Comprehensive Conservation and Management Plan

2001

Peconic Estuary Program

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The Peconic Estuary Program is funded in part by the United States Environmental Protection Agency under assistance agreements #CE992002 to the Suffolk County Department of Health Services and #CE992066 to the New York State Department of Environmental Conservation. The mention of trade names or commercial products does not in any way constitute an endorsement or recommendation for use.

Technical editing and layout of this report is funded by the United States Environmental Protection Agency under Contract Nos. 68-C7-0004 and 68-C-00-121, Work Assignment Nos. 2-12 and 0-18 respectively, to Battelle, Duxbury, Massachusetts and Shor & Orrick Planning Associates, LC, Corpus Christi, Texas, subcontractor to Battelle.

Approved by the USEPA on November 15, 2001

This plan should be cited as:

Peconic Estuary Program. 2001. Peconic Estuary Comprehensive Conservation and Management Plan. 866 pp. Sponsored by the United States Environmental Protection Agency under Sec. 320 of the Clean Water Act. Suffolk County Department of Health Services, Program Office.

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Special Appreciation

Association of Marine Industries
Long Island Farm Bureau (Joseph Gergela)
Towns of Brookhaven, East Hampton, Riverhead, Shelter Island, Southampton and Southold

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Sponsoring Agency Acknowledgements

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For their leadership, guidance and assistance, we wish to thank Jeanne Fox, Bill Muszynski, Rich Caspe, Kevin Bricke, Felix Locicero, Noemi Mercado, Betsy Tam Salter, Mario Del Vicario, Jon Gorin, Mario Paula, Bob Vaughn, Patrick Durack, Paul Giardina, Mary Logan, Mary Mears, Pat Carr, Terry Ippolito, Dennis McChesney, Jim Ferretti, Towana Joseph, Eric Simpson, Jim Olander, Donna Somboonlakana, Doug Pabst, Steve Ferreira, and Tristan Gillespie.

The New York State Department of Environmental Conservation

We wish to thank Gordon Colvin, Karen Chytalo, Byron Young, Alice Weber, Ken Koetzner, Chris LaPorta, and Debra Barnes of the Bureau of Marine Resources for their technical assistance and support of this document. The technical guidance of Phil DeGaetano, Dick Draper, Alan Fuchs, Robert Schneck, Anthony Leung, and Laura Star of the Division of Water are also greatly appreciated. Thanks also to Stephen Hammond, Vinnie Palmer, and Chart Guthrie for their critical input and assistance.

Suffolk County Department of Health Services

Special appreciation is extended to Robert Gaffney, the Suffolk County Executive, for his guidance and support, and the Suffolk County Legislature for its continuing commitment to the Program. Clare Bradley, M.D., M.P.H., Commissioner of the Suffolk County Department of Health Services, is also recognized for her unfailing dedication. The Bureau of Marine Resources, including Dr. Robert Nuzzi, Robert Waters, John Bredemeyer, Gary Chmurzynski, Charles Schell, Cindy MacArthur, Mike Jensen, and Mark Long, and the Bureau of Environmental Management, including Kim Shaw and Mark Reuschle, are much appreciated for all of their hard work. The clerical and cartographic staff at the Office of Ecology, especially Arlene Freudenberg, Jeanine Schlosser, Barbara Harrison, and Thomas Keenan, must be acknowledged for their attention and willingness to contribute to the Peconic Estuary Program.

NOTE: A complete PEP Management Conference membership listing is located in Appendix C.

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LIST OF ACRONYMNS

AEM	-	Agricultural Environmental Management
AMI	-	Association of Marine Industries
ASMFC	-	Atlantic States Marine Fisheries Commission
BMP	-	Best Management Practice
BNL	-	Brookhaven National Laboratory
BTRI	-	Brown Tide Research Initiative
BTSC	-	Brown Tide Steering Committee
CAC	-	Citizen's Advisory Committee
CCMP	-	Comprehensive Conservation and Management Plan
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CNRA	-	Critical Natural Resource Area
COP	-	Coastal Oceans Program
CVA	-	Clean Vessel Act
CZARA	-	Coastal Zone Act Reauthorization Amendments
DDT	-	Dichloro-diphenyl-trichloroethane
DIN	-	Dissolved Inorganic Nitrogen
DMR	-	Discharge Monitoring Report
DMS	-	Dimethyl Sulfide
DNA	-	Deoxyribonucleic Acid
DO	-	Dissolved Oxygen
DON	-	Dissolved Organic Nitrogen
DPW	-	Department of Public Works
EBPS	-	Environmental Benefits Permitting Strategy
ECL	-	Environmental Conservation Law
EQIP	-	Environmental Quality Incentives Program
EPF	-	Environmental Protection Fund
ER-L	-	Effects Range Low
ER-M	-	Effects Range Medium
FIFRA	-	Federal Insecticide, Fungicide, and Rodenticide Act
HRWG	-	Habitat Restoration Work Group
ISTEA	-	Intermodal Surface Transportation Efficiency Act
MAFMC	-	Mid-Atlantic Fishery Management Council
MSD	-	Marine Sanitation Devices
MTBE	-	Methyl *tert*-butyl Ether
NDA	-	No Discharge Area
NEP	-	National Estuary Program

NMFS	-	National Marine Fisheries Service
NOAA	-	National Oceanic and Atmospheric Administration
NPS	-	Nonpoint Source
NRCS	-	Natural Resources Conservation Service
NWIRP	-	Navy Weapons Industrial Reserve Plant
NYS	-	New York State
NYSDEC	-	New York State Department of Environmental Conservation
NYSDOS	-	New York State Department of State
NYSDOT	-	New York State Department of Transportation
OMWM	-	Open Marsh Water Management
OSDS	-	Onsite Disposal System
OU V	-	Operable Unit V
PCBs	-	Polychlorinated Biphenyls
PAH	-	Polynuclear Aromatic Hydrocarbon
PEP	-	Peconic Estuary Program
RI	-	Remedial Investigation
SAV	-	Submerged Aquatic Vegetation
SCDHS	-	Suffolk County Department of Health Services
SCWQCC	-	Suffolk County Water Quality Coordinating Committee
SEQRA	-	State Environmental Quality Review Act
SPDES	-	State Pollutant Discharge Elimination System
SRS	-	Systematic Random Sampling
STP	-	Sewage Treatment Plant
TAC	-	Technical Advisory Committee
TCA	-	Trichloroethane
TCE	-	Trichloroethylene
TMDL		Total Maximum Daily Load
TSCA	-	Toxic Substances Control Act
USACE	-	United States Army Corps of Engineers
USCG	-	United States Coast Guard
USDA	-	United States Department of Agriculture
USDOE	-	United States Department of Energy
USEPA	-	United States Environmental Protection Agency
USDA-FSA	-	United States Department of Agriculture Farm Services Agency
USFDA	-	United States Food and Drug Administration
USGS	-	United States Geological Survey
UV	-	Ultra-Violet
VOC	-	Volatile Organic Compound

CHAPTER
ONE

OVERVIEW

PLEDGE FOR THE PECONIC ESTUARY

We find and declare that

The Peconic Estuary is an important natural resource that provides incomparable beauty and significant recreational and commercial benefits;

The Peconic Estuary's living resources, water quality, and aesthetic character have suffered from development and other human uses; and

Restoration and protection of the Peconic Estuary's environmental quality require focused management by a partnership of Federal, State, and local governments, affected industries, academia, and the public.

We therefore pledge to restore and protect the environmental quality of the Peconic Estuary through the preparation and implementation of the Comprehensive Conservation and Management Plan.

— Peconic Estuary Management Conference

GOALS

- Ensure a healthy and diverse marine community; optimizing opportunities for water dependent recreation.
- Promote the social and economic benefits, which have been associated with the Peconic Estuary System.
- Establish a comprehensive water quality policy, which ensures the integrity of marine resources, habitat, and terrestrial ecosystems while supporting human activities in the Peconic Estuary study area.
- Ensure an effective technical, regulatory, and administrative framework for the continued monitoring and management of the Peconic Estuary study area.
- Achieve zero discharge (from point and nonpoint sources) of toxic pollutants, and particularly of bioaccumulative chemicals.
- Promote an understanding and, thus, appreciation of the value of the Peconic Estuary as an ecosystem and as a mainstay to the East End economy so that it is preserved and restored as one of the last great places in the Western Hemisphere.
- Involve the many and diverse stakeholders in the Peconic Watershed regarding the implementation of the CCMP and in the future direction and decisions affecting the estuary.

INTRODUCTION

The Peconic Estuary, situated between the North and South Forks of eastern Long Island, New York, consists of more than 100 distinct bays, harbors, embayments, and tributaries (See **Figure 1-1**). The area surrounding the Peconic Estuary's watershed is rich in rolling farmland, scenic beaches and creeks, lush woodlands, and wetlands.

The Peconic Estuary System includes the Peconic Estuary and those land areas that contribute groundwater and stormwater runoff to the Peconic River and Estuary. The estuary system features numerous rare ecosystems that are home to many plant and animal species, including several nationally and locally threatened and endangered plants and animals. The Nature Conservancy has designated the Peconic Estuary System as one of the "Last Great Places" in the Western Hemisphere.

What is an Estuary?

An estuary is a semi-enclosed coastal body of water that connects to the open sea. It is a transition zone where saltwater from the ocean mixes with freshwater from rivers and land. The amount of freshwater flowing into the estuary varies from season to season and from year to year. This variation, together with the daily rise and fall of the tides and the consequent movement of saltwater up and down rivers, creeks, and in embayments creates a unique environment. Estuaries are among the most productive of the earth's systems. More than 80 percent of all fish and shellfish species use estuaries as a primary habitat or as a spawning and nursery ground. Estuaries also provide feeding, nesting, breeding and nursery areas for a wide variety of animals.

Bountiful living resources support commercial fin and shellfishing, as well as other water-dependent and water-related activities. Tourism and recreation are central to the local economy, including businesses such as restaurants and marinas that cater to recreational fishermen, boaters, bathers, hunters, and nature enthusiasts. In 1993, more than 1,100 establishments were identified as "estuarine dependent" and gross revenues for these establishments exceeded $450 million per year. More than 7,300 people are employed in these businesses, with a combined annual income of more than $127 million.[1]

The numerous ecological, cultural, and economic assets of the Peconic Estuary System are enjoyed by both residents and visitors. The East End towns are home to approximately 100,000 people. During the summer season, this number swells to over 280,000. These year-round and seasonal populations put pressure on the area's natural resources and impact water quality. In recent years, many stakeholder groups have expressed concern about the impacts of population growth, new development, and natural resource exploitation on the overall health of the system. Some of the earliest concerns were raised in 1985, after the first appearance of the Brown Tide. The devastating impacts of this algal bloom heightened public awareness about the linkage between the region's ecology and economy. The Brown Tide also served to mobilize the citizens and local governments of eastern Long Island in an effort to save the estuary from careless exploitation and irreversible degradation.

Historically, impacts from population growth and unchecked development have not been as severe in the Peconic Estuary as in certain other regions on Long Island. However, a number of problems have emerged in recent years, in addition to the Brown Tide, which suggest that the estuary is at a crossroads.

[1]Estuarine-dependent establishments include businesses such as commercial fishing, marine transportation, marinas, boat building and repair, eating and drinking establishments, hotels and motels, selected retail and membership sport clubs, and other enterprises that cater in whole or in part to tourists and recreationists during the peak season.

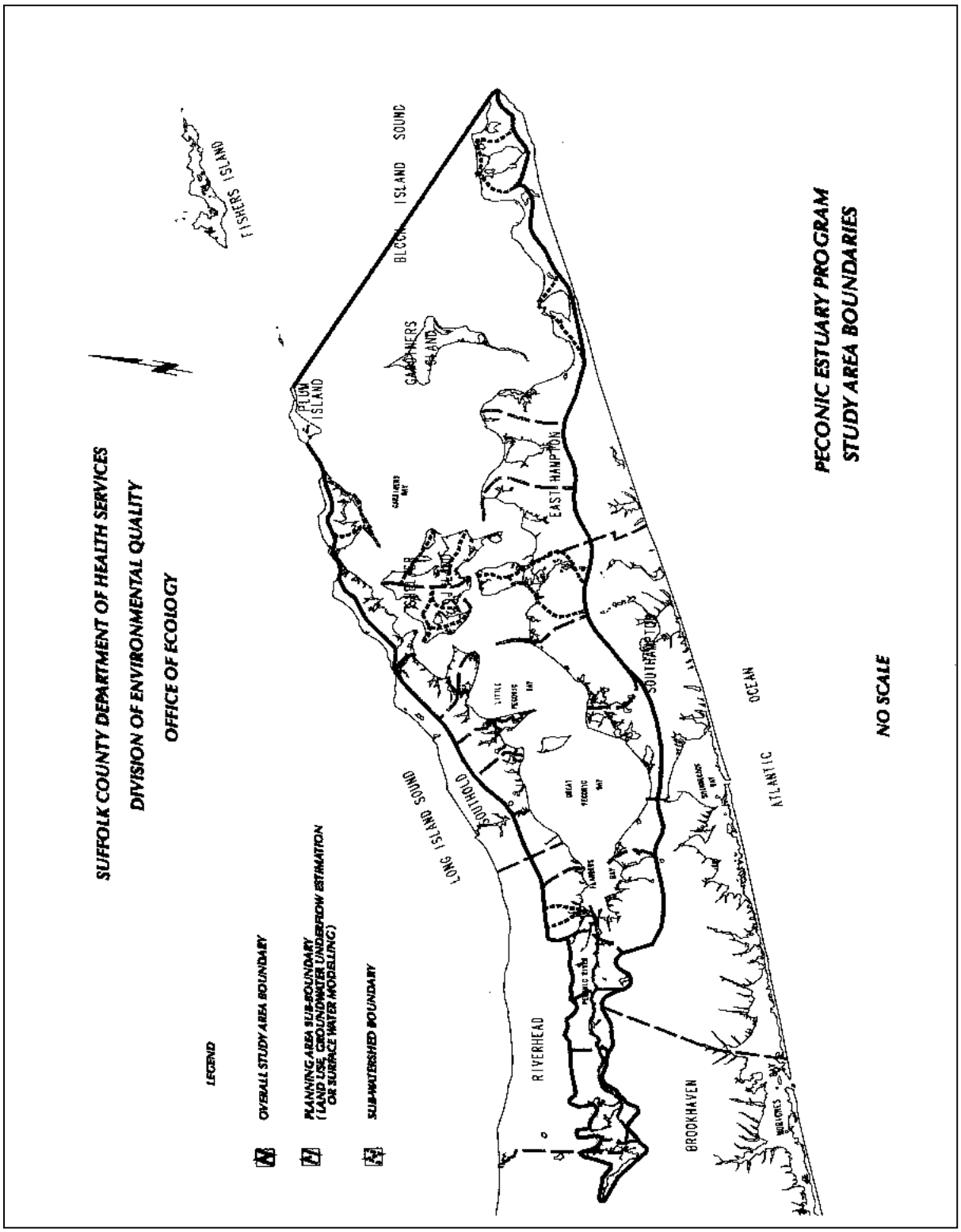


Figure 1-1. Study Area Boundaries.

These problems include the closure of shellfish beds due to pathogenic organisms, declines in finfish abundance, the loss and fragmentation of habitats, nutrient over-enrichment resulting in low dissolved oxygen (DO) levels (in Flanders Bay), the potential for low levels of toxics to impact the system, and the loss of open space and farmland to residential development. There is a growing awareness of the need for remedial efforts to correct existing problems as well as proactive efforts to prevent further degradation of the system.

THE PECONIC ESTUARY PROGRAM

The National Estuary Program (NEP) was established by the Federal Water Quality Act of 1987, which amended the Clean Water Act. Congress added the Peconic Estuary System to the priority list of estuaries for inclusion in the NEP in October 1988. In 1991, the Peconic Estuary was nominated for inclusion in the NEP. This nomination represented the effort and desires of a wide variety of estuary stakeholders, including citizen's groups, environmental groups, local and State governments, academic institutions, and many private organizations. The Peconic Estuary was accepted into the ranks of the NEP in September 1992, and the Peconic Estuary Program (PEP), a partnership of all stakeholders, including Federal, State, and local interests and the public, officially commenced with a kick-off conference in April 1993. This ***Comprehensive Conservation and Management Plan*** (CCMP) is the product of a tremendous amount of research and effort by resource agency staff and local citizens serving on the various task forces and committees known collectively as the Peconic Estuary Program Management Conference. The Management Conference structure and membership are shown in Appendices B and C.

The National Estuary Program

Congress recognized the significance of preserving and enhancing coastal environments with the establishment of the National Estuary Program (NEP) in the 1987 amendments to the Clean Water Act. The purpose of the NEP is to promote the development of comprehensive management plans for estuaries of national significance threatened by pollution, development, or overuse. There are currently 28 estuaries in the program.

Peconic Estuary Program Management Conference Objectives

- *To protect and improve the Peconic Estuary system water quality to ensure a healthy and diverse marine community;*
- *To preserve and enhance the integrity of the ecosystems and natural resources present in the study area so that:*
  - *Optimal fish and wildlife habitat and diversity of species can be ensured; and*
  - *Conservation and wise management of consumable, renewable resources of the estuary are promoted and enhanced;*
- *To optimize opportunities for water dependent recreation;*
- *To promote to the maximum practicable extent, the social and economic benefits that have been associated with the Peconic Estuary system;*
- *To minimize health risks from human consumption of shellfish and finfish; and*
- *To promote, to the maximum extent possible, public awareness and involvement in estuarine management issues.*

Geographic Scope of the Program

The Peconic Estuary is located on the eastern end of Long Island, New York, and is bordered by Long Island's north and south forks. The major river discharging freshwater into the estuary is the Peconic River. This freshwater mixes with the salt water from the many bays in the estuary system leading out to the Atlantic Ocean. **Figure 1-1** depicts the boundaries of the Peconic Estuary Program study area. The eastern end of the study area is an imaginary line through Block Island Sound between Plum Island and Montauk Point, beyond which lies the open sea. The western boundary is at the headwaters of the Peconic River, just west of the William Floyd Parkway. The study area also includes those land areas that contribute groundwater and stormwater runoff to the river and estuary.

The study area includes the following municipalities: all of the Town of Shelter Island; significant portions of the Towns of Riverhead, Southold, East Hampton and Southampton; a small portion of the town of Brookhaven; and all or portions of the Villages of Greenport, Dering Harbor, Sag Harbor, and North Haven. More than 128,000 acres of land and 121,000 acres of surface water are included. **Figure 1-2** shows the percent distribution of land uses in the Peconic Estuary Watershed.

