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Rhode Island's Salt Ponds

Using a Special Area Management Plan to Improve Watershed Governance

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Copies of the report and the supporting case studies can be obtained from:

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List of Acronyms Used in the Report

BMP	Best Management Practice
CES	Cooperative Extension System
COE	Corps of Engineers, United States Army
CNPCP	Coastal Nonpoint Pollution Control Program (Section 6127)
CRC	Coastal Resources Center
CRMC	Coastal Resources Management Council
CWA	Clean Water Act
CZARA	1990 Coastal Zone Act Reauthorization Amendments
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
EPA	Environmental Protection Agency
FTE	Full Time Equivalent
GIS	Geographic Information System
GSA	General Services Administration
GSO	Graduate School of Oceanography, University of Rhode Island
HMP	Harbor Management Plan
IAD	Institutional Analysis and Development
IGM	Intergovernmental Management
MOU	Memorandum of Understanding
NBEP	Narragansett Bay Estuary Program
NBP	Narragansett Bay Project
NEP	National Estuary Program
NERR	National Estuarine Research Reserve
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service, USDA
OSDS	Onsite Sewage Disposal System
RIAR	Rhode Island Association of Realators
RIBA	Rhode Island Builders Association
RICRMP	Rhode Island Coastal Resources Management Program
RIDEM	Rhode Island Department of Environmental Management
RIDOP	Rhode Island Department of Administration, Division of Planning
RIDOT	Rhode Island Department of Transportation
RIGA	Rhode Island General Assembly
RIGL	Rhode Island General Laws
RIGTP	Rhode Island Government Transformation Partnership
RIMTA	Rhode Island Marine Trades Association
RIPDES	Rhode Island Pollution Discharge Elimination System
RISA	Rhode Island Shellfishermen's Association
SAMP	Special Area Management Plan
SGP	Sea Grant Program
SPP	Statewide Planning Program
TMDL	Total Maximum Daily Loading
URI	University of Rhode Island
USFWS	United States Fish and Wildlife Service

Rhode Island's Salt Ponds: Using a Special Area Management Plan to Improve Watershed Governance

Abstract: This case study examines the development and implementation of a Special Area Management Plan (SAMP) for Rhode Island's Salt Ponds. The SAMP was approved by the Rhode Island Coastal Resources Management Council (CRMC) in 1984, was revised in 1994 to include requirements for denitrifying onsite sewage disposal systems (OSDSs), and was substantially revised in 1999 to better address the cumulative and secondary impacts of development. The SAMP was the result of an innovative partnership between state and local government and university researchers. Local governments changed their zoning to be consistent with the SAMP's density requirements; the CRMC uses the SAMP to regulate activities subject to its regulatory authority; and the Rhode Island Department of Environmental Management (RIDEM) changed some of its policies and has supported the implementation of some of the plan's recommendations. These efforts were then assessed using evaluative criteria provided by the National Academy of Public Administration. We concluded that the development and implementation satisfies many of the Academy's criteria. It represents an interesting example of "nesting" science within decisionmaking and there are many interesting examples of collaboration between state and local officials, nongovernmental organizations, and university researchers. It has also improved the capacity of state and local agencies to manage the cumulative and secondary impacts of development in the watershed.

Introduction

This case study examines the efforts to develop and implement a special area management plan (SAMP) for Rhode Island's Salt Ponds by the Coastal Resources Management Council (CRMC) and its partners. The Salt Ponds, as they are known locally, are a string of nine brackish coastal lagoons, which are separated from the ocean by a low narrow strip of barrier beach islands. The watershed encompasses approximately 82.4 km^2 (23,473 acres) 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 groundwater and surface runoff. This makes them valuable as fish and shellfish nurseries but also susceptible to eutrophication and bacterial loading. Historically, the ecology of the ponds has also been influenced by the stabilization of inlets, dredging of channels, the installation of onsite sewage disposal systems (OSDSs), and alterations of the quality and quantity of freshwater inflow resulting from development activities. The low, narrow barrier beaches also make the region particularly susceptible to coastal erosion and storm damage from winter storms (i.e., Nor'easters) and summer hurricanes.

The development and implementation of the Salt Ponds SAMP is closely tied to the development of the CRMC and the Rhode Island Coastal Resources Management Program (RICRMP).[1] The CRMC is a regional planning agency with broad authority to regulate activities that impact the state's coastal resources. The CRMC was created in 1971 with the express purpose of preserving and restoring ecological systems and developing a coastal zone

management (CZM) program for Rhode Island's coastal zone.[2] The CRMC's policies are contained in the RICRMP, which was approved in 1975. The RICRMP became the state's federally approved coastal zone management (CZM) program when it was approved by the National Oceanic and Atmospheric Administration (NOAA) in 1978. The RICRMP was substantially revised in 1983 and 1990 and has been revised periodically since then.[3] Today, the RICRMP is based on two mutually supporting elements. The first is a comprehensive regulatory program. The core of the regulatory program is a series of policies that zoned the state's shorelines and coastal waters (i.e., water types) to encourage or restrict different activities. Many of the CRMC's regulatory requirements (e.g., buffers and setbacks) are linked to these policies.[4] The second component of the RICRMP is a series of SAMPs[5] and municipal harbor management plans (HMPs).[6] These plans are designed to address cumulative and secondary impacts, and to address specific problems in these areas.

The development of the Salt Ponds SAMP was in direct response to the growing awareness of increasing environmental problems and a proposal to build a nuclear power plant in the region.[7] These concerns were expressed at a series of public hearings in 1975. While the public was generally supportive of the RICRMP, there was also the recognition that special policies were needed to address the specific conditions and problems in the Salt Ponds region. When the RICRMP was approved by NOAA in 1978, the CRMC called on the University of Rhode Island's (URI's) Coastal Resources Center (CRC) to help it develop a SAMP for the Salt Ponds watershed.

The development of the SAMP involved a collaborative partnership among state and local officials and researchers at the URI. The CRC coordinated the effort and leveraged research funding from several sources in an attempt to better understand the region's water quality, land use, habitats, storm hazards, and geology. Instead of the usual "ecological characterization," which is quite comprehensive and general, the research effort focused on a few ecological processes related to water quality, sedimentation, and overfishing. In this way, science became the mechanism to investigate issues of concern to the local officials and the general public. Because of the relevance of this research, these issues were elevated on the policy agendas of state and local decisionmakers, and science became an integral part of planning and decision making. The CRC also used a participatory planning process, which included informal gatherings among officials, researchers, and citizens. These informal gatherings yielded many of the ideas that later became central to the management strategy in the SAMP. They also helped develop trust between the CRC and local officials. As a result of this social capital, the CRC was able to convince local officials that they had the power and ability to address environmental problems and influence how land was developed in their communities.

The CRMC approved the SAMP in 1984. It was revised in 1986 to include the portion of the watershed in Westerly, was revised in 1994 to include requirements for denitrification OSDSs, and was substantially revised in 1999 based on new research on the cumulative impacts of nitrogen loadings in the watershed. The implementation of the SAMP is largely a partnership between the four local governments and the CRMC. The heart of the SAMP is its zoning requirements that are largely oriented at reducing nitrogen loadings from onsite sewage disposal systems (OSDSs) and protecting habitat. The CRMC implements these requirements by regulating all development adjacent to the shoreline, all subdivisions six units or more, and large

development projects containing over two acres of impervious surface. Local governments also changed their zoning policies to make them consistent with the SAMP's density requirements. The Rhode Island Department of Environmental Management's (RIDEM) participation has been more mixed. While RIDEM changed its OSDS regulations and supported the implementation of some SAMP provisions, its implementation of other recommendations such as those pertaining to fisheries management, the denitrification memorandum of understanding (MOU) with RIDEM, and the informal review process has been more limited.

Objectives of this Case Study

The case study begins with a brief discussion of the methods used to collect and analyze the data, and the literature that framed and guided our inquiry. The section describes the planning environment. This includes a discussion of the Salt Ponds ecosystem, the problems affecting the region, and the institutional arrangement responsible for managing the watershed. The following sections examine the development of the SAMP and its implementation. These activities are then assessed using evaluative criteria provided by the National Academy of Public Administration. (The criteria are described in more detail in our final report entitled *Environmental Governance in Watersheds: The Importance of Collaboration to Institutional Performance*.)

Methods

This case study was developed using systematic and generally accepted methods of qualitative research. Qualitative approaches[8] 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.[9] 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 coastal zone management, and adaptive management. There is also great deal of environmental policy research in diverse areas such as collaborative decision making, 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.[10] Accordingly, the second stream of research is the growing public administration literature on intergovernmental management (IGM) and networks, which is broadly defined here to include the literature on 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.[11] Of related interest is research on assessing implementation "success" and measuring institutional or network performance. A more detailed review of this literature is available for the authors.

Data for the study were 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.[12] Documents and archival records were an important source of data. Field interviews with 40 individuals representing various organizations were the second source of data. The interviews were confidential and recorded on tape to ensure the accuracy of the data collected. Given the controversial nature of evaluation findings, steps were also taken to protect the identity of our informants.[13] Follow-up 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. The authors' previous involvement with various organizations and presence near the case study locations allowed them to attend meetings, observe the interactions among the actors, and obtain data that would otherwise have been unavailable. 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 subsequently as a consultant to the CRC on two projects. 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 the RIDEM and issued its report in 1990.[14]

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.[15] The basic approach was one of synthesizing interpretations and looking for themes that cut across the cases.[16] The comparisons of the Narragansett Bay experiences with those of the other five case studies (i.e., cross-case analysis) helped deepen our understanding of this case and allowed us to determine the extent to which the findings extended beyond individual cases.

To ensure the validity of the findings, the strategy of triangulation was employed,[17] using 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

Table 1: Physical Characteristics of Rhode Island's Salt Ponds

Salt Pond	Area (acres)	Ave. Depth (ft.)	Ave. Salinity (ppt)	Watershed (acres)	Groundwater Volume (m^3/yr)
Pt. Judith	1,530	6	29	3,536	2.5×10^7
Potter	329	2	27	3,311	5.0×10^6
Cards	43	1.5	4	1,820	2.2×10^6
Trustom	169	1.5	5	794	1.1×10^6
Green Hill	431	2.5	19	3,039	6.8×10^6
Ninigret	1,711	4	24	6,025	1.5×10^7
Quonochontaug	732	6	29	2,307	*
Winnapaug	446	5	28	2,294	*
Maschaug	49	7	7	347	0

Sources: Virginia Lee, *An Elusive Compromise: Rhode Island Coastal Ponds and Their People*, Marine Technical Report Number 73 (Narragansett, RI: Coastal Resources Center, University of Rhode Island, 1980)J. Grace and W. Kelly, *Fresh Water Input to Rhode Island Coastal Ponds* (Narragansett, RI: Report to the University of Rhode Island Coastal Resources Center, 1981); and, RIGIS 1997

their consistency with the data.[18] Arguments and alternative explanations were compared with one another to identify logical inconsistencies.[19] 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.[20] Additional steps were taken to address the particular threats to the validity of the findings created by our past involvement with the actors in this case.

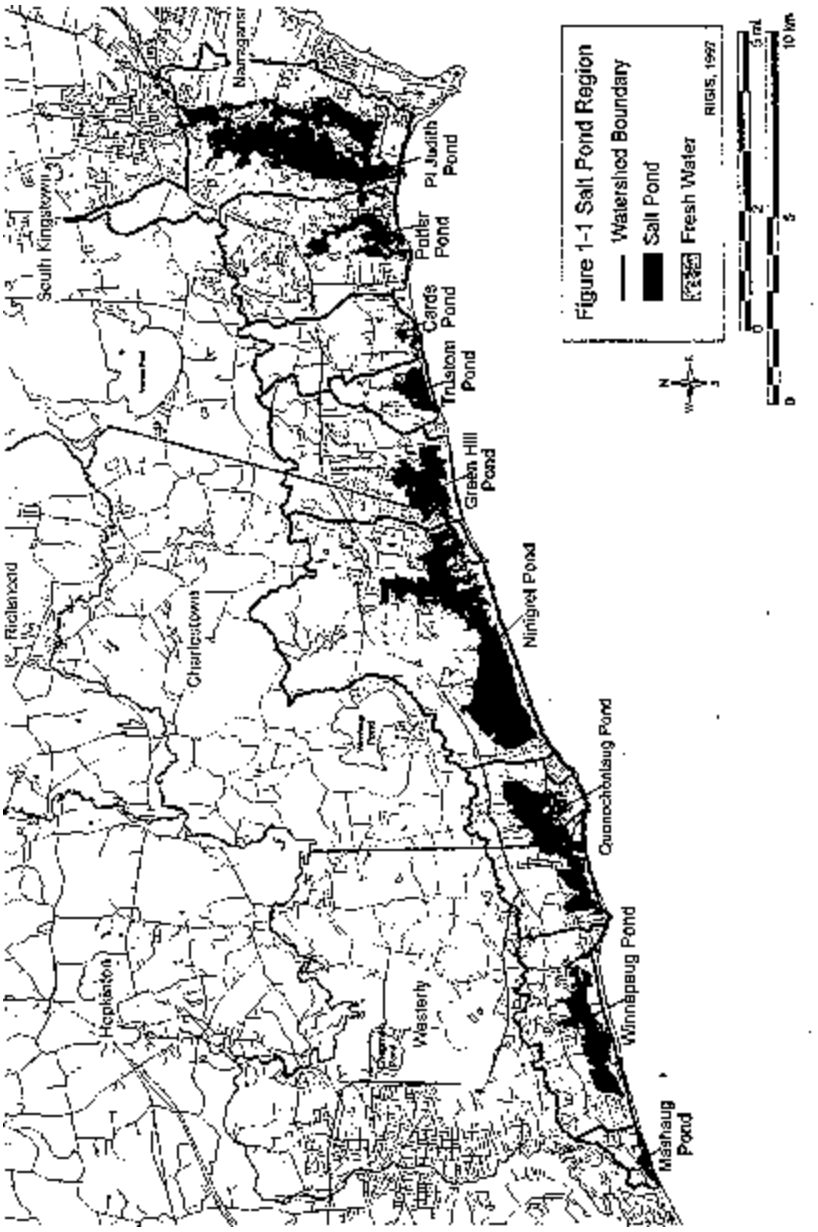
The Planning Environment

In order to understand the development and implementation of the special area management plan (SAMP) for Rhode Island's Salt Ponds, it is important to have some familiarity with the planning environment. The following sections discuss the Salt Ponds ecosystem and the institutional framework governing the watershed.

