quality standards, which in both cases are a narrative criteria rather than numeric standards. Since the computer models require numeric

criteria, it would be necessary to determine how much can be discharged with some margin for safety. However, it is less than clear what those numbers should be. The Salt Ponds may be the most heavily researched shallow lagoon system in the world and yet it is still unclear how much nitrogen is too much. Meanwhile the goal of 70 feet of lake clarity in Lake Tahoe is based on normative judgments and values. If 50-feet were used the model would produce different results. The lack of good water quality data may present problems in developing an effective model. Accordingly, the estimates produced by a TMDL are likely to have a high degree of uncertainty and several respondents were doubtful that these "guesstimates" would be any better than the ones currently in use.

Unless the model's estimates for required nutrient reductions deviated substantially from those achieved by the current programs, no additional action would be necessary. If these programs were not sufficient, then changes would have to occur to satisfy the TMDL's recommendations and these would likely consist of nonregulatory actions since both regulatory programs already have stringent requirements. The concern expressed by many respondents was that EPA might begin using the TMDLs to effectively mandate these nonregulatory activities as a result of sanctions or judicial action. For example, EPA might mandate the EIP even if state and local governments are unable to obtain the necessary implementation funding. Perhaps a similar program would be mandated in the Salt Ponds. It is also possible that TMDL could suggest that the only way the nutrient reductions could be required is to install sewers to remove OSDSs and then to remove all point source discharges, which was what is recommended in the Delaware Inland Bays TMDL. However, as noted in previous sections of the report this could increase residential and commercial development and might cause habitat loss and degradation, user conflicts, and other social problems. This failure to address and accept tradeoffs among problems is a potential problem with the TMDL approach.

Collaborative watershed management and the TMDL approach are not synonymous. Some EPA officials commenting on the draft report argued that the collaborative watershed approach is consistent with the TMDL approach, while others noted that the two approaches are different. While EPA may wish to "market" the proposed TMDL regulations as a "collaborative watershed-based approach" for political reasons, it simply is not the case. In fact, most of our respondents used the inherent differences in the approaches as the basis for arguing that the collaborative approach will be more effective than the TMDL approach, which historically relied on regulation as its primary implementation tool. There are important differences between these approaches and EPA's apparent failure to appreciate these differences is cause for concern. TMDLs are typically done, and arguably are most useful, in stream segments and small subbasins rather than large watersheds.[214] They are also done for single water quality pollutants rather than a combination of pollutants as is the case in collaborative efforts. The collaborative approach is best used when it is strategic in nature and focuses on win-win or win-no-lose situations. Many of the water quality problems that TMDLs address will involve win-lose situations where the incentive structure may be inappropriate for using a collaborative process.

The loadings cap is the heart of a TMDL because it determines the goals to be achieved and how much of the wasteload needs to be allocated. The loadings cap is set by the state environmental agency. It is not set collaboratively. Moreover, while there is no prohibition on collaboration in setting the wasteload allocation and in developing the implementation plan, there are several factors limiting the use of a true collaborative approach. The state environmental agency always has the authority to exit the collaborative process and impose the wasteload allocation or implementation plan. That creates a power asymmetry and suggests that any such process

will probably be better described as using an advisory committee rather than being set collaboratively. Moreover, the CWA citizen suit and other provisions will allow other exit options that will make it difficult to effectively utilize a collaborative approach. From a practical standpoint, the deadlines created by consent decrees and the tight timeframe in developing TMDLs created by the proposed regulations when combined with the high transaction costs and long time required to use a collaborative process make it unlikely that a collaborative approach would be effective.

It should also be noted that the experiences in the Delaware Inland Bays and Tampa Bay support those conclusions. In Delaware Inland Bays, the loadings cap and wasteload allocation were determined by DNREC, not developed collaboratively. While the CIB and DNREC have developed three tributary teams in an attempt to develop voluntary pollution control strategies, the respondents in the case were quick to point out that this approach was only possible because of the social capital that had developed as a result of previous watershed management efforts. The respondents reported more difficulty in developing a stakeholder process to support TMDLs in other areas of the state. Moreover, there was a great deal of uncertainty as to whether the movement towards the implementation plan and stronger requirements envisioned in the proposed TMDL regulations might unravel this collaborative process. In Tampa Bay, the state ended up approving the CCMP and its provisions for nutrient reductions as a TMDL.[215] However, respondents pointed out that the success of the approach was due to the voluntary nature of the commitments. The use of these commitments as a TMDL was simply serendipitous. Several participants noted that they would have been unwilling to accept these commitments if they were to be used as the basis for regulating NPS pollution. Several respondents also noted that if EPA began to use the TMDL as the basis for regulating NPS pollution, it might destroy the collaborative process and force some industry and local government partners to withdraw from the voluntary agreements. Moreover, a great deal of social capital had developed as a result of previous watershed management efforts that facilitated the development of the commitments. Many respondents also questioned whether the approach could be transferred to other areas noting that TMDL efforts in other areas were likely to be much more contentious.

TMDLs are a top-down approach while the watershed approach is bottom-up. Fundamentally, the two approaches are inconsistent because TMDLs are a top-down process while the collaborative watershed approach is bottom-up in nature.[216] Each approach reflects a different model of policy implementation (See Table 12).[217] The TMDL approach is based on a classic "top-down" model of policy implementation. It takes a programmed approach controlled by state officials whose decisions are subject to EPA's approval. EPA can act if states fail to do so. State environmental agencies set state water quality standards, the loadings cap, and have the authority to impose wasteload allocations and implement them through changes in existing NPDES permits or other means. The implementation plan requirements in the proposed TMDL regulations are a further extension of the top-down approach to implementing these policies. Accordingly, the TMDL process is based on well-defined implementation procedures with control centralized in the hands of EPA and state environmental agency officials. While there is nothing that necessarily prohibits state environmental agencies from engaging stakeholders in the process, the process is not based on bargaining. Conversely, the implicit assumption contained in the CWA is that a rational, scientific process will be used to set the loadings cap and then the allocation will be implemented using a top-down regulatory process.

Conversely, the collaborative watershed approach described in previous sections of the report is based on a classic "bottom-up" model of policy implementation. It takes an adaptive ap-

TABLE 12: TOP-DOWN VS. BOTTOM-UP APPROACHES TO POLICY IMPLEMENTATION

TOP DOWN		BOTTOM UP
	Characteristics/Assumptions	
Programmed	Approach	Adaptive
Federal/State Officials	Key Actor	State/Local Officials
High	Federal Government Control	Low
Compliance	Measure of Success	Consensus
Low	Discretion of Implementor	High
Well Defined	Implementation Procedures	Less Defined
Centralized	Implementation Network/Structure	Decentralized or Polycentric
Standards/Regulations	Administrative Tool	Bargaining/Negotiation
	Most Appropriate When	
Narrow	Scope of Policy Change	Broad
Well Defined	Policy Clarity	Less Defined
Minor	Degree of Organizational Change	Major
Low	Conflict over Policy Goals & Objectives	High
Stable	Political Environment	Unstable
Tightly Coupled	Institutional Setting	Loosely Coupled

proach based on state and local priorities such that the effort is tailored to fit particular contextual conditions and the specific nature of the problem.[218] The federal government tends to have less control and influence than the state and local officials who are afforded much discretion in how the watershed management effort develops and is implemented.[219] Rather than relying on a centralized implementation structure, the efforts utilize collaborative or "networked" arrangements that use bargaining and negotiation to address tradeoffs among problems and constituencies with the goal of developing consensus on implementation actions that are typically regulatory and nonregulatory in nature.

Bottom-up approach is more appropriate for addressing NPS problems. The vast majority of respondents expressed strong reservations about using TMDLs to address NPS problems and did not believe that a regulatory approach is generally an effective way of addressing NPS problems. The findings contained in this report raise a number of questions about the efficacy of the TMDL approach when it comes to addressing NPS problems.

Previous research suggests that top-down approaches to policy implementation are most effective when the scope of policy change is relatively narrow, the goals are clear, little organizational change is required, the political environment is stable, and the institutional setting used to implement the policies is tightly coupled. The conditions in the six watersheds reflected the opposite set of conditions. The case studies describe a wide range of policy changes and instruments that were used to address the problems of NPS pollution and habitat loss and degradation. The goals of the effort were frequently unclear at the beginning, had a strong normative component, and developed as a result of a political process that sometimes proved to be quite

contentious (e.g., Delaware Inland Bays, Lake Tahoe, Narragansett Bay). The watershed efforts often required significant organizational changes including the development of new collaborative organizations and new programs in existing agencies. The polycentric and loosely coupled nature of our federal system also suggests that collaboration will be an important strategy for addressing inherently intergovernmental problems such as NPS pollution where no one actor has the authority to compel others to take action. These factors suggest that a collaborative "bottom-up" watershed-based approach would be more effective at addressing problems such as NPS pollution and habitat loss and degradation. Moreover, they raise questions about whether EPA and state environmental agencies will be able to develop implementation plans with requisite "reasonable assurances" that they will actually be implemented.

TMDLs and collaborative approach do not address different problems. One of the frequent responses from some EPA commentators was that the TMDL approach and collaborative watershed approaches provide EPA with increased flexibility because they can be used in different situations. One rational was that a structure with competing approaches allows for the flexibility to address the unique nature of the problems in each watershed. Another rationale was that TMDLs are used when waters fail to meet water quality standards while collaborative approaches take place in other areas.

While such "spin" helps justify the presence of both sets of programs within EPA, our data suggest that is not the case. Actually, there is no flexibility to pick and choose which approach will be used under EPA's proposed TMDL regulations. TMDLs will have to be developed for all 20,000 listed waters and the requirements of an implementation plan will override those of collaborative watershed plans developed by other actors and programs. All six watershed management efforts also had waters that were listed on state Section 303(d) lists and the collaborative approach appeared to be well suited to designing efforts to ameliorate existing problems using both regulatory and non regulatory approaches. While unfortunate, the data suggests that collaboration and other forms of collective action are more likely once problems begin to occur, rather than before problems have developed. In "relatively clean" areas, it will be difficult to get issues on the public agenda and there will be little incentive for individual actors to devote resources to these efforts when other issues are on the policy agenda. Thus, we have every reason to believe that the two approaches are primarily focused on the same situations.

From a conceptual standpoint, one might actually argue that the TMDL approach would be more effective if it was designed to be proactive rather than reactive. TMDLs are nothing more than a planning tool. There is no reason that a loading cap and wasteload allocation could no be developed for every waterbody, not just those on Section 303(d) lists. In fact, they could be powerful tools for identifying ways to address the cumulative and secondary impacts associated with the growth of both point and nonpoint sources over time in a waterbody using both regulatory and nonregulatory programs.

The TMDL approach faces other obstacles. The respondents identified other concerns with using TMDLs as the basis for addressing NPS problems. Several respondents noted that the water quality designations made following the 1972 CWA often contained misdesignations, some of which have been hard to change over time because of the CWA's requirements related to "downgrading" designated uses, the statue's emphasis on antidegradation, and the perception that new designations offer less protection. For example, one source of conflict between the CRMC and RIDEM in Narragansett Bay concerned discrepancies in the water quality desig-

nations for some waterbodies. Respondents noted that it is also difficult to remove waters from the Section 303(d) lists, especially now that many environmental interest groups have placed great importance on developing TMDLs. Previous sections of the report have also noted that a number of respondents raised questions about the Section 305(b) reports and the designations contained in the section 303(d) lists.

Another problem identified based on our analysis of the TMDL effort in the Delaware Inland Bays is that it took the form of a one-time modeling effort, which in this case was based on 10-year old data. Water quality data is not being collected on a continuing basis to verify and refine the model, test predictions, and monitor implementation efforts. Respondents in other cases suggested that this was typical. An intensive monitoring effort over a short period of time is used to collect the data required to develop the TMDL. However, given the shortage of resources for monitoring activities, the intensive monitoring does not continue. Once a TMDL is completed staff move on to begin work on the next model. That limits the usefulness of TMDLs as a planing tool and also limits the learning and adjustment that occurs.

Many of the respondents were also critical of Congress, EPA, environmentalists, and others who view TMDLs as a panacea that will solve NPS problems and compel state actions to address these problems. Most respondents raised serious questions about using TMDLs as the basis for addressing NPS pollution. Problems cited include the lack of data to use in the models and the large number of assumptions embedded within them. Others criticized the computer models as being too sensitive to small changes in assumptions, a common problem with many systems models. Others raised questions about the wisdom of using quantitative computer models for water quality standards such as nutrients that are based on qualitative criteria. Several of the respondents that were knowledgeable of the systems models that formed the basis of the computer models used in developing TMDLs suggested that the general lack of understanding on how these models worked and their limitations caused many individuals to underestimate their problems. Moreover, the general lack of understanding the technical side of the TMDL process suggests that existing EPA guidance documents and technical assistance efforts need improvement.[220]

Several respondents were simply critical of the whole process suggesting that it is expensive and technically demanding, and that it should emphasize developing implementation plans instead. Others even suggested that in many cases you could skip the data collection and modeling and go right to developing the implementation plans, since many public officials are already aware of the possible actions that could be taken to address these problems. A few respondents noted that the technical demands of the process resulted in a heavy emphasis on contracting out work and that only a limited number of staff in state environmental agencies understood the results of the modeling efforts. This raised questions for us about whether there should be more emphasis on developing the capacity within state environmental agencies to do the modeling work.

Others raised concerns about the timeframes included in consent decrees and EPA's proposed regulations noting that they do not correspond to the realities of the problem. As noted in previous section of the report, implementation efforts are likely to take decades rather than years and it may take similarly long periods of time to observe environmental improvements. For example, it may take decades for trees planted along a tributary to Tillamook Bay to mature to the point that temperature standards are met (it is very expensive to transplant mature trees). The long residence time of groundwater in the Delaware Inland Bays and the Salt Ponds also means that it may take decades to come in full conformance with CWA requirements.

Growing emphasis on TMDLs while other provisions are ignored. Despite these problems, the proliferation of TMDL lawsuits and the proposed TMDL regulations suggest that there will be continued emphasis on this CWA provision. We find this newfound interest in this provision curious because other provisions that are an integral part of the overall strategy for managing the nation's water quality problems have long since been deemed to be failures and are no longer used (e.g., Section 208). There is no reason to believe that the current TMDL efforts will not ultimately meet a similar fate. The TMDL requirements were intended to be one small part of a complicated system of point and nonpoint source controls that were embedded within a series of "nested" planning processes. Over time, the importance of planning provisions such as Section 208 has diminished while the emphasis on regulation has increased. Lake Tahoe is one of the few examples we are aware of where a Section 208 plan is still in effect and is being implemented to the full extent allowed under the CWA. However, several respondents in Lake Tahoe noted that it is challenging to do so because EPA's programs and funding sources now assume that these statutory provisions are no longer used. TRPA officials also noted that they have had no success in obtaining the funding authorized in the CWA for areawide waste treatment planning agencies even though they are designated as such. Our analysis also suggested that some states (Rhode Island) make poor use of the Section 401 Water Quality Certification (WQC) process even though this could be a powerful tool for addressing water quality problems (Oregon actively uses the provisions).

We found it puzzling that so much emphasis is now placed on TMDLs when other elements of the same system of water quality planning and regulation are ignored. It is our view that after nearly three decades of implementation and evolution, the current system of water quality planning and regulation embedded within the CWA should be revisited and overhauled in light of the developments of state and local capacity for addressing environmental problems. We do not believe that the reliance on one CWA provision has much potential to produce wide scale reduction in NPS loadings without its integration in a broader framework of planning that emphasizes both regulatory and nonregulatory policy tools.

Could the cure be worse than the disease? We also wonder whether the emphasis on TMDLs may lead to other undesirable consequences. The effort to develop 20,000 TMDLs over the next decade pursuant to EPA's proposed regulations is likely to be costly and have a profound effect on the administration of other state water quality programs as resources are reallocated. It is unclear whether this will cause other state and local priorities to be ignored. It may also prove to be difficult to reallocate staff to these efforts because of the specialized skills necessary to develop a TMDL. Thus, state environmental agencies may become heavily reliant on contractors.

It is also unclear whether the deadlines contained in many consent decrees and EPA's proposed TMDL regulations are realistic and appropriate given the time and resources required. TMDLs for all high-priority waterbodies will have to be developed within five years and with TMDLs developed for all 20,000 listed waterbodies within eight to 15 years. Implementation plans must also include timelines or other interim deadlines for attaining state water quality standards, although none are specified. If the 15-year timeframe is used, that means more than 1,300 TMDLs (i.e., gather data, set loading caps, wasteload allocations, and implementation plans) will have to be developed every year. Some of the respondents we interviewed suggested that might require increasing staffing by a factor of 10, perhaps a conservative estimate. Given the time it takes to develop a TMDL and the new "implementation plan requirements" it is highly unlikely that a single staff member could develop more than one TMDL per year on average. It would also require additional staff to collect data and support those efforts.