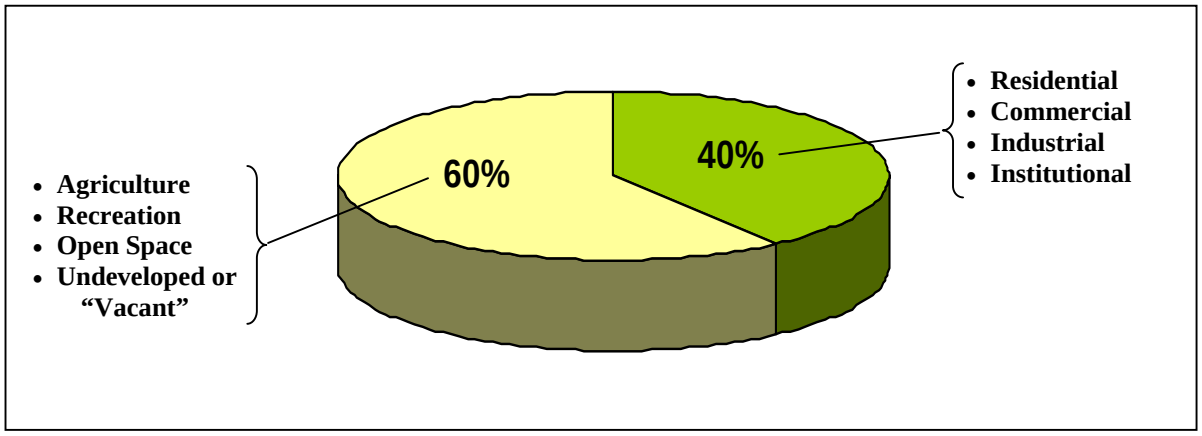


Figure 1-2. Land Uses in the Peconic Estuary.

PECONIC ESTUARY PRIORITY MANAGEMENT ISSUES

Priority management topics were initially identified in the Peconic Estuary nomination document for inclusion in the National Estuary Program. These topics were Brown Tide, nutrients, habitats and living resources, pathogens, and toxics. In this final CCMP, these topics are joined by critical lands protection, public education and outreach, financing, and overall implementation. These priority issues have been selected, both initially and currently, based on impacts, threats, and importance in meeting the overall goals of the Peconic Estuary Program. It is not enough to only address known or existing problems; management conference participants recognize the need to also take a proactive approach and prevent problems from occurring now and in the future. Each of these priority management topics is discussed below. Specific actions to address each of these priority management topics can be found in the Management Plan chapters of this CCMP.

The PEP has developed measurable goals for each chapter. In many cases, these measurable goals are first order estimates based on best available information and on management conference judgment. These goals will be refined in each annual report, as new information becomes available.

Brown Tide

The Suffolk County Department of Health Services (SCDHS) has routinely monitored the water quality of the Peconic Estuary since 1977. In June 1985, an unusually large and persistent algal bloom, now known as Brown Tide, was first noted in Peconics. The Brown Tide organism is identified as the phytoplankton species *Aureococcus anophagefferens*[2] and has also bloomed in Long Island's South Shore Estuaries, as well as in Narragansett Bay, RI, and Barnegat Bay, NJ.

In 1988 Suffolk County expanded its monitoring operations in an effort to determine the cause of Brown Tide. Although the cause of Brown Tide is still not known, the study's resulting final report, the Brown Tide Comprehensive Assessment and Management Program (BTCAMP) (SCDHS, 1992), was the primary source for the Peconic Estuary Program's National Estuary Program Nomination Report (SCDHS, 1991).

The BTCAMP serves as the initial Brown Tide characterization for the Peconic Estuary Program. Brown Tide research and characterizations are routinely reported in scientific literature and are systematically updated through Sea Grant's Brown Tide Research Initiative Reports and SCDHS' Brown Tide Workplan (last updated in 1998).

Since its first appearance in 1985, the Brown Tide has had a serious impact on natural resources, the local economy, the general aesthetic value of the estuary, and possibly regional tourism. The abundant Peconic bay scallop population was virtually eradicated by the onset of this bloom. Eelgrass beds, which contribute to the regional importance of the estuary as a shellfish and finfish spawning and nursery area, have been adversely impacted. Hard clams appear to have been affected by the blooms, although to a lesser extent than scallops. In addition, finfish landings may have declined during the blooms. The Brown Tide turns the normally blue waters of the bays brown — a situation which is unappealing (although not harmful) to swimmers and tourists.

While a significant amount of research has been completed and additional projects are still underway, the chemical, physical, and/or biological factors that cause, sustain, and end Brown Tide blooms are yet to be determined. Efforts are ongoing to determine what management actions can be undertaken to prevent or, if that is not possible, mitigate the effects of the recurrent Brown Tide on the ecosystem and economy of the estuary.

The PEP's measurable goals with respect to Brown Tide blooms include:

- Continue to better coordinate, focus, and expand Brown Tide research efforts (measured by funding appropriated, frequency of Brown Tide symposiums and frequency of updating the Brown Tide Workplan and coordinations within the Brown Tide Steering Committee). [See Action B-1]

[2] Different Brown Tide organisms have been associated with algae blooms in various parts of the country. Throughout this CCMP, the term "Brown Tide" refers specifically to the phytoplankton species *Aureococcus anophagefferens*, which has been identified as the source of the Brown Tide blooms in the Peconic Estuary.

- Continue the current level of water quality sampling in the Peconic Estuary (measured by the number and frequency of samples taken per year and the number of bays and peripheral embayments sampled). Currently, the Suffolk County Department of Health Services conducts biweekly monitoring at 32 stations in the Peconic Estuary throughout the year, resulting in over 830 samples taken annually. [See Action B-1]

Measurable goals for the Brown Tide-related natural resource impacts are found in the Habitat and Living Resources Chapter (**Chapter 4**).

Nutrient Pollution

The Long Island Comprehensive Waste Treatment Management Plan ("L.I. 208 Study"; Long Island Regional Planning Board, 1978) and the BTCAMP (SCDHS, 1992) identified nutrients, specifically nitrogen, as a priority management issue facing the Peconic Estuary. More recent status and trends information in the Point and Nonpoint Source Nitrogen Loading Overview (SCDHS, 1998), the Surface Water Quality Monitoring Report (1976–1996) (SCDHS, 1998), the Peconic Estuary Surface Water Quality: Nitrogen, Dissolved Oxygen, and Submerged Aquatic Vegetation report (SCDHS, 1998), and the Nitrogen Loading Budget and Trends report (SCDHS, 1999) emphasize the need to reduce anthropogenic (human-influenced) nitrogen loads to the estuary. These reports incorporate the results of many other technical studies dealing with groundwater quality and quantity, sediment nutrient flux, etc.

Excessive nutrient loading in an estuary can result in low dissolved oxygen levels in the water, a condition that can be harmful to marine life. Although nitrogen itself is generally not harmful, too much nitrogen can lead to excessive algal blooms. Algae consume oxygen (respire) at night, potentially depleting dissolved oxygen levels in the water column. Also, when algae die, they can settle through the water column to the sediments, where the organic matter is decomposed by bacteria. Bacterial decomposition uses oxygen ("sediment oxygen demand"), as well as releases nitrogen back into the water column ("sediment nutrient flux"). Thus, algal blooms can lead to repeated or prolonged periods of low dissolved oxygen, particularly in poorly flushed embayments. Algal blooms can also produce a shading effect in the water that can impact eelgrass.

Overall, the system is not experiencing widespread low levels of oxygen related to excessive nitrogen loading. However, the western portion of the system (Peconic River and Flanders Bay) has a legacy of nutrient over enrichment and periodic, short-term dissolved oxygen problems. Although there are larger sources of nitrogen, the PEP surface water computer model indicates that the Riverhead Sewage Treatment Plant (STP) is a controllable nitrogen loading sources of major significance in the Peconic River/Flanders Bay area. The importance of the treatment plant nitrogen loading is due to the concentrated nature of the STP discharge at a location near the mouth of the Peconic River, a poorly flushed area of the estuary system.

Historically, duck farming along the shores of the Peconic Estuary was a major pollutant source. At the peak of the industry in the middle of the twentieth century, there were 21 duck farms in the Peconic River and Flanders Bay area discharging large quantities of animal wastes that contained nitrogen into the system. Presently, there is only one duck farm remaining in operation located on Meetinghouse Creek, which discharges to the north-central portion of Flanders Bay.

Bottom sediments contribute recycled nutrients to the water that originate from external point and nonpoint source inputs. The release of nitrogen from the sediments represents more than 50 percent of the estimated total nitrogen load to the system.

Groundwater, accounting for more than 21 percent of the nitrogen input, is the largest external, locally manageable source to the estuary. It combines nitrogen from residential and agricultural fertilizer, on-site sewage disposal systems, and other sources.

Atmospheric deposition to surface waters represents approximately 26 percent of the nitrogen load to the system. The remaining small load (less than 3 percent) to the estuary is from stormwater runoff, tributary streams, and sewage treatment plants. Although these sources are a small percentage of the total regional loading, they may have localized adverse effects.

The quantity of nitrogen found in both groundwater and surface water is directly related to land uses within the system. Undoubtedly, the amount of open space found throughout the study area has spared the system thus far from significant long-term, widespread problems. The fact that much of this open space is available for development heightens the need for enlightened and carefully thought-out growth management plans. This is especially true in most of the western portion of the system (the Peconic River Corridor and Flanders Bay area) and around embayments poorly flushed by cleaner seawater.

The PEP's measurable goals with respect to nutrients include:

- Decrease the total nitrogen concentrations in the western estuary to a summer mean of no more than 0.45 mg/l (based on 1994-96 model verification conditions, and measured by surface water nitrogen concentrations as compared to the PEP nitrogen guidelines). [See Actions N-4, N-5, N-10]
- Improve the dissolved oxygen concentrations in the western estuary to ensure that the New York State dissolved oxygen standard (currently 5.0 mg/l) is not violated (measured by surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-10]
- Ensure that the total nitrogen levels in shallow waters remain at or below 0.4 mg/l to help optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat (based on 1994-96 model verification conditions, and measured by light extinction coefficients as compared to the recommended eelgrass habitat optimization goal of at or below $0.75 \pm 0.05\ m^{-1}$). [See Actions N-1, N-4, N-5, N-10]
- Ensure that the existing total nitrogen and dissolved oxygen levels are maintained or improved in waters east of Flanders Bay (*i.e.*, do not increase TN nor decrease DO) (measured by surface water total nitrogen concentrations as compared to the PEP nitrogen guidelines and surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-2, N-4, N-5, N-10]
- Develop a quantitative total nitrogen load allocation strategy for the entire estuary (measured by development of a strategy and timely endorsement by local and State agencies). Preliminary work group estimates, and work performed by other programs, indicate that a 10-25 percent fertilizer reduction goal is a reasonable first order target for existing residential and agricultural fertilizing programs. [See Action N-3]

- Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program, as well as other recommendations, which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters). [See Actions N-3, N-4, N-5, N-10]
- Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal, which may include groundwater performance standards (*e.g.*, nitrogen concentrations in groundwater resulting from post-development discharge/recharge), implementing fertilizer and clearing restrictions, and zoning. [See Actions N-3, N-4, N-5, N-6, N-10]
- Continue sponsoring and coordinating research and information gathering (measured by funding appropriated, and research conducted, relative to PEP recommendations). [See Actions N-7, N-8, N-9]
- Continue and expand open space acquisition programs (measured by funding appropriated and acres acquired in target areas). [See Action N-6]

Habitat and Living Resources

The eastern end of Long Island, including the Peconic Estuary, contains a large variety of natural communities, from upland pine barrens along the Peconic River to soft-bottom benthos in the main bays. There is a larger percentage of undisturbed habitats and a greater diversity of natural communities within this watershed than anywhere else in the coastal zone of New York State. The Peconic Estuary System is home to a number of species that are rare or endangered globally, nationally, and locally, including a variety of plants, birds, insects, amphibians, reptiles, and fish. In addition to these individual species, there are complete habitats in the region that are found nowhere else in New York State and are rare even on the east coast of the United States, such as pine barrens and Atlantic white cedar swamps. Some of these are currently in danger of being reduced in size or completely lost.

The Characterization Report of the Living Resources of the Peconic Estuary (1998) identified the living resources that are at risk and determined how human activities have or could alter their health. Other PEP reports characterizing the Peconic's living resources include:

- Tidal Creeks Study (1999)
- Eelgrass Habitat Criteria Study (1999)
- Peconic Estuary Surface Water Quality Nitrogen, Dissolved Oxygen, and Submerged Aquatic Vegetation Habitat (1998)
- Historic Shellfishing in the Peconic Estuary Based on Baymen's Interviews; 1945–1985 (1998)
- The Peconic Watershed — Recent Trends in Wetlands and Their Buffers (1998)

- Species Composition, Seasonal Occurrence and Relative Abundance of Finfish and Macroinvertebrates Taken by Small–Mesh Otter Trawl in Peconic Bay, New York (1998)
- An Assessment of Shellfish Resources in the Tributaries and Embayments of the Peconic Estuary (1998)
- Protocols for Harvesting and Transplanting Eelgrass in the Peconic Estuary (1997)
- Peconic Bay System: Aquaculture (1997)
- An Annotated Bibliography of the Natural Resources of the Peconic Estuary and Adjacent Locations on Eastern Long island, NY (1997)
- An Assessment of Shellfish Resources in the Deep Waters of the Peconic Estuary (1997)
- Submerged Aquatic Vegetation Study (1996)
- Marine Mammal and Sea Turtle Report (1996)
- Commercial Finfish and Crustacean Landings from Peconic and Gardiners Bay 1980–1992 (1995)
- Bay Scallop Restoration, Western Peconic Bay (1995)
- Rare Plants, Rare Animals and Significant Natural Communities in the Peconic Estuary (1995)
- Planting Bay Scallops: Results of Reseeding Bay Scallops in the Peconic Bay, NY, 1986 to 1992 (1993)

Habitat loss, fragmentation, and degradation are frequently the result of physical alteration of the land. In the Peconic Estuary System, low-lying marshes and swamps historically have been ditched, drained, and filled for mosquito control and construction. Most of the inlets and navigation channels in the embayments and surrounding creeks have been dredged. The use of bulkheads, rip-rap, and other structures has been widely permitted in order to stabilize waterfront property throughout the system. Much of the uplands have been cleared for agriculture or, more recently, residential use. The natural resources most affected by these practices include wetlands, beaches, grasslands, forests, coastal ponds, and possibly eelgrass beds.

In some cases, these land use practices have caused direct impacts to living resources and habitats in the Peconic Estuary System. More often, however, development and land alteration cause indirect degradation to habitats and subtle changes in natural communities. For example, fill for roads and railroads has cut off the flow of water into some tidal wetlands. Over time, the vegetation has changed and the marsh has either become a freshwater wetland or has gradually filled in and become upland. Dams have been built on many of the rivers and creeks emptying into the estuary, which prevents the movement of anadromous fish into fresh water for spawning. Dredging has altered water currents in small embayments and creeks, which has led to changes in sediment distribution, suspended solids in the water column, and community composition. The use of hard structures along the shoreline has caused scouring in shallow areas and the loss of associated communities. In many cases, these changes have been quite localized and subtle, with no apparent impairments to human uses of the area.

In some cases, development and human uses have caused degradation and destruction of habitat to the degree that the habitat can no longer support certain species, some of which are now endangered. Many species have requirements for very specific habitats, such as pine barrens, freshwater wetlands,

and maritime grasslands that have been slowly degraded and destroyed over time. Other species have historically been over-exploited for food (turtles) and fur (seals). And some species, such as the osprey, became victims of contamination by synthetic chemicals. Because the reasons for the declines in different species vary, solutions for protecting and restoring endangered wildlife populations must be tailored to specific needs. In some cases, preservation and restoration of a single habitat type will contribute to the protection of a whole suite of species. In other cases, species-specific actions must be taken to protect the organisms.

Evidence from monitoring some of the important species found in the estuary, such as winter flounder, scup, weakfish, bay scallops, eelgrass, piping plovers, and least terns, indicates poor productivity and recruitment of these species. Low fish recruitment may be due to less egg development, fewer adults producing eggs, and/or less habitat. Loss of eelgrass from Brown Tide and possibly nutrient enrichment may contribute indirectly to poor recruitment of juvenile bay scallops. Predation, off-road vehicles, and heavy beach use are some of the causes attributed to poor piping plover and least tern productivity. Other causes of poor productivity and recruitment include invasive species, changes in water quality, and habitat loss, degradation, and fragmentation. Impacts may be occurring from specific activities such as navigational dredging, shellfish dredging, overharvesting, shoreline hardening, mosquito control, and tidal obstructions. Many of the actions in the Habitat and Living Resources chapter are intended to reduce or eliminate these threats and to protect, restore, and enhance productivity and recruitment. Additional investigations and monitoring that determine the extent of these threats would be of great value to the Peconic Estuary Program.

Estuary-wide impacts of all kinds can potentially result from the accumulation of localized changes to the system. Daily road runoff of oil and gas, farm and lawn runoff of herbicides and pesticides, nutrient pollution, Brown Tide, and small scale physical changes (*i.e.*, propeller scour, addition of individual docks and piers) are only a few examples of activities that can have reverberating effects throughout the Peconic ecosystem. Physical and chemical disturbances can threaten habitat, health, and reproduction of fish, shellfish, and wildlife. In some instances, effects are only sublethal, altering fecundity or growth, while other outcomes result in low diversity. Unfortunately, stresses on the Peconic Estuary ecosystem from either incremental or “every day” activities have not been fully quantified and analyzed to understand their cumulative impacts. To accurately understand cause and effect relationships, more scientific inquiry and monitoring of Peconic Estuary living resources and its watershed are needed.

The actions of this CCMP focus on broad natural resource conservation efforts, as well as specific management actions for selected species and habitats.

The PEP’s measurable goals with respect to habitat and living resources include:

- Protect the high quality habitats and concentrations of species in the Critical Natural Resource Areas (measured by acres of open space protected and development of model ordinances). [See Actions HLR-1, HLR-6, HLR-10, HLR-11, HLR-13, HLR-14, HLR-15, HLR-16]
- Maintain current linear feet of natural shoreline and over the next 15 years reduce shoreline hardening structures by five percent (measured by the percent change of natural vs. hardened shorelines through GIS mapping). [See Actions HLR-1, HLR-2, HLR-5, HLR-8, HLR-13, HLR-15]
- Maintain current eelgrass acreage (2,100 acres in main stem of the estuary) and increase acreage by ten percent over 10 years (measured by inter-annual aerial surveys with GIS

and SCUBA assessments). [See Actions HLR-1, HLR-3, HLR-4, HLR-6, HLR-9, HLR-10, HLR-15, HLR-16]

- Maintain and increase current tidal and freshwater marsh acreage, and restore areas that have been degraded (*e.g.*, restricted flow, *Phragmites australis* dominated, hardened shoreline) (measured as number of acres of marsh with GIS). [See Actions HLR-1, HLR-2, HLR-4, HLR-5, HLR-7, HLR-8]
- Maintain a policy of no new mosquito ditches and not re-opening ditches that have filled-in by natural processes; and restore 10-15 percent of mosquito ditched marshes through Open Marsh Water Management (measured by the number of acres of restored tide marsh using Open Marsh Water Management). [See Actions HLR-1, HLR-2, HLR-5, HLR-7, HLR-8]
- Increase the number of piping plover pairs to 115 with productivity at 1.5 (over a three-year average), distributed across the nesting sites in the Peconic Estuary (measured by annual piping plover surveys). [See Actions HLR-1, HLR-8, HLR-13**,** HLR-15, HLR-16]
- Develop recommendations and guidelines to reduce impacts to marine life from dredging-related activities (measured by amount of reduced dredging volumes and protected benthic habitat acreage). [See Actions HLR-1, HLR-3, HLR-5, HLR-6, HLR-15]
- Foster sustainable recreational and commercial finfish and shellfish uses of the Peconic Estuary that are compatible with biodiversity protection (measured by juvenile finfish trawl surveys, bay scallop landings, and identifying, protecting, and restoring key shellfish and finfish habitat). [See Action HLR-1, HLR-11, HLR-12]
- Enhance the shellfish resources available to harvesting through reseeding, creation of spawning sanctuaries and habitat enhancement (measured by scallop and clam abundance/landings). [See Actions HLR-4, HLR-7, HLR-8, HLR-9, HLR-10, HLR-12, HLR-16, HLR-17]
- Link land usage with habitat quality in tidal creeks (measured by continued funding of benthic and water quality surveys to measure the quality/impacts to the habitats within selected tidal creeks).
- Ensure that the existing and future aquaculture (shellfish and finfish) and transplanting activities are situated in ecologically low-productive areas of the estuary and that they are mutually beneficial to the aquaculture industry, natural resources, and water quality (measured by the extent and location of aquaculture/transplant facilities, water quality measures, and natural resource data). [See Actions HLR-1, HLR-3, HLR-4, HLR-6, HLR-10, HLR-15, HLR-17]
- Annually initiate five percent of the projects identified in the Habitat Restoration Workgroup Plan for the Peconic Estuary (measured by the number of projects funded and implemented annually). [See Actions HLR-7, HLR-8]

Pathogens and Closed Shellfish Beds

Pathogens are disease-causing organisms that include bacteria, viruses, algae and fungi. The Peconic Estuary Program focused on the potential health risks associated with consumption of contaminated shellfish and direct water contact and/or ingestion, as well as the economic losses associated with shellfish bed and beach closures in the Peconic Estuary. The Characterization Report of the

Pathogens of the Peconic Estuary (1997) identified the main pathogens of concern, as well as their sources. Other PEP reports and projects characterizing the Peconic's pathogen concerns include:

- Water Quality Monitoring (SCDHS)
- Shellfish Sanitation Unit and water quality monitoring/sanitation surveys (NYSDEC)
- Three-Dimensional Hydrodynamic and Water Quality Model of the Peconic Estuary (Tetra-Tech, Inc.)
- Delineations of the stormwater contributing areas in the estuary (SCDHS)
- Regional Stormwater Runoff Management Project (Horsely and Witten, Inc.)
- Several Action Plan Demonstration Projects
- Several Section 319 Nonpoint Source Grant Projects

The primary pathogens of concern in the Peconic Estuary are those associated with human and animal wastes. It is difficult to directly measure the concentration of specific pathogens in seawater due to the variable nature of their occurrence. Instead, the level of fecal bacteria in the water is measured using bacterial indicator species such as coliform.