The Salt Ponds Ecosystem

The Salt Ponds consist of nine brackish coastal lagoons separated from the ocean by a low narrow strip of barrier beach islands located along the southern coast of Rhode Island [Table 1]. The watershed covers approximately 32 square miles (82.4 km^2) and includes in the towns of Westerly, Charlestown, South Kingston and Narragansett (Figure 1). Much of the watershed remains undeveloped and fringed by wetlands that serve as valuable habitat (Figure 2). The ponds are shallow and poorly flushed, and the freshwater input is primarily from groundwater and surface runoff. These conditions make them valuable as fish and shellfish nurseries but also susceptible to eutrophication and bacterial loading. Historically the ecology of the ponds has been influenced by the stabilization of inlets, dredging of channels, the installation of onsite sewage disposal systems (OSDSs) and alterations of the quality and quantity of freshwater

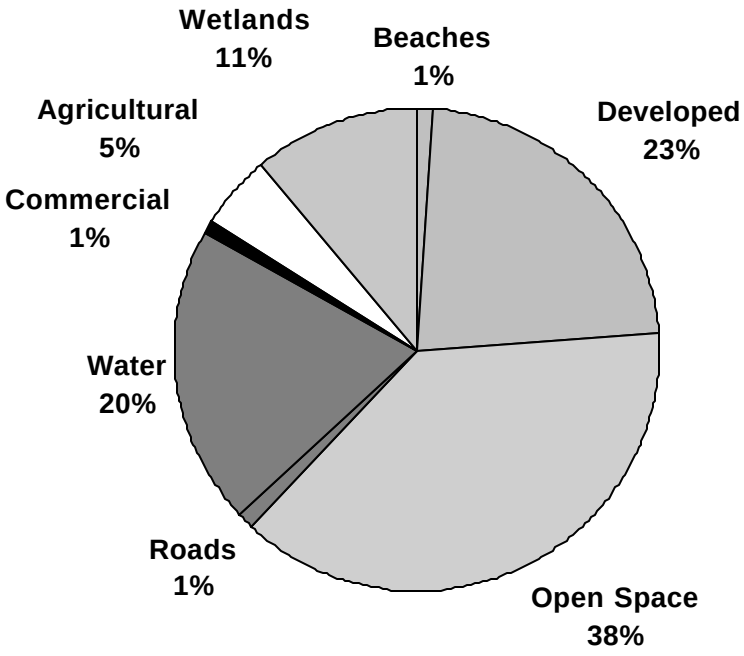
Figure 1: Rhode Island Salt Ponds Watershed



Source: Coastal Resources Management Council (CRMC), *Rhode Island Salt Pond Region: A Special Area Management Plan (Machaug to Point Judith Ponds)* (Wakefield, RI: CRMC, 1999), 1-2.

inflow resulting from development activities. The low, narrow barrier beaches also make the region susceptible to erosion and storm water damage from hurricanes and winter storms. The area is also a spawning and nursery ground for winter flounder, important for both recreational and commercial fishermen. The ponds also support productive shellfisheries for hard shell clams, soft shell clams, oysters and bay scallops.[21] One of the major fishing ports in the region,

Figure 2: Land Use in the Salt Ponds Region (1988)



the port of Galilee, is located in the watershed. The watershed boundary closely follows coastal highway US. 1. This helps to make the watershed somewhat distinct and recognizable, and creates a sense of regional identity among the areas residents.[22]

The beauty and bounty of the ponds region attracts more than 165,000 people a day in the summer months. Barrier beaches in the Salt Ponds region rank as Rhode Island's number one recreational resource.[23] However, these amenities also attract a growing year-round population. For example, Providence, the state capitol, is only 45 minutes away, and the University of Rhode Island (URI) is located only 10 minutes from the shore. Accordingly, a large proportion of the state's population has an interest in maintaining the areas environmental quality. Residents are also politically active and the New England tradition of home rule is very much part of the region's culture. Residents have also demonstrated a strong desire to maintain the region's rural and historic character.[24]

Until a four-lane highway provided easy access to the area in the 1950s, the region remained relatively undeveloped. However, between 1950 and 1980 residential development increased threefold. The population of the Salt Pond Region increased 69 percent from 1981 – 1992. Total population change in the south shore of Rhode Island is projected to increase by 15 percent to 24 percent between 1988 and 2010.[25] The coastal zone in Rhode Island is also densely populated and is expected to increase from 950 persons per square mile in 1990 to 1048 per square mile by 2010.[26]

As a result of the increased suburbanization, the Salt Ponds region began to experience a number of the environmental problems by the late 1970s including:

- 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
- Stormwater runoff increased sedimentation and nutrient loading to the ponds
- Stabilized breachways changed salinity regimes and caused sedimentation problems
- Storm damage from hurricanes and winter storms
- Conflicts among resource users.

There was also a general belief among the public that government was not responsive and that agency decisionmaking was cumbersome, contradictory, and time-consuming.[27]

Institutional Framework Managing the Salt Ponds Watershed

The institutional framework managing the Salt Ponds is quite complex. To simplify the discussion, only the key actors are discussed. These are: University of Rhode Island (URI) and the Coastal Resources Center (CRC); Rhode Island Coastal Resources Management Council (CRMC); Rhode Island Department of Environmental Management (RIDEM); Rhode Island department of Administration's Division of Planning (RIDOP); various nongovernmental organizations (NGOs); and, the municipalities of Narragansett, South Kingston, Charlestown, and Westerly. Other actors played minor roles such as the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (USFWS), Natural Resource Conservation Service (NRCS), the U.S. Army Corps of Engineers, various developers, individual residents, and the newspapers. The roles of these and other actors are noted as appropriate.

University of Rhode Island (URI) and the Coastal Resources Center (CRC)

The University of Rhode Island played an active role in the development of the Salt Ponds SAMP. Researchers at the URI's Graduate School of Oceanography (GSO), the Sea Grant Program (SGP), Cooperative Extension Service (CES), and other departments such as the Departments of Natural Resources Science, Geology, Civil and Environmental Engineering, Marine Resources, Community Planning, and Resource Economics conducted a wide range of studies in support of the SAMP's development and implementation. Perhaps the most influential institution was the Coastal Resources Center, which was created, in part, to assist the CRMC with the development of its federal coastal zone management (CZM) program. The CRC's staff coordinated the development of the SAMP, and negotiated the zoning changes and plan's policies with the CRMC and local officials. Over the years, the CRC has emphasized the importance of stakeholder involvement and constituency building in its technical assistance programs, both domestically and abroad. Historically, the CRC also played an important role in helping to develop new policies and programs for the CRMC. In recent years, the CRC has worked with the RIDEM, helping it develop its statewide watershed strategy.[28]

Coastal Resources Management Council (CRMC)

The Rhode Island Coastal Resources Management Council implements Rhode Island's coastal zone management (CZM) program, which was approved by the NOAA in 1978 pursuant to the 1972 Coastal Zone Management Act (CZMA). As a result, the implementation of CRMC's programs is subject to periodic evaluations by NOAA pursuant to Section 312 of the CZMA.[29] The CRMC's enabling legislation and the CZMA require the agency to balance resource conservation with the needs for development and human use of coastal resources. Specifically, the CRMC's 1971 enabling legislation required it to:

> "preserve, protect, develop and where possible restore coastal resources for this and succeeding generations . . . through comprehensive, long-range planning and management designed to produce the maximum benefit for society and that the *preservation and restoration of ecological systems* shall be the primary guiding principle by which alteration of coastal resources will be measured, judged, and regulated (R.I.G.L. §46-23-1, emphasis added)."

The CRMC approaches fulfilling this mandate by maintaining a balance between planning, management, and regulation. These policies are contained in the Rhode Island Coastal Resources Management Program.[30] The RICRMP contains rules that regulate all development along Rhode Island's 401 miles of shoreline. It also regulates certain activities (e.g., power generation facilities, chemical and petroleum processing facilities, and mineral extraction activities) on a statewide basis and other activities located in the watersheds of poorly-flushed estuaries (e.g., Salt Ponds and Narrow River). All federal, state, and local development projects in its jurisdiction are subject to the CRMC's review and approval. The permit review process is open with opportunities for both written comment and public testimony at hearings that are required for all major development projects. The review process is similar to the one used by local governments in the watershed.

Unlike, RIDEM, which is an executive branch agency, the CRMC is a legislative agency delegated broad authority to develop whatever policies and programs it deemed necessary to fulfill its mandate. The initial focus was not to create a new bureaucracy. Instead, the council relied on staff from the RIDEM and other state agencies to review and comment on development proposals. In 1986, the CRMC was given its own technical staff. However, it continues to rely on some RIDEM permits (e.g., OSDS permits and Section 401 water quality certifications) to complete its technical review for some development projects. Minor permits are issued administratively, while major permit decisions are decided by a 16-member council of politicians and citizens appointed by the governor, lieutenant governor, and the speaker of the house. The formula determining representation on the council is quite complicated and ensures that all regions of the state and communities of different sizes are represented. While the structure of the Council has opened up the agency to charges of being political, we found no evidence to suggest that the CRMC was any more responsive to overt pressure brought by the governor or interest groups (e.g., Save the Bay, RIMTA) than the RIDEM. The CRMC also focused on building a constituency to support its programs, and has been effective in maintaining strong working relations with the Rhode Island General Assembly.

Rhode Island Department of Environmental Management

RIDEM is the state's water quality agency and is delegated the authority under the Clean Water Act (CWA) to implement a number of the Environmental Protection Agency's (EPA) programs such as the Rhode Island Pollutant Discharge Elimination System (RIPDES) permit program and Section 401 water quality certifications. The RIDEM also implements statewide permit programs for freshwater wetlands and onsite sewage disposal systems (OSDSs). Unlike the CRMC's programs that try to balance conservation and development in coastal areas, the mission of the RIDEM's programs, as contained in the State Constitution and various state enabling legislation, focuses on protecting human health and the environment on a statewide basis. This difference in mission appears to be one source of periodic conflict between the RIDEM and the CRMC, particularly in areas where there is overlapping authority and responsibility.

The RIDEM's programs are also more "hierarchical" than the CRMC's and have a centralized decisionmaking process.[31] Responsibility for the review of projects is divided among different divisions, and it is not uncommon for a single development project to be reviewed by different programs located in different offices, which may disagree on the merits of a project. The RIDEM's enabling legislation at both the federal and state levels is also more restrictive than the CRMC's and places constraints on the agency's ability to develop new policies and programs. Opportunities for public participation in RIDEM permit decisions are more limited and closed than the decisionmaking processes of local governments and the CRMC. The latter are required to hold public hearings on all major development projects in addition to having public notice and comment requirements. A council or board also makes permit decisions in full view of the public instead of being issued administratively.

The RIDEM is also saddled with multiple and sometimes conflicting mandates[32] and in recent years has been criticized by the general assembly, the regulated community, and the EPA.[33] For example, a 1990 report by the Environmental Quality Study Commission recommended the complete reorganization of the RIDEM and cited: the inadequacy of staff levels within different divisions of the agency; the inability to attract and retain qualified staff; the inadequacy of certain core functions of the agency in areas of planning, program development, enforcement, and data management; inadequate funding for environmental regulatory bodies; and a flawed organization structure.[34] Many of these same problems continue to affect the agency and are the source of ongoing criticisms.[35] The lack of consistent leadership—as evidenced by the high turnover in its commissioner—has hindered the agency's ability to address these problems and the frequent reorganizations of the agency do not appear to have quelled these concerns.[36]

There is also a history of conflicts between the RIDEM and the CRMC that influenced the development and implementation of the SAMP. The RIDEM and CRMC reflect different philosophies of environmental management as a result of their enabling legislation and relationships with different federal agencies (i.e., EPA and NOAA) and sometimes work to protect the interests of different constituency groups.[37] In the past, bills have been introduced in the general assembly to move the council and its programs to the RIDEM. More recently, there have been proposals to move selected RIDEM programs to the CRMC. For example, in the past

several years, bills have been proposed to move the Narragansett Bay Estuary Program (NBEP), and the authority to implement federally delegated water quality programs, to other agencies, most often the CRMC. Accordingly, it is not uncommon for the two agencies to be involved in periodic political conflicts. While these conflicts are real and are noted periodically, there are also many instances of effective collaboration between the agencies and staff often works well together. Thus, the relationship between the two agencies is a complicated one filled with both conflict and collaboration.

Division of Planning

Rhode Island has aggressive comprehensive planning requirements that went into effect while the CCMP was developed. The Department of Administration's Division of Planning (RIDOP) and the Statewide Planning Council (SPC) administer the Statewide Planning Program (SPP). The SPP provides technical assistance to local governments and state agencies and maintains the *State Guide Plan*, the repository of state policies. State agencies and local governments are required to be consistent with these policies. Moreover, local governments are required to develop comprehensive land use plans consistent with these policies and develop ordinances to implement the plans. The RIDOP reviews the plans to make sure that they are consistent with the policies contained in the *State Guide Plan*. The RICRMP and Salt Ponds SAMP are elements of the *State Guide Plan*. There have been fewer instances of political conflict surrounding the relationship between the CRMC and the SPP. The only major conflict in recent years concerned whether the CRMC's regulations had to be consistent with the policies contained in the *State Guide Plan*. When the conflict arose, at the prompting of the CRMC, the RIGA adopted legislation clarifying that the CRMC's authority superseded that of other state agencies.[38]

Nongovernmental Organizations

A number of nongovernmental organizations have been active in the development and implementation of the SAMP and other state environmental policy initiatives. The Rhode Island Marine Trades Association (RIMTA) represents the recreational boating and ship building industries. The Rhode Island Builder's Association (RIBA) and the Rhode Island Association of Realtors (RIAR) represent the building industry. Another influential group is the Rhode Island Shellfishermen's Association (RISA). Save The Bay is the most powerful environmental advocacy group from a statewide perspective with more than 20,000 members.[39] Historically, its most important role has been to serve as a watchdog, monitoring agencies such as the CRMC and RIDEM. All of these NGOs are influential and play active roles in lobbying the RIGA[40] and typically represent these special interests in environmental policymaking efforts such as the SAMP. At the local level, two smaller environmental NGOs were created to support the development and implementation of the SAMP. The Salt Pond Watchers is a volunteer water quality monitoring organization; the Salt Ponds Coalition is an advocacy group. These environmental NGOs have been much more influential in the development and implementation of the SAMP than Save The Bay.

Local Government

The final set of key actors is the municipalities of Narragansett, South Kingston, Charleston, and Westerly.[41] Prior to the SAMP's development, local officials lacked the technical expertise and information necessary to adequately review the impacts of development projects resulting from OSDSs, erosion, stormwater runoff, and habitat alteration. Local officials typically relied on the staff working for state agencies and the information provided by permit applicants. Some communities lacked comprehensive land use plans while others were outdated. The communities had relatively unsophisticated zoning ordinances that didn't consider how land use activities impacted water quality and habitat. Moreover, there was little integration of local policies concerning the extension of sewer lines, the protection of habitat, and the acquisition of open space. Other problems included the poor management of recreational boating activities and the lack of public access to the shoreline. Accordingly, local communities played a relatively minor role in managing the impacts resulting from coastal development. As a result of the SAMP's development and implementation and other initiatives, local capacity to address environmental problems has expanded considerably.

The Salt Ponds Special Area Management Plan (SAMP)

During the 1975 hearings that took place on the RICRMP, citizens and public officials expressed their concerns about the condition of the ponds: deteriorating water quality, rapid sedimentation, overfishing, increasing vulnerability to hurricane damage, and increasing user conflicts. These problems were largely the result of rapid residential development in the face of what was perceived to be indifference by state officials. These environmental problems and a proposal to site a Nuclear Power Plant at the former Charlestown Naval Air Station along the shores of Ninigret pond[42] were the catalyst for a growing awareness among residents that additional management measures were needed to protect the Salt Ponds ecosystem.[43] While the General Services Administration (GSA) chose not to transfer the land to New England Power, the evaluation of the proposal also led to early scientific knowledge about the Salt Ponds ecosystem.

At the time, the CRMC did not have adequate data or scientific information to corroborate local concerns or to justify or inform policies designed specifically to protect the Salt Ponds. Thus, the CRMC agreed to seek funding to develop a special area management plan for the Salt Ponds region once the RICRMP received its federal approval. From 1979 to 1984 federal funds received by the CRMC, the CRC, and the SGP were combined to support an ambitious interdisciplinary research program similar in nature to the larger research program employed by the Chesapeake Bay Program some years later. The product of this interdisciplinary research program was the creation and formal adoption of the Salt Ponds SAMP in 1984 [Table 2].

Developing the Salt Ponds SAMP

The CRC served as CRMC's planning staff and coordinated the efforts of an interdisciplinary research team that investigated nutrient cycling, fisheries, hydrodynamics, and the geology of the ponds. The CRC used a participatory planning process that involved a series

Table 2: Major Events in the Development of the RICRMP and the Salt Ponds SAMP

Events in the Development of the RICRMP	Events in the Development of the SAMP
▪ 1971 CRMC State Enabling Legislation ▪ 1972 Federal Coastal Zone Management Act ▪ 1975 RICRMP Adopted ▪ 1978 Federal CZM Program Approved ▪ 1983 RICRMP Substantially Revised ▪ 1988 Harbor Management Program Adopted ▪ 1990 RICRMP Revised Again ▪ 1993 New RICRMP Regulations for Stormwater, Erosion and Sediment Control, and Wetlands Mitigation ▪ 1994 New Buffer Zone Requirements ▪ 1997 CNPCP gets a preliminary approval ▪ 2000 CNPCP is approved by EPA and NOAA	▪ 1975 Public Hearing on the RICRMP ▪ 1979 Ecological History Conducted ▪ 1979 – 1984 Multi-Disciplinary Research Study ▪ 1983 – 1984 Salt Ponds Advisory Committee ▪ 1984 SAMP Adopted by the CRMC ▪ 1986 Westerly Added to the SAMP ▪ 1994 Denitrification Requirements for a Sub-Watershed Added to the SAMP ▪ 1994 Study of Cumulative impacts and nitrogen loadings ▪ 1999 Revised SAMP

of formal and informal meetings that synthesized the research findings and identified management strategies to address identified problems. The CRC then negotiated the SAMP's policies with the CRMC and local governments. Previous analyses of the CRC's approach identified several factors that were important contributors to the planning process' effectiveness.[44]

To identify the most important problems in the ponds area and to get the concerned public to understand the issues, an innovative ecological history was prepared. This resulted in the publication of *The Elusive Compromise: Rhode Island's Coastal Ponds and Their People* which became a local best seller.[45] It presented a picture of a time when the ponds were in balance with human users. It also identified the salient issues that a research and management strategy needed to address. At the time, these issues were:

- Formerly abundant fish and shellfish stocks were virtually disappearing while others were declining.
- Human -stabilized inlets were causing rapid sedimentation within the salt ponds.
- Water pollution threatened to become more widespread; bacterial contamination was a threat to larger shellfish areas; eutrophic conditions were degrading fish and shellfish habitats and the scenic quality of the salt ponds.
- Residential development threatened to overwhelm the ecosystems capacity to absorb waste and provide potable drinking water. Farmlands and woodlands that provided the character and beauty of the area were being sacrificed for new residential development.
- Hurricanes remained a recurring problem for the south shore , with residents and developers ill prepared.
- Competition among aquaculture, commercial and recreational fisheries, recreational boating, and other commercial interests required management.