Even if Congress radically increases funding to support these efforts, there is bound to be a steep learning curve as agencies recruit and train staff to develop the TMDLs. State environmental agencies may have a tough time recruiting staff with the necessary technical skills to develop a TMDL, the policy analysis skills necessary to develop effective implementation plans, and the political skills to obtain the commitments necessary to provide the requisite "reasonable assurances" that these plans will be implemented. Moreover, EPA will have to recruit and train staff with a similar set of skills to review and approve the plans. Our data clearly indicates that simply staffing the efforts envisioned in EPA's proposed TMDL regulations may present a formidable challenge.

We are also concerned that the proposed TMDL regulations, particularly the requirement for the development of implementation plans, will outstrip the current capacity of the environmental governance system in many states. If EPA truly intends to develop implementation plans using a participatory stakeholder-based process, then one also needs to consider whether the "stakeholders" will have the capacity to participate in all of the TMDL efforts that would be going on simultaneously around a state. For example, one of the problems Oregon has had in developing more than 80 watershed councils is that the effort has outstripped the capacity for other federal and state agencies and NGOs to actively participate in and support the efforts. The vast number of TMDLs required each year to meet the proposed deadline could have a similar effect. The TMDL activities could also reduce the slack resources available for agencies to participate in other collaborative watershed management efforts. As noted periodically throughout the report, the lack of data is an important problem that will further increase the costs of developing TMDLs. Moreover, the efforts to track and monitor the implementation of the more than 1,300 TMDLs developed each year will outstrip the capacity of the current governance system.

The effort also has the potential to create significant political conflict that may destroy valuable social capital, particularly if EPA and state environmental agencies take a strict interpretation of the proposed "reasonable assurance" provisions. That will create numerous win-lose situations and the true costs to landowners, industry, and state and local governments associated with implementing 20,000 TMDL implementation plans could easily equal or surpass those associated with EPA's construction grant program. It would be naïve to assume that such efforts would not meet with significant political conflict and increase transaction costs for all involved. It could also destroy social capital that has developed. For example, the respondents in both Delaware Inland Bays and Tampa Bay suggested that significant opposition to the tributary strategies and interlocal agreement might develop if EPA used the TMDLs as the basis for regulating NPS pollution. Many local officials expressed concern that an effort to use TMDLs to regulate NPS pollution might lead to attempts to force communities to change their zoning, thus destroying the social capital that forms the foundation of local land use regulations.

Another potential problem is that the combination of tight time constraints in the proposed regulations, limited resources, poor data, nonexistent research on specific waterbodies, the lack of customized computer models, limited implementation funding, lack of capacity, political opposition, and the likelihood that the TMDL approach will not be effective in addressing the specific problems of all 20,000 waterbodies could cause the whole effort to quickly devolve into a "cookie-cutter" approach that focuses on simply satisfying the proposed regulations. While some may view that as progress, it also has the potential to consume and waste significant federal and state resources and meet a similar fate as EPA's implementation of the CWA's Section 208 planning requirements, which only met with limited effectiveness.

These concerns combined with the rather limited base of state experience with developing and implementing TMDLs, particularly when compared to the scope of what is required in the proposed regulations, suggest that the adoption of the proposed EPA regulations are inappropriate at this point in time. We believe a more humble approach is in order; one that recognizes little is actually known about where the TMDL approach embodied in the proposed regulations is effective given the wide range of pollutants, sources of problems, contextual situations, variability in state and local capacity, and differences in governance arrangements. Rather than repeating the Section 208 experience and being halfway through implementing the regulations before learning these lessons, we believe EPA should take a more adaptive approach, one that emphasizes experimentation, learning, and capacity building.

We recommend that EPA begin developing the capacity necessary for such efforts. At the same time, EPA and state environmental agencies should begin to experiment with the TMDL approach and various requirements in the proposed regulations to examine a variety of important variables that might dictate whether TMDLs are an effective pollution control strategy. These include, but are not limited to: point and nonpoint sources; listed and non-listed waters (i.e., explore its ability to be used proactively); different pollutants; different scales (e.g., stream segments, subbasins, and larger watersheds); qualitative and numeric state water quality standards; areas where social capital exists (e.g., areas with established watershed councils or programs) and where no previous efforts exist; areas where data exists and areas where data does not exist; explore the usefulness of a variety of modeling procedures; and explore different approaches to developing implementation plans that include "reasonable assurances." EPA should then commission independent researchers to evaluate and compare these efforts in order to gain a better understanding of the strengths and weaknesses of the TMDL approach, where it is most useful, the costs of developing and implementing the TMDLs, and the capacity needs of state environmental agencies. Congress could then amend the CWA and EPA could promulgate a set of revised regulations that reflects these lessons. Congress and EPA might also consider waiving the TMDL requirements if state and local officials can demonstrate that they have developed a collaborative program that systematically addresses these problems, is based on performance measures, and has the capability to monitor progress towards these measures. That would create an important incentive that could help expand collaborative watershed management and NPS control efforts.

RECOMMENDATIONS

- EPA should postpone promulgating its proposed TMDL regulations. Congress should impose a temporary moratorium on new TMDL lawsuits pending the promulgation of new regulations. EPA and state environmental agencies should then begin an aggressive effort to experiment with the development of TMDLs and implementation plans such as those contained in the proposed regulations. The "experiments" should be done for: point and nonpoint sources; listed and non-listed waters (i.e., explore its ability to be used proactively); different pollutants; different scales (e.g., stream segments, subbasins, and larger watersheds); qualitative and numeric state water quality standards; areas where social capital exists (e.g., areas with established watershed councils or programs) and does not exist; areas where data exists and does not exist; explore the usefulness of a variety of modeling procedures; and explore different approaches to developing implementation plans that include "reasonable assurances." EPA should then commission independent researchers to evaluate and compare these efforts to gain a better under-

standing of the strengths and weaknesses of the TMDL approach, where it is most useful, the costs of developing and implementing the TMDLs, and the capacity needs of state environmental agencies. The revised regulations should reflect those lessons. Congress should then amend the CWA and modify the applicability of the TMDL requirements based on these lessons.

- In formulating revised TMDL regulations, EPA should provide additional flexibility for waiving the requirements if state and local officials are engaged in collaborative efforts that address NPS problems provided that the efforts develop specific goals and take actions designed to systematically address these problems. The programs should also have a monitoring system to evaluate progress towards the performance measures. That would provide an incentive to state to expand watershed management efforts that address point and NPS pollution.

- Congress should consider the development of a new NPS control program such as the one proposed in the final section of this report. The program should attempt to consolidate federal NPS programs, be collaborative in nature, emphasize regulatory and nonregulatory approaches, reflect state and local priorities, emphasize the development of state and local capacity, emphasize a systematic approach to addressing specific NPS problems rather than funding loosely connected projects, emphasize performance and environmental monitoring, and have a sizable and flexible source of implementation funding that is consistent with other recommendations in this report. Congress should then amend the CWA's TMDL provisions such that nonpoint sources of pollutants are not subject to those requirements.

- EPA should require that all future estuary programs develop TMDLs for point sources of pollution as part of their planning process. While EPA is experimenting with TMDLs in the manner noted above, EPA should use estuary programs as laboratories to experiment with different types of TMDLs for point and NPS pollutants.

- EPA should develop guidance for decisionmakers and the public that explains the process used to develop TMDLs. The guidance should explain the basics of water quality modeling, the types of assumptions used, the data limitations, and the sensitivity of the models. The guidance should also explain the commonly recognized strengths and weaknesses of "systems" models. The purpose of the guidance should be to educate those officials who may be involved in TMDLs, but who do not understand how the computer models work.

OTHER ACTIONS TO IMPROVE THE USE OF THE WATERSHED APPROACH

Our analysis of the six watershed management efforts and the examination of the role of other federal programs suggested several additional actions by the president, Congress, and EPA that would support state and local watershed management efforts and facilitate efforts to address problems such as NPS pollution and habitat degradation and loss.

RECOMMENDATIONS

- The president should sign an executive order directing all federal agencies to participate in and cooperate with state and local watershed management efforts to the full extent allowed under current law. The order should allow federal agencies to enter into

relationships with collaborative organizations for the express purpose of improving environmental conditions. It should also require that the goals, policies, and priorities of a state and local watershed management efforts should override those of a federal agency, to the maximum extent allowed by law. The executive order should ensure that the priorities of federal NPS grant programs should reflect the priorities of state and local governments. It should also direct agencies to support efforts to build the capacity of state and local governments to address environmental concerns to the greatest extent allowed under current law.

- The president, Congress, and EPA should limit the use of the budget process and executive action (e.g., CWAP) to create new watershed management efforts that are not debated, have no enabling legislation, have unclear linkages to existing federal, state, and local programs, and require state and local government action by linking the program to existing federal funding.

- Congress and EPA should examine whether the current organization of EPA and its regional offices is an effective implementation structure with respect to addressing NPS water quality problems. Congress and EPA should consider adopting an organizational structure similar to the USDA's system of state and local offices.

What Should Congress Do to Address NPS Problems?

Watershed management efforts such as those analyzed in this report can help stimulate the individual and collaborative implementation activities necessary to achieve some improvement in environmental conditions. The efforts also can develop the capacity of state and local institutions to address environmental problems such as NPS pollution and habitat loss and degradation. However, watershed management is not the only tool for addressing these problems and not all NPS problems will best be addressed at the watershed level. For example, the Delaware Inland Bays and Tillamook Bay cases illustrate how nonpoint source problems can be addressed at the industry level through the imposition of new regulations. The cases also demonstrate the limits of trying to rely on a single policy instrument (e.g., regulation) to address the problems. Instead, the watershed management efforts relied on a wide range of policy instruments such as land use planning, regulation, infrastructure investment, and education that were implemented by a wide range of agencies at the federal, state, and local level. In some cases, the actions were tied directly to the watershed while in other cases implementation activities occurred on a broader regional scale or on a statewide basis.

The cases also illustrate the complex environmental governance system that has developed over the past few decades with numerous federal, state, and local programs addressing the problems of NPS pollution and habitat loss and degradation. While much f this system is good, there are problems, particularly in the area of NPS control. The current system of federal NPS programs is fragmented and does not encourage collaboration between programs within and across federal agencies. The federal programs often fail to fully appreciate the context specific nature of the problems and the tremendous variations in state and local capacity to address them. The grant programs are structured in a manner that encourages funding a collection of isolated and loosely connected projects rather than systematically addressing specific problems. Moreover, federal priorities embedded in the grant programs tend drive state and local implementation efforts instead of state and local priorities.

Options Confronting Congress and EPA

Given the pervasive nature of problems such as NPS pollution and habitat loss and degradation and the problems with the governance system, the question becomes what should Congress do about the problems? One option is to do nothing. An argument can be made that the problems are inherently the responsibility of state and local officials and not that of the federal government. However, if that is the case, then it also follows that Congress should not mandate state or local action to address the problems and the CWA should be revised accordingly.

The second option is a status quo position. Congress and EPA could continue to recognize that NPS and habitat loss and degradation are "national" problems, but maintain the position that the problems do not warrant a significant investment of federal resources. In pursuing that option, Congress and EPA would continue making minor modifications to existing federal programs such as some of the actions recommended in the report. They could also continue to rely on small-scale grant programs that are often symbolic in nature and represent a form of "green pork" that can be distributed across states and congressional districts. Congress and EPA could also decide that the best course of action is greater reliance on CWA regulatory requirements. However, the efforts to develop the 20,000 TMDLs required by EPA's proposed TMDL regulations and the efforts to develop NPDES stormwater permits for increasingly smaller municipalities will come at high cost and will require the redeployment of agency resources to these efforts. It is unclear what effect this might have on other EPA water quality programs. Our analysis also raised questions about the efficacy of the TMDL approach and on relying primarily on a regulatory approach to address existing NPS problems. If Congress and EPA continue to pursue that course of action at existing funding levels, it is important to recognize that the current goals and expectations are unrealistic. Progress addressing these problems will be slow, take several decades, and vary considerably across the states.

The third option is more ambitious. Congress and EPA could recognize that addressing NPS pollution is the next great national challenge to improving the nation's water quality. Pursing that option would require devoting the political capital necessary to change the existing set of government programs and implement some of the more ambitious recommendations contained in the report. It would also require a significant increase in the federal resources devoted to these problems. It is likely to require a federal investment equal in scope and duration to the CWA construction grant program in order to address the problems in a comprehensive and systematic manner.

The question then becomes what would a new national NPS program look like? The following sections speculate about that and were modeled on the collaborative efforts we examined at the state and local level.

National NPS Control Program

At a minimum, we believe the program should reflect the inherently intergovernmental and context specific nature of NPS problems and be built around state and local priorities. It would also involve more than simply spending more money in current programs or tightening existing regulations. The current system of water quality programs was designed more than a quarter of a century ago when little was known about NPS problems and more than a decade has passed since the last revisions to the CWA. Much has transpired since then. State and local capacity to address NPS problems has expanded considerably. In fact, state and local officials rather than federal programs were the source of many of the innovations noted in the case

studies. Many state and local respondents identified the current system of federal programs as providing obstacles to addressing NPS problems effectively. In particular, many respondents noted that the current system for funding NPS efforts was ineffective. Instead, they argued that they needed greater flexibility in the design and administration of the program, that a regulatory approach to addressing NPS problems (e.g., TMDL proposals) would be problematic, and that more funding was needed to address the problems, and that funding priorities and eligibility requirements should address state and local needs. We tend to agree. We also believe the program should be designed to replace a number of existing NPS and watershed management programs in EPA, NOAA, and USDA. We also believe that the program would require a substantial increase in federal funding to address NPS problems. However, the cost savings resulting from the elimination of federal programs should offset most of the administrative costs and a portion of the program's implementation funding.

The program should also be designed to encourage collaboration and reflect the inherently intergovernmental nature of NPS problems and the reality that a wide range of federal, state, and local programs would be involved in implementation efforts. One possibility would be to use an approach similar to that used in four of the cases and create a new collaborative organization. This could be accomplished by creating a new federal commission to administer the new NPS control program. The membership of the commission could consist of the administrators (or their designee) of EPA, NOAA, DOI, DOT, USDA, DOD, the Bureau of Indian Affairs, and the Corporation for National Service. It could also include some collection of congressional and presidential appointees and should be designed to be nonpartisan in nature. The commission could also have two standing advisory committees. The first would be a scientific and technical advisory committee consisting of technical experts from various federal, state, and local government agencies, NGOs, and researchers. The second would be a public advisory committee consisting of equal representation from industry and environmental interest groups. The commission would appoint the director and staff. While the agency would be housed in Washington, D.C., it should have staff detailed to each state where they could be colocated with their state and local counterparts. The commission could also use staff details and IPAs to encourage staff exchanges among federal, state, and local agencies to develop a "partnership" mentality and a "culture of collaboration." An aggressive mentoring and training program could also help in staff development.

We envision such a program as consisting of five components: (1) a two-tiered state-level NPS control program; (2) watershed management efforts to help states address regional problems and prevent threatened waterbodies from becoming impaired; (3) a concerted effort to develop a real performance-monitoring program; (4) a concerted effort to encourage volunteerism and participation of NGOs; and (5) an effort to provide the research and technical assistance necessary to develop and implement effective programs. The following sections speculate about how this program could be structured.

Nonpoint Source Control

The heart of the effort would be a NPS control program that placed increased responsibility for priority setting in the hands of state and local officials.[221] States would be free to design any institutional mechanism it wanted to administer the program. Each state would be required to develop a statewide strategy (or a series of regional or basinwide strategies packaged together) for systematically addressing nonpoint source problems in impaired and threatened watersheds. The objective of the statewide strategy would be to "hold the line" and prevent future

problems due to NPS pollution and prevent "threatened" waters on the CWA Section 303(d) list from becoming "impaired." A statewide strategy would then be developed that emphasized implementation rather than planning, systematic problem-solving rather than projects, and relied on various policy instruments implemented by different levels of government to meet CWA water quality standards. The strategy would have to contain enforceable timelines and benchmarks. Failure to adhere to those timelines would subject a state to a citizen's suit provision that would allow a variety of legal remedies, including the ability for EPA or state environmental agencies to develop the equivalent of a TMDL and require implementation actions. Accordingly, the detailed strategies would be similar in nature to the proposals for an implementation plan contained in the proposed TMDL recommendations[222] and be more detailed in scope and substance than the strategies currently developed pursuant to the Section 319 NPS program.[223]

The statewide strategy could be the framework document with individual strategies (i.e., detailed plans) describing how a state would address specific NPS problems in all impaired waterbodies on the state's Section 303(d) list. The individual strategies would be developed over a 10-year timeframe. The individual strategies would detail actions above and beyond those in the statewide strategy and would be analogous to the additional management measures and critical area provisions of Section 6217 of the CZARA. The strategies could be developed on a pollutant-by pollutant, source-by-source, or watershed basis (using the program described below) depending on the problem(s) and other contextual factors. Each state would be free to build upon its particular framework of programs and reflect the capacity of existing state and local institutions.

When developing the strategies, TMDLs and other modeling techniques could be used in conjunction with other activities. However, the goal is not planning but determining the steps necessary to remove the waterbody from the list of impaired waters. The strategies should clearly articulate the activities needed and contain annual benchmarks and measures of success and progress over the lifetime of the implementation effort, which could last between three and 10 years depending on the size of the drainage area. After that, compliance and maintenance of the water quality standards and funding the efforts would become a state and local responsibility. The approval of the strategies would make them eligible for predefined, multi-year implementation grants of from three to 10 years. Significant lack of progress towards implementation or achieving the benchmarks should result in the loss of implementation funding and trigger a citizen suit provision that would allow EPA or a judge to compel action.