Nonpoint sources of pathogens (especially stormwater runoff) have been identified as the main contributors to the degradation of shellfish beds in the Peconics. Although these pathogens do not directly affect shellfish, human health is at risk from the consumption of contaminated water or seafood harvested from contaminated waters. To protect human health, shellfish beds can be closed to harvesting in two ways: documented violations of bacterial standards ("water quality closures") or proximity to potential sources of pathogens ("administrative closures"), such as sewage treatment plant (STP) outfalls, marinas, or mooring areas. Administrative closures are used because of the potential for unpredictable, intermittent releases of pathogens or the discharge of untreated or insufficiently treated wastes. Both water quality and administrative closures can be either year-round or seasonal. There are also "conditional" closures in which beds are open for the season except when a specified amount of rainfall occurs. This is to avoid pathogens that may be transmitted with stormwater runoff.

Shellfish bed closures in the Peconic Estuary due to pathogen contamination are a significant problem. The number of highly productive, commercially important shellfish lands has been estimated at nearly 21,000 acres. Almost 3,000 of these 21,000 acres, or 14 percent, are closed to shellfishing.

Bathing waters are also sampled for the presence of bacterial indicator organisms. Only one bathing beach, the Town of East Hampton public beach at the south end of Lake Montauk, has been closed due to contamination in recent years. It is believed that this contamination results from wildlife and waterfowl, stormwater runoff, and possibly malfunctioning or failing on-site disposal systems in the Ditch Plains community south of Lake Montauk.

Pathogens that cause disease in marine organisms are not a significant issue in the estuary.

The PEP's measurable goals with respect to pathogens include:

- Maintain current level of lands available to shellfish harvesting, with the ultimate aim of re-opening lands currently closed to harvesting (measured through coliform levels and numbers of acres of shellfish beds available to harvest). [All Actions]
- Maintain and improve water quality of the estuary through a reduction of overall stormwater runoff, particularly key areas identified through the Regional Stormwater Runoff Study (measured through the number of stormwater remediation projects implemented). [See Actions P-1, P-2, P-3, P-4, P-12, P-13, P-14]
- Eliminate all vessel waste discharge to the estuary (measured by the adoption/implementation of a Vessel Waste No Discharge Area in the Peconic Estuary, the number of pump-out facilities and the volume of waste pumped annually). [See Actions P-6, P-7, P-8, P-9]
- Attain a zero discharge of stormwater runoff in new subdivisions (measured by site plans for new developments that achieve this goal and the development of new ordinances and Habitat Protection Overlay Districts). [See Actions P-1, P-2, P-3, P-4]

Toxics

Toxic contamination is not currently a significant problem in the estuary. However, toxic substances have been found in the estuary, and impacts from toxic substances have been documented, and limiting the inputs of toxic substances to the system remains a management topic, particularly as human uses in the watershed and estuary intensify. At some specific locations, remedial investigations and clean-ups are occurring under Federal and State hazardous waste clean-up laws.

Toxic contaminants include both human-made and naturally occurring substances that can cause adverse ecosystem or human health effects. Toxics can be present in surface water, groundwater, soil, sediments, and plant and animal life. Toxics can directly affect the ability of fish, shellfish, and wildlife to survive or reproduce. Some toxics can accumulate in the edible tissues of fish, shellfish, and wildlife, making them unsafe as a food source for either people or wildlife. Toxic contamination could also impact dredging and dredged material placement operations because limited placement options are available for contaminated sediments.

New York has established statewide health advisories to limit or restrict human consumption of fish, shellfish, and wildlife due to the presence of chemicals, including PCBs, pesticides such as dichloro-diphenyl-trichloroethane (DDT) and chlordane, and metals such as cadmium. Some of these advisories are in place for species that can be harvested from the Peconic Estuary. Because these species may migrate, the source of these pollutants may be from outside of the Peconic Estuary.

Toxic contaminants that may be present in the estuary are as diverse as the land uses and activities from which they originate. Sources include runoff from residential developments and businesses, roads and parking lots, sewage treatment plants and individual on-site disposal systems, agriculture, golf courses, mosquito control measures, marinas and recreational boating, Federal and State Superfund sites, treated lumber, and leaking underground storage tanks. Environmental standards, guidelines, or criteria exist for only a small portion of the literally tens of thousands of substances that support our modern lifestyles. Work continues to better assess the impacts toxic substances individually and cumulatively have on the system. The focus of this Management Plan is on those land uses and activities that could contribute toxics to the system in order to prevent problems from

occurring in the future. Of particular concern are those land uses and activities that take place on, are adjacent to, or directly affect surface waters.

Pesticides, an emerging concern, may be introduced to the Peconic System from suburban and urban sources as well as from agricultural operations and mosquito control measures. Though no causal link has been identified, low levels of pesticides may be affecting aquatic resources, including eelgrass, sensitive larval stages of commercially and recreational important finfish and shellfish, including lobsters, and other ecologically important species. Even pesticides that are banned or not being applied can cause or contribute to environmental problems if they are not disposed of or are improperly stored. Several pesticides have already been detected in groundwater resources.

"A Characterization of the Resources of the Peconic Estuary with Respect to Toxics" (PEP, January 2001) is the primary document describing the status of the Peconic Estuary with respect to toxics. Other PEP reports addressing toxic substances in the estuary include:

- Chemical Contaminant Distributions in Peconic Estuary Sediments (Arthur D. Little, Inc., 1996)
- Peconic Estuary Fish, Shellfish and Crustacean Toxics Survey Quality Assurance Project Plan for Field Collection Effort (EPA Region II, 1999)
- Preliminary Data Tables for the Peconic Estuary Tributaries Sediment Toxics Survey (EPA Region II, 1999)
- Sediment Toxicity Testing in the Peconic Estuary/Watershed Using the Amphipod, *Ampelisca abdita* (EPA Region II, August 1998)

Other reports related to toxics that may be of interest include:

- (Final) Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report for Operable Unit V (IT Corporation for Brookhaven National Laboratory/Brookhaven Science Associates, 2000)
- Proposed Plan for Operable Unit V: Peconic River/Sewage Treatment Plant, Brookhaven National Laboratory (U.S. Department of Energy, 2000)
- Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY (Suffolk County Department of Health Services, June 1999)
- Pesticide Concentrations in Surface Waters of New York State in Relation to Land Use — 1997 (U.S. Geological Survey, June 1998)
- Pesticides in Streams in New Jersey and Long Island, New York and Relation to Land Use (U.S. Geological Survey, May 1999)
- Pesticides and their Metabolites in Wells of Suffolk County, New York 1998 (U.S. Geological Survey, June 1999)

The PEP's measurable goals with respect to toxics are:

- Improve the quality of the ambient environment (surface waters, groundwaters, sediments and biota) where there is evidence that human inputs impair or threaten these resources

(as measured by surface water, groundwater, sediment and biota monitoring programs). [See Actions T-2, T-3, T-4, T-5, T-6, T-7, T-8, POE-5]

- Comply with schedules for conducting site characterizations, remedial actions and post-remedial monitoring at hazardous waste sites; effectively characterize risks and protect human health and the environment at hazardous waste sites; ensure compliance with permit limits for point source discharges (as measured by compliance with schedules at hazardous waste sites; conducting effective characterizations; and point source monitoring). [See Action T-2]
- Decrease overall emissions of reportable toxics from the five East End towns (as measured by the Federal Toxics Release Inventory). [See Action T-7]
- Eliminate holdings of banned, unneeded and unwanted pesticides and hazardous substances by 2005 (as potentially measured by collections during "Clean Sweep" programs, household hazardous waste collection programs and events, or surveys of farmers/commercial landscapers/homeowners). [See Action T-4]
- Decrease overall agricultural/residential/institutional pesticide applications in the five East End towns (as potentially measured by point-of-sale surveys, surveys of residents, or commercial applicator tallies). [See Actions T-4, POE-5]
- Eliminate to the maximum extent practicable, pesticide applications on turf grass on all publicly held land by 2003 (as potentially measured by resolutions passed [or equivalent]). [See Action T-4]
- Eliminate underground storage tanks exempt from current replacement requirements via incentive programs and public education and outreach (as potentially measured following baseline established of number of underground storage tanks [USTs] and monitoring of the number of underground tanks removed, retired, and replaced). [See Actions T-6, POE-5]
- Decrease the total amount of treated lumber installed in the marine/estuarine environment (as potentially measured by baseline established from shoreline surveys and monitoring of permits issued for bulkheading installations, replacements, and removal). [See Actions T-6, POE-5]
- Reduce the number of two stroke marine engines in use in the estuary (as potentially measured by harbormaster conducted surveys). [See Action POE-5]

Critical Lands Protection

Ever increasing development is consuming and fragmenting open space and natural habitats, and stressing watersheds and natural communities. Numerous PEP reports, already mentioned in the Nutrients and Habitat and Living Resources chapters, detail the importance of protecting open space to protect the Region's water quality and natural habitats.

This chapter represents the Peconic Estuary Program's strategy for developing a Critical Lands Protection Plan, a recommendation that arose from the public comments of the September 1999 draft Comprehensive Conservation and Management Plan (CCMP). The Critical Lands Protection Plan (CLPP) will ultimately evaluate the land available in the Peconic Estuary Study Area and identify land protection priorities with respect to estuarine management concerns. It is the intent of the Critical Lands Protection Plan to prioritize the land available for development "through the lens" of

habitat and water quality protection and evaluate the funding needed for that protection. The Critical Lands Protection Plan will be a useful tool for state and local agencies that make land acquisition decisions in part on estuarine considerations.

Since the actual Critical Lands Protection Plan still needs to be developed, there are no measurable goals associated with this strategy at this point. Measurable goals will be developed and included in the Post-CCMP annual report.

Public Education and Outreach

Citizen involvement has been a critical component of the PEP since its inception. The Program formed a Citizens Advisory Committee (CAC) to ensure broad-based public participation in the development of the CCMP. This CAC consists of representatives from marine-related industries, environmental and civic organizations, as well as baymen, boaters, recreational fishermen, and other interested citizens. The CAC has made significant contributions by assuring public involvement in all aspects of the program and encouraging the public to learn more about the Peconic Estuary System. The CAC has utilized television events and radio broadcasts as well as printed materials in its public education and outreach efforts.

Educating and involving the public and obtaining public support is vital to the success of the PEP. All residents of eastern Long Island need to understand their role as users of the system and the effect that actions and inaction have on the quality and sustainability of the area's many resources. Effective public participation will provide the broad-based public support needed to ensure that actions reach the implementation phase. The ultimate goal of public participation in the PEP is to establish a public consensus that will ensure long-term support for the implementation of the CCMP. While developing this consensus among individuals and key segments of the public, an understanding of individual and collective roles in watershed protection can be established, making that constituency dedicated to caring for the Peconic Estuary System.

The Public Participation Strategy during implementation of the CCMP stresses the need to continue to bring together the stakeholders in the watershed, participate in decision-making affecting the estuary, encourage participation in programs to protect, enhance and restore the estuary and its watershed, and conduct education and outreach efforts on priority topics. A hallmark of the Peconic Estuary Program has been and will continue to be the preparation and use of innovative and high quality participation, education and outreach methods, including printed materials, television and radio spots, and conferences. The elements of the Public Participation Strategy itself are embodied in the actions in this chapter, as well as through the representation of the Citizens Advisory Committee chair on the Management Committee.

The PEP's measurable goals with respect to Education and Outreach are:

- Annually, embark on one new, substantial public education effort addressing each of the following areas:
  - Conducting Brown Tide education and outreach;
  - Reducing residential fertilizer use in the Peconic Watershed;
  - Improving, protecting or enhancing habitats and living resources;
  - Reducing pathogen loadings to the estuary; and

- Reducing the use and loadings of toxics substances to the estuary.

(as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory committee). [See Actions POE-3, POE-4, POE-5, POE-6, POE-7]

- Annually, conduct one major watershed effort involving students in estuary management (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory committee). [See Action POE-7]
- Annually, conduct one major watershed-wide event to educate those who live, work, or recreate in the Peconics (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Actions POE-7, POE-8]
- Annually, support the establishment of one new local embayment or tidal creek association (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Action POE-7]

Financing

This Management Plan contains actions for the protection, enhancement, and restoration of the Peconic Estuary System. For some actions in this Plan, the agency or organizations involved have made a commitment to carry out the action. For other actions, the PEP is recommending the action be undertaken; often additional funding is needed. These actions and this Plan have been created as part of the characterization and planning phases of the PEP. Funding for the development portion of this process has been provided by the National Estuary Program under Section 320 of the Clean Water Act. Once the final CCMP is approved, the PEP will focus on implementation of the Management Plan and its actions. Funding for the continued operation of the PEP and for the implementation of each action in the Plan will need to be secured.

A wide variety of funding sources will need to be secured to ensure full implementation of the CCMP. Securing this funding is a responsibility of the Peconic Estuary Program as a whole and the agencies, organizations and individuals that make up the Management Conference. Without a comprehensive strategy for funding the implementation of all aspects of the Plan, the PEP runs the risk of not fully achieving its goal of becoming a guide to managing water quality, living resources, and habitats of the Peconic Estuary. The ability of the PEP to achieve its goals and objectives, and the pace at which progress is made, will clearly be a function of the availability of funding.

Substantial funding is currently available for land acquisition programs in the five East End towns at the town, County, and State level. There is also $30 million commitment to implement this Plan and the South Shore Estuarine Reserve Plan under the New York State Clean Air/Clean Water Bond Act. Under the leadership of Governor George E. Pataki, sixty-seven projects have been funded under the New York State Bond Act, Environmental Protection Fund, and State Revolving Fund, for the Peconic Estuary. There are, however, limitations on the types of activities that may be funded under these programs, and therefore additional sources of funding must be secured. Many actions will continue to be funded through ongoing activities of existing governmental and non-governmental stakeholders. Collectively, these are referred to as “Base Programs.”

Numerous existing and new funding sources and mechanisms are described in the Plan, including existing programs at the Federal, State and County level, the State Revolving Loan fund, municipal bonds, funds from fines and settlement, tax abatements and incentives and the establishment of municipal improvement districts, as well as encouraging participation in implementation by not for profit organizations and other private entities.

The PEP's measurable goals with respect to financing are:

- Effectively use existing funding and secure new or additional governmental funding for CCMP implementation from the following sources:
  - Federal Government, particularly the U.S. Department of Agriculture;
  - State Government, particularly the Clean Water/Clean Air Bond Act and State Revolving Loan Fund;
  - County Government, particularly the Suffolk County ¼% Sales Tax Program;
  - Town Governments; and
  - Village Governments.

  (as measured by the Peconic Estuary Program Office). [See Actions F-2, F-3]
- Secure new or additional private sector funding for CCMP implementation, from the following sources:
  - Businesses; and
  - Not for profit organizations.

  (as measured by the Peconic Estuary Program Office). [See Actions F-4, F-7]

Plan Implementation and Post-CCMP Management

The Peconic Estuary Program has long recognized the need for establishing a long-term framework for Peconic Estuary management. In light of the significance placed upon post-CCMP management and monitoring by Congress, the United States Environmental Protection Agency (EPA), the PEP Management Conference, and the PEP Management Committee directed that a separate section of this Management Plan specifically deal with the issue of long-term management. **Chapter 10** of this CCMP includes not only an extended discussion on the critical issue of long-term institutional and organizational framework, but also a summary of other important parameters, such as long-term monitoring, mechanisms for measuring progress, and data management.

The PEP is continuing the existing management structure. A Program Office will continue to be located in the Suffolk County Department of Health Services Office of Ecology, with oversight from a Management Committee consisting of voting representatives from the EPA, the New York State Department of Environmental Conservation (NYSDEC), Suffolk County, Local Government, and chairs of the Technical Advisory Committee and Citizens Advisory Committee.

Chapter 10 also includes actions on reporting progress in implementing the CCMP and measuring environmental quality, as well as working with local governments and local government officials to develop plans for particular waterbodies in each town.

The Peconic Estuary Program's measurable goals with respect to post-CCMP management and implementation are:

- Implement the Peconic Estuary Program Environmental Monitoring Plan. [See Action M-2]

- Produce annual reports. [See Action M-3]
- Update municipal officials. [See Action M-4]
- Develop sub-watershed implementation plans (as measured by the number of sub-watershed plans initiated). [See Action M-5]

Environmental Monitoring Plan

An effective monitoring program is necessary to assess the status and trends of the health and abundance of the Peconic Estuary's water quality, habitat, and living resources. This Environmental Monitoring Plan reports on the region's existing and future monitoring efforts and coordinates the environmental changes these data can be used to track. By reporting on environmental changes, the Peconic Estuary Program will be able to evaluate whether measurable environmental results have been achieved and whether the goals and objectives of the PEP CCMP are being met.

Compiling monitoring programs into one document promotes cooperation among agencies and stakeholders, clarifies existing efforts, and provides an avenue for integrating results from different monitoring programs and projects for scientific, regulatory, and general interests. The Peconic Estuary Program has identified 25 core monitoring workplans, those activities required to determine whether the CCMP measurable goals are being met. These workplans are discussed in detail in **Appendix I**.