This document proved to be an excellent way to provide evidence to document the watersheds problems while also involving and educating residents at the outset of the planning process. It also provided staff with an opportunity to learn more about the culture of those who would be affected by the SAMP.[46]

Second, the CRC was effective in coordinating scientific research on a number of water quality, sedimentation and overfishing problems. The CRC was also successful in keeping the research focused on issues important to the state and local decisionmakers. Third, and perhaps most important, the CRC identified one integrating problem – water quality – to develop the SAMP around. The research suggested that the density of OSDSs needed to be controlled in order to limit the nitrogen loadings to groundwater. In some areas, well water had already become nonpotable. The concern was that further development and the installation of accompanying OSDSs would lead to eutrophic conditions and increase shellfish closures due to bacterial contamination. To be effective, the SAMP would have to manage the density of OSDSs associated with future development in order to limit nitrogen loadings.

Finally, the CRC was very effective in building a constituency to support the SAMP's development and implementation. Two forms of negotiation and collaborative decisionmaking were involved in the development of the Salt Ponds SAMP. The first was an internal process of negotiation among those concerned with the policy and planning implications of the research process. It proved to be a major challenge to coordinate the efforts of the researchers and, at the same time, to keep focused on policy relevant problems. One technique to accomplish this was to have a series of annual meetings where the researchers reviewed findings and brainstormed about possible implications. There was also an effort to involve the interested citizens in the research process. This was accomplished through the creation of the "Salt Pond Watchers," a volunteer water quality monitoring organization that continues to be an important source of water quality information on the Salt Ponds region.[47]

The second was a formal and structured process of negotiation between public interest groups, municipal officials, and state agencies. The CRMC created an advisory committee composed of these stakeholders. The group worked intensively in 1983 and 1984 to develop a detailed synthesis of the research findings that would be included in the management plan. The advisory committee then formulated a set of management measures. Since the CRMC did not have direct authority over the cities and towns, the challenge was to convince municipal officials that they had the authority and capacity to manage the impacts of development in the watershed. To build support among these groups, the CRC organized a series of dinner seminars attended by members of local town councils, zoning boards, and planning boards. This venue helped to build trust between staff and local officials. It also resulted in a shared understanding of the problems affecting the Salt Ponds and their causes.[48] Once the draft SAMP was approved by the committee, it was released for broader public comment and began the process of being formally approved by the CRMC.

The effectiveness of CRC's constituency building approach was evidenced by the fact that the plan met with limited opposition at the final public hearing. Most public comments were supportive, and the Salt Ponds SAMP were formally adopted by the CRMC in November 1984.[49]

The CRC also worked with local officials to enact zoning changes that would implement the SAMP's policies.[50] As a result, South Kingston, Charlestown, and Narragansett amended their zoning policies to make them consistent with the SAMP's requirements in 1984. Westerly was initially reluctant to be part of the SAMP's management framework, but eventually decided to join the effort in 1986.[51]

Implementing the Salt Ponds SAMP: A "Collaborative Constitution"

The SAMP recommended a variety of actions by state and local officials, university researchers, and homeowners [Table 3].[52] The CRC envisioned the SAMP as a sort of "constitution" that would bind the actors to a set of prescribed actions and mitigate the cumulative and secondary impacts resulting from future development in the watershed. In this respect, the SAMP was literally decades ahead of its time.

Local governments revised their zoning ordinances consistent with the SAMP's OSDS density overlays. Local officials prioritized sewer extensions and other infrastructure investment to be consistent with the SAMP's policies. As a result, there have been no large-scale proposals to invest in public infrastructure that would substantially increase the density of development in the watershed. Moreover a review of municipal comprehensive and land plans indicates that, for the most part, local policies are consistent with the SAMPs density requirements. In some cases the comprehensive plans were more restrictive than the SAMP's recommendations.

A number of changes also occurred at the state level. The CRMC enforced many of the SAMP's requirements through it's permit review process. New rules included increased buffer zone and setback requirements, density requirements for large projects, and more stringent stormwater and erosion control requirements. The SAMP became part of the *State Guide Plan*, which required future decisions by federal, state and local agencies to be consistent with the SAMP's policies and recommendations. The RIDEM adopted new requirements for siting and design for OSDSs statewide, as well as more-stringent requirements in the Salt Ponds area. The RIDEM's Section 319 Nonpoint Source (NPS) Management Program has also made the funding of onsite wastewater management programs and alternative wastewater systems a high priority for these grant funds.[53] The RIDEM also provided funding to support the Salt Pond Watchers volunteer water quality monitoring organization. However, the RIDEM did not implement many of the SAMP's fisheries management recommendations and participation in the informal permit review process has been spotty.

These changes resulted in a complex, polycentric, institutional arrangement. Municipalities review development proposals in the towns and they control most of the decisions regarding infrastructure development. The CRMC reviews all projects within 200 feet of the most-inland coastal feature (e.g., bluff, beach, coastal wetland, shoreline etc). The CRMC also reviews all subdivisions of six units or more, large commercial projects, and any development actively generating more than two acres of impervious surface in the watershed. The RIDEM reviews any project that discharges pollutants to coastal or inland waters, alters or impacts freshwater wetlands or requires an OSDS. In sum, a municipality, the CRMC, and one or more regulatory programs in the RIDEM must review any large development project.[54]

Table 3: Actions Recommended in the Salt Ponds SAMP

Problem	Actions Recommended/Adopted
Decisionmaking	- Coordinated permitted review process[b]
Nonregulatory initiatives are ad hoc and uncoordinated	- Recommends an action committee chaired by the CRMC to identify annual priorities and coordinate non-regulatory initiatives[c]
Water Quality Problems from Residential & Commercial Development	- SAMP establishes density overlays[a] - Municipalities changed zoning[a] - Established priorities for sewering[a] - Improved stormwater and erosion controls[a]
Water Quality Problems from Excessive OSDS Loadings	- SAMP establishes density overlays[a] - Construction setbacks and buffer zone requirements[a] - Recommends establishment of wastewater management districts[d] - Recommends use of denitrification systems in some areas[e]
Loss of Habitat	- Limits extension of public water and sewer lines where encourages further high density development[a] - Identifies wetland and other habitat restoration sites[g] - Identifies critical habitat areas[a] - Buffer zone requirements[a]
Stabilization of Inlets	- Limit further dredging[a] - Maintain catchment basins at each inlet - Promotes use of tide gates where practicable
Overfishing and Habitat Degradation	- Proposed modifications in catch limits - Proposed creation of fishing stewards to monitor stocks - Habitat protection and water quality measures[a]
Hurricane and Severe Storm Damage	- Construction setbacks on barrier beaches[a] - Prohibit construction on undeveloped and moderately developed barrier beaches[a] - Prohibits expansion of public infrastructure in many barrier beach areas[a]
User Conflicts and Loss of Open Space	- Water use zoning to protect critical areas and priority uses[a] - Proposed improving public access[f] - Identified priority sites for preservation and restoration[g]

[a] Implemented; [b] Different review process adopted; [c] Operated initially but then gradually faded out when most of the recommendations were implemented, or it was determined that they either couldn't be implemented or were not a good idea; [d] Only by implemented Narragansett; [e] Limited by unavailable technology. Denitrification requirements are now starting to be added to the SAMP; [f] Implemented by the Harbor Management Planning initiative and changes in how public access sites are reviewed by the Council; [g] Used permit stipulations to preserve and restore sites (e.g., Coastal America project near the Port of Galilee)

It was not surprising that the complexity of the institutional setting and the associated transaction costs prompted a move to centralize or "coordinate" the state and local permit review process with the CRMC as the lead agency. However the review process did not develop as envisioned. Fiscal and staffing limitations at the CRMC and specialized expertise in the other agencies led to this approach being abandoned and replaced with an informal, decentralized, review process. Some observers have identified the lack of a centralized permit review process and periodic conflicts between the CRMC and RIDEM as being major weaknesses with the SAMP's implementation.[55] Conversely, others have concluded that some of this conflict is actually a natural and healthy by-product of our federal system, and the polycentric structure of the governance arrangement and informal review process are actually quite cost-effective.[56]

As originally conceived, the CRMC would have served as the permit coordinator, sending all applications to appropriate agencies and coordinating the flow of information between agencies. The problem was that the CRMC had limited slack organizational resources at the time and relied mostly on RIDEM and RIDOP staff to review its permits. Moreover, the CRMC would have to coordinate a number of development activities that had little impact on coastal resources. There were also problems concerning the lack of information about the requirements of the other programs. Essentially, the coordination and information costs of the proposed centralized review process were deemed by the CRMC to be too high.

Instead, the CRMC entered into agreements with each municipality regarding the coordinated review of major development projects. When a major project was proposed, CRMC technical staff or local officials would arrange a meeting with the developers to discuss the project. RIDEM staff are invited to attend but their participation has varied across projects and over time. The coordinated permit review meetings are designed to be an informal forum for communication and negotiation so that all involved could gain an understanding of the other positions. Undertaking coordination efforts during the early stages of the development process has saved developers time and money by allowing them to incorporate state and local concerns into project design. The sharing of scientific and time and place information during the early stages also leads to informed state and local agency decisions. Most importantly, the review process improved communication between the CRMC, local officials, and developers. The coordinated review process became so successful that it formed the basis for the new statewide requirements for subdivision review.[57] Hence while the coordinated review process is different than the centralized process recommended in the SAMP, it may be more effective and helps minimize coordination costs.

Evolution of the Salt Ponds SAMP

One of the interesting features of the SAMP's implementation is its continued evolution and ability to serve as a catalyst for other related activities. This is consistent with Elinor Ostrom's observation that changes in rules occur in "incremental, sequential and self transforming ways".[58] In other words, the initial institutional changes associated with the SAMP's adoption provided a foundation upon which future institutional changes could be built.

The development of the SAMP led to changes in the RICRMP in 1983 while its implementation resulted in other changes to the RICRMP in 1990 and subsequent revisions over

the next nine years. For example, the CRMC substantially revised its stormwater[59] and erosion control requirements, adopted formal wetland mitigation requirements[60] and substantially revised their buffer zone policies.[61] The plan also stimulated the development of a SAMP for the Narrow River watershed adjacent to the Salt Ponds.[62] The SAMP also served as a catalyst for the development of municipal harbor management plans (HMPs) that are approved by the CRMC but are developed and implemented by local municipalities. The HMP helps communities improve the management of recreational boating, identified public access sites for the CRMC's designation, and integrates the local land and water use planning with CRMC's regulatory programs.[63] The CRMC also underwent major organizational changes in the years following the adoption of the Salt Ponds SAMP. It hired its first executive director and acquired its own technical staff in 1986. Prior to this, RIDEM and RIDOP staff reviewed CRMC permit applications. Today, the agency has its own permit review staff and has taken over much of the policy development work previously done by the CRC.

The SAMP also acted as a catalyst for institutional change at the local level. In 1986, the watershed region for the Salt Ponds located in Westerly was amended to the SAMP at the city's request. Westerly also enacted many of the SAMP's recommended zoning changes. Many of the municipalities stepped up their efforts to make recommended sewer extensions and adopted conservation ordinances to protect habitat and address stormwater and erosion problems. Conservation commissions were created to apply these ordinances and they routinely use the information from the SAMP to justify their decisions. The SAMP also helped stimulate the adoption of state enabling legislation that authorized wastewater management districts.[64] Finally, all municipalities were required by state statute to prepare comprehensive land use plans. All four communities in the watershed prepared comprehensive land use plans that embraced and built upon the SAMP's policies and recommendations. As a result of these changes, all four communities now play an active role in managing the region's ecological resources.

By the early 1990s, it was apparent that while water quality had improved in many areas, there were some areas where it had not improved, or had degraded. While the SAMP contained requirements for the installation of denitrification OSDSs, these requirements were largely ignored by the CRMC or RIDEM because of the lack of available technology and the additional cost associated with these systems.[65] In 1993, the RIDEM, CRMC, and university researchers created a denitrification taskforce to begin discussing the state of OSDS technology and to explore the feasibility of beginning to require the installation of alternative OSDSs in selected areas of the Salt Ponds watershed where water quality continued to decline or had not improved. These parties agreed to a pilot effort that would require the installation of denitrification OSDS in areas adjacent to Green Hill Pond and the eastern part of Ninigret Pond. The CRMC amended the SAMP in 1994 to that affect and developed a memorandum of understanding (MOU) with the RIDEM whereby the agency agreed to implement these regulations through their OSDS permit program. Other changes were also made to the SAMP to better address buffer zones, stormwater, and erosion and sediment controls. Unfortunately, recent interviews with CRMC and RIDEM staff indicate that the MOU was not implemented by the RIDEM. These problems were addressed during the 1999 revision to the SAMP.

1999 Revised SAMP

In 1993, the CRMC also revised its Section 309 Enhancement Grants Program Strategy that was developed pursuant to the 1990 Coastal Zone Act Reauthorization Amendments (CZARA).[66] The revised strategy made revisions to the Salt Ponds and Narrow River SAMPs priorities.[67] The focus of the effort was to determine whether the plan was effectively controlling nitrogen loadings. It was also designed to update the technical information in the SAMPs that was used by state and local officials, to computerize the SAMP's maps,[68] and to update the nonregulatory recommendations in the plans. The revised SAMP was also designed to clarify the regulatory requirements with all of standards, policies, and recommendations included in one chapter.[69] The SAMP was also designed to reflect the coordinated permit review process mandated by the Development Review Act.[70] Moreover, given the similarities in the problems in both watersheds, were adjacent to one another, and involved some of the same municipalities, the decision was made to combine the two watersheds into one revised SAMP.[71] In 1994, the CRMC received funding through the Section 309 program to conduct a cumulative impact study that evaluated the effectiveness of the SAMP.[72]

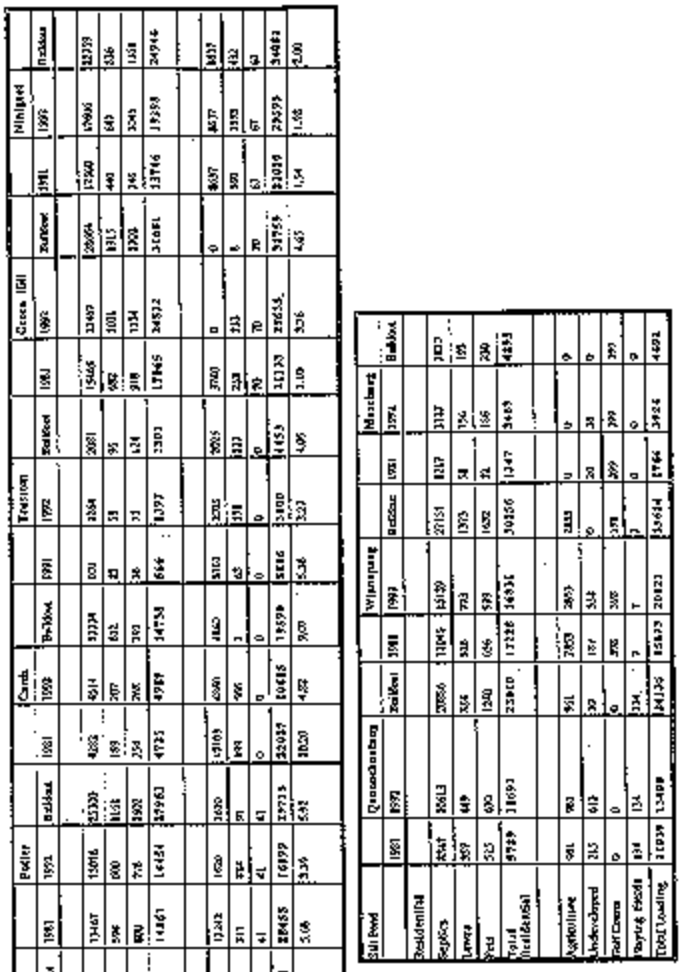
The cumulative and secondary impact study was conducted by the CRC. Nitrogen measured in groundwater, streams, rainfall and the ocean in 1980 and 1981 was compared with new measurements taken from 1994 to 1995.[73] Quantification of the principal sources of total inorganic nitrogen to each of the ponds demonstrated that the groundwater is the dominant pathway by which nitrogen enters the ponds. Of particular concern was the evidence of cumulative impacts of development. For example, the concentration of total nitrogen beneath densely developed areas of the ponds was elevated 100 times above the background levels found in areas unaffected by human changes [Table 4].[74] Symptoms of eutrophication were apparent and included increases in marine macroalgae and increased organic material in bottom sediments during the summer months in poorly flushed waters surrounded by development.[75] Portions of the Salt Ponds area have also been closed to shellfishing since 1994.