To help finance implementation, two long-term funding sources could be created that would last approximately 20 years, roughly equivalent to the Construction Grant Program. The first would be a construction grant program with significant non-federal, hard-match requirements but provisions to offer assistance to rural and low-income communities. The funding should go only to governmental organizations and eligible NGOs to fund environmental projects. Larger investments such as the construction of central sewer systems to remove OSDSs would continue to be funded through current programs such as the current CWSRF program. The second funding source would be a new CWSRF program designed to provide subsidized low-interest loans to landowners and businesses to implement BMPs and other investments described in the strategies. The funding for both efforts should be block-granted to the states to provide maximum flexibility. Congress and the states could also make changes to the IRS tax code such as tax credits and changes in depreciation schedules to create additional incentives for landowners and industry to implement BMPs.

Watershed Management

In order to develop individual strategies on a regional basis and help prevent threatened waters from becoming impaired, the new national NPS control program should also facilitate the development of watershed management strategies. This program should build upon the lessons learned in the NEP. Instead of mandating the use of a "stakeholder" or "collaborative" model, a specific decision rule (i.e., consensus), or any type of participation structure, the program should allow state and local officials to structure the processes in any manner necessary to develop a watershed management strategy that would be similar in scope and content to the individual strategies described in the previous section. The efforts should also be free to address other environmental or social issues if the participants feel it would help achieve their goals and allow them to develop an effective strategy. Some principles that could guide the watershed management component of the program are:

- The program should emphasize strategic plans that focus on a limited number of problems, setting goals and targets, and monitoring collective progress towards the goals. The main goal should be to remove impaired waters from the Section 303(d) list and prevent threatened waters from becoming impaired.

- State and local officials should be encouraged to link actions to improve environmental conditions to other social issues whenever possible to encourage collaboration and build support for the effort.

- The NPS control program should fund only established collaborative organizations with a history of working together so that the implementation structure is in place before planning begins. The NPS control program should provide seed money to help form collaborative groups.

- The planning process should be short, no more than two to three years. It should be strategic in nature and have measurable targets for implementation. The implementation process should last the equivalent of the time allowed for the individual strategies noted in the previous section.

- The NPS control program should have minimal approval requirements and instead emphasize accountability for improving environmental conditions.

- A match in real dollars or dedicated FTEs should be required to ensure that the partners in the collaborative organization are contributing their own resources to the effort. If the state or local officials are unwilling to spend their own money then the federal government should not fund the effort. Some provisions for disadvantaged communities should be made.

These principles are somewhat different than the structure of the NEP, but they are consistent with the findings and recommendations in this report. When the NPS control program described in the previous section has approved the watershed management plan, it should become eligible for the implementation funding consistent with that provided for individual strategies. Failure to demonstrate progress would trigger similar citizen-suit provisions and should lead to the termination of implementation funds.

Performance Monitoring

The third component would be a performance-monitoring program designed to replace existing environmental monitoring programs (e.g., Section 305(b) report). States would be required to track the implementation of both their state and individual strategies. That would include improving the monitoring of environmental conditions. It would also be necessary to collect performance data such as information on the number of permits and enforcement actions, BMPs, conservation plans, forest practices, habitat restoration projects, stormwater and erosion controls, marina BMPs, and other hydromodifcations. This information should be geographically referenced using GPS or other technologies and take full advantage of the latest information technology. To make the monitoring system useful to state and local officials, the system should link data on environmental and social conditions with performance monitoring data. That would allow federal, state, and local officials to monitor the progress of the NPS control program as well as progress towards other federal, state, and local priorities. States should have the flexibility to determine how the information management system is developed and organized in accordance with accepted federal data standards and ensure that the data could be aggregated or disaggregated at different geographic scales. However, data should be collected at the most detailed scale practicable so that they are useful to the broadest range of public officials.

The major obstacle to developing this integrated system is not technological. It is rather the poorly developed information management systems described in earlier sections of the report. A major component of the effort would therefore be block grants to state and local entities to support data integration, build information management capacity, encourage innovative approaches to linking data systems, and to explore the power of the information technology that is currently being developed. It should also fund a variety of efforts at the state and local level to improve our understanding about the cost-effective ways to update and integrate data systems. These pilot efforts could help guide the development of state and local monitoring systems. Funding would also be required to collect environmental data and construct GIS coverages at finer scales. The volunteer efforts described in the following section could assist in these efforts and help reduce the overall costs of the monitoring program.

Volunteer Programs

The fourth component should be a systematic attempt to expand volunteer efforts. Volunteers and NGOs could play a valuable role in collecting environmental data and assisting in implementation efforts. One thing Congress could do is to create a modern version of the conservation corps, perhaps as a new program in the Corporation for National Service or as a component of AmeriCorps. The objective would be to organize volunteer-led implementation activities and establish environmental monitoring programs where they are needed. An effort could also be made to build upon existing university-based service learning programs to provide additional volunteer support. The Sea Grant Program and Cooperative Extension System could also play important roles in organizing the groups, doing the analysis, and performing the requisite QA/QC. Other ways that volunteers and NGOs could also assist the program would be collecting programmatic data, inputting narrative data into a database, and monitoring implementation activities. Volunteers and NGOs could also play a role in efforts to install BMPs and undertake habitat restoration projects. Accordingly, the NPS control program should be structured in a manner that made some NGOs eligible to apply for implementation grants.

Research and Technical Assistance

The final component should be sponsoring the research and providing the technical assistance necessary to support the development and implementation of the state NPS control programs. The research program should be designed to provide policy-relevant information and include policy formulating demonstrations, research targeted at developing performance measures or other indicators, developing inventories that identify priority sites for habitat restoration, or developing other information needed by federal, state, and local officials. Only research consistent with the research needs section of a state strategy should be eligible for funding and the emphasis should be on projects that are transferable to other areas. To foster scientific research and encourage the involvement of the academic community in the effort, Congress could create a new research program in NSF or perhaps develop a grant program similar to the current EPA/NSF Star Partnership. The program should encourage scientific research in the environmental area as well as social science research that informs state and local decisionmakers. In terms of technical assistance, the commission could play an important role in disseminating existing guidance materials, developing new materials, and diffusing information between state and local governments. All research reports and guidance materials should be made available on the Internet.

Summary and Conclusions

Each watershed management effort met with varying degrees of success and was able to demonstrate some ability to improve environmental conditions, enhance watershed governance, or add other public value. Lake Tahoe and the Salt Ponds resulted in innovative regulatory programs while Tampa Bay developed a collaborative partnership with "binding" commitments for nutrient reductions and habitat restoration. Tillamook Bay developed a collaborative organization and specific targets for actions designed to reduce bacterial loadings and restore salmon habitat. Delaware Inland Bays developed a new collaborative organization that enhanced communication between organizations and improved the capacity for research, education, and habitat restoration activities. Narragansett Bay managed to overcome some formidable obstacles and achieved a few notable accomplishments. Those accomplishments were the result of the perseverance, fortitude, creativity, and ingenuity of various individuals and organizations that should be complemented for the hard work, dedication, and the entrepreneurial spirit that allowed their watershed management efforts to survive and flourish.

We concluded that participatory planning and collaboration emerged as the dominant strategies used to improve environmental conditions and enhance the governance of the watersheds. The reliance on these tools is a reflection of the inherently intergovernmental nature of problems such as NPS pollution and habitat loss and degradation. The last 30 years have witnessed the development of a complex framework of programs at the federal, state, regional, and local level that address those problems. Each program tends to adopt parochial solutions and rely on a limited set of policy instruments. Unfortunately, the interlocking system of parochial solutions does not address some complicated, context-specific problems such as NPS pollution and habitat loss and degradation effectively.

Addressing intergovernmental problems is therefore as much a problem of "governance" involving multiple organizations at different levels of government, as it is a question of science and designing effective policies. As a result, it is important to understand the ecology of the governance system in order to develop and implement an effective watershed management effort.

Each watershed management effort involved a different pattern of implementation activity conducted by a variety of federal, state and local institutions. The important role that state and local programs played also reflects the changing nature of federalism and underscores the fact that significant capacity has developed in state and local institutions since the early 1970s. In fact, our analysis suggests that state and local officials were the main sources of policy innovation not the federal government. However, rather than encourage innovation, the current environmental governance system is dominated by federal priorities and controls that impose constraints on the ability of state and local officials to innovate; a source of great frustration to many of our respondents.

The capacity to address problems such as NPS pollution and habitat loss and degradation is now widely dispersed across a set of actors located at different levels of government. Today, "it is often difficult for any one actor, or group of actors, to manage, or manipulate, the flow of problems and solutions onto the political agenda in the first place. Thus, there are complex multi-actor processes for both the identification, definition and resolution of policy problems, and for the implementation of policy."[225] We also concluded that it was difficult to address these problems with a single policy instrument such as regulation. Instead, the experiences of these cases suggests that a wide range of policy instruments is more effective and that there is no one "best" way to design or implement a watershed management program.

The intergovernmental nature of NPS pollution was another reason that collaboration emerged as an important strategy for undertaking the actions necessary address this problem. However, Congress, EPA, and practitioners are cautioned to use the strategy of collaboration wisely. Even when opportunities for collaboration exist, it may not be a good idea. Collaboration is merely a strategy that must be used wisely. When used incorrectly or inappropriately, collaboration can create more problems than it solves. Collaborative decisionmaking can distort information or participants may bargain to the lowest denominator such that no group's interests are threatened – and nothing changes as a result. Collaboration also has the potential to increase transaction costs because it is time consuming, costly, and can stimulate a wide range of strategic behavior. Collaboration should be valued only if it produces better organizational performance or lower costs than can be achieved without it.[226] We would join with Bardach (1998) in offering the following advice:

"We should not be impressed by the idea of collaboration per se. That collaboration is nicer sounding than indifference, conflict, or competition is beside the point. So, too, is the fact that collaboration often makes people feel better than conflict or competition. I do not want to oversell the benefits of interagency collaboration. The political struggle to develop collaborative capacity can be time consuming and divisive. But even if no such struggle were to ensue, the benefits of collaboration are necessarily limited."[227]

The shortage of resources necessary for collaboration and the reality of how federal grants are allocated to address NPS problems are also formidable constraints on the ability of state and local officials to effectively employ this strategy. The most creative and imaginative practitioners will also find themselves constrained by a federal system that places programs at the federal, state, and local level in conflict with one another because these programs often represent different constituencies and have competing or conflicting values and missions. There will also be an underlying tension about whether federal, state, regional, or local priorities should guide decisionmaking. Because those fundamental conflicts exist, there will be limits on how much actors at each level of government can and should be willing to sacrifice for the sake of collaboration, no matter how noble the goal.[228]

Consequently, "collaboration" will not solve all of the nation's NPS problems or fix all of the governance problems in a watershed. There will continue to be the need for unilateral and legislative action whereby differences in priorities and policies that come into conflict with one another from time to time and are debated as each agency tries to advance its goals and protect its constituencies. Such conflict is healthy and represents the essence of our federal system. It

Acknowledgements

This project was funded pursuant to a grant from the National Academy of Public Administration pursuant to their Learning from Innovations in Environmental Protection project (EPA Project No. 68-W-98-211, NAPA Project No. 1815-70X). We are grateful to all of the staff at the Academy, particularly DeWitt John, Rick Minard, and Judi Greenwald and the panel members who have offered useful comments and insights that have improved the quality of this report. We also wish to thank Anne Ruffner Edwards for her editorial assistance. We appreciate also the support given us by the School of Public and Environmental Affairs and the Institute for the Study of Government and the Nonprofit Sector at Indiana University and the Departments of Marine Affairs and Political Science at the University of Rhode Island for their support.

We thank our research assistants, Derek Kauneckis, Leslie Koziol, Katheryn Summers, and Sally McGee for their tireless efforts to help collect and analyze the data contained in the final report and the supporting case studies. This report is as much a product of their efforts as our own. We would also like to thank Bob Agranoff for the intellectual guidance he provided in grappling with the question of how best to evaluate these collaborative efforts. We would also like to thank the members of the other watershed management teams, Stephen Born, Ken Genskow, Caron Chess, and Bob Adler, for sharing their ideas about watershed management with us during the course of the project.

We are also grateful to the wide range of individuals and agencies associated with the watershed management efforts in the Delaware Inland Bays, Lake Tahoe, Narragansett Bay, Salt Ponds, Tampa Bay, and Tillamook Bay for taking the time away from the busy schedules and sharing with us their insights, wisdom, and experiences. These individuals and organizations deserve a great deal of credit for overcoming the challenges associated with developing and implementing this watershed management program. We are grateful that these individuals were willing to provide the valuable information contained in this report and the supporting case studies. Special thanks go to the individuals that took the time to comment on earlier drafts of the final report and supporting case studies. The quality of the final report and supporting case studies is much improved as a result of these comments.

Finally, we wish to note that the views, opinions, and conclusions described in this report and the supporting case studies do not necessarily reflect those of the authors' affiliations, or those of any individual or organization that reviewed and commented on its contents.

Endnotes

1 EPA questioned why these problems are inherently intergovernmental in nature and noted that there is a perception that these problems are not subject to government authority. In fact, many of these problems are regulated directly or have government programs that address these public problems. Additional actions to address these problems will require the establishment of either new regulatory or nonregulatory programs in governmental agencies or NGOs. Our point is that these programs are often located at different levels of government and in different government agencies.

2 W. Odum, "Environmental Degradation and the Tyranny of Small Decisions" *Bioscience* 32 (1982), 728 – 729.

3 Qualitative approaches are often recommended when you want to understand how a process occurs or to examine complex relationships between decisionmaking processes, physical settings, community characteristics, stakeholders' interests, existing institutional arrangements, availability of resources, and the capacities of state, regional, and local actors. Qualitative research employs an intense investigative process that contrasts, compares, replicates, catalogues, and classifies objects and events to provide decisionmakers with the information necessary to improve program performance. As a result, qualitative evaluations tend to be descriptive and focus on explaining why a process is, or is not, effective and how different contextual factors influence the success of that process. For more information on approaches to qualitative analysis see: Norman K. Denzin, and Yvonna S. Lincoln (eds.), *Strategies for Qualitative Inquiry* (Thousand Oaks, CA: Sage Publications, 1998); Norman K. Denzin, and Yvonna S. Lincoln (eds.), *Collecting and Interpreting Qualitative Materials* (Thousand Oaks, CA: Sage Publications, 1998); Joseph A. Maxwell, *Qualitative Research Design: An Interactive Approach* (Thousand Oaks, CA: SAGE Publications, 1996); Sharon L. Caudle, "Using Qualitative Approaches," in Joseph S. Wholey, Harry P. Hatry, and Kathryn E. Newcomer (eds.) *Handbook of Practical Program Evaluation* (San Francisco, CA: Jossey-Bass Publishers, 1994); Matthew B. Miles and Michael A. Huberman, *Qualitative Data Analysis: An Expanded Sourcebook*. Second Edition (Thousand Oaks, CA: SAGE Publications, 1994); Mary Ann Scheirer, "Designing and Using Process Evaluation," in Joseph S. Wholey, Harry P. Hatry, and Kathryn E. Newcomer (eds.) *Handbook of Practical Program Evaluation* (San Francisco, CA: Jossey-Bass Publishers, 1994); Anselm Strauss and Juliet Corbin, *Basics of Qualitative Research: Grounded Theory Procedures and Techniques* (Newbury Park, CA: SAGE Publications, 1990); and, Michael Quinn Patton, *Qualitative Evaluation and Research Methods*, Second Edition (Newbury Park, CA: SAGE Publications, 1990).

4 Maxwell, *Qualitative Research Design*; Miles and Huberman, *Qualitative Data Analysis*; Scheirer, "Designing and Using Process Evaluation"; and, Patton, *Qualitative Evaluation and Research Methods*.

5 Mark T. Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: The Institutional Analysis and Development Framework," *Environmental Management* 24 (1999): 449 – 465.

6 For some discussion of the IAD framework and its application in environmental settings see: Elinor Ostrom, Roy Gardner, and James Walker, *Rules, Games, & Common-Pool Resources* (Ann Arbor, MI: The University of Michigan Press, 1994); Elinor Ostrom, Larry Schroeder, and Susan Wynne, *Institutional Incentives and Sustainable Development: Infrastructure Policies in Perspective* (Boulder, CO: Westview Press, 1993); Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (New York, NY: Cambridge University Press, 1990); Elinor Ostrom, "An Agenda for the Study of Institutions," *Public Choice* 48 (no. 1, 1986): 3 – 25; Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management"; Mark T. Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons From the Rhode Island Salt Ponds SAM Plan," *Coastal Management* 27(no. 1, 1999): 31 – 56; Sue E. S. Crawford, and Elinor Ostrom, "A Grammar of Institutions," *American Political Science Review* 89 (no. 3, September 1995): 582 – 600; Timothy M. Hennessey, "Governance and Adaptive Management for Estuarine Ecosystems: The Case of Chesapeake Bay," *Coastal*

Management 22 (1994): 119 – 145; Mark H. Sproule-Jones, *Governments At Work: Canadian Parliamentary Federalism and Its Public Policy Effects* (Toronto, Canada: University of Toronto Press, 1993);William Blomquist, *Dividing the Waters: Governing Groundwater in Southern California* (San Francisco, CA: ICS Press. 1992); and, Larry L. Kiser and Elinor Ostrom, "The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches," in Elinor Ostrom (ed.) *Strategies for Political Inquiry* (Beverly Hills, CA: Sage, 1982), 179 – 222.