A key component of the long-term Plan is the Suffolk County Department of Health Services routine surface water quality monitoring program, which addresses Brown Tide, nitrogen, dissolved oxygen, light extinction, and point sources. The Suffolk County Planning Department will also monitor changes in land use. For habitat and living resources, the New York State Department of Environmental Conservation (NYSDEC) will continue its juvenile finfish trawl surveys, and will integrate information from other monitoring programs such as the NYSDEC wetlands inventory, the Endangered Species Program, and the NMFS Commercial Landings Program. The Submerged Aquatic Vegetation Long Term Monitoring Program (Cornell Cooperative Extension and U.S. Fish and Wildlife Service) is also a key component of the Plan. Coliform bacteria monitoring (NYSDEC Shellfish Sanitation Program) and toxic chemical monitoring (EPA) are also included in the Environmental Monitoring Plan. The PEP will continue to sponsor and coordinate Brown Tide research, and will seek funding for the Habitat and Living Resources Research and Monitoring Plan.

CCMP ORGANIZATION

The primary purpose of this CCMP is to identify actions that need to be taken by government agencies, businesses, private organizations, and citizens to attain the goals and objectives established by the Management Conference. Toward this end, the CCMP contains seven individual but interrelated Management Plans that address the priority problems of the estuary, as well as the need for public education and outreach. Each Management Plan contains specific actions to address issues and impacts in the Peconic Estuary System. In some cases, the actions fall within the scope of existing programs, while in other cases they represent new programs or initiatives. To aid in implementation, lead and participating agencies and organizations who are committed to implementing actions, or to whom recommendations are being made, are identified. Time frames, schedules, and where possible, the costs and sources of funding for carrying out these actions also have been identified. The costs for some actions will be borne by agencies and organizations in the normal course of carrying out their business and therefore no "new" funding is needed. In such cases, however, existing environmental program funding levels must be maintained and funding authorizations and appropriations continued. Other actions and certain components of general Plan implementation will require the identification of new funding sources or the allocation of funds already set aside for the broad purpose of implementing the Plan (such as the New York Clean Water/Clean Air Bond Act).

There are many existing regulatory programs at the Federal, State, and local level that effectively prohibit or control point and nonpoint sources of pollution. In order to prevent duplication of effort between the actions in this CCMP and existing programs, a Base Program Analysis has been completed as part of the CCMP development process. The Base Program Analysis describes existing mechanisms for addressing priority problems and recommends options for improving or enhancing the management of those problems. In keeping with the findings of the Base Programs Analysis, some of the actions found in the CCMP call for new actions and programs, whereas others expand on existing programs or call for review or coordination with existing management activities.

The PEP will seek funding for the implementation of specific recommendations. Funding opportunities to be explored include public/private partnerships as well as opportunities to apply enforcement settlement and other funds to carry out recommended actions. These funding options are discussed further in **Chapter 9**.

Management Actions

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources, or endorsements need to be secured by some or all of the responsible entities.

The Peconic Estuary Program and Management Conference were formed specifically to prepare the CCMP. However, much work remains to be done to ensure coordinated implementation of the Plan. This effort will be led by the Peconic Estuary Program, as discussed in **Chapter 10**. Remaining research needs, long-term monitoring efforts, and a mechanism for measuring the progress of CCMP implementation are also included in **Chapter 10**.

Action Costs

Information in the cost column of the management action tables in the back of each chapter represents the Peconic Estuary Program's best estimate of the costs associated with each action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where practicable, the Peconic Estuary Program has made estimates of the costs of base programs, either in terms of dollars or work years. Where this Plan recommends or commits to new, expanded, or enhanced efforts beyond those tasks that may be described as base programs, the Peconic Estuary Program has attempted to quantify the necessary resources to carry out the new, expanded, or enhanced work.

Resources were expressed as a dollar amount, typically for projects suitable for contracting out, or as "work years" or "full time equivalent" employees (or "FTEs") for work that is most likely to be carried out by governmental staff. Some activities require both contracting dollars and FTEs. Resource needs expressed as FTEs are usually estimated to the nearest one-tenth of a work year (*i.e.*, approximately one month or 20 work days). For some of the smaller tasks that are likely to be undertaken with other separate but related tasks, the FTE estimates may be combined, and this is indicated in the table. For estimating the overall cost of implementing this Plan, the Program will use an estimate of $75,000 per FTE per year, which includes salary, fringe benefits, and indirect costs. The actual cost of a full time worker may be more or less than this amount and will likely vary by agency, complexity of task, and point in time at which work is initiated.

Carrying out some tasks requires an annual and ongoing investment of resources. Other tasks have been expressed as one-time investments. This distinction is made for each action in the Plan, and is also reflected in the total cost of implementing the Plan.

For programmatic resource allocation analysis, a significant effort has been made to quantify time commitments for actions involving PEP sponsoring agencies (EPA, NYSDEC, or SCDHS). For such actions, a commitment has been indicated and resource needs have been estimated. Carrying out these actions forms the core workplan for the PEP coordinators from the sponsoring agencies and the Program Office staff.

In many cases, the Peconic Estuary Program was unable to quantify resources (either in dollar amount or in work years) associated with these base programs. This is because elements related to recommendations and actions are frequently inextricably linked to regional management initiatives targeted at areas larger than the PEP watershed, making segregation of PEP resources exceedingly difficult or impossible (*e.g.*, coastal zone management programs for all of Long Island; endangered species management, etc.). Also, recommendations and actions are often intertwined in larger and/or related programs, making their individual cost isolation impractical (*e.g.*, staff working on wetland mapping and trends analysis also work on numerous other natural resource efforts, such as permitting and enforcement, as well). Finally, parties responsible for implementing actions use diverse and often incompatible methods of accounting and cost/time analysis, making efforts to discretize costs difficult and ultimately, inherently inaccurate, and thus, unhelpful.

Not all resource needs have been estimated at this point in time, and the costs of some activities will be subject to further refinement in the future. Many costs have not been estimated for the private sector, because the planning processes have not developed actions specific enough to do so (*e.g.*, septic tank management recommendations, since recommended pump-out intervals have not yet been specified and upgrade incentive programs have not been fully agreed upon). The PEP will attempt to estimate these costs in the future as needed and will attempt to identify funding for compliance assistance where possible.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

CHAPTER
TWO

BROWN TIDE MANAGEMENT PLAN

OBJECTIVES

1) Determine the chemical, physical and biological factors responsible for producing, sustaining and ending blooms of the Brown Tide organism, *Aureococcus anophagefferens.*

2) Determine what management actions can be undertaken to prevent or, if that is not possible, to mitigate the effects of recurrent Brown Tide blooms on the ecosystem and economy of the Peconics.

MEASURABLE GOALS

The PEP's measurable goals with respect to Brown Tide blooms include:

- Continue to better coordinate, focus, and expand Brown Tide research efforts (measured by funding appropriated, frequency of Brown Tide symposiums, frequency of updating the Brown Tide Workplan and coordinations within the Brown Tide Steering Committee). [See Action B-1]

- Continue the current level of water quality sampling in the Peconic Estuary (measured by the number and frequency of samples taken per year and the number of bays and peripheral embayments sampled). Currently, the Suffolk Department of Health Services conducts biweekly monitoring at 32 stations in the Peconic Estuary throughout the year, resulting in over 830 samples taken annually. [See Action B-1]

Measurable goals related to natural resources are found in the Habitat and Living Resources Chapter (**Chapter 4**).

INTRODUCTION

Brown Tide is a marine microalgal bloom. Microalgae, or phytoplankton, are microscopic, single-cell plants that are found in all natural freshwater and marine ecosystems. The Brown Tide has appeared in Long Island's Peconic and South Shore Estuaries (see **Figure 2-1**) as well as in Narragansett Bay, Rhode Island, Barnegat Bay, New Jersey, the Delaware Inland Bays, the Maryland Coastal Bays, and in South Africa.

When present in large numbers, the Brown Tide organism literally turns the usually clear blue-green waters of the Peconic Bays a deep brown. At concentrations above 200,000 to 250,000 algal cells per milliliter (ml), water transparency drops to two feet or less. The brown waters are unappealing to swimmers and fishermen, impacting residents, tourists, and the sportfishing industry. An even greater impact of the Brown Tide organism is its impact on natural resources. Although the Brown Tide is not known to be harmful to humans, either through direct contact, ingestion of Brown Tide-filled waters, or through the ingestion of finfish or shellfish harvested from affected waters, the Brown Tide organism has had deadly effects on at least one marine organism, the bay scallop.

The abundant Peconic bay scallop population was virtually eradicated by the onset of the Brown Tide. The reasons for the severe impact of the Brown Tide on the bay scallop are not well understood. The devastating effects on the scallops may be related to toxic, mechanical (*i.e.*, the small size of the Brown Tide organism may interfere with proper ingestion) and/or nutritional (*i.e.*, the Brown Tide organism may not provide required nutrients) parameters, and effects may vary with the growth stage (larval, juvenile, adult) of the scallop.

Other impacts of the Brown Tide potentially include declines in eelgrass coverage and hard clam populations. Eelgrass beds provide important shellfish and finfish spawning and nursery areas. Impacts to eelgrass may be due in part to reduced light penetration caused by the Brown Tide bloom density. Sharp declines in finfish landings between 1985 and 1988 also may have been due, in part, to the Brown Tide. Finally, harmful algal blooms such as Brown Tide are also believed to be a causal factor for anoxia/hypoxia (no or little dissolved oxygen), and may affect the hatching and survivorship of fish larvae.

The overall economic impacts of the Brown Tide have been severe, for the scallop industry as well as other bay-related businesses dependent on tourism, recreation, fishing, and shellfishing. Scientists are still working to try and understand what causes the Brown Tide blooms, how future blooms can be prevented, and how the impacts of the Brown Tide blooms can be mitigated.

*In 1982, the 500,000 pound Peconic Estuary scallop harvest accounted for 28 percent of all U.S. landings and had a dockside value of $1.8 million. After appearing in the Peconic Estuary in June of 1985, and persisting in high, though decreasing, concentrations for extended periods in 1985, 1986, 1987, and 1988, the Brown Tide bloom virtually eliminated the bay scallop population. By 1987 and 1988, the Brown Tide harvest had dropped to only about 300 pounds per year (see **Figure 2-2**). As a result of re-seeding efforts and the disappearance of the Brown Tide, bay scallop landings once again reached pre-Brown Tide levels in 1994. Based on NYSDEC data, 266,448 pounds of scallops worth $1,732,357 were harvested in 1994; however, a Brown Tide bloom in 1995 caused severe scallop mortality. The 1995 scallop harvest dropped to 23,000 pounds, valued at $180,000. The 1996 scallop landings came in at only 53 pounds, valued at $400.*

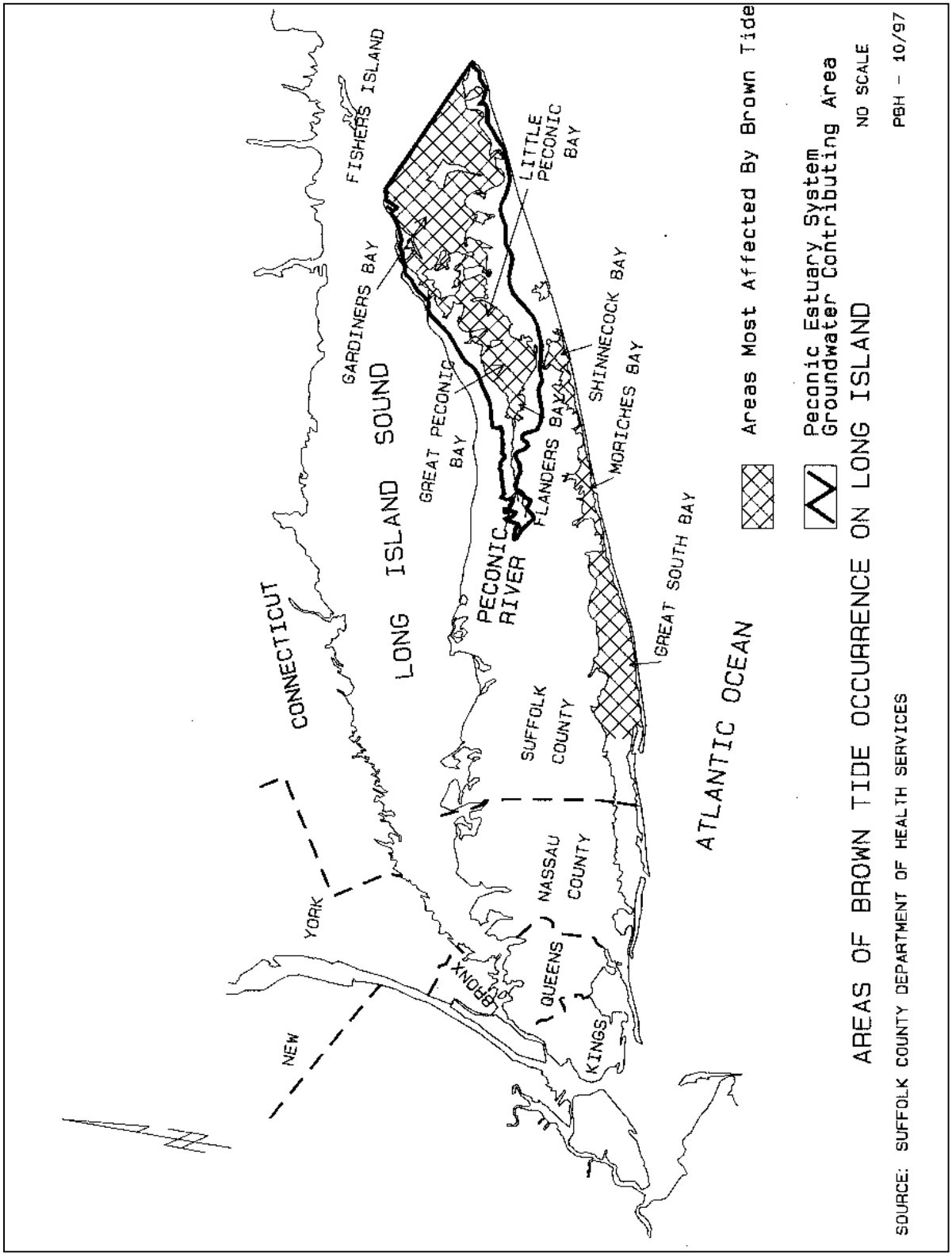


Figure 2-1. Areas of Brown Tide Occurrence on Long Island.

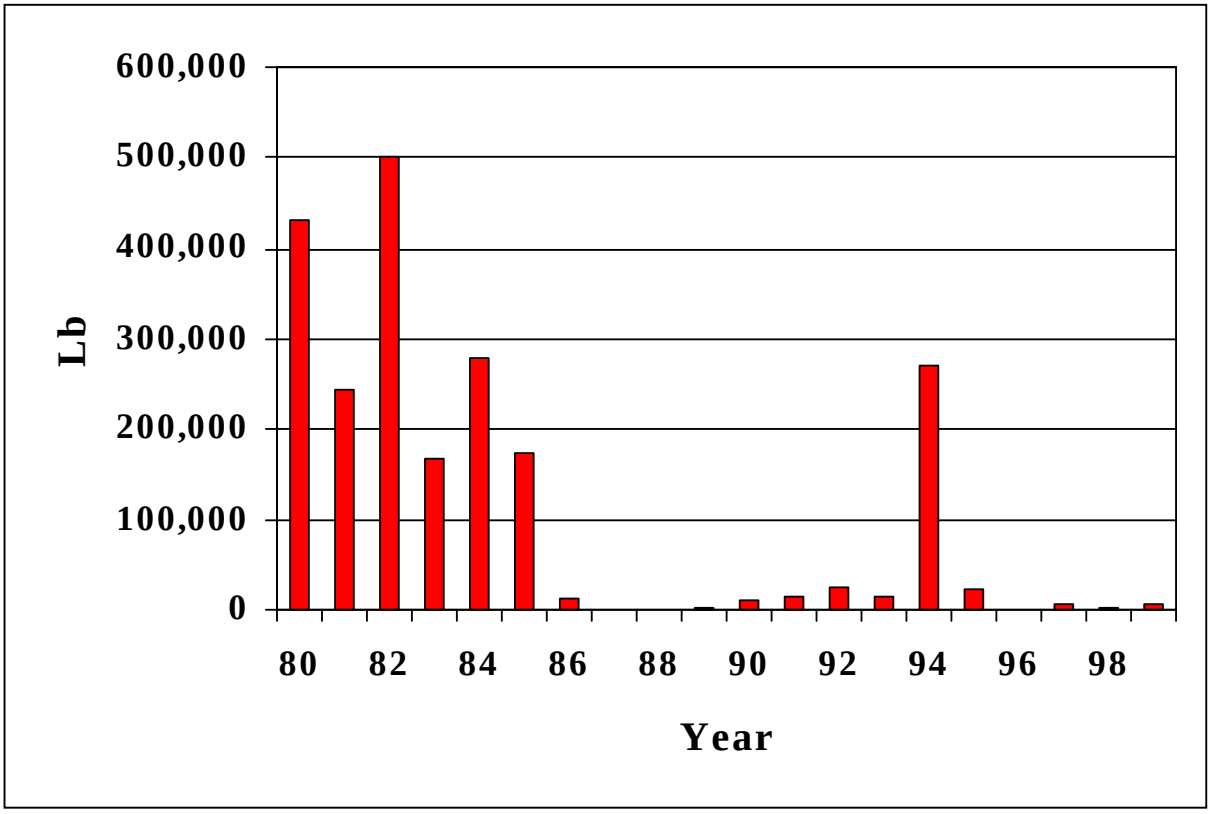
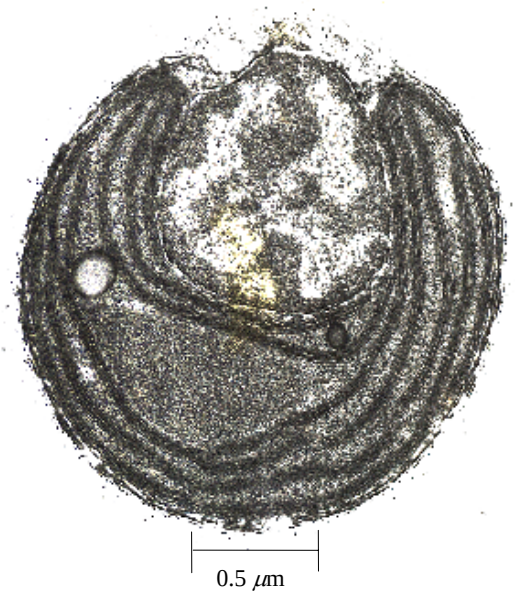


Figure 2-2. Bay Scallop Landings.

The Brown Tide Organism

The Brown Tide was first detected in the Peconic Estuary in June of 1985. Researchers at the University of Rhode Island's Graduate School of Oceanography, using electron microscopy, determined that the Brown Tide is caused by a particularly small and previously unknown phytoplankton species, *Aureococcus anophagefferens* (see **Figure 2-3**). The Brown Tide organism is only problematic when under "bloom" conditions. Phytoplankton communities in temperate coastal waters display a seasonal cycle of abundance and species composition. An algal bloom occurs when accelerated growth of one or a few species is superimposed on this overall community cycle due to a particular concurrence of environmental conditions that strongly favors the growth of a particular species. Most blooms are of relatively limited spatial and temporal extent (McElroy, 1996), but the Brown Tide can persist for unusually long periods of time over large areas (Sieburth *et al*., 1988). The Brown Tide appears and recedes in the bays of the Peconic Estuary and around Long Island, with no predictable onset, duration, or cessation.