This research combined with an updated calculation for all the potential development in the watersheds according to 1995 zoning practices and the revised technical information on habitat and geological processes provided the foundation for the 1999 revisions. The specific objectives of the 1999 Revised SAMP are to:

- Evaluate the cumulative and secondary impacts of pollutant loadings
- Develop revised boundaries, regulatory requirements, policies, and recommendations for the SAMP
- Develop revised regulatory requirements for the RICRMP
- Develop additional management measures for Rhode Island's Section 6217 Coastal Nonpoint Pollution Control Program (CNPCP)[76]
- Simplify the format of the SAMP by placing all regulatory requirements and standards in one chapter on land use management[77]

Accordingly, the focus of the 1999 revisions was primarily the development of additional density controls and other regulatory requirements that would better manage NPS pollution and cumulative and secondary impacts of development such as habitat loss, erosion and sediment

Table 4: Nitrogen Loading (kg/yr) to groundwater in the Salt Ponds Region



Source: Laura Ernst, Virginia Lee, and Alan Desbonnet, "The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Pond Region." in *Seeking Balance: Conflict, Resolution, & Partnership* Conference Proceedings for The Coastal Society. 15th International Conference, July 14 - 17, 1996. Seattle, Washington

control problems, stormwater impacts, and groundwater impacts from OSDSs. The 1999 revisions also addressed other important issues such as wetlands protection, breachway modifications, dredging, recreational boating, storm hazards and public access.

The core of the SAMP continues to be its density controls that limit future development in the watershed, and thus the total the number of OSDSs. OSDSs are the largest contribution of nitrogen to groundwater in the Salt Ponds watershed, accounting for 92 percent of nitrate loadings from residential development.[78] However, instead of recommending sewering out the watershed as occurred in Lake Tahoe and is now occurring in the Delaware Inland Bays, the participants recognized that important tradeoffs existed between the problems affecting the watershed. While sewers could be used to reduce nitrogen loading from OSDSs it would also remove an important restriction on development in some areas of the watershed and it would make it difficult for local officials to oppose zoning changes that would increase the density of development. Thus, while sewers could remove nitrogen loadings from OSDSs it could also result in lost habitat, increased nonpoint source (NPS) pollution, and change the quality of life in the watershed. Moreover, the removal of OSDSs would change the hydrology of the region since well water served as the main source of drinking water. Thus, the original SAMP recommended sewering only isolated portions of the watershed where changes in density or OSDS requirements would be ineffective. Density restrictions or "downzoning" was recommended in other areas to limit the potential for future nitrogen loadings and other cumulative and secondary impacts associated with future development.[79]

The revised SAMP is based on the same logic and recognizes the same tradeoffs. The revised requirements are more sophisticated and offer more environmental protection by better mitigating the cumulative and secondary impacts of development. (The land use classifications and key regulatory requirements for the revised SAMP are presented in Table 5.) Lands are classified into three different types: developed beyond carrying capacity; critical concern and, self-sustaining. Various Coastal Buffer Zone Requirements, Construction Setback Requirements, OSDS Setback Requirements, and Nitrogen Reducing Technology Requirements are linked to each land use type while other requirements (e.g., erosion and sediment control, stormwater management) apply to activities regardless of their location. Of particular importance are the SAMP's new requirements for nitrogen reducing OSDSs. RIDEM's revised OSDS regulations only focus on site specific goals for nitrogen reduction and are not designed to take into account the "tyranny of small decisions."[80] In other words, RIDEM's individual permit decisions do not take into account the cumulative impacts that result overtime due to individual permit decisions. The revised SAMP adds value by allowing the CRMC, RIDEM, and municipal officials to address these and other cumulative impacts resulting from future development activities.

Most of the SAMP's implementation efforts continue to be regulatory in nature in that many of the plan's requirements are implemented through local zoning and regulatory programs in the CRMC and RIDEM. Thus, the development of the revised SAMP involved a series of negotiations between environmental groups that wanted more nutrient restrictions, builders which wanted less controls and restrictions, and local officials that all had their own unique sets of concerns. Thus, the challenge for the CRMC was to try and balance these interests before going out to public notice on the final rules.

Table 5: CRMC's Land Use Classifications and the Revised SAMP's Requirements

Requirements	Developed Beyond Carrying Capacity	Critical Concern	Self-Sustaining
Definition	Lands developed o undeveloped at < 80,000 square feet	Lands developed or undeveloped at 120,000 square feet and have sensitive salt pond or watershed resources	Lands developed, undeveloped at 80,000 square feet
Coastal Buffer Zone Requirements [1]	Coastal buffer based on RICRMP §150	200'	150'
Construction Setback Requirements [1]	Coastal buffer plus 25'	Coastal buffer plus 25'	Coastal buffer plus 25'
OSDS Setback Requirements [1]	Nitrogen reducing technology is required	225'	200'
Nitrogen Reducing Technology Requirements [1, 2]	New OSDS installations or replacement	Lands subdivided after adoption of SAMP that do not meet the CRMC density requirement and substandard lots of record	Lands subdivided after adoption of SAMP that do not meet the CRMC density requirement and substandard lots of record

[1] A special exception (SE) is required for relief from the density requirement, coastal buffer, construction setback, OSDS setback, and nitrogen reducing technology requirement unless the lot is preplatted n accordance with Section 920.1 and cannot accommodate the requirement.

[2] Nitrogen reducing technologies are alternative wastewater systems which can reduce total nitrogen loadings by at least 50 percent.

Modified From: Coastal Resources Management Council (CRMC), *Rhode Island Salt Pond Region: A Special Area Management Plan (Machaug to Point Judith Ponds)* (Wakefield, RI: CRMC, 1999), Table 9-1.

The revised SAMP also continues to rely on nonregulatory efforts as well. Local governments have extended sewer lines and upgraded sewage treatment plants in accordance with the original SAMP's recommendations. Several of the local governments have used the development of comprehensive land use plans and municipal harbor management plans to address issues in the SAMP. The Salt Ponds Coalition has helped fill a void in the area of public education and involvement, while the Salt Pond Watchers continues to provide an important source of data on changes in water quality.

Habitat restoration efforts have been more limited. In part, this is due to the lack of a dedicated source of funding or FTEs that can support habitat restoration efforts in the CRMC or other state or local agencies. The overlapping authority between RIDEM and the CRMC and the

periodic interagency conflict, turf battles, and duplication of effort have also served as an obstacle to collaboration in the area of habitat restoration.[81] For example, in recent years the RIGA has debated two competing versions of habitat restoration legislation during the past three sessions. One is supported by CRMC while the other is supported by the Narragansett Bay Estuary Program (NBEP), RIDEM, and Save the Bay. The three groups have yet to agree on a means of sharing the administration of a statewide habitat restoration program.

Despite these problems, the three organizations have formed a Rhode Island Habitat Restoration Team that includes governmental and nongovernmental actors and local representation to begin coordinating the efforts of various organizations. More recently, the NBEP, CRMC, and Save The Bay were jointly awarded a $270,000 grant from NOAA to develop a collaborative coastal habitat restoration program for the state, identify priority sites for restoration efforts, and develop a restoration database that could be used by various stakeholders. The CRMC and other federal, state, and local agencies have been able to undertake some notable restoration efforts. There have been instances when the CRMC achieved some habitat restoration in the watershed as a result of permit stipulations. One notable example is the Coastal America project near the Port of Galilee that restored a sizable area of wetlands as a result of a permit stipulation on the construction of the new Jamestown Bridge. Other collaborative projects have focused on the restoration of seagrass beds in three ponds and an impacted salt marsh east of Quonochontaug Pond. The Salt Ponds region has also been identified as one of the pilot areas for projects developed in accordance with the state's new watershed approach.[82] Moreover, given the breadth and scope of the CRMC's jurisdiction, all coastal habitat restoration projects are subject to the CRMC's approval. Thus, even when it is not the lead agency, its technical are still in a position to provide guidance and ensure that the projects are done in an appropriate manner.

Prospects for the Future

Our interviews indicate that the major actors at the state and local level appear quite satisfied with the Salt Ponds SAMP and its evolution over the last 25 years. Protection of the Salt Ponds continues to be high on the agenda of state and local officials. Actors inside and outside the watershed also view the effort as being a success story. For example the CRMC has been approached by the town of New Shoreham to develop a SAMP for Block Island. The Narragansett Bay Project (NBP) recommended that SAMPs be developed to address water quality in three watershed areas around the state.[83] The RIDOP used a similar special are management planning process to develop a management plan to protect the Scituate Reservoir Watershed. The EPA noted it was an effective model for local environmental planning in the original guidance for the National Estuary Program (NEP).[84] The coordinated permit review process was viewed as being an effective process for reviewing subdivisions and was expanded statewide by the RIGA.[85] The CRC also uses this experience in their training program for international coastal zone managers and has used a similar constituency building process to develop similar SAM plans in developing countries such as Ecuador and Sri Lanka. The CRMC has also developed SAM plans for other regions such as the Narrow River, Providence Harbor, and the Pawcatuck River.

The more difficult question to answer is the degree to which these efforts improved environmental conditions in the watershed. It was clear that much of the original SAMP was implemented [Table 3] and we have similar expectations for the revised SAMP given its regulatory approach and the strong public d political support for these efforts. It is also clear that the density restrictions have helped reduce nitrogen loadings that would otherwise have occurred. The growth restrictions also limited the potential for future environmental degradation as a result of continued development. The efforts to develop and implement the SAMP have also sparked the development of new institutions (e.g., Salt Ponds Watchers and the Salt Ponds Coalition) and efforts to preserve and acquire open space.

It is harder to generalize about the overall changes in water quality that have occurred as a result of the SAMP's implementation. It is clear that there are consistently higher nutrient loadings in densely developed areas. The cumulative impacts study conducted by the URI's CRC suggests that water quality in some ponds has improved while it has declined in other areas.[86] The analysis examined the changes in land use and calculated the nitrogen loading budgets in 1981 and 1992 [Table 4]. The study concluded that:

> "At buildout, there is the potential for nitrogen concentrations in groundwater to increase between 1 and 5 mg/1 in some watersheds. The largest contribution of nitrogen to groundwater in 1981 and 1992 is from septic systems with the exception of Cards pond in 1981, where agricultural land uses accounted for 3/4 of the nitrogen budget. In Potter pond, nitrogen loadings from residential land use declined in 1992 due to little development in the watershed and a decrease in the median number of people per house between 1980 and 1990. At full development , Potter Pond watershed has the potential for 1286 more houses which would increase the total loading to the salt pond by 43 %. In Point Judith, Trustrom, and Green Hill Pond watershed, nitrogen loading from agriculture in 1981 was replaced by loadings from residential land uses in 1992. As a result, groundwater concentrations decreased from 6 mg/l to 3/mg/1."[87]

Moreover, the original SAMP attempted to control nitrogen loadings through recommended zoning changes in each of the towns. However, "[c]hanges between 1981 and 1992 indicate that septic systems, domestic pets and lawn fertilizers increased the amount of groundwater nitrogen loading. Indeed, under current zoning regulations, sources of nitrogen will continue to increase and Potter, Cards and Green Hill ponds could approach or exceed 5 mg/NO3-N/1 at full development."[88] Thus, the policies in the revised SAMP are designed to help prevent this from occurring.

While a great deal of scientific uncertainty still exists, there is reason to believe that the revised SAMP offers the potential to improve environmental conditions or at least prevent further degradation as a result of continued development. However, it is also clear that regulatory efforts alone may not be sufficient. Additional habitat restoration efforts designed to restore degraded areas may be necessary. It may also be necessary to replace existing OSDSs with denitrifying systems in areas located adjacent to degraded waters. Additional land acquisition and preservation efforts will also be necessary, perhaps funded through an open space bond referendum. While past efforts have focused on preserving ecologically important lands, it may also be necessary to purchase undeveloped lots in densely developed areas to prevent

additional nutrient loadings in areas that already exceed desirable thresholds. Accordingly, while significant progress has been made and the SAMP remains one of the most progressive efforts to manage cumulative and secondary impacts of development at the watershed level, important challenges remain.

Analysis

The analysis of this case study is divided into two sections. The first identifies those factors that appear to influence the success of a watershed management initiative, whether it be positively or negatively. In some cases, the Academy requested we explore the importance of certain factors (e.g., public and community involvement). In other cases, the factors emerged from our comparative analysis and review of the applicable literature. The second section examines the institutional performance of the SAMP's implementation using criteria provided by the Academy.

Components of Successful Watershed Management Programs

Our comparative analysis suggested that the following factors had some influence on the development and implementation of watershed management programs:

- a program's contextual situation
- public and community involvement
- use of science and other technical information
- well managed decision making process
- program administration
- collaboration
- EPA's programs and action forcing mechanisms
- performance-based management. The following sections discuss the importance of each factor. (For a more detailed discussion of the definitions and concepts discussed in this analysis, please consult the main report, *Environmental Governance in Watersheds: The Importance of Collaboration to Institutional Performance*.)

Context Matters

One observation was that contextual factors played a role in influencing the SAMP's development and implementation. While a detailed analysis of these contextual factors is beyond the scope of the analysis, a few examples are provided below.

The configuration of the watershed was also important. A highway tracks along the northern boundary of the groundwater watershed. During the early years of the planning process this made the watershed identifiable to the public. However, the boundary of the groundwater watershed was difficult to identify in the field and on the maps in the SAMP. This was part of the reason why the revised SAMP is based on the surface watershed that closely follows that of the groundwater watershed and is easier to identify on topographic maps. Another important geographic feature is that the watershed is also composed of nine subwatersheds, many of which are located within particular towns. This helped minimize potential free-rider problems because

it was not possible for a town to benefit from changes in zoning or infrastructure investment in other communities.

The nature of the problem was also important. Participants were fortunate to find one central problem, water quality, to structure the SAMP and its management strategies around. This helped focus the effort. However, the problem is also highly complex and difficult to monitor since it involves nutrient discharges to groundwater and groundwater discharges of nutrient laden water to surface waters. The long residence time of groundwater and the added difficulty and expense of monitoring groundwater makes it difficult to evaluate progress in addressing the problems.

The case study also illustrates the importance of understanding the ecology of governance in order to explore and exploit the opportunities for collaboration that exist in the governance system. The governance framework for the Salt Ponds is a complex polycentric pattern of institutional relationships between the CRMC, RIDEM, local governments, and the statewide planning program (i.e., RIDOP). This complexity creates opportunities for collaboration but also causes periodic conflict, particularly between the CRMC and RIDEM, which can create obstacles to collaboration. This complexity is a natural reflection of our federal system,[89] which can have some distinct advantages over centralized systems of government.[90] Polycentric arrangements allow for specialization that takes advantage of economies of scale.[91] For example, RIDEM has a technical staff with a high degree of specialization in evaluating the siting and design of OSDSs, the CRMC has technical staff specialized in evaluating impacts to water quality and coastal resources, and local officials have expertise with respect to zoning and building code requirements.[92]

Thus, while the fact that each agency reviews the same project could be viewed as "wasteful duplication and overlap," it could also reflect functional specialization that minimizes administrative costs through economies of scale (e.g., RIDEM's OSDS regulatory program) while increasing information.[93] The fact that the CRMC, RIDEM, and local officials may disagree on the merits of a project could be viewed as a costly fragmentation of authority or it could simply guarantee that the interests represented by different institutions like RIDEM, CRMC, and local governments are considered. This deliberative process is arguably more "democratic" than simply giving one agency the authority to impose its will on others. The conflicts and turf fights that periodically take place between CRMC and RIDEM could be viewed as "wasteful," or be viewed as a constructive debate over different ideas and policies. This competition of ideas can be valuable and previous research suggests that an "institutionally rich environment" improves the prospects of solving complex problems.[94] It can stimulate the diffusion of ideas, information, administrative processes, and policies which then enables others to solve similar problems in different programs and other geographic areas.[95] For example, the analysis demonstrates how the informal coordinated permit review process diffused to towns outside the watershed, and was ultimately adopted statewide.

Accordingly, it is important for practitioners to understand the ecology of this governance system if they are to identify and exploit opportunities for collaboration. It will also help them to identify areas for policy innovation that allow the actors to integrate their different regulatory programs. The SAMP is an interesting example of where state and local officials were able to

recognize the important relationships between problems (e.g., land use, water quality, and habitat) and the tradeoffs among problems resulting from different management strategies (e.g., OSDSs vs. sewers) that are implemented using a polycentric governance arrangement.