7 While some of the individuals that commented on this report and the case studies questioned our use of this procedure, it is actually a standard way to conduct qualitative research and university regulations pertaining to human subjects often require researchers to protect the anonymity of their respondents.

8 See: Mark T. Imperial, *Developing Integrated Coastal Resource Management Programs: Applying the NEP's Experience to Developing Nations* (Kingston, RI: University of Rhode Island, Coastal Resources Center, July 1995). The discussion of the NEP contained in this report and some of the data gathered on this project was the basis for a subsequent article on the NEP. See: Mark T. Imperial and Timothy M. Hennessey, "An Ecosystem-Based Approach to Managing Estuaries: An Assessment of the National Estuary Program," *Coastal Management* 24 (no. 1, 1996): 115 – 139.

9 In 1989, Hennessey worked as a subcontractor for Arthur D. Little, Inc., which had been hired by the Governor's Environmental Quality Study Commission and issued its report in 1990 (Environmental Study Commission, *Environmental Quality Study Commission Final Report* (Providence, RI: Office of the Governor, 1990).

10 Miles and Huberman, *Qualitative Data Analysis*.

11 Ibid.

12 Richard Rose, *Lesson-Drawing in Public Policy: A Guide to Learning Across Time and Space* (Chatham, NJ: Chatham House Publishers, Inc., 1993).

13 Triangulation involves using independent measures derived from different sources to support, or at least not contradict, a research finding. For more information see: Miles and Huberman, *Qualitative Data Analysis*; and, Robert K. Yin, *Case Study Research: Design and Methods*, Second Edition (Thousand Oaks, CA: SAGE Publications, 1994); and, Royce A Singleton, Jr., Bruce C. Straits, and Margaret Miller Straits, Approaches to Social Research, Second Edition (New York, NY: Oxford University Press, 1993), 324 – 327.

14 Yin, *Case Study Research*.

15 Thomas D. Cook and Donald T. Campbell, *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. (Boston, MA: Houghton Mifflin Company, 1979).

16 Several EPA and estuary program staff we interviewed suggested that the three-year and in some cases four-year timeframes are too short. While it has worked in some estuary programs where previous collaborative efforts have developed a significant amount of social capital, it has been problematic in other situations. Our data suggested that you simply cannot rush a collaborative process because it takes time to develop these relationships.

17 This is often the result of shorter timeframes. Estuary programs do not have the time to conduct new research and collect large-scale efforts to collect new data. Instead, they are forced to rely on existing data and previous characterization efforts.

18 RIDEM's participation in implementing the Salt Ponds SAMP could be described historically as one of being a reluctant partner. It resisted implementing many of the plan's original OSDS recommendations and only did so a result of political pressure. Little attempt was made to implement the recommendations pertaining to improved fisheries management. RIDEM participates only sporadically in the informal permit review process and has a mixed history with respect to complying with other agreements with the CRMC. For example, the two agencies negotiated an MOU that would

require RIDEM to require the installation of denitrification OSDSs and review projects for consistency with other CRMC recommendations. Our data suggests that RIDEM did not adhere to the terms of the MOU. More recently, the two agencies negotiated an MOU to coordinate the review of projects that impact both freshwater and coastal wetlands. Implementation appears to be more constructive. RIDEM has also targeted Section 319 funds at installing alternative OSDSs and supports volunteer water quality monitoring efforts. It is too soon to accurately characterize RIDEM's implementation of specific recommendations in the CRMC's revised SAMP. However, we have every reason to believe that the experiences will encounter a similar range of successes and problems. For example, the CRMC had RIDEM develop the revised SAMP's chapter on living resources and when the plan was released for public comment this chapter was criticized by RIDEM. We believe this summary of activities as well as the detailed technical supports support our conclusion that RIDEM's participation in SAMP's implementation has been mixed.

19 The final draft underwent a public comment period from January through March of 1992 during which time the NBEP staff held several public meetings throughout the watershed on the CCMP.

20 These organizations also include Newport, East Providence, Town of North Smithfield, Rhode Island Department of Economic Development, Narragansett Bay Commission, Rhode Island Shellfishermen's Association, Rhode Island Society of Environmental Professionals, Kickemuit Rivers Council, Rhode Island State Planning Council Technical Committee, and various other NGOs, government organizations, and citizens. For the comments on the draft CCMP see: Narragansett Bay Project (NBP), *Comprehensive Conservation and Management Plan for Narragansett Bay Appendices*, State Guide Plan Element 714, Report Number 71 (Providence, RI: NBP and RIDOP, September 1992), Appendix E.

21 The level of conflict exhibited by the comments on the draft CCMP exceeds that of any of our cases including the Delaware Inland Bays where critical comments primarily involved the Sierra Club, EPA, and the Poultry industry with many others being supportive in nature. What is striking about the comments on the NBP's CCMP is that a wide range of groups commented on a broad range of issues and in some cases where one might thing groups would be opposed to one another (e.g., Sierra Club and poultry groups opposed in Delaware Inland Bays) the groups were critical of the same things. We believe that the breadth and scope of these comments confirms the information provided by our respondents that many organizations were dissatisfied with the draft CCMP and the planning process did not result in a consensus document, although there was more agreement on the content of the final CCMP. Conversely, the comments on the draft Tampa Bay and Tillamook Bay CCMPs were different in tone. While there were certainly criticisms and changes requested by a wide range of agencies, there was little substantive disagreement on core issues with the vast majority of issues addressed by clarifications and wording changes such as changing "shalls" to "shoulds." The only case involving greater conflict was the watershed management efforts in Lake Tahoe that resulted in lawsuits and a court injunction that prohibited the Tahoe Regional Planning Agency (TRPA) from implementing its plan.

22 Narragansett Bay Project (NBP), *Comprehensive Conservation and Management Plan for Narragansett Bay Final Report*, State Guide Plan Element 714, Report Number 71 (Providence, RI: NBP and RIDOP, December 1992), 5-95.

23 Many of our respondents also suggested that many of these actions were actually initiated as a result of other policy initiatives and actions to improve the administration of existing programs rather than being designed to implement the CCMP's recommendation. It is questionable whether these activities should be classified as implementation activities. This conclusion is documented in the Narragansett Bay technical report.

24 EPA staff and NBEP staff who commented on this draft report and the draft of the Narragansett Bay technical report consistently maintained that the CCMP is being implemented because there has been some progress towards the 41 high-priority actions. As noted earlier, much of this activity is only loosely related to the actual recommendations or only partially implements the recommendations. The respondents were nearly uniform in their position that the original NBP partners were no longer

implementing the CCMP. The NBEP staff maintain they are still implementing the CCMP because their activities advance the CCMP's goals and address issues in the CCMP. They also claim that they are implementing the goals of annual work plans. They did not claim to be implementing specific CCMP recommendations. The fundamental problem with this rationale is that the CCMP's goals are so general and the plan addresses nearly every environmental issue either directly or indirectly. Therefore, any activity by any agency can be classified as an implementation activity as long as it does not degrade environmental conditions. The NBEP's actions should not be designed to advance work plan goals rather the work plan goals should be designed to implement CCMP recommendations. The Implementation Committee is not actively involved in developing work plans so the goals are also an inappropriate basis for guiding staff activities. Recent calls for the development of a new Bay plan and the need to develop white papers in support of the Narragansett Bay Summit are further evidence that the priorities and issues have changed and that the CCMP is no longer used as a policy document that guides agency decisionmaking. Finally, not one respondent other than NBEP or EPA staff stated that they were currently using the CCMP or found it to be a useful policy document.

25 One problem is that attendance at meetings is sporadic and the committee meets infrequently, only one to two times per year on average. The Implementation Committee also does not serve many of the functions specified in the CCMP. It has not done a good job of "overseeing the progress of CCMP implementation." It is not "facilitating the adoption of relevant portions of the CCMP into agency policies, plans, and regulations." It is not "coordinating agency requests for external funding . . . to implement the CCMP." It is not "participating in the review of federal activities for consistency with the CCMP." Moreover, the CCMP recommended that the NBEP staff (referred to as a Narragansett Bay planning section in the CCMP) should support Implementation Committee activities and that staff may be reassigned to other implementation authorities to support planning and implementation committees. This has not occurred. Instead, the Implementation Committee is designed to support NBEP staff activities and advises the staff. This is a different relationship between staff and the Implementation Committee than the one envisioned in the CCMP. Moreover, the vision recommended in the CCMP is more similar to the relationship between staff and the advisory committees in the three other estuary programs that rely on collaborative organizations. See: NBP, *Comprehensive Conservation and Management Plan for Narragansett Bay*, 5.6 – 5.7.

26 While no record of decision was reached, EPA staff reported that they were ready to disapprove the CCMP right up until the morning of the signing ceremony. This sequence of events is described in the technical report.

27 n its comments on the draft report, EPA correctly noted that the CCMP contains a description of the CIB. However, the CIB was created by the General Assembly in 1994 and the concept for the implementation entity evolved considerably from original proposals and the draft CCMP was completed much earlier than the final form of the CIB. Thus, the CCMP was not designed to be a policy document that would guide the organization's decisionmaking. In fact, one of the first actions of the CIB was to undertake another effort to set implementation priorities. The priorities of other actors have now changed and while some of the priorities in the CCMP continue to guide implementation, others are no longer being pursued.

28 Only small portions of Polk, Pasco, and Sarasota counties are within the watershed. Because of the limited land areas, small population, and rural nature of these areas, they are small contributors to Tampa Bay's water quality and habitat problems. These counties had limited involvement in the Tampa Bay Estuary Program.

29 Regulation and enforcement comprised 5.4 percent or $13.5 million of total expenditures. Habitat restoration, preservation, and management totaled about $7 million or 2.8 percent of budgets not including the cost of land acquisition, which comprised another 3.9% of the budgets. Dredging and dredged materials management (2.6%), environmental monitoring (1.8%), public education (.5%), and program administration (.9%) comprised the remaining expenditures.

30 In its comments on the draft report EPA commented that the main reason the planning process too longer than expected was due to the realization that air deposition was a primary nitrogen source.

This statement is not supported by the data. Not one respondent identified this as the main reason that the planning process took longer than expected and instead were unanimous in reporting the aforementioned cause for the delay.

31 In its comments on the draft report, EPA commented that "staff problems should be more specifically phrased as staffing changes." This would be incorrect and actually supports our findings in later sections of the report that state that EPA liaisons need be more aware of the administrative problems experienced by estuary programs so that they can provide better technical assistance. In this instance, the high staff turnover is simply a symptom of a much wider range of problems that included poor leadership, problems in staff supervision, the lack of appropriate mechanisms for resolving staff grievances, and insecurity in funding created by EPA's annual funding. These and other problems discussed in the technical report were the problems that resulted in staff turnover. In addition, other problems also occurred that could not be discussed without revealing the identity of our informants.

32 This refers to the amount of time the average drop of water resides in the lake and contributes to the ecological response to nutrient loading.

33 Interstate compacts are legally binding agreements between two or more states and the US Congress created to address problems that transcend state lines. The process of interstate compact creation is often lengthy because all parties must agree to identical compacts. Compacts can be amended granted all parties agree to the amendments.

34 It is important to note that approximately one year earlier the new statewide RICRMP was adopted. This version of the RICRMP benefited from the research in the Salt Ponds region and adopted some of the policies recommended in SAMP on a statewide basis.

35 Westerly was initially reluctant to amend its zoning ordinances and had minimal involvement in the plan's development. However, based on the experience of the other three municipalities and pressure from nongovernmental organizations, Westerly decided to join the management plan. The CRC prepared recommended zoning changes and these changes were amended to the plan in 1986.

36 The HMP helps communities improve the management of recreational boating activities, identifies public access sites for the CRMC's designation, and integrates local land use planning with the CRMC's regulatory policies.

37 There is no county government in Rhode Island.

38 EPA comments on the draft report suggest that the government actors from Massachusetts were never supposed to be significantly involved in that portion of the watershed. That statement is not true and is inconsistent with other comments and information provided by respondents. The CCMP is also clearly written in a manner that assumes involvement in Massachusetts. Moreover, if it were the case, it raises questions about why EPA assumes the NBP/NBEP can effectively address the watersheds problems when 60 percent of the causes of these problems are not addressed.

39 For more information and overview of some of the precursors to the National Estuary Program see: Mark T. Imperial, Donald Robadue, Jr., and Timothy Hennessey, "An Evolutionary Perspective on the Development and Assessment of the National Estuary Program," *Coastal Management* 20 (no. 4, 1992): 311-341; and, Mark Imperial, Timothy Hennessey, and Donald Robadue, Jr., "The Evolution of Adaptive Management for Estuarine Ecosystems: The National Estuary Program and its Precursors," *Ocean and Coastal Management* 20 (no. 2, 1993): 147-180.

40 In the case of Delaware Inland Bays and Tampa Bay, these efforts had a strong relationship to the watershed management efforts while in Narragansett Bay and Tillamook Bay little relationship with the watershed management efforts was reported.

41 While this is obviously a generalization, it is a fairly accurate one that cut across all six cases. In part it is a natural by-product of large bureaucracies and program specialization at the federal level. For example, it is even evidenced by the very nature of the comments on this report where different EPA officials commented on their specific program rather than on our report as a whole. In fact, very few

comments pertained to the non-EPA programs discussed in this report. Another example that is discussed in more detail later in the report is that EPA liaison to the estuary programs were often unaware of requirements and activities undertaken by related programs such as the Section 319 program.

42 One EPA official who commented on this report questioned why environmental infrastructure investment in sewers is not considered a regulatory activity. We think it is more appropriately classified as non regulatory. Most of the activities are not specifically required by regulation. Moreover, while EPA and state environmental agencies do have the authority to require the installation of sewers to reduce water quality problems from failing OSDSs, this is actually a rare occurrence. For example, this option was not pursued in the case of Greenwich Bay as is discussed in the Narragansett Bay case study. Instead, the actors voluntarily chose a $130 million bond referendum to largely pay for the installation of sewers to remove failing OSDSs. Moreover, recent takings decisions have made federal and state officials less willing to impose injunctions to prohibit development until sewers of problems from OSDSs are corrected. An example of that can be found in the Delaware Inland Bays.

43 Eugene Bardach, *Getting Agencies to Work Together: The Practice and Theory of Managerial Craftsmanship* (Washington, DC: Brookings Institution Press, 1998), 8.

44 Barbara Gray and Donna J. Wood, "Collaborative Alliances: Moving from Practice to Theory," *Journal of Applied Behavioral Science* 27 (no. 1, 1991), 3 – 22.

45 The lack of specificity with which terms like collaboration, coordination, and integration are used both in the academic literature and by practitioners is problematic. For a discussion of these problems see: Donald Snow, "Collaboration: What are We Talking About?" *Natural Resources Environmental Administration* (1999), 4 – 7.

46 This categorization is based upon the three levels of action proposed by Kiser and Ostrom (1982). See: Larry L. Kiser and Elinor Ostrom, "The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches," in Elinor Ostrom (ed.), *Strategies for Political Inquiry* (Beverly Hills, CA: Sage, 1982), 179 - 222.

47 There are a wide range of factors that influence the willingness or capacity for actors to become engaged in collaborative activities. Studies of interorganizational relationships suggest that the attributes of individual organizations such as their culture (e.g., attitudes towards change) structure (e.g., formalization, centralization, task specialization), resources (e.g., slack resources. staff expertise and training, etc.), and strategy (e.g., innovativeness, boundary spanning, etc.) can influence the potential for interorganizational coordination (Ernest R. Alexander, *How Organizations Act Together: Interorganizational Coordination in Theory and Practice*, (Gordon and Breach Publishers, 1995)). The same literature suggests that the symmetries or asymmetries of interdependence among organizations (Alexander, *How Organizations Act Together*; and, Richard H. Hall, *Organizations: Structures, Processes, and Outcomes*, Sixth Edition (Englewood Cliffs, NJ: Prentice Hall, 1995)) will influence interorganizational coordination. In addition, research on social network analysis argues that the position within the network influences the patterns of interaction (e.g., Stanley Waserman and Katherine Faust, *Social Network Analysis: Methods and Applications* (New York, NY: Cambridge University Press, 1994)). Research also suggests that organizations may relate in permanent functional networks or in temporary project-based or ad hoc networks (Myrna P. Mandell, "Network Management: Strategic Behavior in the Public Sector," in Gage, Robert W. and Myrna P. Mandell (eds.), *Strategies for Managing Intergovernmental Policies and Networks* (Westport, CT: Praeger, 1990), 29 – 53) and managers may be involved in over-lapping networks that influence one another (e.g., Robert Agranoff and Michael McGuire, "Multi-Network Management: Collaboration and the Hollow State in Local Economic Policy." *Journal of Public Administration Research and Theory*. 8 (No. 3, January 1998), 67-91; and, Hans Bressers, Laurence J. O'Toole, Jr. and Jeremy Richardson (eds.), *Networks for Water Policy: A Comparative Perspective* (London, England: Frank Cass & Co, 1995)). Moreover, some collaborative activities are preparatory to others (Bardach, *Getting Agencies to Work Together*).