Transmission electron micrograph of the Brown Tide organism. (x47,000)

AUREOCOCCUS ANOPHAGEFFERENS

("golden sphere") *("causing cessation of feeding")*

Figure 2-3. Brown Tide Organism.

BROWN TIDE BLOOMS IN THE PECONIC ESTUARY SYSTEM

After its initial discovery in the Peconic Estuary in June of 1985, the Brown Tide bloom persisted in high, though decreasing, concentrations for extended periods in 1985, 1986, 1987, and 1988. Peak Brown Tide cell counts in the Peconics often exceeded one million cells per milliliter of water, as compared with a normal, mixed phytoplankton assemblage concentration which would typically range from 100 to 100,000 cells per milliliter.

Brown Tide blooms were not evident during 1989. In July of 1990, however, elevated Brown Tide cell counts were observed in West Neck Bay, an enclosed embayment off Shelter Island. Another intense bloom of Brown Tide began in the Peconic Estuary System in May 1991 and persisted in high concentrations through July 1991. In the summer of 1992, Brown Tide reappeared in high concentrations in West Neck Bay and Coecles Harbor, subsiding in the fall of 1992. The Brown Tide did not appear again in the Peconic Estuary until May of 1995, when an intense bloom lasted through June and July, declined in August, became more intense, and then again subsided in September. In 1996, the Peconic Estuary was free of Brown Tide blooms, although a bloom occurred in the South Shore Estuary. Only one localized and short-term Brown Tide bloom occurred in the Peconic Estuary in 1997, in West Neck Bay, but a more widespread bloom occurred in Great South Bay in the South Shore Estuary Reserve System that year. In 1998, there was a summer bloom in West Neck Bay and Great South Bay, with no major Peconic Estuary blooms. In 1999, a major late fall/early winter

bloom took place in Great South Bay, and an early summer bloom occurred in Quantuck Bay, with no major blooms anywhere in the Peconics. The Great South Bay bloom continued into the summer of 2000, while the Peconics remained free of Brown Tide in 2000.

The dynamics of the Brown Tide bloom (*i.e.*, concentration and timing of onset, persistence, and subsidence) in the main Peconic Estuary System have often radically differed from those in West Neck Bay and the South Shore Estuary Reserve System. In general, bloom conditions have been consistently most severe in Flanders and West Neck Bays. Peak Flanders Bay Brown Tide cell counts are shown in **Figure 2-4**.

The Brown Tide organism has been observed in small numbers (non-bloom conditions) from Massachusetts to New Jersey. Outside of Long Island, Brown Tide blooms have been observed in Narragansett Bay, Rhode Island, Barnegat Bay, New Jersey, the Delaware Inland Bays, the Maryland Coastal Bays, and in South Africa.

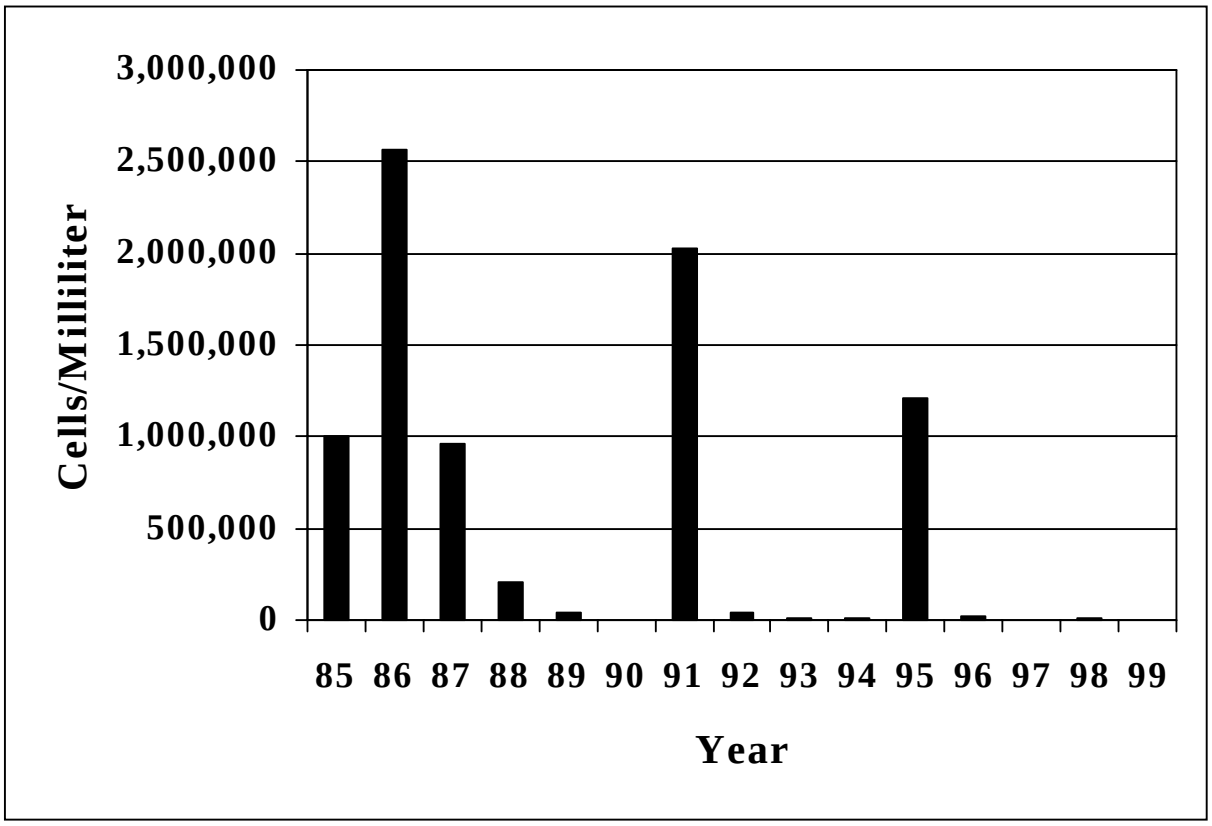


Figure 2-4. Flanders Bay Peak Brown Tide Cell Counts.

Contributing Factors

Although advances have been made regarding the identification and characterization of the Brown Tide organism and its growth needs, the causes of Brown Tide are not known. The input of conventional inorganic macronutrients such as nitrogen and phosphorus apparently do not trigger the onset of the Brown Tide blooms, although organic nitrogen may play a role (discussed below). This conclusion is based on laboratory research, comparative monitoring data (historical trends within Peconic Estuary, as well as a comparison of Peconic Estuary to other estuaries), and statistical analysis. More recent analysis of the long-term data set collected by the Suffolk County Department of Health Services (SCDHS) suggests that groundwater inputs (related to rainfall patterns) affect the relative amounts of dissolved inorganic and organic nitrogen in the waters of the Peconic Estuary, and that this may be an important factor in the onset of Brown Tide blooms. Various constituents and situations believed to play a role in Brown Tide blooms are discussed below.

Chemicals and Trace Metals

Chemicals implicated by prior research as potential contributors to the Brown Tide's pervasiveness include chelators (molecules or ions that are able to form bonds with metals) such as citric acid and trace metals such as iron, selenium, vanadate, arsenate and boron. A correlation has been noted between the Brown Tide bloom and elevated concentrations of dimethyl sulfide (DMS) in the Peconic Estuary. Because acrylic acid is part of the compound, which forms DMS, it is postulated that acrylic acid also is directly related to the Brown Tide. These, or perhaps some other as yet unidentified chemicals, may be toxic to potential grazers that might otherwise control phytoplankton blooms.

Meteorological and Climatological Factors

Water circulation in certain areas of the estuary is strongly influenced by winds. It has been postulated that reduced flushing in the Peconics due to a reduction or change in wind patterns results in a retention of land-derived nutrients that may stimulate Brown Tide blooms.

Dissolved Inorganic and Organic Nitrogen

In terms of using actual field data, perhaps the most plausible hypothesis set forth to date has been produced by Brookhaven National Laboratory (BNL), using SCDHS data. BNL hypothesizes that Brown Tide bloom onset conditions may be optimized by elevated ratios of available dissolved organic nitrogen (high “DON”) in surface waters, with respect to the supply of dissolved inorganic nitrogen (low “DIN”). These nitrogen constituents may, in turn, be related to groundwater inputs and weather patterns. Thus, the hypothesis is that Brown Tide bloom onset conditions could be optimized in a dry year (low DIN supply from groundwater), particularly when the dry year is preceded by a wet year (which results in conversion of prior groundwater DIN inputs to current DON supply). A long-term management implication of the BNL hypothesis, should it be validated, is to reduce nitrogen loadings (septic systems, fertilizers, etc.; see **Chapter 3**) to dampen the effect of groundwater nitrogen inputs.

In an independent analysis, the U.S. Geological Survey (USGS) lent further credibility to the hypothesis in a study of relative water table altitudes. The USGS found that, between 1985 and 1995, Brown Tide blooms coincided with below-average water table altitudes in the Peconic Estuary study area. During four years with nearly average or above-average water table altitudes, there were no widespread Brown Tide blooms.

Other Factors

Monitoring data collected by Suffolk County since 1985 suggest physio-chemical limits for Brown Tide bloom events. It appears that salinities in excess of 26 parts per thousand (ppt) and temperatures between 20-25 degrees Centigrade are factors associated with the occurrence of major bloom events. These limits are consistent with the findings for optimal growth of *A. anophagefferens* in laboratory cultures, but are not believed to be sufficient causal mechanisms in and of themselves. Finally, a virus, which has been shown to be associated with the Brown Tide organism, is suspected to be important in ending blooms.

Ongoing Brown Tide research is being funded with an initial $1.5 million commitment from NOAA (over three years), $100,000 in BNL services, and $100,000 in Suffolk County funds to be used in conjunction with the BNL funds. Suffolk County appropriated an additional $450,000 (over three years) in Brown Tide research capital funds, and is considering additional appropriations. Historic Brown Tide research has been funded primarily by Suffolk County and the New York Sea Grant Institute. An additional $1.5M over three years for Brown Tide research recently has been committed by NOAA. ***Appendix E*** *contains a summary of funded projects.*

The CCMP discussion about Brown Tide represents a sketch of various historical theories and investigations. The state of knowledge about Brown Tide is advancing at a rapid rate, and would be impossible to fully capture in a document such as this CCMP. Therefore, persons interested in obtaining updates about Brown Tide research are encouraged to contact New York Sea Grant to obtain bulletins summarizing the most current results of Brown Tide Research Initiative investigations (discussed below). Also, the Suffolk County Department of Health Services may be contacted to obtain copies of the latest summaries and status reports of Suffolk County-funded Brown Tide research.

Public Comments

Questions have been raised about the possible relationship between radionuclides, toxics, and Brown Tide. The issue of radionuclide and toxic contamination, and Brookhaven National Laboratory, is dealt with in detail in **Chapter 6**. With respect to Brown Tide, to the knowledge of the PEP, the scientific community has, to date, not produced a credible theory that links Brookhaven National Lab's radionuclide contamination and Brown Tide. This is based on several factors, including the appearance of the Brown Tide in several locations (not just the Peconic Estuary) dating back to 1985. Also, there has been a recent global increase in harmful algal blooms. Moreover, there does not appear to be a hypothesis, which offers a mechanism by which relatively low-level radioactive contamination can result in onset or persistence of Brown Tide.

More important than the specific issue, however, is the PEP approach to dealing with the matter. With the assistance of the New York Sea Grant, the PEP has submitted queries to Brown Tide Research Initiative researchers about whether the onset and/or persistence of the Brown Tide may be related to, or caused by, radioactive and/or toxic chemical contamination associated with BNL. The researchers, who are closest to the latest findings about Brown Tide, were asked to offer commentary on the viability of this hypothesis, citing the nature of the basis of their response (personal knowledge of relevant studies, personal expert opinion based on well-established scientific principles, discussions with third parties, etc.). Also, they were asked to provide guidance on elements of a recommended research and/or monitoring program to test it. They were also asked similar questions about other issues posed by the public, including a theory that a relatively low supply of dissolved inorganic nitrogen may be causing the Brown Tide; the corollary to that hypothesis is that human DIN enrichment of surface waters (*e.g.*, direct applications of nitrogen) could prevent or minimize Brown Tides. This issue is discussed in greater detail in **Chapter 3**.

Other external experts were also identified to respond to the questions about radionuclides. Via this active process of soliciting input from experts, coupled with periodic updates to the Brown Tide Workplan by the Brown Tide Steering Committee (discussed below), the PEP is able to actively respond to public concerns on a continuing basis.

RESEARCH EFFORTS

Since the first appearance of the Brown Tide in 1985, significant effort has gone into researching the causal mechanisms behind the appearance and persistence of the Brown Tide. Numerous agencies and organizations from New York, as well as Rhode Island and New Jersey, have become involved in Brown Tide research.

To refine the research agenda, the PEP, in cooperation with the New York Sea Grant Institute and the State University of New York at Stony Brook's Marine Sciences Research Center, hosted a Brown Tide Summit in October 1995, with local, national, and international experts meeting to develop a comprehensive research agenda. The Summit resulted in both recommendations for the direction of future research and commitments for funding. BNL and Suffolk County announced the formation of the Brown Tide Monitoring Network, funded with $100,000 in Suffolk County funds with a matching amount from BNL. NOAA announced that $1.5 million, over three years, would be used for funding the Brown Tide Research Initiative (BTRI). Finally, a Brown Tide Steering Committee was proposed by various Federal, State, and local representatives to more broadly coordinate and guide Brown Tide research and monitoring efforts. The proceedings of the Summit were published in January 1996 as a New York Sea Grant publication (No. NYSGI-W-95-001). An additional $1.5 million over three years has been committed by NOAA to pursue the most promising avenues of Brown Tide research and management.

Brown Tide Monitoring Network

The Brown Tide Monitoring Network is a research effort funded jointly by BNL and Suffolk County. The primary objectives of this research effort are to:

- Determine the basic photosynthetic physiology of *Aureococcus* in the field;
- Deploy three real-time monitoring buoys in the Peconic Bays system to measure the abundance of chlorophyll, temperature, salinity, dissolved oxygen and tidal information, and use this information to develop and test models for bloom dynamics; and
- Develop and maintain a Brown Tide “home page” on the World Wide Web containing real-time data from the buoys.

BNL is also funding an in-house research effort that will investigate the photosynthetic and nutrient uptake physiology of Brown Tide, including conducting nutrient addition experiments with natural seawater samples from Peconic Bay that contain Brown Tide. The final part of the study, a retrospective analysis of the oceanographic, meteorological, and biological conditions that are associated with Brown Tide blooms in the Peconic Estuary, has already resulted in the formulation of the hypothesis previously noted on the roles of dissolved inorganic and organic nitrogen and groundwater levels and rainfall patterns in the onset of blooms. Work by BNL researchers (now at the University of Kiel) has also produced the first axenic (bacteria-free) culture of Brown Tide, a major breakthrough.

Historic Research Efforts and Findings

Between 1986 and 1997, Suffolk County funded Brown Tide research projects totaling approximately $400,000. The New York Sea Grant Institute funded $700,000 in Brown Tide research projects from 1991-1996 and $57,000 in projects for 1996-1997.

The following achievements are a result of the SCDHS and Sea Grant research projects.

- *An immunofluorescent Brown Tide identification procedure which allows accurate, reliable, and expeditious analysis of Brown Tide cell concentrations;*
- *The production of a laboratory culture of the Brown Tide organism which could be used for investigating the organism's chemical and physical requirements;*
- *Laboratory results bolstering the indication from monitoring data that conventional inorganic macro-nutrients, such as nitrogen and phosphorus, do not appear to trigger Brown Tide blooms;*
- *The laboratory indication that micronutrients, such as iron and selenium, may be important in bloom formation;*
- *Mathematical modeling indicating that Brown Tide blooms do not seem to be directly related to the concentrations of conventional nutrients;*
- *Studies which indicate that Brown Tide may be stimulated by a relatively high ratio of available dissolved organic nitrogen, with respect to supply of dissolved inorganic nitrogen;*
- *Field verification of the decimation of eelgrass populations, possibly due, in part, to the light shading effects of Brown Tide; and*
- *Microzooplankton grazing experiments that strongly suggest that microzooplankton consume alternative phytoplankton and avoid Brown Tide cells.*

Other Suffolk County Capital Programs

Between 1997 and 1999, Suffolk County appropriated $450,000 to support Brown Tide monitoring and investigation efforts (above and beyond historic appropriations of $400,000). The general criteria used to select Suffolk County-funded projects included:

- Consistency with the Brown Tide Workplan;
- Linkages with potential physical management applications (*e.g.*, nutrient reductions, structural changes to the Shinnecock Canal locks, etc.);
- Focus on collection and application of actual field data (typically with the assistance of the SCDHS marine monitoring crew);
- Development of data and products useful to the broader research and management community; and
- Cost-effectiveness of proposals.

Five projects have been funded with this $450,000, including the Brown Tide Monitoring Network (discussed above). The Suffolk County Capital Program moneys also support an investigation of the various constituents of dissolved organic nitrogen in Long Island waters (BNL/Woods Hole Oceanographic Institute; LaRoche, Repeta, *et al.*), with the goal of eventual linkages to Brown Tide and other phytoplankton dynamics. Also prominent is a forthcoming study of the influence of various groundwater constituents on Brown Tide (Taylor *et al.*, SUNY MSRC). In addition, Suffolk County

field staff are assisting in the collection of samples for a Differential Phytoplankton Analysis project (Lonsdale *et al.*, SUNY MSRC). Finally, Tetra-Tech, Inc. will be calibrating and verifying a Shinnecock Bay model (coupled with the Peconic Estuary model), to test the hypothesis that reversal of the locks at the Shinnecock Canal will greatly improve Peconic Estuary flushing, potentially mitigating or preventing Brown Tide blooms. An additional $133,000 was appropriated for Brown Tide research by Suffolk County in 2000, and $150,000 per year has been authorized by Suffolk County for 2001 and following years.

Brown Tide Research Initiative

NOAA, through its Coastal Oceans Program (COP), is providing Brown Tide research funding totaling $3.0 million over six years. A Brown Tide Research Initiative (BTRI) committee, chaired by New York Sea Grant, was formed by the COP in consultation with the PEP to manage the research funding process. The BTRI committee includes representatives from the PEP, COP, South Shore Estuary Reserve, Suffolk County, citizens groups, and local government. The primary objectives of the BTRI are to:

- Develop additional isolates and axenic cultures of the Brown Tide organism and methods for culture maintenance;
- Identify the physical, chemical, and biological factors that initiate and sustain Brown Tide blooms; and
- Identify factors leading to the cessation of Brown Tide blooms.

A full list of the Brown Tide research projects being funded by NOAA can be found in **Appendix E**.

Brown Tide Steering Committee and Workplan

The Brown Tide Steering Committee (BTSC) was formed to broadly coordinate Brown Tide research efforts both inside and outside of New York through the development of a comprehensive Brown Tide research and management plan or Brown Tide Workplan. The BTSC includes representatives from various agencies and environmental groups as well as elected officials, commercial fishermen, and other interested parties. The BTSC is coordinated by Suffolk County. The Brown Tide Workplan will be implemented by the BTSC through the PEP, NOAA, and Sea Grant and in coordination with the Barnegat Bay National Estuary Program, the Narragansett Bay National Estuary Program, the South Shore Estuary Reserve Program, the Delaware Inland and Maryland Coastal Bays Programs (to be included on committee) and other participants.