Public and Community Involvement

Public and community involvement played an active role in the development of the SAMP. In fact, the CRMC's decision to develop the SAMP was actually the product of public and community involvement during the 1975 hearings on the RICRMP. State and local officials, stakeholders, researchers, and citizens were actively involved in the SAMP's planning process, which focused on building a constituency to support the SAMP's implementation. The planning effort appears to have been effective because it educated decisionmakers and the citizens involved in the process about the problems affecting the watershed. The CRC was also effective in developing a shared understanding of problems and necessary management actions. This helped elevate these problems on the agendas of decisionmakers. These interactions also developed trust between the CRC staff who were developing the SAMP and state and local officials. This social capital facilitated the negotiation of the SAMP's final policies and the local zoning changes. The planning process also resulted in the development of two NGOs, the Salt Ponds Watchers and the Salt Ponds Coalition. These groups provide an important source of social capital and provide concerned citizens with an opportunity to get involved in efforts to study and protect the Salt Ponds. The heavy reliance on local involvement in the SAMP's implementation provides additional opportunities for involvement in local conservation and harbor management commissions. Local land trusts and the Nature Conservancy have also become increasingly involved in efforts to preserve land and have helped elevate these issues on the agendas of state and local decisionmakers.[96] There has been less emphasis on public involvement and public education by the CRMC during the implementation of the SAMP. This is likely due to the lack of slack organizational resources that can be devoted to these efforts.

Use of Science and Other Technical Information

The Salt Ponds case is an excellent example of a prolonged effort of "nesting" science within agency decisionmaking processes. The CRC was effective in keeping research during the planning process focused on policy relevant issues and synthesizing the research findings and presenting them in a manner that was useful to state and local decisionmakers. This is reflected in the fact that many state (e.g., CRMC's technical staff) and local officials (e.g., local conservation commissions) often relied on the technical information contained the SAMP when making permit decisions. More importantly, the effort began a long-lasting collaboration between the CRMC and specific university researchers. Some of the same researchers involved in the SAMP's development continue to conduct research on these problems. This ongoing collaboration has helped keep a great deal of this research focused on policy relevant information. Moreover, the periodic interactions between researchers and agency staff has serves as an important vehicle for transferring the information between researchers and agency officials. This has encouraged the type of policy-oriented learning that has led to policy changes.[97] The 1994 SAMP amendments on denitrification and many of the policy changes contained in the revised 1999 SAMP are evidence of this.

However, not all efforts to "nest" science in a decisionmaking process have been effective. The National Estuarine Research Reserve (NERR) is supposed to provide ongoing research and technical information to support state CZM programs. Unfortunately, the NERR in Rhode Island is not located in the Salt Ponds region, and its research funding historically has not helped inform the efforts to develop or implement the SAMP even though the CRMC and NERR both receive their funding from NOAA. Accordingly, the CRMC has lacked any sort of dedicated funding to conduct the type of research that would allow it to continue to refine the SAMP's nutrient loading requirements. Instead, the CRMC has had to rely on research being conducted at the URI that fortuitously has continued to address policy-relevant questions.

The case study also illustrates some of the limitations in terms of our understanding of how ecological systems function and the availability of important data on environmental conditions. Research helped to determine what the nitrogen loadings would be at buildout but even though the Salt Ponds may be the most heavily researched shallow lagoon system in the world, it is still unclear how much nitrogen is too much. Thus, the development of the SAMP's policies has always been informed by, but not determined by, science.

The case study also illustrates the important role that volunteer water quality monitoring data can have. However, surface water quality data provides only a partial glimpse of the health of the ecological system. Unfortunately, given the expense of monitoring groundwater and the lack of an ongoing funding source, there is only limited data upon which to evaluate the impact of the SAMP's policies on nutrient loadings to groundwater.

Well Managed Decisionmaking Process

We concluded that it is important to develop a well-managed decisionmaking process. Overall, the CRC appears to have done a good job of managing the participatory planning process. It was clear from the start that the SAMP would be used in the CRMC's regulatory process. This fact combined with the emphasis on local zoning changes made the process one of bargaining and negotiation. The CRC's efforts to build trust with state and local officials facilitated these efforts as everyone involved viewed them as being a neutral proponent for consensus. At the same time, they tried to ensure that the resulting policies were consistent with the research findings. The CRC was also effective in getting the high level decisionmakers (e.g., CRMC Council members and town council members) involved with technical staff in these negotiations. Thus, the CRC provided the leadership necessary to complete the planning process and resolve the policy conflicts that emerged. Overtime, this leadership role has gradually shifted to the CRMC has its technical staff expanded.

Program Administration

There is no substitute for a well-managed program and an effective organization. The CRMC lacked its own staff prior to 1986. As a result, the agency relied on RIDEM and RIDOP staff to review development projects and the CRC essentially served as the agency's planning staff. As the CRMC's technical staff has expanded and the agency's planning capacity expanded, the agency has taken on more of these responsibilities and now contracts with the CRC is isolated circumstances depending on the agency's funding, staffing, or technical

limitations. The development of this capacity within the CRMC is important because it has allowed it to continue developing its policies and programs as evidenced by the continued evolution of the policies in the SAMP and RICRMP.

Resources have also played an important role in shaping and constraining the development and implementation of the SAMP. The vast majority of the CRMC's resources have always been allocated to the agency's permitting efforts. This should not be surprising since these efforts may be the most visible, and there is continually pressure by the general assembly and NOAA to ensure that permits are issued in a timely fashion and that the regulations are enforced. As a result, the CRMC only has a limited planning staff. The funding available from NOAA for planning initiatives such as the revisions to the SAMP is also limited. The CRMC and the state also lack a dedicated source of funding for the type of habitat restoration and water quality improvement projects that could be used to further restore degraded areas in the Salt Ponds watershed. Accordingly, the CRMC has been forced to rely on a project-based approach which leverages funding from other grant programs or uses its permit process to exact restoration projects as a condition of approval.

Collaboration and Building Effective Partnerships

The Salt Ponds case study also illustrates the important role that collaboration played in the development and implementation of the SAMP. The SAMP was designed to serve as a "collaborative constitution" that would bind the actors to a set of shared policies. These polices were then institutionalized by adopting the SAMP as part of the state's federally approved CZM program, its incorporation into the State Guide Plan, changes in local zoning ordinances, and MOUs. These policies continue to influence the actions and decisions of the CRMC, RIDEM, and local governments.

The case study also reveals a number of interesting forms of collaboration in implementing these policies. The CRMC has worked with local building officials to ensure that they refer permit applicants ad report violators to the agency. There is also a specialization of functions. For example, the RIDEM historically has relied on the CRMC to enforce its Section 401 Water Quality Certification under the CWA. Conversely, the CRMC relies on the RIDEM's OSDS permit to satisfy that part of the agency's technical review. The agencies have also tried to find ways to better provide these services to the public (i.e., permit applicants). For example, the CRMC and RIDEM have worked together to ensure that the information submitted by permit applicants satisfies both agencies. More recently, the RIDEM began deferring its review of freshwater wetlands permits when an applicant was also subject to the CRMC's review of tidal wetlands. This simplifies the process for permit applicants. The coordinated review process where the CRMC meets with local officials, the developer, and RIDEM staff while projects are still in the preliminary design stage has proven to be an effective way to educate participants about their respective programs and interests. It has also helped developers design better projects that reduce the transaction costs for all involved. There have also been examples of collaboration in the area of habitat restoration.

These collaborative activities have added value in several ways. The development of the integrated growth management policies offers the potential for improved environmental

conditions. The efforts to coordinate the permitting programs and reliance on specialization (e.g., RIDEM's OSDS program) can improve the effectiveness of these programs and reduce agency costs. The coordinated permit review process can save developers money and can reduce the transaction costs associated with the review of development projects during the permit review process. These activities have also built trust between the CRMC, municipal officials, and university researchers. This social capital has helped integrate research findings into agency decisions and facilitated the ability to develop the original and revised SAMPs. The development of new organizations such as the Salt Pond Watchers and Salt Ponds Coalition is another source of additional social capital.

While these examples are notable, additional opportunities for collaboration have not been utilized, particularly between the CRMC and RIDEM. We identified several examples of where the RIDEM did not actively support the SAMP's implementation. The RIDEM has the primary responsibility for fisheries management in the ponds and little has been accomplished in this area since the inception of the plan in 1984 and it is unclear whether the agency will support efforts to implement the revised SAMP.[98] The RIDEM's participation in the coordinated review process has been sporadic. The RIDEM also failed to implement the MOU that was developed to support the 1994 SAMP amendments requiring denitrification systems.

There are several explanations for the RIDEM's reluctance to embrace the SAMP's implementation. First, while protecting the Salt Ponds is a major priority for the CRMC and the local governments, this is just one of many watersheds that the RIDEM has to worry about. Thus, the CRMC's focus on the Salt Ponds watershed allows RIDEM officials to concentrate their efforts in other areas of the state. Second, the periodic policy conflicts between the RIDEM and the CRMC has probably had an adverse impact on the SAMP's implementation and limited opportunities for additional collaboration. Third, there are several potential explanations for the RIDEM's sporadic participation in the coordinated review process. The costs in terms of staff time may be perceived as being greater than the associated benefits. The RIDEM's staff may also be reluctant to informally comment on development proposals until an official agency position has been determined. Finally, the RIDEM's internal organization has been segmented by media (e.g., air, water) and by individual regulatory programs. This makes it difficult to orient the RIDEM's efforts towards protecting individual watersheds and their unique problems. This is less of an issue in the CRMC, which is less hierarchical in structure. This has changed over the last several years as the RIDEM has improved its planning capacity and has begun to adopt the watershed approach advocated by the EPA. As a result, coordination between the RIDEM and the CRMC in issues related to the Salt Ponds has improved. Coordination has also improved between RIDEM and communities in other watersheds around the state. Thus, there is reason to be optimistic that collaboration will continue to expand between the two agencies.

EPA's Role in Watershed Management

The role of EPA and RIDEM water quality programs and NPS programs (National Estuary Program and Section 319) and action forcing mechanisms (e.g., TMDLs) varied within the case. The EPA has had little direct involvement in the development of the SAMP, although it did provide some funding to support research leading to the SAMP's development. Most of the involvement has been with the RIDEM. RIDEM has recently begun efforts to develop a

TMDL for Greenhill Pond for bacteria but it is unclear what value will be added by this effort since the SAMP's policies are already very restrictive. There has been no attempt to develop a TMDL for other waters in the watershed, even though it contains waters on the state's Section 303(d) list. There has been some involvement with Section 319 NPS Management Program which has targeted onsite wastewater management programs and the installation of alternative wastewater systems as a high priority for these grant funds. The RIDEM has provided funding to support the Salt Pond Watchers volunteer water quality monitoring organization. Most of the involvement in the development and implementation of the Salt Ponds SAMP has been with other RIDEM programs such as those that regulate OSDSs and freshwater wetlands that have not been developed in response to specific EPA programs.

Performance-Based Management

The Salt Ponds case study also illustrates some of the challenges of performance-based management. The challenge for practitioners has always been on first determining what the desirable loading levels should be in order to construct policies and regulations that could achieve the goals. The original SAMP's density requirements and the revised SAMP's density requirements and nutrient reduction requirements (i.e., denitrifying OSDSs) are therefore designed to achieve an overall nutrient loading at buildout in the watershed. Thus, there are implicit goals built into both the original and revised SAMP. However, these goals are only informed by, not determined by, science. As noted earlier, previous research did not suggest a definitive nutrient-loading limit, but it did help the policymakers set a level based on the region's particular contextual conditions and pattern of residential and commercial development.

Another challenge facing practitioners has been in monitoring progress towards these goals, and continuing a research effort that could lead to further revisions in the SAMP's density and nutrient loading goals. The difficulty has been in monitoring progress towards these loading limits given the variance in loadings across nonpoint sources, the lack of regular groundwater monitoring data, and the long residence time of groundwater. Thus, the CRMC has been unable to monitor performance on a regular basis, although the cumulative impact study undertaken in 1994 and 1995 did provide a glimpse at how effective the original SAMP's policies were. This allowed the CRMC to make adjustments in these policies based on this data on environmental outcomes. Thus, the case reveals many of the challenges associated with adaptive management. The CRMC also does not have access to dedicated research funding. While it is fortunate that URI is located nearby, and that researchers continue to focus on policy relevant questions, further development and refinement of the performance measures contained in the SAMP (i.e., density and nutrient loading requirements) will be needed in the future.

Institutional Performance

When examining the performance of an institutional arrangement, it is important to use several criteria to understand its strengths and limitations. It is also important to recognize that there may be a disconnect between the performance of an institutional arrangement and its ability to achieve environmental outcomes.[99] For example, you could have a well-functioning institutional arrangement with a flawed underlying policy and unable to achieve the desired outcomes. The nature of watershed management also makes it difficult to determine causality.

Numerous federal, state, regional, and local programs have an impact on the outcomes of interest (i.e., changes in water quality and habitat). It is difficult to disaggregate the effects of each program, let alone determine which marginal changes in these programs were due exclusively to a watershed management program. Moreover, given the collaborative efforts employed, it is important to assess performance form the perspective of different actors since measures of success might change as you move from actor to actor.

Our analysis relies primarily on criteria provided by the Academy which were then supplemented with additional criteria derived from the literature. These criteria were:

- risk reduction
- potential for short- and long-term gain
- cost-effectiveness
- predictability of the process
- certainty of effect
- accountability
- equity
- adaptability
- capacity building. (For a more detailed discussion of the definitions, concepts, criteria, and the application of these criteria, please consult the main report, *Environmental Governance in Watersheds: The Importance of Collaboration to Institutional Performance*.)

Risk Reduction

This criterion is concerned with the question of whether the program demonstrated an ability to achieve the desired environmental outcomes. Despite the aforementioned causality problems and the lack of good water quality data, there is reason to believe that the SAMP has improved environmental conditions. A number of actions were taken individually or collaboratively such as the construction of sewers and habitat restoration projects that offered some promise of benefits resulting *directly* from the activity. The implementation of the SAMP's regulatory requirements and other planning activities (e.g., HMPs) also had the potential to produce *indirect* environmental benefits. The data also suggests that the SAMP has resulted in some improvements in the water quality of some ponds, while water quality in other ponds has remained unchanged or has degraded. Despite these mixed results, the SAMP has clearly reduced the overall density of development in the watershed and has helped minimize the cumulative and secondary impacts of development. The 1999 revisions to the SAMP offer additional potential for environmental improvements.

Potential for Short- and Long-Term Gains

The SAMP's focus on minimizing cumulative and secondary impacts of development also helps ensure that there is some potential for both additional short- and long-term gains. In fact, a clear strength of the SAMP's approach is its orientation towards mitigating cumulative and secondary impacts ensures that over the long-term development will not severely degrade environmental conditions. The combination of the CRMC and local government implementation

of the SAMP's regulatory requirements should help ensure that the environmental impacts associated with future development are minimized and prevent significant deterioration in water quality. The larger question is whether the CRMC, or some other state or local agency, will get a stable source of funding that could be used to implement a series of projects that are systematically designed to restore degraded habitat, acquire environmentally sensitive lands, and install best management practices (BMPs) to improve water quality in degraded portions of the watershed. We concluded that additional short and long term gains are likely to require the development of a program to fund these nonregulatory actions.

Cost-Effectiveness

Efficiency is an important principle of public administration. Accordingly, it is important to examine the cost-effectiveness of a program. Our analysis is concerned with how a program uses its resources compared to the benefits it generates. What complicates the analysis is the wide range of intangible costs and benefits associated with these efforts as well as the transaction costs involved with developing and implementing a watershed management plan.

Some researchers have been critical of the duplication of responsibility and periodic conflicts between CRCM and RIDEM and the lack of a centralized permit review process.[100] While the duplication of responsibilities can impose some additional transaction costs on the agencies, we believe these costs are offset by the benefits that result in this polycentric arrangement (e.g., functional specialization, economies of scale, improved representation of different interests). The polycentric approach to integrating growth policies has also reduced coordination costs and the relatively high compliance with the SAMP's policies suggests that strategic costs are low. We also believe that the coordinated review process has helped reduce transaction costs for agencies and permit applicants for large development projects and it has also proven to be an effective way of improving communication between participants and improving trust between the CRMC and municipal governments.