48 The operational level described here is similar to that proposed by Kiser and Ostrom (1982). Organizations functioning at the operational level take direct action or adopt strategies for future action depending on expected contingencies. Basically, actors are free to take action without prior agreement of other actors. Accordingly, most of the direct activities of organizations such as permitting, planning, construction of environmental infrastructure, installation of BMPs, public education, water quality monitoring, and issuing grants are operational level activities. They create a wide range of potential opportunities for collaboration. Frequently, these activities were guided by the collaborative activities that occurred at the policymaking level.

49 The policymaking level is analogous to the collective-choice level (Kiser and Ostrom, "The Three Worlds of Action"). The policymaking level is the world of collective decisions that determine, enforce, continue, or alter actions. It would also include plans for future action. The key is that there is some ability to enforce these decisions whether it is through a formal or legally binding process or through some sort of social peer pressure mechanism. Thus, these activities can serve to guide or constrain activities as the operational level. Conversely, they may synthesize and add additional value to activities that occur at the operational level.

50 EPA questioned why Narragansett Bay is not included here. The answer is that the NBEP does not *regularly* report on implementation efforts. It has only undertaken one effort to report on the progress towards the 41 high-priority recommendations and reported no intention to become engaged in an effort to monitor progress towards the plan's other 460 recommendations. Efforts to identify implementation activities conducted by agencies other than RIDEM and NBEP staff were limited. The information is not widely distributed, as was the case in the other three programs. The CCMP also does not contain specific goals.

51 While EPA encourages estuary programs to report on the status towards specific recommendations and the progress towards their goals, it does not require it. The NBEP did not report on progress in its 1997 biennial review and only reported on the progress of its 41 high-priority actions in 1999. See: Narragansett Bay Estuary Program (NBEP), *1999 Biennial Review: Narragansett Bay Estuary Program* (Providence, RI: RIDEM, NBEP, May 1999).

52 The institutional/capacity building level is analogous to the constitutional level (Kiser and Ostrom, "The Three Worlds of Action"). The institutional/capacity building level involves developing the rules that will govern future collective choice level decisions. Therefore, institutional level choices involve making decisions that constrain the development of future policymaking and operational level activities. Organizing a collective enterprise or collaborative organization is an institutional level action because membership in this organization presumably has consequences that constrain the future policymaking and operational level actions. These constraints can either be formal or legal requirements (e.g., Delaware Inland Bays, Lake Tahoe, Salt Ponds, and Tampa Bay) or it may be based on social norms (e.g., Salt Ponds, Tampa Bay, and Tillamook Bay) (the Salt Ponds and Tampa Bay are a mixture of both).

53 Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons."

54 Bardach, *Getting Agencies to Work Together*.

55 Our discussion of the value added by these activities builds on: Bardach, *Getting Agencies to Work Together*; and, Mark H. Moore, *Creating Public Value: Strategic Management in Government* (Cambridge, MA: Harvard University Press, 1996).

56 Our techniques for drawing these lessons follow those recommended in the literature: Rose, *Lesson-Drawing in Public Policy*.

57 The assessment also revealed the nested nature of collaboration and helps to illustrate how some activities are preparatory to others (Bardach, *Getting Agencies to Work Together*, 20).

58 The concept of "collaborative capacity" is a useful concept for practitioners (Bardach, *Getting Agencies to Work Together*). It helps draw attention to the fact that collaboration often begins with small efforts

and expands over time. Often it appears to follow a trial and error process as practitioners discover ways to add public value through collaborative efforts. Collaborative planning also appears to be another mechanism that spurs the development of collaborative activity. An effort such as a new collaborative organization can provide the institutional infrastructure that future collaborative efforts can build upon. The capacity concept also draws attention to the potential problems that inhibit the utilization this capacity for collaboration. The question for practitioners is whether they are able to exploit the opportunities for collaboration that exist in a manner that adds public value. One way value is added is through improved environmental outcomes. As illustrated in the following section, this is only one of many ways that value is added. Collaboration can also create costs and problems.

59 EPA comments on the draft and final report question why it is unquestionable in the Lake Tahoe case but questionable in Tampa Bay and suggest that it has to do with the lack of watershed management activity in Lake Tahoe. This is not the case. There is actually a longer history of watershed management activity in Lake Tahoe than Tampa Bay. The reason it is unquestionable in Lake Tahoe is that it is reasonable to conclude that there would be more houses in the watershed today if TRPA did not adopt its growth restriction. The question in Tampa Bay is different so the answer is different. It is unclear how much NPS activity increased because there was already a great deal of activity occurring.

60 For a discussion of these problems see: Robert Costanza, Bryan G. Norton, and Benjamin D. Haskell, 1992. *Ecosystem Health: New Goals for Environmental Management* (Washington, DC: Island Press, 1992).

61 These problems are further complicated by the fact that there are differing assumptions about stability and change in ecological systems and how these changes should be modeled (C. S Holling, "What Barriers? What Bridges.," in Gunderson, Lance H., C. S. Holling, and Stephen S. Light (eds.), *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. New York, NY: Columbia University Press, 1995), 3 – 34).

62 This list of criterion is not by any means exhaustive. Rather, they focus on those criterion that were of interest to the Academy. For a discussion of other criterion that can be used to assess institutional performance of watershed governance programs and the importance of examining the transaction costs associated with these institutional arrangements see: Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management"; Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"; and, Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development.*

63 This is important because preferences for centralized institutional arrangements are often rarely questioned and tend to be supported by truncated analyses that fail to consider the full range of transaction costs or benefits associated with these arrangements. Practitioners should not to fall into the trap of thinking that specific institutional arrangements (e.g., markets or hierarchies) necessarily improve policy outcomes. When the full range of transaction costs are considered, decentralized or polycentric (i.e., networked) arrangements may be more effective. It is also important for practitioners to understand that there is no direct causal linkage between institutional performance and policy outcomes and that there may be a disconnect between the performance of an institutional arrangement and its ability to achieve desired environmental outcomes. For example, you could have a well-functioning institutional arrangement with a flawed underlying policy unable to achieve the desired outcomes. Moreover, given the emphasis on collaborative or "networked" approaches to implementing these programs, it is important to assess performance form the perspective of different actors since measures of success might change from actor to actor. See: Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management"; and, Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons."

64 Accountability "involves the means by which public agencies and their workers manage the diverse expectations generated within and outside the organization (Barbara S. Romzek and Melvin J. Dubnick, "Accountability in the Public Sector: Lessons from the Challenger Tragedy." in Frederick S. Lane (eds.) *Current Issues in Public Administration*, Fifth Edition (New York, NY: St. Martin's Press, 1994), 160)."

65 Gormley (1994) proposed looking at accountability as lying along a continuum (William T. Gormley, Jr., "Accountability Battles in State Administration," in Frederick S. Lane (eds.) *Current Issues in Public Administration*, Fifth Edition (New York, NY: St. Martin's Press, 1994)). Catalytic controls tend to stimulate change but bureaucratic discretion is retained (e.g., public meetings, public comment periods, lay representation on a board). The other end of the continuum would be coercive controls that stimulate change and limit bureaucratic discretion by requiring a specific action, which sometimes causes bureaucratic resistance or circumvention (e.g., judicial review, legislative oversight, directives). Hortatory controls lies somewhere in between these two sets of mechanisms. They often involve more pressure than catalytic controls but provide bureaucrats with more discretion in how they respond (e.g., sunset laws, reorganization, partial preemption, cross-over sanctions). Their efficacy often depends on the credibility of the threat (Gormley, "Accountability Battles in State Administration," 146 - 148).

66 Catalytic controls tend to stimulate change but bureaucratic discretion is retained (e.g., public meetings, public comment periods, lay representation on a board) (Gormley, "Accountability Battles in State Administration," 146). The other end of the continuum would be coercive controls that stimulate change and limit bureaucratic discretion by requiring a specific action, which sometimes causes bureaucratic resistance or circumvention (e.g., judicial review, legislative oversight, directives) (Gormley, "Accountability Battles in State Administration," 148). Hortatory controls lies somewhere in between these two sets of mechanisms. They often involve more pressure than catalytic controls but provide bureaucrats with more discretion in how they respond (e.g., sunset laws, reorganization, partial preemption, cross-over sanctions). Their efficacy often depends on the credibility of the threat (Gormley, "Accountability Battles in State Administration," 147).

67 The scope and substance of these monitoring and reporting efforts are very different than those in Narragansett Bay which reports primarily on the activities of its staff and it only has provided a one-time analysis of the progress made towards the CCMP's 41 high-priority recommendations as part of the biennial review. See: NBEP, *1999 Biennial Review*. The activity reported here is above and beyond that included in the biennial reviews and is distributed more broadly to the public. While the NBEP has periodically produced annual reports, the reports are focused on describing activities and accomplishments not the progress (both good and bad) towards specific CCMP goals and recommendations.

68 In this case, a controlling actor (e.g., legislature, external agency, judge) outside the organization imposes requirements on the actors within an organization (Romzek and Dubnick, "Accountability in the Public Sector," 161). These relationships are often based on a fiduciary relationship.

69 Romzek and Dubnick, "Accountability in the Public Sector," 161.

70 Ibid.,162.

71 Regardless of the constituency, an administrator is expected to be responsive to its priorities and needs (Romzek and Dubnick, "Accountability in the Public Sector," 162).

72 EPA Region I comments on the draft report denied that RIDEM was designed to protect the interests of a constituency group and stated at RIDEM was created to implement federal environmental laws and is often opposed by organized constituency groups and special interests. We believe that is incorrect. RIDEM was not created specifically to implement federal environmental laws and does not currently exist to exclusively implement environmental laws. The agency maintains the state parks system and implements state statutes that regulate freshwater wetlands and OSDSs that exceed any federal standards or requirements. RIDEM does in fact protect the interests of various organized constituency groups and special interests that are focused on environmental protection and public health. At the federal level this might include groups like the Sierra Club and Natural Resources Defense Council and at the state level groups such as Save the Bay. The comment is correct in its assertion that there are other groups that are opposed to RIDEM. In fact, the point made here and in the technical report is that these groups often align themselves in such a manner that makes collaboration more difficult. During the NBP CCMP's development, it was not uncommon for groups like

the Rhode Island Marine Trade Association to align themselves with the CRMC, which might be in conflict with RIDEM on an issue. Finally, there is a broad political science literature that supports the notion of competing coalitions of interest groups and agencies. See: Paul A. Sabatier and Hank C. Jenkins-Smith, "The Advocacy Coalition Framework: An Assessment," in Paul A. Sabatier (ed.), *Theories of the Policy Process* (Boulder, CO: Westview Press, 1999), 117 – 166; Paul A. Sabatier and Hank C. Jenkins-Smith, *Policy Change and Learning: An Advocacy Coalition Approach* (Boulder, CO: Westview Press 1993); Paul A. Sabatier, "Toward Better Theories of the Policy Process," *PS: Political Science and Politics* 24 (no. 2, June 1991), 147-156; and, Paul A. Sabatier, "An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein," *Policy Sciences* 21 (1988), 129-168.

73 For development of the concept of policy-oriented learning see: Sabatier and Jenkins-Smith, *Policy Change and Learning*.

74 Unless institutional arrangements have the capacity to respond to their ever-changing environments, institutional performance is likely to suffer (Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management"; Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: lessons"; and, Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development*, 112 - 116). Reflected here are concerns similar to those who argue for adaptive approaches to ecosystem-based or community-based management which encourage learning and institutional innovations (e.g., C. L. Smith, J. Gilden, and B. S. Steel, "Sailing the Shoals of Adaptive Management: The Case of Salmon in the Pacific Northwest," *Environmental Management* 22(no. 5, 1998), 671 – 681; Holling, "What Barriers? What Bridges"; C. S Holling, *Adaptive Environmental Assessment and Management* (New York, NY: John Wiley and Sons, 1978); Lance H. Gunderson, C. S. Holling, and Stephen S. Light. (eds.), 1995. *Barriers and Bridges to the Renewal of Ecosystems and Institutions* (New York, NY: Columbia University Press, 1995); K. N. Lee, "Deliberately Seeking Sustainability in the Columbia River Basin." *in* L. H. Gunderson, C. S. Holling, and S. S. Light (eds.), *Barriers and Bridges to the Renewal of Ecosystems and Institutions* (New York, NY: Columbia University Press, 1995), 214 – 238; K. N. Lee, *Compass and Gyroscope: Integrating Science and Politics for the Environment* (Washington, DC: Island Press, 1993); K. N. Lee, "Rebuilding Confidence: Salmon, Science, and Law in the Columbia Basin," *Environmental Law* 21 (1991), 745 – 805; K. N. Lee, and J. Lawrence, "Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program," *Environmental Law* 16 (1986), 431 – 460; and, C. Walters, *Adaptive Management of Renewable Resources* (Macmillan Publishing Company, New York, 1986)). Many of these researchers argue that environmental management efforts should be treated as policy experiments where the policies are modified and changed as more is learned about the policy's effectiveness. In support of these arguments, Holling has also noted that rigid, centralized attempts to manage ecosystems often led to their collapse (Holling, "What Barriers? What Bridges"; and, Holling, *Adaptive Environmental Assessment and Management*). Thus, there is reason to question the frequent assumption that centralized institutional arrangements result in more effective natural resource management.

75 EPA disagreed, stating that every year through the work plan process goals are reaffirmed or new goals are developed. There are several problems with the proposed process. First, work plans are supposed to be oriented towards implementing a CCMP. If implementing the work plan is synonymous with implementing a CCMP, why develop a CCMP in the first place? Second, the NBEP notes in its biennial review that the implementation committee is largely advisory in nature, it meets infrequently, and often has only limited involvement in the development of the work plans. Third, EPA comment does not indicate what basic principal or goal the changes in the work plan goals are designed to achieve. Changing goals is not the same things as the type of adaptation implied by the measure. Finally, a CCMP is a public document and its goals and recommendations apply to a wide range of actors and it is a public document. Work plans apply only to NBEP staff and are not distributed to the public, although they are available upon request.

76 Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York, NY: John Wiley, 1990); and, Peter M. Haas, "Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control," *International Organization* 43 (1989), 376 – 403.

77 For a discussion of some of the different types of capacity that are important in the management of state environmental programs see: Lani Lee Malysa, "A Comparative Assessment of State Planning and Management Capacity: Tidal Wetlands Protection in Virginia and Maryland," *State and Local Government Review* 28 (no. 3, Fall 1996), 205 – 218; and, Lauriston R. King and Steven G. Olson, "Coastal State Capacity for Marine Resources Management," *Coastal Management* 16 (No. 4, 1988), 305 – 318. For more discussion of some of the different ways the capacity concept has been defined see: Malysa, "A Comparative Assessment of State Planning and Management Capacity"; and, Beth W. Honadle, "A Capacity Building Framework: A Search for Concept and Purpose," *Public Administration Review* 41 (no. 5, Sept./Oct 1991), 575 – 580.

78 Malysa, "A Comparative Assessment of State Planning and Management Capacity," 206.

79 Hennessey, "Governance and Adaptive Management for Estuarine Ecosystems."

80 Ibid.

81 They also recognized that installing sewers could result in systematically drawing down groundwater since much of the region is served by well water.

82 This was noted in an EPA comment on the draft report explaining why the NEP does not address other social issues.

83 Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management"; and, Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: lessons."

84 EPA's comments on the final report claim that the estuary programs already do that. In actuality, estuary programs only address other social issues in so far as they are directly related to reducing environmental risks. For example, in Tillamook Bay, EPA had the TBNEP remove flooding recommendations that did not directly relate to reduced environmental risks. The point of this recommendation is to allow estuary programs to systematically address public policy issues rather than only the environmental component of an issue. We believe this will help prevent estuary programs from failing to recognize the important tradeoffs that can exists while helping them build more effective coalitions to support CCMP implementation.

85 Problems do not exist when there is no dissatisfaction (i.e., a discrepancy between "what is" and "what ought to be") and the desired state is not attainable (i.e., there is no conceivable solution) (David Dery, *Problem Definition in Policy Analysis* (Lawrence, KA: University Press of Kansas, 1984), 17).

86 Dery, *Problem Definition in Policy Analysis*, xi.

87 Charles E. Lindblom and David K. Cohen, *Usable Knowledge: Social Science and Social Problem Solving* (New Haven, CT: Yale University Press, 1979), 50; Lisa V. Bardwell, "Problem Solving: A Perspective on Environmental Problem-Solving," *Environmental Management* 15 (no. 5, September/October 1991), 603 – 612; and, David A. Rochefort and Roger W. Cobb, "Problem Definition, Agenda Access, and Policy Choice," *Policy Studies Journal* 21 (no. 1, 1993), 56 - 71.