The Brown Tide Workplan recommends Brown Tide research priorities for the next three years. Research priorities are based on a review of past and current research efforts as well as recommendations for research from the Brown Tide Summit. The ***Brown Tide Interim Workplan*** (BTSC, 1998) estimates that, over the next three years, $2.1 to $2.8 million will be necessary to conduct the high priority research efforts identified by the BTSC. The Interim Workplan has been approved by the BTSC and the PEP Management Committee and will be refined and updated periodically. A copy of the Interim Workplan can be found in **Appendix F**.

MANAGEMENT ACTIONS

The Peconic Estuary Program recognizes the need to continue to better coordinate, focus, and expand Brown Tide research efforts. To this end, the PEP has worked to coordinate Brown Tide research and has prepared a comprehensive, regional Brown Tide research workplan. Further, the PEP recommended a commitment of significant additional funding to extend promising avenues of research and management. This funding is in addition to the funds allocated for the preparation/implementation of the PEP CCMP. Thus, comprehensive, regional Brown Tide research can take place on a separate, parallel course with the current Management Conference direction, which deals with conventional water quality and natural resource issues.

The Brown Tide management action contained in this chapter reinforces the need for continued research and monitoring as well as the need for continued coordination of research efforts and information sharing. The Brown Tide management action, shown in the accompanying text box, is detailed below. The Brown Tide Management Action Summary Table (**Table 2-1**) includes information on the costs, status, and timeframe associated with the action. The table is located at the end of this chapter.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

In addition to Brown Tide research initiatives, the PEP has been involved in restoring those natural resources believed to be most impacted by Brown Tide: bay scallops and eelgrass. Many of these efforts have been funded by the PEP, the State, Suffolk County, and local towns. These initiatives and the associated management actions are found in the Habitat and Living Resources section of this CCMP (see **Chapter 4**).

BROWN TIDE MANAGEMENT ACTION

B-1. Ensure Continued Brown Tide Monitoring, Research, Coordination, and Information Sharing.

B-1. Ensure Continued Brown Tide Monitoring, Research, Coordination, and Information Sharing.

Addresses Brown Tide Management Objectives 1 and 2.

Since 1985, the Suffolk County Department of Health Services (SCDHS) Office of Ecology has maintained a monitoring program, which has included the analysis of thousands of water samples for Brown Tide levels and for the chemical and physical characterization of the estuary. This program has been important for a number of reasons, including the determination of the timing and spatial extent of Brown Tide blooms; the determination of physical and chemical parameters associated with the blooms; and the generation of data supporting numerous research and management efforts. The joint SCDHS/BNL project (the Brown Tide Monitoring Network) also contains a much-needed Brown Tide monitoring component.

Continued research on Brown Tide depends on continued funding. Historically, most of the Brown Tide research was funded by NY Sea Grant and Suffolk County. In 1995, several additional avenues of Brown Tide research were opened through the NOAA funding initiative. Additional research continues to be funded by the PEP, Suffolk County, NOAA, and Sea Grant.

Steps

B-1.1 Ensure that the SCDHS water quality monitoring program continues to provide information needed for analysis and research related to Brown Tide.

B-1.2 Include Brown Tide monitoring as a component of the long-term monitoring program of the PEP.

B-1.3 Continue research efforts by BNL and Suffolk County under the Brown Tide Monitoring Network and BNL hind-casting and autoecological investigations, as well as other monitoring and investigation projects funded by the Suffolk County Capital Program.

B-1.4 **Priority** Support continued funding for NOAA-funded Brown Tide research and management projects, cooperation among researchers, and dissemination of information on progress and results under the Brown Tide Research Initiative.

B-1.5 **Priority** Identify potential funding sources to implement the Brown Tide Workplan and secure funding for Workplan priorities.

B-1.6 Assign agency staff members to coordinate Brown Tide research.

B-1.7 **Priority** Coordinate Brown Tide Steering Committee activities to periodically update the Brown Tide Workplan with necessary research and management projects.

Responsible Entities

B-1.1 Suffolk County Department of Health Services (lead), PEP

B-1.2 Suffolk County Department of Health Services (lead), PEP

B-1.3 BNL and Suffolk County (co-leads)

B-1.4 NY Sea Grant (lead), NOAA, BTRI Steering Committee, PEP

B-1.5 Suffolk County (lead), Brown Tide Steering Committee, and various agencies funding Brown Tide research

B-1.6 PEP (lead)

B-1.7 Suffolk County (coordination), PEP, EPA, NOAA, Sea Grant, SUNY Marine Sciences Research Center, local government, New York State, and other estuary programs (Buzzards, Narragansett, Barnegat Bays, and South Shore Estuary Reserve Program)

BENEFITS OF THE BROWN TIDE MANAGEMENT ACTIONS

Successful management actions, which prevent Brown Tide blooms, lessen their severity, cause blooms to subside, or otherwise mitigate impacts, are vital to the restoration and protection of the once economically important Peconic bay scallop industry. Other important shellfish that will benefit from successful Brown Tide management include blue mussels, hard clams, and oysters. The reduction or control of Brown Tide will be helpful in protecting eelgrass, which serves as an important habitat for finfish as well as shellfish. There is also evidence that the Peconic Estuary is important as a nursery and spawning ground for a variety of marine organisms, including weakfish and other commercially valuable finfish. Although the dockside value of commercial fishery landings is significant, it is much smaller than actual revenues generated by other water-related activities, including marinas, restaurants, and other businesses and institutions which cater to sports fishermen, boaters, bathers, and tourists who utilize the Peconic system. An economic assessment conducted by the PEP has shown that there are over one thousand business establishments that are estuarine-dependent (21 percent of the total businesses in the Peconic Estuary study area). Gross revenues for these establishments total $442 million/year, and they employ over 7,000 individuals.

COSTS OF THE BROWN TIDE MANAGEMENT ACTIONS

At this time, the long-term costs of identifying the causes of the onset and persistence of Brown Tide blooms, and of developing measures to control and minimize those blooms, are unknown. As of 1997, Brown Tide-specific and related research totaled approximately $1.2 million (excluding NOAA funds). As mentioned previously, NOAA has committed $3 million over six years to conduct Brown Tide research, beginning in 1996, and BNL and Suffolk County have committed a combined total of $200,000 in equipment and services for Brown Tide research.

The County will continue to monitor the waters of the Peconic Estuary for Brown Tide and other constituents of concern. Between 1997 and 2000, Suffolk County appropriated $583,000 of Capital Program funds for Brown Tide research. Suffolk County has also authorized $150,000 each year for

the next three years (2001-2003) from the Capital Budget. Suffolk County also has requested that $1 million in NY Clear Water/Clean Air Bond Act funds be dedicated to Brown Tide investigations.

The Brown Tide Steering Committee has identified short-term Brown Tide research and management needs in the form of a workplan. These needs are currently estimated to be $2.1 to 2.8 million over the next two to three years. Additional funding may be needed to extend promising new avenues of research, and may be requested in the future, based on the recommendations of the Committee.

The total cost of all actions proposed for Brown Tide management is $3.25 million in new one-time costs. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

BROWN TIDE ACTIONS SUMMARY TABLE

Table 2-1 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 2 1. Brown Tide Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
B-1	**Ensure Continued Brown Tide Monitoring, Research, Coordination, and Information Sharing.** ***(Objectives 1 and 2)***				
B-1.1	Ensure that the SCDHS water quality monitoring program continues to provide information needed for analysis and research related to Brown Tide.	SCDHS (lead), PEP	Ongoing	Minimum grant commitment of $120,000/yr to satisfy EPA local match requirements. As with prior years, costs likely to be substantially higher than EPA grants. (See Environmental Monitoring Plan)	C/O
B-1.2	Include Brown Tide monitoring as a component of the long-term monitoring program of the PEP.	SCDHS (lead), PEP	Ongoing	Included in Action B-1.1	C/O
B-1.3	Continue research efforts by BNL and Suffolk County under the Brown Tide Monitoring Network and BNL hind-casting and auto-ecological investigations; as well as other monitoring and investigation projects funded by the Suffolk County Capital Program.	BNL, Suffolk County (co-leads)	Ongoing	(Between 1997 and 2000, $583,000 Suffolk County Capital Program funds. Suffolk County has authorized $150,000 each year for the next three years (2001-2003) from the Capital Budget.)	C/O
B-1.4 **Priority**	Support continued funding for NOAA-funded Brown Tide research and management projects, cooperation among researchers, and dissemination of information on progress and results under the Brown Tide Research Initiative.	NY Sea Grant (lead), NOAA, BTRI Steering Committee, PEP	1996-2001	$3,000,000	C/O

Table continued on next page

Table 2-1. Brown Tide Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
B-1.5 **Priority**	Identify potential funding sources to implement the Brown Tide Workplan and secure funding for Workplan priorities.	Suffolk County (lead), Brown Tide Steering Committee, and various agencies funding Brown Tide research	Ongoing	Identify funding: Secure funding: The necessary workplan research is estimated to require an additional $2.1–2.8 million over 2 to 3 years. Funds obligated: None. Potential sources: NYS Environmental Protection Fund or Clean Water/Clean Air Bond ($1 million requested); Suffolk County Capital funds ($450,000 requested)	C/O R
B-1.6	Assign agency staff members to coordinate Brown Tide research.	PEP (lead)	Ongoing	EPA – 0.1 FTE/yr NYSDEC – 0.05 FTE/yr SCDHS – 0.1 FTE/yr	C/O
B-1.7 **Priority**	Coordinate Brown Tide Steering Committee activities to periodically update the Brown Tide Workplan with necessary research and management projects.	Suffolk County (coordination), PEP, EPA, NOAA, Sea Grant, SUNY Marine Sciences Research Center, local government, New York State, and other estuary programs (Buzzards, Narragansett, Barnegat, Delaware Inland, and Maryland Coastal Bays, and South Shore Estuary Reserve Program)	Ongoing; Interim Workplan last updated in Feb. 1998; workplan to be updated annually as necessary	SCDHS – 0.2 FTE/yr	C/O

CHAPTER
THREE

NUTRIENTS MANAGEMENT PLAN

To facilitate viewing the many figures that accompany this chapter, all figures have been placed at the end of this chapter.

OBJECTIVES

1) No net increase in western estuary. Immediately prevent net increases in nitrogen loading to the surface waters of the western estuary (Peconic River and Flanders Bay) to prevent worsening of current dissolved oxygen (DO) stresses in the marine surface waters of the area.

2) Long-term reductions in western estuary. Develop and implement a long-term nitrogen load reduction strategy to the western estuary, to optimize surface water conditions for dissolved oxygen, with ancillary consideration of potential benefits to submerged aquatic vegetation (especially eelgrass) habitat.

3) Eelgrass habitat optimization in shallow water. Maintain and, where cost-effective, improve conditions with respect to nitrogen (and related chlorophyll-a, light extinction, and possibly other parameters) in shallow waters (less than three meters) to optimize eelgrass habitat.

4) Water quality preservation in eastern waters. Implement a "water quality preservation" policy in eastern estuary waters (east of Flanders Bay) to prevent degradation which could adversely impact the high quality of those surface waters.

5) Subwatershed management. Focus on characterization of peripheral creeks and embayments and management of their subwatersheds; optimize surface water quality in these areas, which are often highly productive but poorly flushed and subject to environmental stresses.

6) Load allocation in the entire watershed. Develop and implement a load allocation strategy for point and nonpoint sources in the entire estuary, which accomplishes the above objectives.

MEASURABLE GOALS

The PEP's measurable goals with respect to nutrients include:

- Decrease the total nitrogen concentrations in the western estuary to a summer mean of no more than 0.45 mg/l (based on 1994-96 model verification conditions, and measured by surface water nitrogen concentrations as compared to the PEP nitrogen guidelines). [See Actions N-4, N-5, N-10]
- Improve the dissolved oxygen concentrations in the western estuary to ensure that the New York State dissolved oxygen standard (currently 5.0 mg/l) is not violated (measured by surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-10]
- Ensure that the total nitrogen levels in shallow waters remain at or below 0.4 mg/l to help optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat (based on 1994-96 model verification conditions, and measured by light extinction coefficients as compared to the recommended eelgrass habitat optimization goal of at or below $0.75 \pm 0.05\ m^{-1}$). [See Actions N-1, N-4, N-5, N-10]
- Ensure that the existing total nitrogen and dissolved oxygen levels are maintained or improved in waters east of Flanders Bay (*i.e.*, do not increase TN nor decrease DO) (measured by surface water total nitrogen concentrations as compared to the PEP nitrogen guidelines and surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard). [See Actions N-1, N-2, N-4, N-5, N-10]
- Develop a quantitative total nitrogen load allocation strategy for the entire estuary (measured by development of a strategy and timely endorsement by local and State agencies). Preliminary work group estimates, and work performed by other programs, indicate that a 10-25 percent fertilizer reduction goal is a reasonable first order target for existing residential and agricultural fertilizing programs. [See Action N-3]
- Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program as well as other recommendations which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters). [See Actions N-3, N-4, N-5, N-10]
- Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal, which may include groundwater performance standards (*e.g.*, nitrogen concentrations in groundwater resulting from post-development discharge/recharge), implementing fertilizer and clearing restrictions, and zoning. [See Actions N-3, N-4, N-5, N-6, N-10]
- Continue sponsoring and coordinating research and information gathering (measured by funding appropriated and research conducted, relative to PEP recommendations). [See Actions N-7, N-8, N-9]
- Continue and expand open space acquisition programs (measured by funding appropriated and acres acquired in target areas). [See Action N-6]

INTRODUCTION

Nutrients are critical for sustaining the marine ecosystem, but can be harmful to an estuary at excessive levels. "Cultural eutrophication" is the process by which estuaries can become overenriched with nutrients and associated organic carbon, due to human inputs. Nitrogen and phosphorus are the primary nutrients that can impact water quality. Micronutrients, salts, metals, and organic solids can also contribute to the nutrification of an estuary. Nitrogen is the primary nutrient of concern in the marine waters of the Peconic Estuary during critical summer conditions when environmental stresses are greatest.

In the Peconics, excessive levels of nutrients can harm eelgrass, a critical habitat, due to algal light shading, stimulation of epiphytes (plants which live on eelgrass), and, possibly, direct adverse metabolic impacts. One theory also holds that Brown Tide may be related to levels of dissolved organic nitrogen (DON) in relation to the supply of dissolved inorganic nitrogen (DIN). This, however, is one of several hypotheses, many of which do not implicate nutrients as a causal factor.

When nutrients are introduced to the estuary at higher than normal rates from runoff, groundwater inflow, atmospheric deposition, or point source discharges, the excess nutrients stimulate aquatic plant growth, including production of microscopic algae (microscopic plants that live in surface waters). Algae photosynthesize in the day, producing oxygen, which is released into the water column. At night, they undergo respiration, consuming dissolved oxygen (DO) in the water column. This respiration can result in short-term dissolved oxygen depression, which is known as "diurnal" dissolved oxygen variation. In the Peconic Estuary, which is generally a shallow, well-mixed estuary, chronic dissolved oxygen problems due to "stratification" (a deeper layer of water which can experience sustained DO depression) are usually not a problem, as they are in deeper systems such as Long Island Sound.

Increased aquatic plant productivity adds organic material to the system, which eventually dies and decays. The decaying organic matter settles to the bottom and depletes oxygen levels in the water which are needed by aquatic organisms in what is known as "sediment oxygen demand" (SOD). From sediments, nutrients can be recycled back into the system ("sediment nutrient flux"), further exacerbating the pollution problem with nitrogen contributions.

Sediment Nutrient Flux

Sediment Flux (i.e., exchange of chemicals, such as nutrients, between the sediment and water column due to geochemical and bacterial processes) is an internal (recycled) nitrogen source that reflects current and historic anthropogenic pollution inputs. It is greater than any other individual source of point or nonpoint pollution.

Processes such as diurnal DO depression, sediment oxygen demand, and sediment nutrient flux can result in dissolved oxygen levels which are low enough to be harmful to marine life. Factors and processes which govern oxygen levels are complex, and include temperature, light availability, wind mixing, localized water column stratification (such as the salt wedge which occurs in the Peconic River area), zooplankton grazing, submerged aquatic vegetation (SAV) dynamics, and bio-geochemical and bacterial processes. Low DO levels adversely affect marine life, potentially resulting in mortality and in behavioral and physiological effects on individual species and communities.

The increased production of microscopic algae caused by increased nutrient enrichment results not only in dissolved oxygen problems but also discolors the water, decreases water clarity and diminishes the amount of light received by rooted aquatic plants. Submerged aquatic vegetation that are at a species' depth limit for clear water conditions would be expected to decline due to the lack of sufficient light energy in turbid waters. Eutrophication will also promote the growth of epiphytes on

eelgrass blades, again shading the plant itself and hindering production. Furthermore, species such as red or green macroalgae, which adsorb nutrients more quickly than eelgrass, may competitively exclude eelgrass plants.

Eutrophication may also impact eelgrass as a result of this species' high nitrate uptake efficiency. Eelgrass lacks a mechanism to terminate nitrate uptake. It is thought that excess nitrate in eelgrass impairs carbohydrate metabolism, resulting in impaired plant health and a decline in shoot production (Cashin Associates, 1996).

Because SAV beds are prime habitat for bay scallops and juvenile fish, the loss of SAV can have repercussions throughout the food chain. SAV beds also provide numerous other functions including a food source, bottom stabilization, and nutrient cycling all that are further discussed in **Chapter 4**.

Nitrogen levels may also be linked to the Brown Tide. One hypothesis is that Brown Tide conditions may be favorable when dissolved organic nitrogen (DON) is elevated in relation to dissolved inorganic nitrogen (DIN) supply. Brown Tide bloom conditions may thus be most favorable in a dry year (LaRoche, 1997; USGS, 1998), where there is a low DIN supply as a result of low groundwater inputs. This may be particularly significant when the dry year follows a wet year, which results in elevated DON levels. Because inorganic nitrogen levels in groundwater appear to have risen substantially, the levels of DON (DIN is "converted" to DON in the marine environment) in surface waters may, too, have become elevated.

Ecosystem impacts due to excessive nutrient inputs are often long-term and difficult to measure. Nitrogen may be having subtle effects on species abundance and distribution in the system. Moreover, nitrogen is often associated with other pollutants, such as organic carbon, and can be considered as one "indicator" measurement of human degradation. Because major, short-term, nitrogen-induced impacts have not been demonstrated in the Peconic Estuary, the PEP is faced with the difficult task of establishing rational, cost-effective preservation policies to prevent impacts which have generally not yet occurred.

*No major eelgrass beds exist west of Shelter Island (except Bullhead Bay), possibly due in part to nitrogen enrichment (see **Figure 3-1**). Also, sediment flux studies and other characterizations suggest eutrophication pressures on the "central estuary" (Great and Little Peconic Bays). Finally, recent research indicates that elevated levels of nitrogen in groundwater input may be one causal factor related to Brown Tide onset.*

For most Peconic Estuary waters, the PEP goal is to establish rational and implementable preservation targets *prior* to degradation and occurrences of use impairments. In the absence of detailed ecosystem data, the PEP was faced with the major challenge of characterizing water segments with respect to nitrogen and dissolved oxygen quality. As part of this characterization process, numerous discrete studies were performed to examine issues such as land use, groundwater, and sediment nutrient flux.