Conversely, the periodic conflicts between the CRMC and RIDEM have reduced opportunities for collaboration that could further improve cost effectiveness (e.g., failure to actively participate in the coordinated review process, failure to implement the denitrification MOU). The RIDEM's failure to embrace and implement other SAMP provisions (e.g., fisheries management recommendations) is an additional reduction in the effort's cost-effectiveness. In addition, permit applicants are not subject to the coordinated review process often have increased transaction costs as a result of the polycentric regulatory system in which they may spend money (e.g., engineers, consultants, lawyers) to satisfy one agency's requirements, only to find out that they have to modify a project to satisfy another agency's permit requirements.

Predictability of the Process

Institutional performance can be judged in terms of the predictability of the process. We were concerned with two related questions: the ability of the planning process to produce the intended result; and, whether the program creates predictable conditions or requirements that allow its participants to plan and budget with confidence. While the planning process was much less structured than that of the four NEP cases, it was clear that the process was intended to result

in regulations to guide future development in the watershed. From an implementation standpoint, the process is very predictable since the SAMP is implemented through a regulatory process. The development of other policies (e.g., sewer extensions) also helped local officials to prioritize their investments in environmental infrastructure.

Certainty of Effect

One measure of success for any planning effort is whether the "plan" was actually implemented. This involved making two distinct judgements. First, we determined whether the CCMP recommendations were implemented, or were likely to be implemented in the future. Second, if the recommended actions were not been implemented, we determined whether the participants were engaged in a substitute set of activities designed to achieve the goals of the CCMP. The use of a regulatory approach led to a high degree of certainty that many of the SAMP's recommendations were implemented as specified in the plan. Table 3 indicates that many of the SAMP's nonregulatory recommendations were also implemented, although often a substitute set of activities occurred (e.g., coordinated permit review process). Moreover, while there is a high degree of certainty that the SAMP's density controls and nutrient loading limits will be achieved over the long term, it is unclear whether these nutrient limits will be sufficient to protect water quality in the Salt Ponds.

There is less certainty that some of the nonregulatory and recommended actions in the SAMP will be implemented. If previous implementation experience is used as the basis form making these judgements, it is reasonable to conclude that the RIDEM will not implement some of the SAMP's recommendations that are primarily its responsibility (e.g., fisheries management recommendations). It is also reasonable to conclude that the CRMC and other actors will continue to lack important scientific information on the nutrient loadings to groundwater and whether the SAMP's policies will be effective.

Accountability

It is important that there are mechanisms to hold officials accountable for their actions and the allocation of scarce resources. There are several mechanisms that have helped improve the accountability of the CRMC, municipal governments, and RIDEM for implementing the SAMP. The SAMP contains clear and enforceable policies and regulations and the CRMC and local government permit review processes are open and provide opportunities for individuals and nongovernmental organizations to play an active role in monitoring decisions related to the SAMP's implementation. Meanwhile, the Salt Pond Watchers actively monitor water quality conditions throughout the watershed and disseminate this information to the public and agency decisionmakers. The coordinated permit review process is another example where participants can monitor others actions. Because the SAMP is part of the CRMC's federally approved coastal zone management program, implementation efforts are also subject to a periodic evaluation by NOAA pursuant to the CZMA's Section 312 evaluation process.

Equity

Another useful criterion for examining institutional performance is equity or fairness. There are many different ways to view equity. Fiscal equivalence holds that those who benefit from a service should bear the burden of financing it: those who derive greater benefits are expected to pay more. Redistributional equity concerns structuring program activities around differential abilities to pay. Considerations about the equality of the process and the equality of the results are also important. The efforts to develop and implement the SAMP have minimized many potential equity problems. The proposed policy changes did not create redistributional concerns among the towns. An effort was also made to examine the economic impacts of the downzoning proposals and other options in order to ensure that the SAMP's policies would not adversely affect a particular municipality.[101] The configuration of the watershed also aided in the development of equitable policies. Because the watershed is composed of nine subwatersheds [Table 1], there is little potential for municipalities to be "free-riders". Accordingly, each town saw the benefit of its investments in infrastructure and zoning changes. The SAMP's policies focused on managing development in each municipality and did not channel development and tax revenue into one town at the expense of the others.

The coordinated permit review process was also the result of equity concerns. The main problem with the recommended review process was that it imposed disproportionate costs on the CRMC. Instead, the coordinated permit review process was designed to be voluntary so that those that receive benefits choose to participate, although the process is now mandated. An equity concern may also explain RIDEM's sporadic participation in the coordinated review process. The CRMC and the municipalities are located close to one another while RIDEM is located in Providence. Thus, the transaction costs associated with participating in the SAMP's coordinated review process are much higher for the RIDEM. Moreover, the RIDEM has less to gain from these discussions. Whereas the CRMC and municipalities are charged with balancing the competing needs of conservation and economic development and benefit from hearing competing perspectives on a development project, the RIDEM's mandate is narrower and focuses on environmental protection and public health and has less to gain from these discussions since development considerations do not factor into the agency's decisionmaking.

Adaptability

Unless institutional arrangements have the capacity to respond to their ever-changing environments, institutional performance is likely to suffer. Reflected here are concerns similar to those who argue for adaptive approaches to ecosystem or community-based management. The evolution of the SAMP reveals a conscious attempt to adapt and learn from previous implementation experience. The best example is 1999 SAMP revisions based on the cumulative impact study by the CRC. Other changes occurred in response to experiences with the RICRMP and SAMP's implementation (e.g., new stormwater, erosion control, and wetland mitigation requirements) while others occurred in response to changes outside the watershed (e.g., HMP, Section 6217, and land use planning requirements). Changes occurred in response to new information and changes in technology. For example, when the SAMP was adopted, the technology for denitrification OSDSs was quite limited. As technology developed and surface water quality data suggested a continued decline in surface water quality in several small

embayments due to nitrogen loadings and bacterial contamination, the CRMC and RIDEM adopted new denitrification requirements that were incorporated into the SAMP.

It was also clear that there were major differences between the RIDEM, the CRMC, and local governments in terms of their adaptability. The CRMC has proven to be the most adaptable. It changes its regulations frequently, often in as little as a few months. The RIDEM lies at the other end of the spectrum. It changes its regulations infrequently, and it often takes several years to do so. The local governments cover the full range of this spectrum. It is important to consider these dynamics and the asymmetric relationships that result because they can cause conflicts. For example, while the CRMC is often frustrated by the time it takes RIDEM to change regulations, the RIDEM becomes frustrated and distrustful of the CRMC because it has trouble maintaining a clear understanding of current regulations.

Our analysis of these efforts at adaptive management resulted in several additional observations. One is that adaptation and policy change tend to be incremental. This can make it easier to get political support. It also allows participants to gradually develop and enhance their capacity to manage complex problems. For example, an incremental change such as requiring denitrification OSDSs in a small sub-watershed in the Salt Ponds region allowed the participants to experiment with new policies before requiring them on a broader scale. These findings also demonstrates the self-organizing and self-transforming nature of institutional arrangements in that it is not uncommon for policies to develop and operate in ways unintended by their designers.[102] The best example of this finding is the emergence of the coordinated permit review process which is very different than the centralized permit review process proposed in the original SAMP.

The case study also reveals the important observation that institutional change tends to be path dependent.[103] As a result, institutions both constrain and enhance what you do in the future. For example, the density overlays resulting from the SAMP's implementation allowed other policies such as denitrification requirements to be linked to the density requirements. At the same time, the density overlays constrain future choices. It would be difficult to change radically the current density requirements because legal rights to develop at these levels now exist. Municipalities have also made long range planning and infrastructure investment decisions based on current densities. It is important for practitioners to recognize that a policy choice can reduce the possibility of achieving an optimal solution when the solution exists in the policy space cut off early in the process of developing policies.[104] Therefore, practitioners should give careful consideration to how a proposed policy change might constrain future policy choices.

This study reveals several observations about the limitations of adaptive management. There are still major limitations in terms of what we know about how ecological systems function. For example, despite all of the research in the Salt Ponds watershed it is still unclear how the groundwater system functions and what the optimum nitrogen loading levels should be. The groundwater monitoring data needed to monitor policy implementation were unavailable. When the CRMC did obtain funding to conduct the groundwater studies, 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 management policies are having and when the effect should be observed. Moreover, even if it were possible to determine that the policies were not working, it is not clear what policies should be changed. For example, if the CRC's data indicated that nitrogen loadings increased, it isn't clear whether the density overlays or the RIDEM's OSDS regulations should be modified. It is also clear that there is a loss of eelgrass in many of the Ponds, but it unclear what the exact causes for the declines actually are.

These findings suggest that adaptive management is best thought of as a management philosophy. One that encourages policy-oriented learning and is not resistant to organizational change. The study also demonstrates some of the different types of policy-oriented learning that are important in an ecosystem-based management program.[105] The CRC and other scientists at URI are engaged in ongoing research designed to improve the understanding of how the ecological system functions. This increased knowledge helps government practitioners gain a better understanding of the problems and whether the policies are likely to function as designed. Practitioners are also engaged in learning about how their policies work and interact with related programs. Practitioners and advocacy groups are learning about changes in environmental conditions and the causes of problems. Moreover, as political, economic, and cultural conditions change, the policy preferences of constituency groups can change with them. These learning processes are important because they can lead to changes in current policies.

Capacity Building

A final criterion is whether the efforts to develop and implement the SAMP were effective at building the capacity for solving complex environmental problems. The implementation of the SAMP reflects numerous ways that the capacity to address environmental problems improved in the CRMC, municipal governments, and RIDEM. Prior to the SAMP, the CRMC had no staff and relied on staff in other agencies to review development projects, (e.g., RIDEM and RIDOP) and the CRC served as its policy staff. Today, the CRMC has a sophisticated technical staff and performs most of its planning and policy development. The development of capacity at the local level is even more remarkable. The municipalities went from having little capacity to manage environmental problems to having an active role as a result of the zoning changes, development of environmental ordinances implemented by local conservation commissions, and municipal harbor management planning efforts. The RIDEM's capacity to regulate OSDSs has also improved as the SAMP efforts have served as the catalyst for several revisions in these regulations.

Capacity has improved in other ways as well. The development of the SAMP resulted in integrated policies that improved agency decisionmaking and helped local governments prioritize investments in environmental infrastructure. These integrated policies also improved resource management by minimizing the cumulative and secondary impacts of future development activities. Efforts such as the coordinated review process and the MOU coordinating the review of freshwater and coastal wetlands improve the ability of these agencies to provide services and improved communication between decisionmakers.

Summary and Conclusions

The Salt Ponds SAMP has served as an important mechanism for managing land and water use decisions in the Salt Ponds region for the last 16 years. As a result, land use and water quality issues in the watershed have remained high on the agendas of state and local decisionmakers. The SAMP also represents an innovative partnership between state and local governments to manage growth, mitigate the cumulative and secondary impacts of development, and improve environmental conditions in the watershed. These achievements are notable because few state and local regulatory programs around the country have been able to address effectively the cumulative and secondary impacts of development.[106] It was also clear that much could be learned from this watershed management effort. Some of the lessons identified in the case study include the importance of:

- Understanding the ecology of governance
- Nesting science in the decisionmaking process
- Building capacity in state and local institutions
- Institutionalizing the watershed management plan in other institutions

One of the reasons that the development and implementation of the Salt Ponds SAMP was effective is that the participants understood the ecology of the governance system. That is, the participants understood the tradeoffs among problems (e.g., installation of sewers vs. relying on OSDSs), effectively linked various issues and problems (e.g., linkage between land use, water quality, and habitat issues), and understood how various institutions functioned and interacted with one another. As a result, the participants were able to find opportunities for collaboration and developed an integrated set of policies that are implemented through a complex, polycentric regulatory framework.

The Salt Ponds SAMP is also an interesting example of effectively "nesting" science in the decisionmaking process. The CRC was effective at keeping research focused on policy-relevant questions. The CRC was also effective in educating decisionmakers and developing a shared understanding of problems and necessary management actions. This mutual understanding combined with the trust that developed between planning staff and state and local officials allowed the development of the SAMP's complicated zoning policies. The CRC was also effective in synthesizing the results of this research and presenting the technical information in a manner useful to state and local officials. The planning effort also began a long-standing collaborative relationship between various URI researchers and the CRMC that provides an important source of policy-relevant information. The CRMC has also proved to be receptive to an adaptive management approach, revising the SAMP based on new scientific data and research. For example, the 1994 denitrification amendments were based on water quality data and the emergence of new alternative OSDS technologies while the 1999 revisions were based on the results of the cumulative impact study. Thus, the implementation of the Salt Ponds SAMP is an interesting example of adaptive management whereby plans are adjusted and modified when new information becomes available.

The development and implementation of the Salt Ponds SAMP also illustrates how watershed management efforts can build capacity in existing institutions. Prior to the SAMP,

local officials had little capacity for addressing environmental problems. Today, local governments have an active role in addressing a wide range of environmental problems. The watershed management efforts also improved the capacity of the CRMC and RIDEM. Both agencies developed new regulations that were applied on a statewide basis, illustrating how watershed management efforts can often stimulate policy-oriented learning and the diffusion of policy innovations. The case study also illustrates the importance of slack organizational resources. During the planning process, the CRMC had to rely on staff of other organizations (RIDEM, RIDOP, and CRC….) to support its operations. As the CRMC's organizational capacity (funding, staffing, technical expertise, etc.) developed, the CRMC has been able to take on a leadership role, and has improved its ability to change and adapt its policies and programs in response to new information.

The efforts also illustrate the importance of institutionalizing a watershed plan in other institutional arrangements. The adoption of the SAMP's policies into the federal CZM program increased accountability (e.g., Section 312 evaluations) and ensured the policies will be implemented. It also ensured that federal activities are consistent with the plan's policies (e.g., the CZMA's federal consistency authority). The inclusion of the growth policies into local zoning ordinances helped ensure that local governments will implement the SAMP. Moreover, the inclusion of the SAMP into the *State Guide Plan* allows the CRMC to review draft local comprehensive land use plans to ensure they remain consistent with policies outlined in the SAMP. These relationships combined with the coordinated permit review process, also ensure that the SAMP is used actively, and guides decisions of state and local decisionmakers.

Given the history of previous implementation efforts, we are optimistic that the 1999 revised SAMP will guide the actions of state and local decisionmakers and will minimize the cumulative and secondary impacts of development. While these accomplishments are notable, there are several challenges that may limit further progress in preserving and restoring the Salt Ponds ecosystem. Little has been done to address the fisheries management problems noted in the original SAMP. While the RIDEM was actively involved in developing the revised SAMP's chapter on fisheries management, respondents were not optimistic that significant progress in this area would be forthcoming.

The heavy emphasis on a regulatory approach in the SAMP is another source of concern. The regulatory approach will limit the cumulative and secondary impacts of future development. However, the history of the SAMP's implementation suggests that the regulatory approach is more limited in its ability to restore degraded areas of the Salt Ponds watershed. While there have been some notable restoration projects undertaken by various organizations, these efforts are largely project-oriented and the state and local agencies have to rely on leveraging funding from other agencies. This means these activities are largely the product of the priorities and grant restrictions of the funding agencies rather than the priorities contained in the SAMP. We believe these restoration efforts would be enhanced of the CRMC or some combination of state and local agencies had a stable and flexible source of grant funding that could be used to support a systematic effort to restore degraded habitat and install BMPs to improve water quality.

The final obstacle to the revised SAMP's implementation is likely to be the continued tension and periodic conflicts between the CRMC and RIDEM, which have limited collaboration

in the past. For example, the RIDEM did not implement its commitments in the 1994 MOU pertaining to the installation of denitrification OSDSs. Therefore, it is possible that similar actions could limit the full implementation of the revised SAMP's policies. Moreover, while there are many positive examples of where state and local officials have exploited opportunities for collaboration, other opportunities for collaboration have not been exploited.

We do not find this surprising. Even the most creative and imaginative practitioners will find themselves constrained by a federal system that places programs at the federal, state, and local level in conflict with one another because they often represent different constituencies, and have competing or conflicting values and missions. Because these 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. Consequently, "collaboration" may not be an effective strategy for addressing all of the Salt Pond's environmental problems. There will continue to be the need for unilateral or 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.

Despite these obstacles, our analysis of the Salt Ponds SAMP using the criteria provided by the Academy concluded that it was an effective watershed governance program that relies on an innovative partnership between state and local governments to "manage" the watershed. However, the most important measure of success may be how collaborators view the SAMP and whether they believe that the effort adds value and is worth their continued investment in time and resources. When viewed from this perspective, the Salt Ponds SAMP is a resounding success. All of the respondents were supportive of the SAMP and viewed the experience in positive terms. This is significant because developing effective institutional arrangements can be a complicated and time-consuming task. Moreover, designing "satisfactory" policies is often a significant achievement regardless of whether an optimal solution is achieved.[107] Even when a population is relatively homogenous and its members are well informed about problems, it is strong incentives may exist that cause actors to act opportunistically and resist the changes necessary to improve the management of the watershed.[108] Unlike many regional watershed management efforts in the late 1970s and early 1980s (e.g., Section 208 plans), the Salt Ponds SAMP has not found a dusty home on the shelves of state and local officials. Instead, the participants were able to overcome these obstacles to develop an effective set of integrated policies to manage the cumulative and secondary impacts of development in the watershed. For these reasons, we believe that the Salt Ponds SAMP's accomplishments are notable and worthy of continued attention.