88 The relationship between humans and nature has been the focus of a great deal of philosophical discourse (e.g., Michael E. Zimmerman, J. Baird Callicott, George Sessions, Karen Warren, and John Clark, *Environmental Philosophy: From Animal Rights to Radical Ecology*, Second Edition (Upper Saddle River, NJ: Prentice Hall, 1998); Matthew Alan Cahn and Rory O'Brien (eds.), *Thinking About the Environment: Readings on Politics, Property, and the Physical World* (Armonk, NY: M. E. Sharpe, 1996); Lester. W. Milbrath, *Envisioning a Sustainable Society: Learning Our Way Out* (Albany, NY: State University of New York Press, 1989); and, L. Caldwell, "The Ecosystem as a Criterion for Public Land Policy," *Natural Resources Journal* 10(2, 1979), 203 - 221). Some ardent environmentalists view ecological systems in purely objective terms and see humans as intruders and destroyers of these systems.89 At the other end of the continuum, are those individuals who view environmental problems in purely subjective terms. This view argues that both human and ecological systems are constantly changing and that environmental problems are no different than other social problems in policy areas like crime, poverty,

health, transportation, and education. Such philosophical differences can lead individuals to adopt very different perspectives on the nature and causes of environmental problems (Lamont C. Hemple, *Environmental Governance: The Global Challenge* (Washington, DC: Island Press, 1996)).

90 The "precautionary principle" advocated by many environmentalists is one example of their high tolerance for risk and a willingness to err on the side of acting in the face of uncertainty while industry is often more risk averse and is often reluctant to act in the face of uncertainty if there is the potential to suffer economic costs.

91 For a discussion of the parameters of problems see: Rochefort and Cobb, "Problem Definition, Agenda Access, and Policy Choice."

92 The Narragansett Bay technical report notes that the failure to identify a focal problem cause problems. Moreover, while the CCMP ended up including 41 high-priority actions, this was established by a voting procedure that allowed different groups to ensure that their "pet" issue was included on the list. Some actors (e.g., EPA and Save the Bay) actually required that CSOs be included as a priority issue as a condition of the CCMP's approval even though the science did not support this determination.

93 Haas, *Saving the Mediterranean*; and, Haas, "Do Regimes Matter?."

94 A standard EPA response reflected in their comments on the draft report was that the two competing approaches provided a measure of flexibility that could allow the different approaches to be used in different situations. Unfortunately, as discussed in the TMDL section of this report, the two approaches are likely to be used in the same situations as evidenced by the fact that all six watershed management efforts in this study contained waters on the Section 303(d) list. Moreover, the proposed TMDL recommendations would require TMDLs in these watersheds and these requirements would supercede those developed by a collaborative watershed management effort.

95 Alvin M. Weinberg, "Science and Trans-Science," *Minerva* 10 (no. 2, April 1972), 209 – 222; and, A. Miller, "The Role of Analytical Science in Natural Resource Decisionmaking," *Environmental Management* 17(no. 5, 1993), 563 – 574.

96 Scientific information is "acquired by individuals through education and/or experience about the *regularities* of relationships among key variables rather than the particular state of those variables in a specific context (Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development*, 50)." Examples include research on how ecological systems function and the effects of contaminants on these systems.

97 Many respondents actually noted that many decisions were made without the assistance of this research and that scientific information often had little impact on decisionmaking.

98 EPA's comments on the final report suggested that governor's nomination process already requires this. Our recommendations suggest a greater level of activity than is currently occurring. In fact, our cases suggest that the governor's nomination was less effective at doing this than was having a history of previous watershed planning efforts.

99 EPA comments on this report question how this proposal is either flexible or adaptive. We see nothing in the proposal that would prevent EPA from taking a flexible or adaptive approach. Separating funding sources might allow for increased specialization that would improve the benefits resulting from these expenditures. At the same time, it could be done in a manner that increased flexibility and nothing prevents EPA from delegating that authority to regional offices. However, it would likely increase the transaction costs of approving annual work plans. We believe these additional costs would be offset by the improved transferability of research results.

100 For a discussion of the roles and limitations of incorporating science into the policy process see: Michael Healey and Timothy M. Hennessey, "The Utilization of Scientific Information in the Management of Estuarine Ecosystems," *Ocean & Coastal Management* 23 (1994), 167 - 191.

101 The results of some studies can even serve as focusing events that stimulate much discussion and debate. This was also observed in the Delaware Inland Bays case.

102 For greater discussion of how focusing events can raise issues and get them on the public agenda see: Kingdon, J, *Agendas, Alternatives and Public Policies* (Boston, MA: Little Brown, 1984); and Cobb, R. and C Elder, *Participation in American Politics* (Baltimore, MD: Johns Hopkins Press, 1983).

103 Information asymmetries are another reason why low-cost mechanisms (e.g., collaborative and advisory committee planning models) to facilitate communication, make decisions, and resolve conflicts between scientists, agency officials, interest groups and the public are needed. Reducing information asymmetries is also a reason why many ecosystem-based programs give a high-priority to public involvement (e.g., citizen advisory committees, focus groups, public meetings, workshops) and education (e.g., newsletters, fact sheets, videos) activities.

104 For a discussion of how policy-oriented learning can lead to policy changes see: Sabatier and Jenkins-Smith, *Policy Change and Learning*.

105 The uncertainty also means that farmers have received mixed messages from scientists and extension agents over the years. For decades, farmers were told not to worry about phosphorus loadings because it was a nitrogen-limited system and there were fears that excessive nitrogen loadings would contaminate drinking water wells. Therefore, most nutrient management efforts focused on controlling nitrogen. The scientific consensus has now changed and more attention is focusing on phosphorus loadings. This fact combined with the continually changing advice regarding BMPs causes many farmers to question the credibility of scientists and agency officials. It also allows agricultural groups to say that if you were wrong once you might be wrong again.

106 EPA CMB comments questioned how collaboration and public participation can occur if the research agenda is included in the governor's nomination. There are many ways this can occur. The authors would encourage EPA to change its nomination requirements to only accept nominations submitted by collaborative organizations (as defined in this report) and to require public participation in the development of a nomination package to address their concerns. See: EPA, *The Streamlined National Estuary Program: Instructions on the Preparation of a Governor's Nomination* (Washington, DC: Environmental Protection Agency, Office of Water, December 1994); and, EPA, *The National Estuary Program: Final Guidance on the Contents of a Governor's Nomination* (Washington, DC: EPA, Office of Water, January 1990).

EPA's comments on the final report suggested that it already requires this to be included in a governor's nomination. What is recommended involves more than simply identifying gaps in existing research and outlining a general research strategy. We believe a more focused research agenda, which clearly identifies policy-relevant questions, is needed.

107 EPA's final comments on the report question why you would separate planners and advocates from scientists in such a committee. Our response is that one need not do this. As TBEP demonstrated, you can often blend these participants. Interestingly, the NEP's recommended management conference structure is designed specifically to do what EPA's comments recommend against doing as the model structure separates the scientists, advocates, and decisionmakers. Such a functional separation is not inherently good or bad but rather depends on how the overall structure is designed and managed.

108 Time and place information refers to the knowledge "acquired by individuals who know the nature of a particular physical and social setting (Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development*, 50)."

109 This is a common finding and argument in both public participation and environmental justice research. See: Mark T. Imperial, "Environmental Justice and Water Pollution Control: The Clean Water Act Construction Grants Program." *Public Works Management & Policy* 4 (no. 2, October 1999): 100 – 118; and, Mark T. Imperial, *Public Participation in the National Estuary Program: A Descriptive and Empirical Analysis*, Masters Thesis (Kingston, RI: Department of Marine Affairs, University of Rhode Island, May 1993).

110 Natural Resource Conservation Service (NRCS), *Inland Bays Hydrologic Unit Area Project: Final Report* (Dover, DE: NRCS, October 1998).

111 Ibid.

112 The documents currently available are an outdated *Saving the Bays and Estuaries: A Primer for Establishing and Managing Estuary Programs* (discussed elsewhere in the report), the volunteer monitoring guidance and a community profiling guidance, both of which are not really applicable to developing and implementing effective public involvement and outreach programs. There is clearly a wealth of experience that could form the basis for additional guidance materials for practitioners involved in other watershed management programs.

113 Lee, *Compass and Gyroscope.*

114 Michael D. Cohen, James G. March, and Johan P. Olsen, "A Garbage Can Model of Organizational Choice," *Administrative Science Quarterly* 17 (no. 1, March 1972), 1 - 25.

115 Ibid.

116 Ibid.

117 Dennis J. Palumbo, and Steven Maynard-Moody, *Contemporary Public Administration* (New York, NY: Longman, 1991).

118 The presence of a focal issue is important because research on policy networks suggests that the composition of interorganizational networks (IONs) is a function of the issues addressed (Bressers, O'Toole, and Richardson, *Networks for Water Policy*). For example, the individuals and organizations involved in agricultural issues may be very different than those involved in habitat protection.

119 Palumbo, and Maynard-Moody, *Contemporary Public Administration.*

120 Obviously, collaborative decisionmaking based on majority-rule will yield very different outcomes than decisionmaking based on consensus (Palumbo, and Maynard-Moody, *Contemporary Public Administration*). These rules will also lead to different forms of strategic behavior.

121 For example, the plan could serve as a vehicle for advancing a shared vision or resolving conflict or it could serve as a means of legally binding participants to a future course of action (Selin and Chavez 1995). The plan's future status is likely to significantly influence the nature of the strategic behaviors of participants involved in decisionmaking.

122 Participants may view compromise as watering down an organization's mission. There could also be relational factors that complicate the use of collaborative decisionmaking. For example, some of the participants could have been bitter adversaries in the past, which could make it difficult to reach agreement. There could also be important power differences among the participants (Steve Selin and Deborah Chavez, "Developing a Collaborative Model of Environmental Planning and Management," *Environmental Management* 19 (no. 2, 1995), 189 - 195.). It is also important to note that obstacles to interorganizational coordination can be particularly difficult to overcome when: 1) conflict is the result of basic ideological differences; 2) one or more stakeholders has the authority to take unilateral action; 3) constitutional issues or precedents are sought; 4) past decisionmaking efforts were unsuccessful; and, 5) issues are threatening because of past conflict (Barbara Gray, *Collaborating: Finding Common Ground for Multiparty Problems* (San Francisco, CA: Jossey-Bass, 1989); and, Selin and Chavez, "Developing a Collaborative Model of Environmental Planning and Management").

123 Opinion leadership is the degree to which an individual can influence other individuals' attitudes or overt behavior (Everett. M. Rogers, *Diffusion of Innovations*, 4th ed. (New York, NY: Free Press, 1995), 354). There are two types of opinion leadership. Polymorphism (polynuclear) is the degree to which an individual (or organization) acts as an opinion leader for a variety of topics. Monomorphism (mononuclear) is the degree to which an individual acts as an opinion leader for a single topic (Rogers, *Diffusion of Innovations*, 293).

124 Most human communication involves the exchange of ideas among individuals who are alike, homophilous individuals. Research often finds that diffusion networks are homophilous because communication is often more effective (Rogers, *Diffusion of Innovations*, 287). Heterophily is the opposite of homophily. It is the degree to which the individuals who interact are different in certain attributes (Rogers, *Diffusion of Innovations*, 287). Heterophilous communication also has important information potential because it connects socially dissimilar individuals. While homophilous communication facilitates the diffusion of an innovation within a network, Heterophilous communication can accelerate the diffusion across networks (Rogers, *Diffusion of Innovations*, 288).

125 Transaction costs are likely to increase as you increase the number of bargaining partners and the number of routine interactions (M. Levi, "A Logic of Institutional Change," *in* K. S. Cook and M. Levi (eds.), *The Limits of Rationality* (Chicago, IL: University of Chicago Press, 1990), 403). They can also increase when asymmetries of information and power exist. Thus, as jurisdictional complexity increases and actors' interests become increasingly heterogeneous, transaction costs may increase (Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management").

126 Coordination costs are the sum of the costs invested in negotiating, monitoring, and enforcing agreements about the development and implementation of a resource management plan (Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development*, 120). A number of factors could increase coordination costs. Participants may lack the flexibility in agency procedures necessary to implement agreements or change the allocation of agency resources.

127 Turf refers to the exclusive domain of activities and resources over which an agency has the right to exercise operational or policy responsibility (Eugene Bardach, "Turf Barriers to Interagency Collaboration," *in* D. F. Kettl and H. Brinton Milward (eds.), *The State of Public Management.* Baltimore, MD: The Johns Hopkins University Press, 1996), 168 – 192). In many respects, "turf" is the actualization of our federal system in which agencies located at different levels of government are issued directives to perform specified functions. In many instances, programs are designed to protect certain constituency groups or interests. The overlap in functions and conflicts between these organizations is an important part of our federal system (Vincent Ostrom, *The Intellectual Crisis in American Public Administration*, Second Edition (Tuscaloosa, AL: The University of Alabama Press, 1989); and, Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"). All else being equal, the individual or organizational preference is likely to be towards maintaining or increasing turf since it secures the agency's strategic position and enhances long-term survival by developing continued support from these constituency groups and the legislators that control the organizations resources (Bardach, "Turf Barriers to Interagency Collaboration," 177).

128 Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management."

129 Bardach, "Turf Barriers to Interagency Collaboration," 178 –179

130 Staff may view the collaborative activities as a threat to their staffing levels or job security. This appears to be a particular problem when there are few slack resources and upper level management does not recognize or reward collaboration. In these instances, line managers are often reluctant to allocate their staff collaborative efforts when they might not get rewarded or could get penalized if they fail to meet management's expectations in core program areas. This phenomenon was observed in most of the state water quality agencies. Many of these agencies have an organizational culture that in not supportive of collaborative efforts and they often view these activities as threats to their existing resources.

131 Another threat may be the challenge to individual or agency's expertise. One of the consequences of collaborative activities is that they expand the decisionmaking domain and validate new opinions. Thus, actors will often have to give up some of their claim to professional expertise and validate the opinions and expertise of other actors. In our Rhode Island cases, this appears to be one of the obstacles to collaboration between RIDEM and the CRMC. As the CRMC has developed its technical expertise over the last 15 years, RIDEM has resisted acknowledging this expertise or sharing decisionmaking with the agency.

132 Another threat to an actor's turf is through the loss of policy direction. Many collaborative activities result in shared policies. Clearly, the outcome of these struggles influence turf since actors are expected to change their policies. It is natural for actors to fight over new policies and try to protect their interests. In cases like the NBEP and TRPA such discussions result in severe conflicts that take a long time to resolve. In other cases like the TBEP and SAMP, the discussions took time but the conflict was more manageable and involved give and take. While in the TBNEP, the actors were dissatisfied with the present set of policies and looked forward to the opportunity to develop shared goals. The costs of these changes and who should bear the costs is also a potential problem.

133 Collaboration could also alter traditional agency priorities. In some cases, the new responsibilities are a welcome addition to an agency. RIDEM welcomed the creation of a new program within the agency and it helped improve their problem-solving capacity. In the TBEP, local governments welcomed the changes to their environmental monitoring programs because it improved their effectiveness. However, it also possible that an agency will view a new program as an unwelcome competitor for existing resources. For example, when the NBEP completed its plan, the state was mired in a deep recession and the agencies were experiencing budget cuts. Many agencies were thus reluctant to commit to new programs or initiatives. It is also possible that such efforts will undermine the traditional priorities or core constituencies of a program.

134 Another threat to an actor's turf may come from anxiety over accountability. Collaborators may be reluctant to make commitments that allow others to hold them accountable for specified actions. This appears to have been one source of conflict in the NBEP case. Actors were anxious about how the plan's inclusion as an element of the *State Guide Plan* might be used to hold them accountable for implementation at some future date. They may also be concerned about committing to outcomes that they have little control over such as budgetary resources, uncertainty over cause and effect relationships, or the presence of other factors that would influence policy outcomes. One of the common ways that our cases have addressed these concerns is through constructing monitoring systems that are based on peer pressure (DIBEP, TBNEP, and TBEP). For example, instead of reporting on what every actor committed to in its five-year action plans, the TBEP reported on the group's progress towards their collective commitments. It reported the information in a manner that allowed for peer pressure to develop. However, no effort was made to make any actor standout.

135 Bardach, "Turf Barriers to Interagency Collaboration," 179.

136 Ibid.

137 Ostrom, Schroeder, and Wynne, *Institutional Incentives and Sustainable Development*.

138 The first problem is the use of stereotypes. Stereotyping is the psychological tendency for people to simplify when faced with a complex problem. While this can help determine the important outlines of a problem, these simplifications can ultimately become a caricature of people and problems that place blinders on decisionmakers (Palumbo, and Maynard-Moody, *Contemporary Public Administration*). For example, environmentalists may stereotype developers and industry by assuming that they want to "destroy the planet" or that they "don't care about the environment." These stereotypes will shape how individuals perceive information and can pose formidable barriers the effective exchange of information and ideas.