CHARACTERIZATION OF THE ESTUARY SYSTEM

Characterization Studies

Numerous characterization studies have been completed and others are ongoing to determine the sources, loadings, and impacts of nutrients to the estuary system. The work of past programs, such as the L.I. 208 Study (1978) and BTCAMP (1992), have been refined and expanded with a more comprehensive surface water monitoring program, detailed land use data, and improved sediment

characterizations. A habitat linkage was added with a submerged aquatic vegetation study, and a state-of-the-art model was developed to integrate and use the data.

One overall goal of this characterization process was to bring the amount of information available on the eastern estuary waters (east of Flanders Bay) and watershed (see **Figure 3-2**) to the level of the western estuary, which had been analyzed in great detail in prior studies. The PEP also committed to detailed studies of subwatersheds for peripheral creeks and embayments, such as Meetinghouse Creek, Sag Harbor, and West Neck Bay.

The water and sediment quality technical characterization framework is illustrated, in simplified schematic form, in **Figure 3-3**. Within the watershed, the PEP sought to characterize not only direct loads, such as point source discharges, but also land use and land cover, which greatly affect the nature of nonpoint source loadings. Groundwater quality and quantitative input rates were also the subject of major investigations. Finally, atmospheric (airshed) and direct (*e.g.*, point source) loads to surface waters were evaluated. In the estuary itself, surface water monitoring and modeling were major initiatives. Sediment quality and dynamics were also the foci of major studies, including sediment toxics, sediment nutrient flux, and sediment accretion.

The size of the data sets is tremendous. For example, the Suffolk County Department of Health Services (SCDHS) has collected over 8,000 surface water samples, analyzed for a comprehensive array of physical and chemical parameters (including Brown Tide and coliform bacteria), at 39 routine surface water monitoring stations and 10 routine point source monitoring stations. Also, the Suffolk County Planning Department has developed precise, field-verified land use data for each tax map parcel in the 110,000-acre watershed. Thousands of SCDHS groundwater quality samples were analyzed in conjunction with the U.S. Geological Survey's groundwater budgets and subwatershed models.

This characterization process is discussed in great detail in several characterization reports available from the Peconic Estuary Program Office. Key findings from characterization studies have been used to formulate the proposed nutrient actions in this CCMP. Some of these findings are shown in the accompanying text box.

PEP Hydrodynamic and Eutrophication Model

The PEP Hydrodynamic and Eutrophication Model will serve as a tool for evaluating main bays water quality, as well as water quality for embayments such as Sag Harbor, West Neck Bay, and Meetinghouse Creek. The model is a three-dimensional hydrodynamic and water quality model with a predictive sediment submodel. It is the only known model to be run for a continuous eight-year simulation robustly, with no intermediate forcings or corrections to the sediment processes.

Model results are still under review by the Peconic Estuary Program Management Conference, and its advisory panel, the Model Evaluation Group. When the model is approved for evaluating preliminary management alternatives, several realistic best-case, worst-case, and intermediate management alternatives will be examined. Economic estimates of various management measures will be developed by a consultant, and costs of various management strategies can be weighed against benefits (*e.g.*, attainment of guidelines and criteria discussed below). Through this process, feasible and quantitative subregional loading targets can be developed, and costs and timeframes for implementation mechanisms can be established. The goal is to make this powerful management tool

available in the near future (calendar year 2001) and to develop an implementable load allocation strategy for the entire watershed.

Specific functions of the PEP water quality model include the following abilities:

- Simulate historic water quality conditions based on data collected since 1988;
- Predict future water quality conditions if present trends continue;
- Predict future water quality conditions in the estuary as a result of management actions;
- Simulate responses of water quality and sediment processes to point and nonpoint source control actions;
- Perform both short-term (seasonal) and long-term (multi-year) simulations;
- Determine the effect of localized management actions in peripheral embayments; and,
- Determine the response time of the estuary to management actions.

Key Findings Related to Nutrients in the Estuary System

- Overall, the Peconic Estuary main bays and monitored embayments generally have "excellent" water quality with respect to dissolved oxygen (DO), with less than three percent of the area of the estuary exceeding the recommended total nitrogen (TN) guideline for DO attainment purposes (the DO standard is 5.0 mg/l, at all times) (see **Figures 3-4** and **3-5**). Similarly, most of the estuary attains light extinction properties optimal to eelgrass, at least in non-Brown Tide years (see **Figure 3-6**). However, the westernmost estuary (Peconic River and Flanders Bay) and several small embayments violate TN guidelines and exhibit DO stresses (see **Figures 3-7** and **3-8**, discussed further in **Table 3-2**). Also, several studies suggest eutrophic stresses in the "central estuary" (Great and Little Peconic Bay);
- Nitrogen loadings appear to be at an all-time high (see **Figure 3-9**), showing an increase of greater than 200 percent since the 1950s due to increasing residential land use and more pervasive use of highly soluble fertilizers;
- In the early to mid-1900's, western estuary (Peconic River and Flanders Bay) nutrient inputs were dominated by point source duck farm discharges. The decline in duck farming has been more than offset by an increase in nonpoint source nitrogen loading, primarily attributable to residential fertilizer and sanitary systems, coupled with agricultural fertilizers. Water quality trends probably reflect these loading patterns: dramatic improvements in water quality in western estuary creeks and embayments once affected by duck farms, and gradual increases in eutrophication stresses for the waters east of Flanders Bay;
- Fully 40 percent of the study area is still subject to development, posing a substantial potential threat to water quality in the main bays as well as in the embayments (see **Figure 3-10**);
- On a regional basis, over 80 percent of the existing total nitrogen load comes from developed lands and farmland (see **Figure 3-11**). Thus, for existing land uses, on a regional basis, management of residential and agricultural lands is an obvious priority. For medium density residential lands, sanitary waste and fertilizers contribute comparable amounts of nitrogen. At lower densities, fertilizer loadings become more prominent;
- New residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. Under a scenario in which 100 percent of farmland is preserved and developable land is developed, nitrogen loading could increase substantially in every major region of the estuary (see **Figures 3-12** and **3-13**). This scenario is considered "worst case" because farmland has a higher nitrogen loading rate than most other allowable uses on developable lands. Overall, a total nitrogen increase for the estuary study area would be near 40 percent (about 41 percent in eastern estuary, and 34 percent in western estuary). In the eastern estuary, the increase on the South Fork would be most profound (over 60 percent);
- New industrial and commercial development is an issue prominent mainly in the western estuary, particularly in Riverhead Town. Overall, over 90 percent of the developable industrial acreage in the study area, and almost one-half of the developable commercial acreage, is in Riverhead Town;
- Open space acquisition and preservation programs have been tremendously successful in averting potential nitrogen loading increases (see **Figure 3-14**);
- Widespread areas of groundwater are enriched with total nitrogen on about an order of magnitude higher than native groundwater (see **Figure 3-15**). Most of the groundwater entering the estuary system is contributed from the western estuary and South Fork (see **Figure 3-16**); and,
- Low DO levels can adversely affect the feeding, growth, and survival of living marine resources. DO levels tend to be lowest during the summer, unfortunately when the abundance of many finfish and invertebrate species, including eggs, larvae, and juveniles are at their greatest.

SOURCES AND LOADINGS OF NUTRIENTS IN THE SYSTEM

Many sources contribute nutrients to the Peconic Estuary System, including sediments, groundwater, direct rainfall to surface waters, point source discharges (such as discharges from the Riverhead sewage treatment plant), and stormwater runoff.

Sediments contribute nutrients to the estuary system through a process called sediment flux. Sediment nutrient flux is an internal, recycled source of nitrogen where sediments release nitrogen into the water column. Sediment flux is related to point and nonpoint source nitrogen inputs. Reductions in human nutrient inputs will eventually be reflected in lowered sediment flux rates. The annual sediment flux to the estuary, at about 14,000 pounds per day, is overwhelmingly the largest source of nitrogen to the estuary. This source comprises 51 percent of the total nitrogen loading to the estuary.

Groundwater is one of the largest external sources of nitrogen to the estuary (21 percent of total nitrogen load or about 7,560 pounds/day). It integrates nitrogen from fertilizer, sanitary system waste, and other sources. Atmospheric deposition (to surface waters) contributes substantial nitrogen (26 percent of total load). The remaining load to the estuary, only about 2 percent, is from stormwater runoff and sewage treatment plants. Although these sources represent a small percentage of total nitrogen loading, they may have localized effects.

In the early to mid-1900s, western estuary (Peconic River and Flanders Bay) nutrient inputs were dominated by point source duck farm discharges. The decline in duck farming has been more than offset by an increase in nonpoint source nitrogen loading, primarily attributable to residential fertilizer and sanitary systems, coupled with agricultural fertilizers. The water quality of the Peconic Estuary, on a regional basis, is primarily nonpoint-source impacted. However, point sources such as the Riverhead Sewage Treatment Plant and Meetinghouse Creek (which integrates the Corwin Duck Farm and other upstream sources) are very significant locally due to their direct, concentrated discharge to poorly flushed and stressed areas of the estuary. The Sag Harbor sewage treatment plant, although a relatively small facility, may also have localized effects in Sag Harbor Cove.

Stormwater runoff in the overall western study area is almost negligible from a nitrogen perspective, but may still be significant for water quality in specific embayments. In the far western portions of the estuary, total nitrogen loads may have increased substantially due to nonpoint source loadings from fertilizers and sanitary systems (LaRoche, 1996). This suggests that central main bays water quality may slowly be becoming more enriched with nutrients, via direct contributions from groundwater and indirect recycling from sediment nutrient flux, although this is certainly a “most probable scenario” assessment, in the absence of long-term monitoring data.

For the eastern estuary, sediment flux is, by far, the greatest quantitative source. The only other major, externally controllable source in the eastern estuary is groundwater, which still has significant degradation potential. Point sources and stormwater runoff in the overall eastern study area are minor nitrogen sources, but both may still be significant for water quality in specific embayments.

Nonpoint source nitrogen loading to the estuary appears to be at an all time high. The nature of nonpoint source management is complex and challenging, as it deals with relatively small but extremely pervasive contributions from sanitary systems, fertilizers, and other sources.

Existing nitrogen loads to the estuary are shown in **Table 3-1**, and in **Figures 3-17** and **3-18**. These estimates are derived directly from characterization studies conducted by the PEP and others and are discussed in detail in the SCDHS report, *Point and Nonpoint Source Loading Overview* (1998).

ENVIRONMENTAL CRITERIA AND RECOMMENDED GUIDELINES

The Clean Water Act (CWA) mandates two types of approaches to meeting water quality standards: technology-based and water quality-based approaches. Section 301 of the Clean Water Act requires the application of technology-based criteria to point source discharges, so that effluent will meet specific effluent limits for the given discharge class. This can be considered a "minimum requirement" for all point source discharges to surface waters.

However, if technology-based standards are not sufficient to achieve water quality standards, then additional pollution control measures may be required of point sources to ensure attainment of the water quality standards. The water quality-based approach under Section 303 of the Clean Water Act results in specific limits applied to discharges so that waterbodies meet standards.

The Clean Water Act requirements are reflected in the New York Code of Rules and Regulations (NYCRR). 6 NYCRR 754.1(a)(I) sets forth the requirement that limitations (more stringent than technology-based limitations) shall be included in State Pollutant Discharge Elimination System (SPDES) permits where necessary to meet water quality standards or to implement total maximum daily loads (TMDLs).

Dissolved Oxygen

Low dissolved oxygen (DO) levels can adversely affect the feeding, growth, and survival of the Peconic Estuary's living marine resources. Dissolved oxygen levels tend to be lowest in the Peconic Estuary during the summer, which is also when the abundance of many finfish and invertebrate species are at their greatest. Additionally, summer-time is when the eggs, larvae, and juveniles of many marine species are also at their greatest concentrations following the adult spawning events in the spring and summer months. These early life history stages are also known to have increased susceptibility to the effects of low DO concentrations.

New York State has a water quality standard for DO of no less than 5.0 mg/l for all class SA, class SB, and class SC waters (see 6 NYCRR Part 703.3). All of the waters in the Peconic River and Flanders Bay drainage basins fall within the SA, SB, or SC classifications (see 6 NYCRR 921).

In addition to the 5.0 mg/l DO standard, which has regulatory significance, there are other technical "benchmarks" which are used to evaluate surface water quality with respect to DO. This is because 5 mg/l is considered extremely protective, and scientists believe that levels slightly below 5 mg/l can be sustained without harming marine life. For example, the Long Island Sound Study (LISS), a research and management project funded by the National Estuary Program, has developed the following benchmarks: 5.0 mg/l to be fully protective; 3.5 mg/l (one day average) to be protective of most species; and 2.0 mg/l (all times) to prevent major loss.

Table 3-1. Peconic Estuary Program Total Nitrogen Loading Estimates (Annual Average).

	West [1] (of Flanders Bay)		East		OVERALL	
	(lb/day)	(% West)	(lb/day)	(% East)	(lb/day)	(% Total)
NONPOINT SOURCES						
Sediment Flux [2]	250	*12*	13,600	*54*	13,850	*51*
Groundwater [3]	1320	*61*	4,500	*18*	5,820	*21*
Atmospheric Dep. [4]	160	*7*	6,900	*28*	7,060	*26*
Stormwater Runoff [5]	30	*1*	100	*0*	130	*0*
TOTAL NONPOINT	***1,760***	*81*	***25,100***	*100*	**26,900**	*98*
POINT SOURCES						
Peconic River [6]	140	*6*	---	---	140	*1*
Riverhead STP [7]	170	*8*	---	---	170	*1*
Meetinghouse Creek [8]	110	*5*	---	---	110	*0*
Sag Harbor STP [9]	---	---	14	*0*	14	*0*
SI Heights STP [10]	---	---	3	*0*	3	*0*
TOTAL POINT	***420***	*19*	***20***	*0*	**440**	*2*
TOTAL POINT & NONPOINT	**2,200**		**25,100**		**27,300**	

[1] Note: Preliminary analysis of historical duck farm data in the western estuary indicates that duck farms may have discharged 1,400 pounds/day or more for decades through the early 1970s. Discharge dropped to about 500 pounds/day in mid-70s, and 400 pounds/day in early-mid 1980s. In 1988, the last duck farm (Corwin Duck Farm on Meetinghouse Creek) stopped surface water discharge.

[2] Summer sediment flux rates: 120 pounds/day west, 16,200 pounds/day east.

[3] Groundwater underflow estimates:

Area	cfd (per USGS)	mg/l N	lb/day N
North Fork	3,800,000	9	2130
South Fork	11,000,000	3	2060
Shelter Island	1,700,000	3	320

Peconic River e/o gauge: 20.8 cfs, 6 mg/l N, 670 pounds/day N

North Flanders: 8.8 cfs, 9 mg/l N, 430 pounds/day N

South Flanders: 13.8 cfs, 3 mg/l N, 220 pounds/day N

[4] Uses 6.06 mg/m^2/day, after Tetra-Tech. Areas: 12.1 km^2 for west, 522 km^2 for east. Eastern study area estimates are for sediment flux analysis study area, including part of Block Island Sound. The modeler will spread the loading rate over the surface area accordingly.

[5] Load is taken from *Brown Tide Comprehensive Assessment & Management Program* for west; eastern study area loadings are rough estimates only. Estimates will be refined using land use data.

[6] Peconic River based on 37 cfs (mean from 1942-96), 0.7 mg/l.

[7] Based on Riverhead STP Discharger Monitoring Report (DMR) data for Jan-June 1997.

[8] Meetinghouse Creek: 1.4 cfs, 15 mg/l

[9] DMR data for 6/96-5/97: 0.083 mgd, 20 mg/l TN.

[10] DMR data for 6/96-5/97: 0.033 mgd, 9.2 mg/l TN.

The results of the LISS experiments have shown that short-term exposure to DO levels below 2.0 mg/l can have adverse effects on growth and survival during the larval and juvenile stages of development. The studies also demonstrated that short-term exposure (24 hr) to DO levels in the range of 5.0 - 3.5 mg/l can affect their growth and survival in the larval and juvenile stages.

The LISS studies also showed that exposure to DO levels in the range of 5.0 - 3.5 mg/l for 24 hours significantly reduced the growth of larval marsh grass shrimp (*Palaemonetes vulgaris*), larval longnose spider crab *(Libinia dubia)* and larval sheepshead minnow (*Cyprinodon variegatus)* by 20 percent, 10 percent, and 10 percent, respectively. Additionally, at these DO levels, larval Atlantic rock crab (*Cancer irroraturs)* displayed a 10 percent decrease in survival.

Oxygen levels between 3.5 and 2.0 mg/l resulted in a 50 percent reduction in the survival and growth of larval rock crabs and grass shrimp and a 30 percent reduction in the growth of larval sheepshead minnow. Furthermore, exposure to dissolved oxygen levels in this range reduced the growth rates of juvenile grass shrimp by 50 percent and juvenile summer flounder (*Paralichthys dentatus)* by 30 percent.

Short-term exposure to dissolved oxygen levels below 2.0 mg/l resulted in the greatest effects to marine finfish and invertebrate survival. The following species experienced a 50 percent reduction in survival during the juvenile stage: silverside (*Menidia beryllina),* winter flounder *(Pleuronectes americanus),* scup (*Stenotomus chrysops*), Atlantic menhaden (*Brevoortia tyrannus),* summer flounder, sand (*Crangon septemspinosa)* and grass shrimp, tautog (*Tautoga onitis*), windowpane flounder *(Scoptalmus aquosus*), and fourspine stickleback (*Apeltes quadracus*).

Pollutant Loadings

Under the Federal Clean Water Act Section 303(d), states develop a list of waterbodies not meeting water quality standards after the implementation of technology-based limitations and must develop Total Maximum Daily Loads (TMDLs) to reduce point and nonpoint sources of pollutants to those waterbodies that do not meet their designated uses. TMDLs are detailed technical water quality assessments which determine the maximum amount of a given pollutant a waterbody can assimilate while still meeting water quality standards and designated uses.

A TMDL with waste load allocations and loading allocations prescribing total nitrogen (TN) load reductions to meet the 0.45 mg/l TN guideline and allow attainment of the DO standard of 5.0 mg/l is recommended for the entire Peconic River/Flanders Bay watershed (including subwatersheds for Meetinghouse and East Creek/Riverhead). The PEP will ultimately develop very detailed, waterbody-specific load control strategies for the remainder of the estuary to ensure that existing high water quality is preserved.

While the organisms tested in the LISS experiments are representative of those found in the Peconic Estuary, species such as the bay scallop *(Argopecten irradians)* and bay anchovy *(Anchoa mitchilli)* were not specifically studied. These species are known to be of significant ecological and commercial importance to the Peconic Estuary. Nevertheless, the LISS experiments examined a wide range of finfish and invertebrate species known to occur throughout the Peconics and can, therefore, be used as a guideline to assess the impacts of low DO concentrations to the living resources of the Peconic Estuary.

Nitrogen

New York State has not adopted a general water quality standard for nitrogen. However, to mitigate adverse impacts of dissolved oxygen depletion in marine surface waters, regulatory entities, including

the New York State Department of Environmental Conservation (NYSDEC), control nitrogen discharges from point sources. This is based on the well-documented relationship between nitrogen loading and dissolved oxygen stresses in marine surface waters. In addition, the NYSDEC has adopted a marine surface water total nitrogen guideline for the Peconic River/Flanders Bay of 0.5 mg/l based on 1988-90 conditions. (See the *Brown Tide Comprehensive Assessment and Management Program* and PEP *Action Plan*.) This guideline supports the "no net increase" discharge policy for point sources of nitrogen in the western estuary.