Endnotes

[1] For a discussion of the CRMC's development see: Donald D. Robadue, Jr., Timothy Hennessey, and David W. Kaiser, "Adaptive Implementation and Coastal Ecosystem Management: The Rhode Island Coastal Resources Management Council 1971 – 1986," Paper prepared for the American Political Science Association Annual Meeting, Washington, DC. August 27 - 31, 1986. Narragansett, RI: Coastal Resources Center, November 1986.

[2] Rhode Island General Laws (R.I.G.L.) §46-23

[3] Coastal Resources Management Council (CRMC), Rhode Island, *The State of Rhode Island Coastal Resources Management Program. As Amended* (Providence, RI: CRMC, 1990).

[4] The original RICRMP only contained the raw elements of this zoning approach. The revised RICRMP in 1983 fully developed this approach which has continued to get more sophisticated over time. The SAMP has its own zoning approach that is integrated with the approach contained in the RICRMP.

[5] The CRMC has formally approved SAMPs for the Salt Ponds, Narrow River, and Providence Harbor and developed a draft SAMP for Newport Harbor. The CRMC also jointly developed a SAMP for the Pawcatuck River with Connecticut's CZM program. See: Coastal Resources Management Council (CRMC), Rhode Island, *The Narrow River Special Area Management Plan*. Prepared by Mary M. Howard-Strobel, Terry Simpson, and Timothy Dillingham. Wakefield, RI: CRMC. December 8, 1986; Coastal Resources Management Council (CRMC), Rhode Island, *Rhode Island's Salt Pond Region: A Special Area Management Plan*, Prepared by Stephen Olsen and Virginia Lee, Adopted November 27, 1984 (Providence, RI: Coastal Resources Management Council, 1985); Coastal Resources Management Council (CRMC), Rhode Island, *Providence Harbor: A Special Area Management Plan*, Prepared by Donald Robadue (Wakefield, RI: CRMC, August 1984); and, Coastal Resources Management Council, State of Rhode Island and Connecticut Department of Environmental Protection, *The Pawcatuck River Estuary and Little Narragansett Bay: An Interstate Management Plan*, Prepared by Timothy Dillingham, Rush Abrams, Alan Desbonnet, and Jeffrey Willis (Wakefield, RI: CRMC, July 1993).

[6] The development of HMPs was actually a by-product of the SAMP's implementation. The plans are designed to address local issues such as public access, siting of mooring fields, user conflicts, and waterfront development. For a discussion of the efforts to develop and implement municipal harbor management plans (HMPs) see: Mark Amaral, *The Changing Role of Today's Harbormaster* (Narragansett, RI: Rhode Island Sea Grant, University of Rhode Island. April 1990); and, Coastal Resources Management Council (CRMC), Rhode Island, *Guidelines for the Development of Municipal Harbor Management Plans* (Wakefield, RI: CRMC. November 22, 1988).

[7] For a discussion of the factors that led to the development of the SAMP see: Mark T. Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons From the Rhode Island Salt Ponds SAMP," *Coastal Management* 27(no. 1, 1999), 31 – 56; Stephen Olsen and Virginia Lee, "Rhode Island Lagoons," in *The Management of Coastal Lagoons and Enclosed Bays,* Proceedings of Coastal Zone 93, New Orleans, LA: July 19 - 23, 1993 (New York, NY: American Society of Civil Engineers, 1993).; and, Stephen Olsen and Virginia Lee, "A Management Plan for a Coastal Ecosystem: Rhode Island's Salt Pond Region," in Brian Needham (ed.) *Case Studies of Coastal Management: Experience from the United States* (Kingston, RI: Coastal Resources Center, University of Rhode Island, 1991).

[8] 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. 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).

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

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

[11] 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; Mark T. Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: The Institutional Analysis and Development Framework" *Environmental Management* 24 (1999), 449 –465; Mark T. Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons From the Rhode Island Salt Ponds SAMP," *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.

[12] 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).

[13] Several RIDEM, former NBP, and EPA staff who commented on our report were critical of our efforts to protect the identity of our sources. However, this is a common practice when conducting qualitative research and was particularly important in this controversial case where staff were often critical of staff in their own agency. We have also protected the identity of those that commented on the draft report.

[14] Environmental Quality Study Commission, *Environmental Quality Study Commission Final Report.* Providence, RI: Office of the Governor, 1990.

[15] Miles and Huberman, *Qualitative Data Analysis*.

[16] *Ibid.*

[17] Triangulation is one of the recommended strategies when using quantitative research methods (Yin 1994; Rossi and Freeman 1993; Singleton, et al. 1993). Triangulation involves using independent measures derived from different sources to support, or at least not contradict, a research finding (Miles and Huberman 1994; Yin 1994; and, Singleton, *et al*. 1993).

[18] A detailed discussion of the procedures used to ensure the validity of our findings is beyond the scope of this report but it included: All data was collected using the procedures recommend in the literature (e.g., Maxwell 1996; Miles and Huberman 1994; Yin 1994; Patton 1990); All sampling decisions and interview procedures were documented as will techniques used in the data analysis; The investigators worked with the principal contacts at each site to identify appropriate interview respondents; A snowball sampling technique was used to ensure a diverse range of actors were interviewed; Follow-up phone interviews were conducted as necessary until a complete picture

of the integrated watershed management program emerged; Detailed field notes will be prepared for each interview; All interviews will be recorded on audiotape to ensure that there is an accurate record; Strict confidentiality will be maintained both during and after the study; Detailed timelines were developed to examine potential cause and effect relationships; To ensure that the record of events was accurate, the principal contacts will be sent a draft of the findings for "factual" verification; and, The interview data and archival records were analyzed using systematic procedures recommended in the literature (e.g., Maxwell 1996; Miles and Huberman 1994; Yin 1994; Patton 1990).

[19] Yin, *Case Study Research*.

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

[21] For a detailed discussion of the Salt Ponds ecosystem and the ecological problems see: J. Boothroyd, et al., "The Geology of Selected Microtidal Coastal Lagoons: Rhode Island," *Marine Geology* 63 (1985), 35 – 76; R. Conover, R. 1961. "A Study of Charlestown and Green Hill ponds, Rhode Island" *Ecology* 42 (1961), 119 – 140; Richard Crawford, *Winter Flounder in Rhode Island Coastal Ponds* (Narragansett, RI: Rhode Island Sea Grant, University of Rhode Island. March 1990); A. Gold, et al., "Nitrate -Nitrogen Losses to Groundwater from Rural and Suburban Land Uses," *Journal of Soil and Water Conservation* March-April (1990), 305 – 310; J. Grace and W. Kelly, *Fresh Water Input to Rhode Island Coastal Ponds* (Narragansett, RI: Report to the University of Rhode Island Coastal Resources Center, 1981); M. M. Harlin and B. Thorne-Miller, "Nutrient Enrichment of Seagrass Beds in a Rhode Island Coastal Lagoon," *Marine Biology* 65 (1981), 221 – 229; Andrew Milliken and Virginia Lee, *Pollution Impacts from Recreational Boating: A Bibliography and Summary Review* (Narragansett, RI: Rhode Island Sea Grant, University of Rhode Island, January 1990); S. Nixon, "Nutrient Dynamics , Primary Production and Fisheries Yields of Lagoons," *Oceanologica Acta*. No. SP (1982), 357 – 371; S. Nixon, "Nutrients and Coastal Waters: Too Much of a Good Thing?" *Oceanus* 36 (1993); S. Nixon, "Coastal Marine Eutrophication: A Definition, Social Causes and Future Concerns," *Ophelia* 41 (1995), 199 – 219; Scott W. Nixon and M. Q. Pilson, "Nitrogen in Estuarine and Coastal Marine Ecosystems," in E. J. Carpenter and D. G. Capone (eds.), *Nitrogen in the Marine Environment* (New York, NY: Academic Press, 1983); Scott W. Nixon, B. N. Furnas, R. Chinman, S. Granger, S. Heffernan, *Nutrient Inputs to Rhode Island Coastal Lagoons and Salt Ponds: Final Report to the Rhode Island Statewide Planning* (Kingston, RI: Graduate School of Oceanography, University of Rhode Island, January 1982); Stephen Olsen and Virginia Lee, "Eutrophication and Management Initiatives for the Control of Nutrient Inputs to Rhode Island Coastal Lagoons," *Estuaries* 8 (no. 2B, 1985), 191 – 202; Stephen Olsen and Virginia Lee, "Inlet Modification: An Example of an Holistic Approach to the Management of Lagoons," Proceedings international Symposium on Coastal Lagoons. Bordeaux, France September 8 - 14, 1981. Oceanologica Acta, 1982; B. Thorne-Miller and M. M. Harlin, "The Production of Zostera marina L. and Other Submerged Macrophytes in a Coastal Lagoon in Rhode Island, USA," *Botanica Marina* 27 (1984), 539 – 546; and, B. Thorne-Miller, M. M. Harlin, G. B. Thursby, M. M. Brady-Campbell, and B. A. Dworetzky, "Variations in the Distribution and Biomass of Submerged Macrophytes in Five Coastal Lagoons in Rhode Island, USA," *Botanica Marina* 26 (1983): 231 - 242.

[22] For a discussion of the region's culture and ecological history see: Virginia Lee, *An Elusive Compromise: Rhode Island Coastal Ponds and Their People*, Marine Technical Report Number 73 (Narragansett, RI: Coastal Resources Center, University of Rhode Island, 1980).

[23] E. Ely, *Salt Ponds of Rhode Island* (Silver Spring, MD: NOAA Office of Sea Grant, 1990).

[24] Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"; Olsen and Lee, "Rhode Island Lagoons"; Olsen and Lee, "A Management Plan for a Coastal Ecosystem"; and, Lee, *An Elusive Compromise*.

[25] National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *50 Years of Population Change Along the Nation's Coasts: 1960 – 2010* (Rockville, MD: NOAA, Strategic Assessment Branch. April 1990)

[26] *Ibid.*

[27] Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"; Laura Ernst, "Integrating State Government for Improved Coastal Water Quality: Analysis of the Rhode Island Salt Pond Region," *Coastal Management* 23 (no. 4, 1995), 315 – 326; Olsen and Lee, "Rhode Island Lagoons"; Olsen and Lee, "A Management Plan for a Coastal Ecosystem"; and, Lee, *An Elusive Compromise*.

[28] For more information on the state's watershed approach see: Meg Kerr, Donald Robadue, Jeff Brownell. *The Rhode Island Watershed Approach*, Draft for Review (Narragansett, RI: Coastal Resources Center, University of Rhode Island, January 1999).

[29] The reviews have generally been favorable. See: National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Final Evaluation Findings for the Rhode Island Coastal Resources Management Program June 1992 Through September 1996* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated); National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Final Evaluation Findings for the Rhode Island Coastal Resources Management Program May 1989 Through June 1992* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated); National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Evaluation Findings for the Rhode Island Coastal Resources Management Program May 1987 Through May 1989* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated); National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Evaluation Findings for the Rhode Island Coastal Resources Management Program Covering the Period From May 1985 Through April 1987* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated); National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Evaluation Findings for the Rhode Island Coastal Resources Management Program Covering the Period From May 1983 Through April 1985* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated);and, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Evaluation Findings for the Rhode Island Coastal Resources Management Program Covering the Period From January 1982 Through April 1983* (Silver Spring, MD: Office of Ocean and Coastal Resource Management, NOAA, Undated).

[30] With assistance from the CRC, the CRMC developed the Rhode Island Coastal Resources Management Program (RICRMP) which received federal approval in 1978. The program has been substantially revised several times since its inception and the CRMC routinely makes minor revisions to its program.

[31] The CRMC is a very flat or "horizontally" structured agency whereas the RIDEM's organizational structure is vertical in orientation. This observation was supported by interviews with RIDEM staff that complained about the agency's organization and its cumbersome and centralized decisionmaking process.

[32] An independent study of the DEM says changes are needed to strengthen the agency's leadership structure, improve customer service and bolster environmental law enforcement. The $800,000 study, commissioned by a panel of legislative and executive leaders, notes "the sense among some state officials" that the agency's two main functions— regulating polluters and protecting natural resources—are "incompatible." See: Rhode Island Government Transformation Partnership (RIGTP), *DEM Recommendations Report* (RIGTP, Undated).

[33] At least two formal reports have been issued: Environmental Quality Study Commission, *Environmental Quality Study Commission Final Report* (Providence, RI: Environmental Quality Study Commission, 1990); RIGTP, *DEM Recommendations Report*.

[34] *Environmental Quality Study Commission*, 49 – 55.

[35] This is supported by the report's findings pertaining to the NBEP's problem's related to its location within RIDEM's hierarchy. Other evidence can be found in the recent $800,000 report that proposed changes in RIDEM programs and its organizational structures. See: RIGTP, *DEM Recommendations Report*. The RIDEM has

undergone frequent reorganizations and continues to suffer many of the same staffing and funding problems noted in the *Environmental Quality Study Commission*.

EPA has also been critical of the RIDEM as exemplified in comments EPA Administrator Carol Browner made while campaigning for the Democratic candidate for governor during the last election. The EPA warned the RIDEM to improve hazardous waste enforcement, which "narrowly escaped an EPA takeover" after Gov. Lincoln Almond (R) promised to add new staff and "beef up" enforcement. The proposal was unveiled at Governor Almond's state of the state address where "dozens of House and Senate members skipped the applause" for Almond's initiative, because the RIDEM has undergone "years" of controversial directors, charges of mismanagement and "attempted raids on its power." "History may also outweigh hope." In the past, reform efforts have "eroded under a steady rain of acrimony". Other recent bills have been introduced that would make the RIDEM more accountable to the public and subject deputy directors to Senate confirmation as well as reorganize the agency. For the recent set of bills see: R.I.G.A. 99–H 5603; R.I.G.A. 99–H 6336; R.I.G.A. 99–H 6168; and, R.I.G.A. 99–H 5647. The most critical voice of the RIDEM in recent years was the Kennedy Commission, which among other things, investigated the agency's freshwater wetlands program. These controversies have all been well documented in the *Providence Journal Bulletin* and other news sources, and were frequently identified by our respondents.

[36] The RIDEM has had at least five commissioners over the last ten years. They are Robert Bendick, Louise Durfee, Timothy Keeney, Andrew Mcleod, and most recently Jan Reitsma. Michael Annarumo also served for some time as the acting RIDEM director as well. This includes three commissioners in the last four years as the RIDEM has been under attack by the EPA and the general assembly.

[37] We should note that the EPA region I staff who commented on this report did not agree with our observation stating that the RIDEM was not created to protect a constituency group but is there to implement federally delegated laws and is often opposed by organized interest groups. Clearly, the national statutes are designed to protect and advance the interests of organized and established groups at the federal (e.g., Sierra Club) and state level (e.g., Save the Bay) who often are opposed by other organized groups. A clear example relevant to this case would be the controversial proposals concerning the reconciling of RIDEM's water quality classifications and the CRMC's water uses. The CRMC's water uses are designed to protect water dependent uses and organizations such as RIMTA often support the CRMC in these issues. At the same time, the impacts of recreational boating and the RIDEM's water quality classifications often cause the agency to oppose the expansion of these efforts and they are frequently joined by Save the Bay and the RISA. Thus, we disagree with EPA Region I's comments (see page 6 of EPA Region I's comments on our reports).

[38] The CRMC is required to be consistent whenever practicable with the policies in the *State Guide Plan*.

[39] For more information on Save The Bay see: http://www.savebay.org/Mission.htm (October 7, 1999).

[40] Save The Bay and RIMTA both lobby Congress as well.

[41] Rhode Island does not have a county-level of government, other than for the purposes of its judicial system.

[42] G. A. Brown, V. C. Rose, S. F. Bartlett, A. Romano, R. Gularte. *Power Plant Site Considerations at Charlestown, Rhode Island* (Marine Technical Report Series Number 23. Kingston, RI: Coastal Resources Center and Ocean Engineering, University of Rhode Island, 1974).

[43] Olsen and Lee, "Rhode Island Lagoons"; and, Olsen and Lee, "A Management Plan for a Coastal Ecosystem".

[44] Rather than repeating this analysis, the following discussion summarizes some of these findings. For more discussion of the planning process see: Olsen and Lee, "Rhode Island Lagoons"; Olsen and Lee, "A Management Plan for a Coastal Ecosystem"; and, Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons."