139 Cognitive bolstering involves magnifying the value of a chosen action while denigrating those implied by the rejected alternatives (Irving L. Janis, and Leon Mann, *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment* (New York, NY: The Free Press, 1977)). This is typically achieved by exaggerating the favorable consequences of actions and giving great weight to the data supporting your argument. At the same time, these same individuals will minimize the unfavorable consequences of actions or ignore the data that contradicts the chosen action. The problem with cognitive bolstering is that it represents the abandonment of critical evaluation. Research also suggests that stress and deadlines can bring on cognitive bolstering. For example, when individuals are forced to make rapid decisions based on uncertain information (Palumbo, and Maynard-Moody, *Contemporary Public Administration*, 149).

140 Defensive avoidance occurs when individuals or groups avoid making decisions that have unpleasant consequences or entail risk. Symptoms include suppressing or ignoring information that requires action and avoiding decisions by continually mulling over information or choices. Gathering more and more information becomes a means of avoidance (Palumbo, and Maynard-Moody, *Contemporary Public Administration*, 149). Thus, instead of making tough choices, participants in a collaborative process instead may chose to recommend more research before acting or decide to recommend a new planning effort to postpone making this tough decision.

141 The fourth problem is one of entrapment or the escalation of commitment. While commitment to decisions is often viewed in positive terms, it can become a serious problem when individuals become committed to a failure in the same way that they become committed to a success. When individuals publicly announce their commitment to a course of action it can be difficult for them to change their minds because their prestige or success may be tied to the policy's success or failure. Thus, once commitments are made, decisionmakers will often make every attempt to make it work. Research also suggests that the escalation of commitment is greater when the evidence of success or failure is unclear or when there is even the slightest hope that it might succeed. The negative effect of an escalation of commitment is that it restricts the critical evaluation of information and policy options (Palumbo, and Maynard-Moody, *Contemporary Public Administration*).

142 Groupshift is an acute case of groupthink in which the group decision tends to be riskier or more cautious, although the tendency is towards making riskier decisions.

143 There are eight common symptoms of groupthink: 1) The group shares an illusion of its own superiority and invulnerability in which the group members believe they are the "best and brightest"; 2) The group collectively avoids and discounts information that calls into question the choices of the group or its own superiority (i.e., cognitive bolstering); 3) The group believes in the inherent morality of its goals and members equate their views with the public interest; 4) The group develops negative stereotypes of outsiders or dissenters which allows the group to casually dismiss legitimate challenges to the group's decisions; 5) The group attempts to silence internal dissenters by making them the brunt of jokes or emphasizing their disloyalty; 6) Individual group members may censor their own self-doubts as they internalize group pressures to conform; 7) Even though overt and self-censorship is prevalent, the group perceives the lack of dissent as unanimity; and, 8) Certain group members take on the role of "mind guards" who protect leaders and the group from dissenting views. The more symptoms that occur, the higher the likelihood that the group has lost its ability to critically evaluate information and available policy options. It can also cause group members to falsely believe that the management plan enjoys greater support than it actually does. For more discussion see: Irving L. Janis, *Victims of Groupthink: A Psychological Study of Foreign-Policy Decisions and Fiascoes* (Boston, MA: Houghton Mifflin 1972).

144 Steps that practitioners can take to avoid these problems include: 1) Encourage members to act as critical evaluators and individuals should accept criticism for their decisions; 2) Invite outside experts to join decisions and criticize conclusions; 3) Require members of the group to discuss matters with people outside the group; 4) Assign two or more groups to work on the same problems; 5) Assign one or group members to play devil's advocate; 6) Periodically break the large group into smaller groups; 7) Set aside plenty of time to periodically question the group's decisions, the assumptions made, and the possible weaknesses in them; and, 8) At major decision points hold last chance sessions where individuals are encouraged to air their reservations about the pending decision (Palumbo, and Maynard-Moody, *Contemporary Public Administration*).

145 Odum, "Environmental Degradation and the Tyranny of Small Decisions."

146 For an excellent discussion of the importance of argument and persuasion skills for a policy analyst see: Giandomenico Majone, *Evidence, Argument, & Persuasion in the Policy Process* (New Haven, CT: Yale University Press, 1989).

147 An EPA staff member commenting on this report stated that the agency's reporting requirements are designed to prevent the problems associated with reconstructing how the data was collected. EPA's

reporting requirements do not address this particular problem because the agency does not require any specific internal reporting or documentation procedures. The problem in this instance had to do with staff's implementation of the project and the lack of a system to document how various coverages were collected. Respondents also noted that there was poor record keeping at the time. No respondents suggested that the problems were due to a failure to follow EPA reporting requirements nor did any suggest that the agency should have reporting requirements to address them. Rather, internal administrative problems and poor record keeping caused problems.

148 There are a number of other factors that likely give rise to this observation. They include the presence of detailed planning requirements with detailed guidance on how to satisfy these requirements but relatively few requirements or guidance with respect to implementing the CCMP. The disproportionate amounts of planning funds compared to implementation funds are another cause for this observation.

149 The organizational theory literature refers to these challenges as the liability of newness. For more information see: Terry L. Amburgey, Dawn Kelly, and William P. Barnett, "Resetting the Clock: The Dynamics of Organizational Change and Failure," *Administrative Science Quarterly* 38 (March, 1993), 51-73; Josef Bruderl and Rudolf Schussler, "Organizational Mortality: The Liabilities of Newness and Adolescence," *Administrative Science Quarterly* 35 (September 1990), 530-547; Kim S. Cameron, Myung U. Kim, and David A. Whetten, "Organizational Effects of Decline and Turbulence," *Administrative Science Quarterly* 32 (June 1987), 222-240; Daniel A. Levinthal, "Random Walks and Organizational Mortality," *Administrative Science Quarterly* 36 (September 1991), 397-420; William McKinley, "Complexity and Administrative Intensity: The Case of Declining Organizations," *Administrative Science Quarterly* 32 (March 1987), 87-105.

150 Malcolm L. Goggin, Ann O'M. Bowman, James P. Lester, and Laurence J. O'Toole, Jr., *Implementation Theory and Practice: Toward a Third Generation* (Glenview, IL: Scott, Foresman/Little, Brown Higher Education, 1990); Laurence J. O'Toole, Jr., "Policy Recommendations for Multi-Actor Implementation: An Assessment of the Field," *Journal of Public Policy* 6 (no. 2, 1986), 181-210; Randall B. Ripley and Grace A. Franklin, *Bureaucracy and Policy Implementation* (Homewood, IL: The Dorsey Press, 1982); Carl E. Van Horn, *Policy Implementation in the Federal System* (Lexington, MA: D. C. Heath and Company, 1979); Carl E. Van Horn and Donald S. Van Meter, "The Implementation of Intergovernmental Policy," in Donald S. Van Meter and Carl E. Van Horn (eds.), *Public Policy in the Federal System* (Lexington, MA: Lexington Books, 1976); and, Donald S. Van Meter, and Carl E. Van Horn, "The Policy Implementation Process: A Conceptual Framework," *Administration and Society* 6 (1975), 445-88.

151 For a discussion of the history and development of the NEP see: Imperial, Robadue, and Hennessey, "An Evolutionary Perspective on the Development and Assessment of the National Estuary Program"; and, Imperial, Hennessey, and Robadue, "The Evolution of Adaptive Management for Estuarine Ecosystems."

152 EPA's comments on the final report suggest that this point is absurd and that at the time EPA's Section 320 funding was much greater than it is now. EPA is simply incorrect in its assertion. There was no allowance for implementation funding as there is now so funding for implementation is greater today. Moreover, funding to support implementation activities in other programs is greater today. Regardless, the fact of the matter is that the estimated implementation costs for the NBEP CCMP was much greater than would be realistically expected. See the NBEP case study for more discussion of this issue.

153 J. A. Gale, D. E. Line, D. L. Osmond, S. W. Coffey, J. Spooner, J. A. Arnold, T. J. Hoban, and R. C. Wimberly., *Evaluation of the Experimental Rural Clean Water Program*, EPA-841-R-93-005 (National Water Quality Evaluation Project, North Carolina State University (NCSU) Water Quality Group, Biological and Agricultural Engineering Department. Washington, DC: EPA, Office of Water. May 1993).

154 NRCS, *Inland Bays Hydrologic Unit Area Project.*

155 We are grateful to the respondents in the Tillamook Bay that crystallized this problem for us. This is the terminology they use to discuss the problem in addressing the NPS and habitat problems affecting endangered salmon. The watershed councils developed to address these problems are having this problem as well.

156 EPA's comments on the final report suggest that this is one reason for an environmental characterization. While that may be true, you will not necessarily find these tradeoffs and linkages unless you look specifically for them. They often are not self evident. It is not uncommon for characterizations to be prepared by media with different researchers working on different sections of a report with little effort to synthesize across the problems.

157 An EPA official commenting on this report correctly noted that there has been stability at the federal and state level as funding has gradually increased from $38 million in 1990 to $200 million in 2000 While some states reported having difficulty in managing the increased funding levels, the problems created by the lack of stability primarily occur at the grant applicant level. The changes in funding priorities at the federal level, changes in EPA guidance, the program's grant restrictions, the annual grant allocation process, and the changing eligibility and selection criteria at the state level create a create deal of uncertainty for grant applicants seeking to use the Section 319 program to implement their watershed management program.

158 While demonstration projects are commonly used in many social policy areas (e.g., crime, welfare, education, environmental protection, etc.) research in this area is poorly developed (e.g., Walter, C. Baer, Johnson Conover, Cheryl Cook, Patricia Fleischauer, Bruce Goeller, William Hederman, Leland L. Johnson, Edward W. Merrow, Richard Rettig, and John Wirt, *Analysis of Federally Funded Demonstration Projects: Supporting Case Studies* (Santa Monica, CA: Rand. Report R-1927-DOC. April 1976); Walter Baer, Leland L. Johnson, and Edward W. Merrow, *Analysis of Federally Funded Demonstration Projects: Final Report* (Santa Monica, CA: Rand. Report R-1926-DOC. April 1976); Walter Baer, Leland L. Johnson, and Edward W. Merrow, "Government-Sponsored Demonstrations of New Technologies," *Science* 196 (no. 4293, 27 May 1977), 950 – 957; Thomas K. Glennan, Jr., (ed.), *Case Studies of the Management of Demonstration Programs in the Department of Health and Human Services* (Santa Monica, CA: Rand. Report N-2253-HHS. May 1986); Thomas K. Glennan, Jr., *The Management of Demonstration Programs in the Department of Health and Human Services* (Santa Monica, CA: Rand. Report R-3172-HHS. March 1985); and, Thomas K. Glennan, Jr., W. F. Hederman, Jr., L. L. Johnson, and R. A. Rettig, *The Role of Demonstrations in Federal R & D Policy* (Santa Monica, CA: Rand. Report R-2288-OTA. May 1978); Cheryl D. Hayes, *A Study in the Management of Social R & D: The Functions of Demonstrations* (National Research Council Study Project on Social Research and Development, Volume 4. Washington, DC: National Academy Press, 1981)). For example, little research has examined the federal or state roles in sponsoring nonagricultural demonstrations (Stephen R. Lefevre, "Using Demonstration Projects to Advance Innovation in Energy," *Public Administration Review* 44 (no. 6, Nov/Dec 1984), 483-490; Kathleen P. Magill and Everett M. Rogers, "Federally Sponsored Demonstrations of Technological Innovations," *Knowledge: Creation, Diffusion, Utilization* 3 (no. 1, September 1981), 23-42; John M. Darley and James R. Beniger, "Diffusion of Energy-Conserving Innovations," *Journal of Social Issues* 37 (no. 2, 1981), 150-171; James L. Regens, "State Policy Responses to the Energy Issue: An Analysis of Innovations," *Social Science Quarterly* 61 (no. 1, June 1980), 44-57; David L. Weimer, "Federal Intervention in the Process of Innovation in Local Public Agencies: A Focus on Organizational Incentives," *Public Policy* 28 (no. 1, Winter 1980), 93-116; and, Baer, Johnson, and Merrow, "Government-Sponsored Demonstrations of New Technologies"). Previous research also tends to focus on innovations which have positive financial incentives associated with their adoption (Giovanni Dosi, "The Research on Innovation Diffusion: An Assessment," in Nebojsa Nakicenovic and Arnulf Grubler (eds.), *Diffusion of Technologies and Social Behavior* (New York, NY: Springer-Verlag, 1991); Giovanni Dosi, "Sources, Procedures, and Microeconomic Effects of Innovation," *Journal of Economic Literature* 26 (September 1988), 1120 – 1171; Gerald Silverberg, Giovanni Dosi, and Luigi Orsengio, "Innovation, Diversity and Diffusion: A Self-Organizational Model," *The Economic Journal* 98 (December 1988), 1032-1054; and, J. David. Roessner, "Incentives to Innovate in Public and Private Organizations," *Administration and Society* 9 (no. 3, November 1977), 341-365). Accordingly, it is unclear whether the diffusion model developed by Rogers (1995) is

appropriate for examining the diffusion of innovations that have negative financial incentives but have other positive social consequences (e.g., conservation measures) (Rogers, *Diffusion of Innovations*). This remains an important area of ongoing research (e.g., Walter Firey, "The Small Farm and the Conservation of Natural Resources: A Problem in Theory Construction and Application," *The Rural Sociologist* 4 (no. 6, 1984), 396-403; Frederick C. Fliegel, *Diffusion Research in Rural Sociology: The Record and Prospects for the Future* (Westport, CT: Greenwood Press, 1993); Peter J. Nowak, "Adoption and Diffusion of Soil and Water Conservation Practices," *The Rural Sociologist* 3 (no. 2, 1983), 83-91; and, J. C. van Es, "The Adoption/Diffusion Tradition Applied to Resource Conservation: Inappropriate Use of Existing Knowledge," *The Rural Sociologist* 3 (no. 2, 1983), 76-82). Accordingly, it was not surprising to observe that many of the programs used demonstration projects ineffectively.

159 They provide decisionmakers with information about: 1) the technological and administrative feasibility of adopting the innovation on a larger scale; 2) the expected impacts of the project; 3) relative merits of alternative policies or innovations; and, 4) the unexpected consequences of adopting a particular policy or innovation (Glennan, Hederman, Johnson, and Rettig, *The Role of Demonstrations in Federal R & D Policy*, 25).

160 Glennan, Hederman, Johnson, and Rettig, *The Role of Demonstrations in Federal R & D Policy*, 25

161 Baer, Johnson, and Merrow, "Government-Sponsored Demonstrations of New Technologies", 952.

162 For examples of practices recommended by EPA see: EPA, *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, EPA 840-B-92-002 (Washington, DC: EPA, Office of Water. January 1993).

163 Baer, Johnson, and Merrow, "Government-Sponsored Demonstrations of New Technologies," 952.

164 Ibid.

165 In part this is due to the Section 319 requirements that waive cost share requirements for some "demonstration" projects.

166 The most fully developed conceptual model of the diffusion process was developed by Rogers (1995) based on the results of over 3,000 studies on the diffusion process (Rogers, *Diffusion of Innovations*). Rogers defines diffusion as the process by which an innovation (e.g., new agricultural practices, educational campaigns, products, technologies, etc.) is communicated through certain channels over time among members of a social system (Rogers, *Diffusion of Innovations*, 5). Diffusion includes both the planned and spontaneous spread of innovations. Innovations are ideas, practices, or objects, which are perceived as new by the individual or organization that adopts them (Rogers, *Diffusion of Innovations*,).

167 Rogers, *Diffusion of Innovations*, 207; and, Christopher M. Dewees and Glenn R. Hawkes, "Technical Innovation in the Pacific Coast Trawl Fishery: The Effects of Fishermen's Characteristics and Perceptions on Adoptive Behavior," *Human Organization* 47 (Fall 1988), 224-34. Rogers further hypothesizes that innovations perceived as having "greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (Rogers, *Diffusion of Innovations*, 16).

168 Rogers, *Diffusion of Innovations*, 371.

169 Rogers, *Diffusion of Innovations*, 380; and, Fariborz Damanpour, "Organizational Innovation: A Meta-Analysis of Effects and Determinants and Moderators," *Academy of Management Journal* 34 (no. 3, 1991), 555 – 590.

170 Terry L. Amburgey and Tina Dacin, "As the Left Foot Follows the Right: The Dynamics of Strategic and Structural Change," *Academy of Management Journal* 37 (no. 6, 1994), 1427-1452; W. Graham Astley and Andrew H. Van de Ven, "Central Perspectives and Debates in Organization Theory," *Administrative Science Quarterly* 28 (June 1983), 245-273; John Child, "Organizational Structure,

Environment and Performance: The Role of Strategic Choice," *Sociology* 6 (1972), 2-22; Richard L. Daft and Karl E. Weick, "Toward a Model of Organizations as Interpretation Systems.," *Academy of Management Review* 9 (no. 2, 1984), 284 – 295; Lawrence Hrebiniak and William F. Joyce, "Organizational Adaptation: Strategic Choice and Environmental Determinism.," *Administrative Science Quarterly* 30 (September 1985), 336-349; and, Raymond E. Miles, and Charles C. Snow, *Organizational Strategy, Structure, and Process* (New York, NY: McGraw-Hill Book Co, 1978).

171 Rogers, *Diffusion of Innovations*, 207.

172 Ibid.,293.

173 This demonstration strategy is employed not only in agriculture, but in many areas such as energy conservation, environmental protection, education, substance abuse, and mass transportation (Baer, Johnson, and Merrow, "Government-Sponsored Demonstrations of New Technologies").

174 Rogers, *Diffusion of Innovations*, 335.

175 A common mistake made by change agents is to select opinion leaders who are too innovative or to mistake innovators for being opinion leaders (Rogers, *Diffusion of Innovations*, 354).

176 George W. Downs, Jr., and Lawrence B. Mohr, "Conceptual Issues in the Study of Innovation," *Administrative Science Quarterly* 21 (December 1976), 700; and, Rogers, *Diffusion of Innovations*.

177 This tendency is reinforced by the fact that many of the practitioners are strong supporters for environmental protection and tend to be risk takers from the standpoint that they would rather err on the side of protecting the environment. The widespread acceptance of "the precautionary principle" is evidence of this fact.

178 Amburgey, Kelly, Barnett, "Resetting the Clock: The Dynamics of Organizational Change and Failure."

179 That can create situations in which individuals (or organizations) are blamed for the failure to adopt an innovation without giving adequate attention to contextual characteristics that may be the true determinants (Rogers, *Diffusion of Innovations*, 114). A related source of bias in the research community is the tendency for researchers to side with change agents that promote the diffusion of innovations rather then with potential adopters who may have sound reasons for rejecting an innovation.

180 This finding is consistent with previous research. See: Thomas W. Church and Robert T. Nakamura, *Cleaning Up the Mess: Implementation Strategies in Superfund* (Washington, DC: The Brookings Institution, 1993).

181 Imperial and Hennessey, "An Ecosystem-Based Approach to Managing Estuaries."

182 EPA suggested that this was because the guidance on the contents was developed when Puget Sound's CCMP was nearing completion and the Delaware Inland Bays were well aware of EPA requirements. Another EPA official noted that Puget Sound was exemplary in the quality of its products and its development of required elements under Section 320 while the Delaware Inland Bays struggled to produce key components of the CCMP including the monitoring, implementation, and finance plans.

While that may explain why EPA was willing to disapprove the Delaware Inland Bays CCMP because of its failure to comply with the requirements of the monitoring, implementation, and financing plan, it does not explain why EPA would not waive any of the characterization requirements. Moreover, while EPA was clearly dissatisfied with the "quality" of Delaware Inland Bays work products, state and local officials largely viewed these requirements as being unnecessary based on their experience of how previous watershed management plans had been implemented and how the CCMP was likely to be implemented. Therefore, they put as little effort into the development of the work products as they could. In retrospect, the monitoring, implementation, and financing plans largely proved not to be too helpful in supporting implementation efforts. These comments on the "quality" of a CCMP

also illustrate the strong role EPA plays in the planning process but there is no corresponding role in the implementation process. It is unclear why there is strong EPA involvement in one and not the other. It appears to be more appropriate to have either a strong or weak role in both.

EPA's comments also do not address the point, which questions why EPA waived some requirements for one program (e.g., Puget Sound) but did not waive requirements for other programs (e.g., Delaware Inland Bays). As noted in the Delaware Inland Bays technical report, there was a history of ongoing characterization efforts when the estuary program entered the NEP. Delaware Inland Bays wanted to therefore downplay the characterization work and focus more on implementation during the planning process. EPA refused and among other things forced state and local officials to fund an expensive computer model that was of no use during the planning process, although state officials were careful to ensure it could be used in other efforts (e.g., TMDL).

183 For an example from EPA's administration of the Superfund program see: Church and Nakamura, *Cleaning Up the Mess*.

184 EPA suggested that we had not read the guidance document and suggested that it requires the analysis suggested by our findings in the section on the ecology of governance. In actuality, we did read the document and are very familiar with it. The document does not address all of the aspects and issues contained in the ecology of governance section of the report. For example, there is nothing that requires the exploration of tradeoffs among problems. It is oriented towards developing a written report that is largely a discussion of various environmental programs rather than other social programs and NGOs. It not oriented towards finding opportunities for collaboration and provides little guidance on how to actually conduct an institutional analysis. Instead, it is oriented towards developing checklists and matrices and summary descriptions of programs that are largely for EPA's consumption. That is why many respondents referred to it as a "hoop" you had to jump through.

185 EPA, *National Estuary Program: Base Program Analysis*, EPA 842-B-93-001 (Washington, DC: EPA Office of Water, March 1993.

186 Memorandum of Understanding between State of Oregon, USDA Forest Service Region 6, DOI Bureau of Land Management – Oregon, DOI Fish and Wildlife Service – Oregon, NOAA National Marine Fisheries Service, DOI Bureau of Indian Affairs, Environmental Protection Agency, DOI Bureau of Reclamation, COE, and DOI National Park Service, 1997; *Oregon Watershed MOU Reinvention Laboratory Agreement*, July 1998.

187 Only one estuary program, the Albermarle-Pamlico Estuarine Study (APES), received a failing grade during EPA's biennial review process. They only lost one year of implementation funding after they undertook some actions and agreed to changes in their program.

188 While EPA's biennial review process helps in this regard, EPA has not used the process to require these fundamental changes in the estuary programs as a condition of future funding. Instead, EPA's comments tend to highlight a few issues and minor changes that the estuary program should complete by its next review.

189 Delaware Inland Bays, Tampa Bay, and Tillamook Bay all are good examples in this regard.

190 Interviews conducted as part of two previous research projects and our periodic contacts with EPA region and headquarters staff and various estuary program managers over the past five years indicate that EPA has been aware of the issue for some time and has chosen not to take action. This research resulted in the following publications: Imperial, *Developing Integrated Coastal Resource Management Programs: Applying the NEP's Experience to Developing Nations*; and, Imperial and Hennessey, "An Ecosystem-Based Approach."

191 The fact that issues addressed at the Narragansett Bay Summit 2000 were very different than the 41 high-priority actions and the CCMP's other recommendations and the fact that some Summit participants were calling for a new planning effort supports this conclusion as does the interview data.

192 The administrative costs we are referring to are the proportion of overall Section 319 funding devoted to administrative expenses versus the amount spent on individual NPS projects. We are not referring to the 40 percent non-federal cost-share established by statute.

193 It should be noted EPA staff who commented on this report do not dispute the finding that the emphasis of the Section 319 program should be on systematically solving specific problems rather than funding discrete, loosely connected projects.

194 EPA, *Nonpoint Source Program and Grants Guidance for Fiscal Years 1997 and Future Years* (Washington, DC: EPA, May 1996).

195 It was also the case that even when states (CA, FL, OR) had a regional office structure, the Section 319 NPS program was administered out of the headquarters office rather than delegated to regional offices, although the regional offices may provide input or have some control over these grant awards.

196 This problem is discussed in some detail in the Tampa Bay case study and is the reason for the regulatory flexibility provisions contained in the interlocal agreement.

197 The CWSRF program provided $26 billion for point source abatement projects and has provided approximately 6 times more funding that the USDA's Rural Utility Service (Information provided by EPA OWOW's comments on the draft report dated February 17, 2000 (Page 2)).

198 EPA reported that some states developed common application procedures and coordinated the funding selection for projects under the CWSRF program, USDA's Rural Utility service, and HUD's CDBG program to maximize efficiency However, none of our respondents report that this has occurred.

199 Imperial, "Environmental Justice and Water Pollution Control"; EPA, *1992 Needs Survey: Report to Congress* (Washington, DC: Office of Water, September 1993); Laurence J. O'Toole, Jr. "Hollowing the Infrastructure: Revolving Loan Programs and Network Dynamics in the American States," *Journal of Public Administration Research and Theory* 6 (no. 2, 1996), 225 – 242; and, EPA, *State Revolving Fund (SRF) Final Report to Congress: Financial Status and Operations of Water Pollution Control Revolving Funds* (Washington, DC: EPA, Office of Wastewater Enforcement and Compliance, October 1991).

200 It is unclear whether the funding figure provided by EPA is an annual or cumulative total and whether the figure includes funding in Massachusetts. Our figure does not include Massachusetts to make the estimate more conservative and if even if these figures represented annual expenditures they are still relatively insignificant.

201 In its comments on the draft the report, EPA OWOW provided some examples of significant NPS projects in California's NAPA River Valley and Minnesota.

202 Observation from our cases is further supported by the information noted above on the breakdown in project funding.

203 For evidence of these differences see: O'Toole, "Hollowing the Infrastructure"; and, Craig L. Johnson, "Managing Financial Resources to Meet Environmental Infrastructure Needs: The Case of State Revolving Loans," *Public Productivity and Management Review* 18 (no. 3, Spring 1995), 263 - 275.

204 EPA region I noted in its comments on this report that this already occurs to varying degrees and there was no barrier to this sort of involvement. We agree. The purpose for this recommendation is to expand and institutionalize these efforts.

205 EPA comments on the final report questioned why we did not use this as an example of "science nested in a political process." This is actually an example of using science to set policy. As noted periodically throughout this and other sections of the report, the science and models used in TMDLs are far from being accurate enough to determine these caps with a high degree of certainty. Therefore, the failure to debate the science and set "caps" that reflect a consensus is likely to cause them to be challenged. This could cause conflict and exacerbate the transaction costs associated with the process.

206 Computer models are not required, however, the vast majority of modeling techniques rely on either spreadsheets or computer simulations. See: EPA, *Compendium of Tools for Watershed Assessment and TMDL Development*, EPA 841-B-97-006 (Washington, DC: EPA, Office of Water, May 1997).

207 While this may be the official policy position or belief of the officials commenting on the report, we are unaware of any study that documents these claims. Moreover, it is not consistent with the data in this report. We believe this is an open question.

208 It is interesting that many proponents of TMDLs simply dismiss as failures the long history of collaborative and voluntary NPS programs. As noted in the supporting technical reports, that conclusion is not supported by the data. Moreover, many of the problems noted in this report such as the lack of stable and flexible funding sources and the limited federal investment in addressing these problems is an equally compelling explanation for the limited effectiveness some efforts have noted. It should also be noted that many officials misinterpret the lessons learned from the efforts to address point source problems. Many conclude that the installation of sewers and construction of wastewater treatment plants was due to primarily to regulations promulgated pursuant to the CWA. In many respects, this is true. However, the presence of a corresponding construction grant program that provided billions of dollars to comply with these regulations was an important factor as well. If that type of funding were available to support voluntary NPS efforts much greater progress would occur.

209 EPA's position that it is not regulating NPS pollution is misleading. In the past, EPA has also taken rather interesting, if unfounded position, that it is not regulating or requiring government or industry when it passes new requirements that will be implemented by state and local officials (e.g., recent Clean Air Act regulations). This argument appears to help address requirements of the Regulatory Flexibility Act and the Unfunded Mandates Reform Act. For a discussion of EPA's analysis of the impacts of the proposed TMDL regulations and the agency's conclusion that it will mandate actions see: *Federal Register* 64 (No. 162, Monday August 23, 1999): 46041 - 46044. EPA has included similar arguments in both its comments on this report. The argument is a bit disingenuous because the proposed regulations clearly require local and state governments to take action because if they do not, EPA can compel them to do so.

210 EPA, *Guidance Specifying Management Measures*.

211 EPA implies in its comments that these regulatory activities are separate and apart from the TMDL regulations when in fact they are intimately linked. For example, the Municipal Separate Storm Sewer System (MS4) permits in Florida issued pursuant to the NPDES stormwater provisions in the CWA contain provisions that allow the permits to be reopened once a TMDL has been issued such that the permit requirements can be revised. To suggest that a TMDL will not serve as the basis for regulating these sources of NPS pollution is misleading.

212 *Federal Register* 64 (No. 162, Monday August 23, 1999), 46034.

213 Ibid.,46016.

214 See: EPA, *Compendium of Tools for Watershed Assessment and TMDL Development*.

215 This conclusion is largely based on the difficulty of modeling large complex ecological systems.

216 Some state and local officials questioned whether the CCMP and its associated commitments technically satisfied the CWA's TMDL requirements. Because the state was under pressure to develop TMDLs, there were commitments for nutrient reductions, and a great deal of uncertainty with respect to EPA's proposed TMDL regulations. The respondents reported that they "rushed" to approve the CCMP as a TMDL in an attempt to avoid having to do a TMDL, which might result in a loss of political support for the whole effort.

217 EPA noted in its comments on this report that the actual situation is more complicated than a simple top-down or bottom-up dichotomy. We do not necessarily disagree and there is a growing implementation literature that actually encourages the use of network models. However, the TMDL process has

many of the characteristics of the top-down approach as it has been described and documented in the literature and shares few of the characteristics of the collaborative approach. Thus, the dichotomy helps illustrate the fundamental inconsistency between the two approaches.

218 For a discussion of these differences see: Paul Berman, "Thinking About Programmed and Adaptive Implementation: Matching Strategies to Situations," in Helen M Ingram and Dean Mann (eds.) *Why Policies Succeed or Fail* (Beverly Hills, CA: Sage Publications, 1980), 205 – 227; James P. Lester, Ann O'M. Bowman, Malcolm L. Goggin, and Laurence J. O'Toole, Jr., "Public Policy Implementation: Evolution of the Field and Agenda for Future Research.," *Policy Studies Review* 7 (no. 1, Autumn 1987), 200-216; Richard E. Matland, "Synthesizing the Implementation Literature: The Ambiguity-Conflict Model of Policy Implementation." *Journal of Public Administration Research and Theory* 5 (no. 2, 1995), 145-174; and, Laurence J. O'Toole, Jr., "Policy Recommendations for Multi-Actor Implementation: An Assessment of the Field," *Journal of Public Policy* 6 (no. 2, 1986), 181-210.

219 EPA noted in its comments on the draft report that it issued guidance encouraging the use of "phased TMDLs" and that they are meant to be adaptive in nature. While that may be true, it does not change our underlying argument because the changes or adaptations are simply then implemented using a top-down process.

220 The fact that EPA can reject a TMDL and an implementation plan and replace it with one of its own is an example that illustrates a fundamental difference in the two approaches. EPA could not reject a collaborative watershed management plan and replace it with one if its own. Even in the NEP, at best EPA can simply reject a management plan. It cannot compel anyone to take action.

221 EPA noted that it has developed a guidance document, *Compendium of Tools for Watershed Assessment and TMDL Development*, and maintains a website and conducts two-day intensive training for EPA and state environmental agency officials. While notable, those efforts only scratch the surface. The guidance does little to educate decisionmakers about the general limitations and problems inherent in developing TMDLs. This is to be expected because EPA might lose political support for its proposed TMDL regulations if there was greater awareness of the technical limitations.

222 EPA officials commenting on this report noted that the current Section 319 NPS program provides flexibility to state officials and cited the contents of EPA's May 1996 *Nonpoint Source Program and Grants Guidance for Fiscal Years 1997 and Future Years*. We do not dispute that the current Section 319 program provides greater flexibility or that some states may be satisfied with guidance. However, we do question the overall structure of the program that relies on state plans with general recommendations and then funds a series of loosely connected projects. The administration of the grant program often reflects changes in federal priorities and that when combined with grant restrictions influences the projects that can be funded. State officials also noted that the program was often treated as "green pork" with an effort being made to disperse money around the state instead of systematically solving specific NPS projects. We believe a consolidation of the federal NPS programs and a reorientation from projects to systematically addressing specific NPS problems at the watershed or some other regional level would be more effective and EPA seems to agree. Unfortunately, we are less optimistic than EPA that this transition can be made in the current Section 319 program even with recent proposals for drastic increases in NPS funding. This is the rationale for our proposals in this section of the report and other findings reported herein.

223 *Federal Register* 64 (No. 162, Monday August 23, 1999).

224 An EPA official commenting on this draft report correctly notes that the nine key elements contained in EPA's May 1996 *Nonpoint Source Program and Grants Guidance for Fiscal Years 1997 and Future Years* and the subsequently updated Section 319 programs address some of the recommendations noted in this report. While EPA official noted that some state water quality agencies are taking the new requirements seriously, our data suggest that some are not and only half of the states have developed updated NPS programs in the four years since the guidance was issued. Moreover, the proposals noted in this section of the report are much more sweeping in scope and impact than the changes resulting from the revised EPA guidance.

225 This advice is consistent with Elmore's (1985) advice on forward and backward mapping. See: Richard F. Elmore, "Forward and Backward Mapping: Reversible Logic in the Analyses of Public Policy," in Kenneth Hanf and Theo A. J. Toonen (eds.), *Policy Implementation in Federal and Unitary Systems; Questions of Analysis and Design* (Boston, MA: Maartinus Nijhoff Publishers 1985), 33 - 70.

226 Hans Bressers, Laurence J. O'Toole, Jr. and Jeremy Richardson, "Networks as Models of Analysis: Water Policy in Comparative Perspective." In Hans Bressers, Laurence J. O'Toole, Jr. and Jeremy Richardson (eds.), *Networks for Water Policy: A Comparative Perspective* (London, England: Frank Cass & Co., 1995), 4.

227 Bardach, *Getting Agencies to Work Together*, 17

228 Ibid.

229 Ibid.