[45] Lee, *An Elusive Compromise*.

[46] Olsen and Lee, "Rhode Island Lagoons"; and, Olsen and Lee, "A Management Plan for a Coastal Ecosystem".

[47] *Ibid.*

[48] *Ibid.*

[49] It should be noted that since the SAMP became part of the state's federally approved CZM program, it approval by NOAA also required the preparation of an Environmental Impact Statement (EIS) had to be developed pursuant to the National Environmental Policy Act (NEPA). See: National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, *Final Supplemental Environmental Impact Statement* (Washington, DC: NOAA, U.S. Department of Commerce, 1985).

[50] Stephen Olsen, Virginia Lee, Olsen, and Clarkson Collins, *Recommended Measures to Maintain and Protect the Qualities of South Kingston's Salt Pond Region* (Narragansett, RI: Coastal Resources Center, University of Rhode Island, September 1982); and, Stephen Olsen, Virginia Lee, Olsen, and Clarkson Collins, *Recommended Measures to Maintain and Protect the Qualities of Charleston's Salt Pond Region* (Narragansett, RI: Coastal Resources Center, University of Rhode Island, August 1982).

[51] Clarkson Collins, *A Water Quality Element for the Extension of the Salt Ponds Special Area Management Plan to Quonontaug, Winnapaug (Brightmans) and Maschaug Ponds* (Narragansett, RI: Coastal Resources Center, University of Rhode Island, September 1985).

[52] For a more detailed discussion of the SAMP's implementation see: Laura Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds*, Unpublished Masters Thesis (Kingston, RI: University of Rhode Island, Department of Marine Affairs, 1996); Ernst, "Integrating State Government for Improved Coastal Water Quality"; Laura Ernst, Virginia Lee, and Alan Desbonnet, "The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Pond Region." in *Seeking Balance: Conflict, Resolution, & Partnership* Conference Proceedings for The Coastal Society. 15th International Conference, July 14 - 17, 1996. Seattle, Washington; Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"; Olsen and Lee, "Rhode Island Lagoons"; and, Olsen and Lee, "A Management Plan for a Coastal Ecosystem".

[53] Department of Environmental Management, Rhode Island (RIDEM) *Rhode Island Nonpoint Souce Pollution Management Plan*, State Guide Plan Element 731, Report Number 87 (Providence, RI: RIDEM. October 1995).

[54] Some of the wetlands alterations would also be subject to the COE's permit requirements as well. However, the state's regulations are more restrictive and there has been little reason to coordinate state efforts with those of the COE.

[55] Ernst, "Integrating State Government for Improved Coastal Water Quality"; Olsen and Lee, "Rhode Island Lagoons"; and, Olsen and Lee, "A Management Plan for a Coastal Ecosystem".

[56] Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons".

[57] Rhode Island General Laws (R.I.G.L.) §45-23.

[58] Ostrom, "An Agenda for the Study of Institutions."

[59] Department of Environmental Management and Coastal Resources Management Council, State of Rhode Island, *State of Rhode Island Stormwater Design and Installation Standards Manual* (Wakefield, RI: CRMC. September 1, 1993).

[60] Coastal Resources Management Council (CRMC), Rhode Island, *Projects of Special Merit* (Wakefield, RI: CRMC. February 1, 1993).

[61] Alan Desbonnet, Virginia Lee, Pamela Pogue, David Reis, James Boyd, Jeffrey Willis, and Mark T. Imperial, "Development of Coastal Vegetated Buffer Programs," *Coastal Management* 23 (no. 2, 1995), 91-109.

[62] CRMC, *The Narrow River Special Area Management Plan*.

[63] CRMC, Rhode Island, *Guidelines for the Development of Municipal Harbor Management Plans.*

[64] The Narragansett Bay Project (NBP) was an active proponent of this legislation but the origins of this policy proposal lie in the Salt Ponds SAMP.

[65] Some local governments would actively require the installation of these systems when a variance was needed.

[66] For more discussion of the Section 309 Enhancement Grants Program see: Tina Bernd-Cohen, Pamela Pogue, Virginia Lee, and Richard F. Delaney, "Review of the Section 309 Coastal States Enhancement Grants Program," *Coastal Management* 23 (no. 3, 1995), 173-194.

[67] Coastal Resources Management Council (CRMC), Rhode Island, *Strategy for Program Enhancement* (Wakefield, RI: CRMC. December 2, 1993).

[68] The original SAMP's maps were hand drawn and developed before the advent of geographical information systems (GIS). The new maps are now digitized, more accurate, and more easily modified.

[69] In the original SAMP it was often hard to tell which requirements were recommendations and which were CRMC regulations.

[70] Rhode Island General Laws (R.I.G.L.) §45-23.

[71] *Ibid.*

[72] Coastal Resources Management Council (CRMC), Rhode Island, *Cumulative and Secondary Impacts Study of the Salt Ponds and Narrow River Watersheds*, A proposal for a project of special merit. Wakefield, RI: CRMC. January 31, 1994; and,

[73] Nixon, *et al*., *Nutrient Inputs to Rhode Island Coastal Lagoons and Salt Ponds*; Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds*; and, Ernst, Lee, and Desbonnet, "The Cumulative Impacts of Management Decisions".

[74] Olsen and Virginia Lee, "Eutrophication and Management Initiatives for the Control of Nutrient Inputs"; Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds*; and, Ernst, Lee, and Desbonnet, "The Cumulative Impacts of Management Decisions".

[75] Olsen and Virginia Lee, "Eutrophication and Management Initiatives for the Control of Nutrient Inputs."

[76] For information on the Section 6217 program requirements see:

[77] Coastal Resources Management Council (CRMC), *Rhode Island Salt Pond Region: A Special Area Management Plan (Machaug to Point Judith Ponds)* (Wakefield, RI: CRMC, 1999), 6.

[78] Gold, *et al*., "Nitrate -Nitrogen Losses to Groundwater from Rural and Suburban Land Uses."

[79] The concept of cumulative impacts has been a part of our national environmental policy since 1978 when the Council on Environmental Quality mandated federal agencies to identify the cumulative impacts of federal actions (40 C.F.R. 1508.9 et. seq. 1978). The 1990 CZARA created a Coastal Zone Enhancement Program to encourage states to strengthen their CZM programs in the area of cumulative and secondary of development impacts. Cumulative impacts are defined as the total effect on the environment of development activities and/or natural events taking place within a geographic area over a particular period. But cumulative impacts are difficult to measure and evaluate (B. Vestal and A. Rieser, "Methodologies and Mechanisms for Management of Cumulative Coastal Environmental Impacts." In *Part 1. Synthesis, with Annotated Bibliography. Part 2 :Development and Application of a Cumulative Impacts Assessment Protocol*, NOAA, Coastal Ocean Program, Decision Analysis Series No. 6 (Silver Spring, MD: National Oceanic and Atmospheric Administration, Coastal Ocean Office, 1995)). Nevertheless ten coastal states have managed and regulated to control cumulative impacts. Connecticut, for example, has used their Coastal Management Act which contain specific policies, standards and adverse impact criteria to evaluate direct, cumulative and secondary effects on coastal resources (Vestal and Rieser, "Methodologies and Mechanisms"). Development of resource goals and long range comprehensive plans have allowed communities to establish a broader context for site specific regulatory decisions and comprehensive plans that guide development to those areas where the least damage will occur (Vestal and Rieser, "Methodologies and Mechanisms"). Rhode Island's Salt Pond SAMP uses a combination of these approaches.

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

[81] Narragansett Bay Estuary Program (NBEP), *1999 Biennial Review: Narragansett Bay Estuary Program* (Providence, RI: RIDEM, NBEP, May 1999), 6-3.

[82] Kerr, Robadue, and Brownell. *The Rhode Island Watershed Approach*.

[83] Narragansett Bay Project (NBP), *Comprehensive Conservation and Management Plan for Narragansett Bay. Final Report*, State Guide Plan Element 714, Report Number 71 (Providence, RI: RIDEM, Narragansett Bay Project and RI Division of Planning, December 1992).

[84] Environmental Protection Agency (EPA), United States, *Special Area Management Plan for Salt Pond Protection: Water Quality ad Resource Protection through Local Planning* (Washington, DC: EPA, Undated).

[85] Rhode Island General Laws (R.I.G.L.) §45-23.

[86] Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds*; and, Ernst, Lee, and Desbonnet, "The Cumulative Impacts of Management Decisions".

[87] Ernst, Lee, and Desbonnet, "The Cumulative Impacts of Management Decisions," 3. See also: Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds.*

[88] Ernst, Lee, and Desbonnet, "The Cumulative Impacts of Management Decisions," 3. See also: Ernst, *The Cumulative Impacts of Management Decisions on Nitrogen Loading to the Rhode Island Salt Ponds.*

[89] Vincent Ostrom, *The Meaning of American Federalism: Constituting a Self-Governing Society* (San Francisco, CA: ICS Press, 1994); Vincent Ostrom, *The Intellectual Crisis in American Public Administration*, Second Edition (Tuscaloosa, AL: The University of Alabama Press, 1989); Daniel Elazar,. *Exploring Federalism*

(The University of Alabama Press, Tuscaloosa, 1987); and, Deil Wright, *Understanding Intergovernmental Organizations*, 3rd Edition (Pacific Grove, CA: Brooks/Cole Publishing Co, 1988).

[90] Too many researchers neglect the positive aspects associated with polycentric institutional arrangements and the fact that they can be just as effective as centralized hierarchical or market-based arrangements. The criticism that the duplication and fragmentation of authorities or the lack of a centralized coordination mechanism decreases effectiveness is simply not supported by the analysis. In fact, it can be argued that an effort to centralize decision making could increase transaction costs. Centralized governance arrangements and large bureaucracies often: become increasingly undiscriminating in its response to diverse demands; impose increasingly high costs on presumed beneficiaries; fail to proportion supply to demand; allow public goods to erode by failing to prevent one use from impacting others; become increasingly error-prone and uncontrollable to the point where actions deviate from public purposes and objectives; and, these problems can be compounded to the point that remedial actions actually exacerbate rather than ameliorate problems (Ostrom, *The Intellectual Crisis in American Public Administration*, 56). Holling also noted that rigid, centralized attempts to manage ecosystems often lead to their collapse (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; and, C. S Holling, *Adaptive Environmental Assessment and Management* (New York, NY: John Wiley and Sons, 1978). Thus, there is reason to question the assumption that a centralized arrangement will result in more effective natural resource management. Moreover, given the local home rule tradition and the turf battles between the RIDEM and the CRMC, an effort to centralize decision making could have reduced the likelihood of the SAMP's implementation.

[91] William Blomquist, *Dividing the Waters: Governing Groundwater in Southern California* (San Francisco, CA: ICS Press. 1992), 340.

[92] It is important to note that the CRMC has the authority to review OSDSs if it chose to do so. The CRMC's reliance on RIDEM's OSDS program is a conscious choice designed to rely on that agency's function specialization rather than to have to develop a similar specialization within the CRMC.

[93] Blomquist, *Dividing the Waters*.

[94] Blomquist, *Dividing the Waters*, 360; and Ostrom, *The Meaning of American Federalism*, 258.

[95] Everett. M. Rogers, *Diffusion of Innovations*, 4th ed. (New York, NY: Free Press, 1995).

[96] The North American Wetland Conservation Act has also provided the U.S. Fish and Wildlife Service (USFWS) with funding for land preservation and field staff located in the watershed have also been active in land preservation efforts.

[97] For more information on this type of policy-oriented learning see: Paul A. Sabatier and Hank C. Jenkins-Smith, *Policy Change and Learning: An Advocacy Coalition Approach* (Boulder, CO: Westview Press 1993).

[98] To try and gain RIDEM's participation, the CRMC had staff in this RIDEM program develop the draft chapter of the SAMP. However, when the plan went out for public review and comment, RIDEM staff were critical of this chapter of the SAMP. Thus, many respondents were unsure whether the agency would begin to address these problems in the Salt Ponds watershed.

[99] Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons"; and, Imperial, "Analyzing Institutional Arrangements for Ecosystem-Based Management".

[100] Ernst, "Integrating State Government for Improved Coastal Water Quality"; Olsen and Lee, "Rhode Island Lagoons"; and, Olsen and Lee, "A Management Plan for a Coastal Ecosystem".

[101] L. McGillvray, G. Anderson and N. West., "Managing Coastal Development: An Evaluation of the Transfer of Development Rights Approach," *Coastal Zone Management Journal* 13 (1985), 25-47; and, G. Anderson, and S. Edwards, "Protecting Rhode Islands Coastal Salt Ponds: An Economic Assessment of Downzoning," *Coastal Zone Management Journal* 14 (1986), 67 - 91.

[102] Ostrom, *Governing the Commons.*

[103] *Ibid.*

[104] Ostrom, Gardner, and Walker, *Rules, Games, & Common-Pool Resources*, 325.

[105] Sabatier and Jenkins-Smith, *Policy Change and Learning*.

[106] Odum, "Environmental Degradation and the Tyranny of Small Decisions"; and, Vestal and Rieser, "Methodologies and Mechanisms".

[107] Ostrom, Gardner, and Walker, *Rules, Games, & Common-Pool Resources*, 325.

[108] Ostrom, *Governing the Commons*, 210.

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Timothy M. Hennessey is a Professor of Political Science and Marine Affairs and the Associate Director of the Rhode Island Public Administration Program at the University of Rhode Island. He has over twenty years of experience studying the management and governance of coastal and estuarine ecosystems. In 1985, he and his colleagues at the Coastal Resources Center at the University of Rhode Island conducted a five-year Sea Grant funded comparative analysis of the governance structure and process in five estuaries; Narragansett Bay, Galveston Bay, San Francisco Bay, Albermarle-Pamlico Sound, and Puget Sound. More recently, Hennessey conducted a major study of the Chesapeake Bay Program and worked with Mark Imperial on a research project examining the National Estuary Program. He has also studied the role of science in the management of estuaries through a comparative analysis of Puget Sound and the Fraser River Estuary in Canada. Professor Hennessey has published numerous articles in journals such as *Marine Policy*, *Coastal Management*, and *Ocean and Coastal Management* as well as chapters in edited books.

Derek Kauneckis received a Masters of Science degree in International Development with an emphasis on Natural Resource Management and Policy in 1997 from the University of California, Davis. Currently he is a Ph.D. student in Public Policy at the Department of Political Science and the School for Public and Environmental Affairs at Indiana University, Bloomington. Derek's professional experience includes working with the US Forest Service in Alaska on Cultural Resource Management and Community Development programs, the Division of Natural Resources at Winrock International Institute for Agricultural Development and various environmental consulting firms in the Western United States. Derek's dissertation research uses a comparative approach to examine the effect of political decentralization on local public policy decisionmaking regarding natural resource management.

Leslie Koziol graduated Magna Cum Laude from Northland College, Ashland, Wisconsin, with a Bachelors of Science degree. Leslie has received numerous awards and achievements including the Aldo Leopold Award in Environmental Ethics, The Northern States Power Environmental Achievement Award, and Distinction in the Social Sciences. Leslie is currently pursuing a Masters degree in Environmental Science at Indiana University. Her

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Katheryn Summers received a Bachelor of Science degree, with a concentration in Zoology and a minor in Wildlife Ecology, from the University of Florida in 1994. From 1994 to 1995, she conducted research University of Florida's Neurobiology Lab and provided staff support at the National Biological Survey=s Sirenia Project. Katheryn then worked for The Nature Conservancy's in Gainesville, Florida where she produced the 1995 Eglin Air Force Base Annual Research Report, a compilation of inventory, monitoring and research conducted in support of ecosystem management. She also participated in the development of an agreement to conduct joint ecosystem management on 750,000 acres near Eglin Air Force Base. In 1996, she began her graduate studies at Indiana University and graduated in May 1999 with a Master of Environmental Science and a Master of Public Affairs, concentrating in Environmental Policy and Natural Resource Management. Katheryn is also working as a research assistant at the Center for the Study of Institutions, Population, and Environmental Change (CIPEC) on a project examining the private ownership of forested lands in Indiana.

Sally McGee is a graduate of Smith College where she received her B.A. in economics in 1989. She lived in Washington, DC for several years, working with environmental groups including Greenpeace and Conservation International. This work inspired her to experience the marine environment first hand, so she left Washington to study and then work for Sea Education Association in Woods Hole, MA. Sally has worked aboard a number of traditionally rigged sailing vessels and has sailed the eastern seaboard of the US and Canada, the Caribbean, and in the North and South Pacific. She returned to the US in 1997 and worked for Mystic Seaport (Mystic, CT) before entering the Marine Affairs Program at the University of Rhode Island in the Fall of 1998. The focus of her studies at URI is environmental conflict resolution.