Submerged Aquatic Vegetation (SAV)

SAV provides critical habitat for shellfish and finfish as well as numerous other functions, such as bottom stabilization and nutrient cycling. In the Peconic Estuary, eelgrass is generally considered to be the most valuable SAV species, due largely to its high habitat value. It is a rooted plant and has a vascular system. Other SAV that are present in the estuary include widgeon grass (present in relatively small areas), which is also rooted and vascular. The presence and extent of rooted aquatic plants is a quantitative measure of ecosystem health. Rooted aquatic plants generally are sensitive to conditions of water clarity and associated nutrient concentrations (which result in algal light shading) and suspended particulate levels. Also, research suggests that elevated levels of nutrients may have direct adverse metabolic impacts on eelgrass.

Macroalgae are also considered SAV, but they are not rooted or vascular. Rather, they are algal colonies, visible to the eye, and sometimes attached to the bay bottom. They generally have lower habitat value and are, in some cases, considered indicators of environmental degradation.

*Excess nutrients may result in the displacement of eelgrass by macroalgae (see **Figure 3-21**). In the western and central estuaries (Flanders and Great/Little Peconic Bays), with the exception of Bullhead Bay, there are no known significant beds of eelgrass present.*

For dissolved oxygen management, this Management Plan recommends modification of the NYSDEC's total nitrogen guideline to 0.45 mg/l, based on 1994-96 data. The SCDHS PEP data analysis, based mainly on the 1994-96 expanded monitoring program, suggests that the mean TN guideline of 0.45 mg/l for summer conditions (July-September), as a benchmark based on 1994-96 conditions, may be a valuable management tool to minimize the risk of DO depression below the 5.0 mg/l New York State dissolved oxygen standard. This recommendation is based mainly on correlating surface water TN levels with the frequency of DO standard violations, using SCDHS data from daytime (non-worst case) conditions (see **Figures 3-19** and **3-20**). The 1994-96 database was used in the empirical analyses because it provided the extensive shallow water and peripheral bays data necessary to assess the relationship between TN and DO, as well as light extinction and chlorophyll-a, within a temporally consistent timeframe of synoptic sampling events.

This proposed guideline will be used to empirically assess relative spatial variations in water quality in given waterbodies over a given time period and to establish modeling benchmarks against which impacts of future load allocations can be assessed. Thus, the proposed guideline is an assessment tool and a vehicle for setting rational load allocations, rather than a standard in the regulatory sense.

To optimize eelgrass habitat and preserve water quality in eelgrass habitat areas, a more stringent total nitrogen criterion of 0.4 mg/l is recommended for shallow estuary waters (three meters or less). This recommendation is based on the relationships between mean summer nitrogen, chlorophyll-a, and light extinction (Kd) for the 1994-96 period of the "expanded" SCDHS monitoring program and model verification period, coupled with an analysis of water quality in relation to SAV beds delineated in a 1994 survey (Cashin Associates). Other recommended habitat criteria include Kd (0.75 +/- 0.05 m^{-1}), and chlorophyll-a (5.5 +/- 0.5 µg/l), which are modest refinements to guidelines recommended in the LISS. A detailed discussion of the methodology and conclusions of the SAV

evaluation are contained in the SCDHS *Peconic Estuary Surface Water Quality* (1998) report. The SAV analysis also provided preliminary guidance to PEP natural resources programs, such as the SAV Long-Term Monitoring Program (Cornell Cooperative Extension) and the Eelgrass Habitat Criteria Study (EEA, Inc., 1999), which is providing more detailed guidance on SAV habitat criteria. These proposed criteria are based on the fact that lower nutrient levels clearly relate to greater water column light penetration, an important factor for eelgrass, which needs adequate light to survive.

For the time being, these criteria are being proposed as "interim" criteria because the scientific community has not come to consensus regarding the causal factors related to eelgrass decline. Substantial additional data from ongoing studies will be available soon. When coupled with the expanded SCDHS monitoring program, with additional sites at eelgrass beds and additional years of data, a more exhaustive analysis will be performed for developing SAV habitat criteria.

OVERALL QUALITY AND USE IMPAIRMENTS

Based on the recommended total nitrogen guideline of 0.45 mg/l, the PEP Management Conference has developed a water quality hierarchy to describe use impairments and recommend management measures for waterbodies within the Peconic Estuary System (see **Table 3-2**). This hierarchy includes "mitigation priority" waters, "stressed/threatened" waters, and "preservation priority" waters. The water quality hierarchy can be used to better channel resources for best management practices and other land use and pollution control programs and can assist in review and prioritization of potential implementation projects. It can also be used in numerous other programs, such as the State Environmental Quality Review Act, whereby all applications to undertake, fund, or approve an action must undergo rigorous environmental review prior to approval.

The PEP Management Conference's adoption of the hierarchy has important implications. However, the hierarchy does not imply prioritization among categories. That is, funding for mitigation for Flanders Bay is not presumptively a higher priority than preservation efforts in eastern waters.

Mitigation Priority Waters

In relatively small areas of the estuary, particularly the tidal Peconic River and Flanders Bay (the "western estuary"), Meetinghouse Creek, and East Creek/Riverhead, nitrogen levels need to be reduced to optimize DO conditions. These waters are characterized by substantial violations of the proposed total nitrogen guideline for mean summer conditions. There are also frequent and sometimes "serious" DO standard violations in surface samples. These are extremely small areas, making up far less than one percent of the estuary's surface waters (see **Table 3-2**).

Management considerations for these waters include mitigation to alleviate these frequent and sometimes serious DO problems. TMDLs are prescribed by Section 303(d) of the Clean Water Act for surface waters not attaining water quality standards. Based on the conditions in mitigation priority waters, a Clean Water Act Section 303(d) listing based on not achieving the state dissolved oxygen standard and a TMDL should be considered for the entire Peconic River/Flanders Bay watershed (including subwatersheds for Meetinghouse Creek and East Creek/Riverhead).

Table 3-2. Surface Water Characterization and Management Hierarchy.

	Mitigation Priority Waters	***Stressed/Threatened Waters***	***Preservation Priority Waters***
Waterbodies	*Tidal Peconic River/western Flanders Bay *Meetinghouse Creek *East Creek/Riverhead	*Flanders Bay (Central/East) *West Neck Bay *Sag Harbor *East Creek complex/Southold *Town Creek complex *Northwest Creek	*Presumptively all other waters
TN Guideline Attainment	"Extreme" exceedances (>0.6 mg/l TN)	Exceedances (not "extreme")	Compliance
DO Standard Violation Frequency	Frequent violations (>20% of samples)	Frequent (>20%) or occasional (2-5%) violations for some stations; depressed mean DO for all others.	No more than one violation
DO Standard Violation Severity	Several "serious" violations (below 3.5 & 2 mg/l)	Not "serious" (no DO <3.5 mg/l)	No "serious" violations
Management Implications**	Total Maximum Daily Loads; load reductions***	TN load controls prevent substantial additional loads***	Rational load control targets***

* Based on nitrogen and DO concerns.
** Does not imply management prioritization among three categories.
*** Based on total nitrogen guidelines, modeling results, and cost-effectiveness analysis.

Stressed/Threatened Waters

A small class of waters exists that exhibit marginally "stressed" or "threatened" characteristics with respect to nitrogen and dissolved oxygen concentrations. These waters include:

- West Neck Bay
- Central/Eastern Flanders Bay
- East Creek complex/Southold
- Town Creek complex
- Sag Harbor
- Northwest Creek

These waters are characterized by modest violations of the proposed total nitrogen guideline for mean summer conditions, and "occasional" but no "serious" DO standard violations for surface samples for many of the stations (see **Table 3-2**).

Management considerations include mitigation to reduce nitrogen and ensure optimal DO conditions, and nitrogen reduction controls should be considered and implemented where cost-effective. Neither a Clean Water Act 303(d) listing nor a TMDL establishment is recommended for these waters at this time. However, the subwatersheds to the waterbodies should be the particular focus of load control strategies, with specific load targets developed.

Preservation Priority Waters

Preservation priority waters include all waters of the Peconic Estuary System not listed as mitigation priority or stressed/threatened waters above. These waters are in compliance with total nitrogen guidelines and exhibit no more than one DO violation and have no "serious" DO violations. Because surface water quality conditions with respect to DO (and related nitrogen) are generally excellent in the Peconic Estuary, much of the estuary falls within this classification. The New York State DO standard of five mg/l is consistently attained in greater than 97 percent of the estuary (see **Table 3-2**).

Recommended management considerations for these waters are that mitigation and nitrogen reduction controls are appropriate where demonstrated to be cost-effective, especially when multiple benefits will accrue (coliforms, toxics, habitat, etc.). Cost-effective preservation also is needed to prevent degradation so that nitrogen levels are maintained at their current levels. In these "preservation priority" waters, model results will be especially critical in evaluating results of best-case and worst-case management scenarios, as well as very discrete management plans.

Even though some of the estuary's waterbody segments are clearly more enriched than others with respect to nitrogen, most have not demonstrated obvious and acute impairments with respect to conventional dissolved oxygen, such as fish kills. This does not mean, of course, that subtle, long-term ecosystem changes have not occurred due to nitrogen enrichment.

MANAGEMENT STRATEGY

An overarching PEP management principle is to support management decisions based on comprehensive, site-specific studies (monitoring, modeling, land use, etc.) for the main bays and main watershed, as well as in subwatersheds such as West Neck Bay, Sag Harbor, and Meetinghouse Creek. Increasing emphasis is also being placed on linkages with living resource issues, such as submerged aquatic vegetation.

Already, a point source total nitrogen freeze has been implemented for the western estuary (Peconic River and Flanders Bay). Major sewage treatment plant upgrades at Riverhead and Sag Harbor have been funded, in large part, by New York State, two examples of numerous demonstration and early implementation actions.

Overall, the PEP management strategy is based on three distinct, but related, approaches:

- Optimize pre-existing and emerging management programs;
- Provide additional local characterizations, applying water quality and pollutant load assessments; and,
- Utilize the surface water model and economic valuation and financing tools to develop and implement a total nitrogen load allocation strategy for the entire estuary.

The load control strategy includes a recommendation to pursue a Clean Water Act Section 303(d) listing and a TMDL for the Peconic River and Flanders Bay, and a non-regulatory total nitrogen load allocation for the areas east of Flanders Bay. The load reductions targeted for the western estuary appear feasible for nonpoint sources (the primary nitrogen inputs), since only modest increases in the western estuary are likely (13 percent increase maximum) under full build-out over a manageable area. The need for "water quality preservation" in the eastern estuary is highlighted, since greater nitrogen load increases are likely (greater than 20 percent increase) over a much larger area at full build-out.

These approaches are designed to achieve the following goals (based on 1994-96 model calibration conditions):

- Attain 0.45 mg/l TN guideline in all waters, to ensure that the New York State DO standard (5 mg/l) is maintained at all times, thereby minimizing potential adverse impacts to marine life;
- Attain 0.4 mg/l shallow water TN criterion, where feasible and cost-effective, to optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat; and,
- Implement the "preservation policy" in waters east of Flanders Bay, to prevent degradation and maintain nitrogen levels at their current concentrations, where water quality meets or exceeds established standards, criteria, or guidelines.

Existing and Emerging Management Programs

In addition to the programs noted above, including sewage treatment plant upgrades and a point source nitrogen freeze update, several other programs are critical to nitrogen management. As discussed above, perhaps the most prominent is open space preservation, which continues to protect not only drinking water, but also estuarine water quality (see **Figure 3-14**). Funding available for open space acquisition and farmland preservation along the East End has risen dramatically in recent years. A substantial part of a pool of funding totaling $361 million could be available, largely for the Suffolk County East End (see **Chapter 9**). Aggressive continuation of open space programs will be a critical aspect of CCMP implementation.

Important regulatory programs discussed in this chapter include the Pine Barrens Program, the East Hampton Harbor Protection Overlay District, the State Environmental Quality Review Act (SEQRA), and the Suffolk County Planning Commission review process.

The Pine Barrens Program has resulted in ensuring the preservation of over 2,000 acres in the Peconic River corridor in their natural state. Were it not for this program, potential additional nitrogen loading to the estuary would be substantial.

A program which occurred during the formative years of the PEP is the Harbor Protection Overlay District in East Hampton Town. This program has instituted several key land management and pollution control measures in areas contributing groundwater and stormwater runoff from all coastal properties in the Town of East Hampton. These include sanitary system upgrades, clearing restrictions, and stormwater containment requirements for structures and driveways.

The SEQRA requires special environmental assessments prior to undertaking, funding, or approving certain types of actions. Most new development and pollution control actions are subject to SEQRA. PEP recommendations and actions will be important factors for State and local agencies that undertake, fund, and review projects.

The Suffolk County Planning Commission is a regional commission that reviews several types of land development applications and plans, including those occurring within 500 feet of the shoreline. An adverse determination by the Commission can only be overridden by a supermajority of the approving town board. Thus, consideration of PEP recommendations and actions by the Commission is an excellent mechanism for CCMP implementation for nearshore areas.

Several other programs with nitrogen implications are ongoing. These include river and wetlands preservation programs including the Wild, Scenic and Recreational Rivers statute and regulations (6 NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608). These regulations can mitigate nitrogen loads by minimizing stormwater runoff and improving denitrification and uptake. With regard to local government, upzoning efforts, wetland restrictions, clearing restrictions, and clustering requirements have resulted in a much lower pollutant loading potential.

In addition to future funding for proposed and ongoing management programs, a total of over $11 million in Federal and State funds has already been dedicated to performing 55 priority demonstration/implementation projects identified by the PEP. Early nutrient action projects include sewage treatment facility upgrades in Riverhead and Sag Harbor and improved waste treatment systems at the Corwin Duck Farm. Public education and outreach initiatives, an Agricultural Environmental Management (AEM) Initiative, and Clean Water Act Section 319 (Nonpoint Source Management Program) projects are also key components of the management program.

Numerous non-regulatory efforts also have been targeted at nitrogen controls. Perhaps the most prominent of these are public education and outreach initiatives directed at stakeholders such as residential homeowners, tourists, youth groups, and small business owners. These efforts are described in the Public Education and Outreach chapter of this Management Plan. Best management practices (BMPs) are yet another important component of the PEP approach. With respect to residences and commercial and industrial uses, the PEP has developed a draft *Nonpoint Source Inventory* of local programs, which is being translated into management actions. A large part of the process is review and implementation of Section 6217(g) management measures and practices identified as part of the Coastal Zone Act Reauthorization Amendments of 1990.

Additional Planning and Management Based on PEP Characterizations

The characterization-based management strategies are discussed in the preceding sections. These include a marine surface water total nitrogen (TN) "guideline" (0.45 mg/l) for DO management purposes. Based on that guideline, this CCMP identifies a surface water quality "hierarchy" which can immediately be used in resource allocation and planning efforts and in other programs involving environmental review. The PEP is recommending a presumptively even split for funding of preservation and mitigation efforts (50 percent for preservation, 50 percent for mitigation).

An even more stringent "shallow water criterion" of 0.4 mg/l TN is proposed for the shallow waters (waters three meters deep or less) of the estuary to optimize eelgrass habitat. This is an interim

criterion, subject to interpretation of ongoing modeling efforts and submerged aquatic vegetation studies.

Based on nitrogen loading evaluations, the PEP has determined that management of existing residential and agricultural lands is a priority. Sanitary system and fertilizer actions are emphasized accordingly. For proposed new development, residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. New industrial and commercial development is an issue prominent mainly in the western estuary, particularly in Riverhead Town.

Modeling and Nitrogen Loading Workgroups

Based on the overall TN guideline, the TN shallow water criterion, and water quality preservation policy, the PEP will establish a total nitrogen loading goal for the entire watershed, based in large part on the results of state-of-the-art surface water modeling of various management alternatives. This model will allow evaluation of future water quality conditions, as compared with current conditions and recommended guidelines and criteria.

Economic consultant data on resource benefits, implementation costs, and financing will be important components of the process. Subwatersheds for stressed/threatened waterbodies will also be the focus of particular planning attention.

Because of the need to accelerate the quantitative nitrogen management process, a short-term, focused set of work groups is recommended, as shown in **Figure 3-22**. These work groups are addressing priority management issues by applying PEP modeling and assessment tools in relation to existing and emerging programs. The goal is to set quantitative loading targets and detailed plans for load management (timing, costs, parties, etc.). Work group members include representatives from the PEP Management Conference as well as Federal, state, and local agency representatives. The work groups convened in September 1999. Each work group will produce a strategy that will lay out the steps and timeframe for setting nitrogen load controls

Lead parties for the work groups will be integrally involved in PEP activities. Therefore, there will be close coordination with other efforts, such as critical natural resource area management and monitoring. The work group leaders will be in close contact with each other, so that all initiatives are coordinated.

The Agricultural Work Group is charged with refining existing agricultural nitrogen loading estimates and developing an implementation plan for regional nitrogen load reductions. This effort includes expanding the Agricultural Environmental Management (AEM) Initiative and considering “Purchase of Development Rights” links to farm management plans.

To date, the Agricultural Work Group has made significant progress towards their goals, including producing agricultural use GIS maps, and determining the nitrogen loading rates and estimates of potential reductions for specific crops. The Work Group has produced an Agricultural Environmental Management Strategy, located in **Appendix H**.

An ambitious Agricultural Environmental Management (AEM) Initiative program has been piloted in the Peconic Estuary. Using the AEM approach, a comprehensive inventory and analysis was conducted for all farms within one sub-watershed to assess the potential impact the farms may have on that part of the Peconic Estuary and shallow aquifer. Plans were developed for a total of 13 farms

within the sub-watershed and high priority BMPs were implemented. This program will be a model for agricultural environmental management at farms throughout the study area.

The focus of the Non-Agricultural Work Group includes both existing and prospective nitrogen loading. For existing loads, the emphasis is on residential uses and BMPs as well as other programs (primarily dealing with fertilizer and sanitary waste). For prospective loads, the Non-Agricultural Work Group will focus on residential uses. Efforts will be directed at land management strategies, including zoning, clustering, clearing restrictions, and model ordinances. This group will address nutrient loadings on publicly held land as well as on private/commercial properties, such as golf courses.

The West Estuary TMDL Work Group is addressing the TMDL process. This process includes refining the loading analysis for the western Peconic River and will consider the costs and benefits of developing a separate model for the freshwater portion of the river. Finally, industrial and commercial planning analysis for the Peconic River watershed will be a crucial component of the work group's efforts.

Each of the work groups will be developing and evaluating a range of options and considering costs and benefits. The surface water model will be used to help assess benefits of the management actions.

In the Agricultural Environmental Management Strategy, the Agricultural Work Group strongly recommends that the following tasks be pursued:

Task I *Develop a Long Island component to the New York State Agricultural Environmental Management (AEM) program;*

Task II *Identify potential pilot projects to demonstrate Best Management Practices and test them, where appropriate;*

Task III *Investigate the creation of a farm insurance plan;*

Task IV *Provide funding for increased local AEM development and implementation;*

Task V *Investigate and implement innovative/ alternative finance mechanisms for education and outreach and other tasks noted above; and,*

Task VI *Gather and analyze economic data on a regular basis and continue to promote and integrate economic analyses and support mechanisms into the AEM initiatives.*

MANAGEMENT ACTIONS

A number of important completed actions and accepted policies, as well as new proposed solutions to nutrient-related issues, are included in the nutrients action plan. These include adoption of the water quality hierarchy, endorsement of the nitrogen management work group process, and early commitments to freeze point source nitrogen loading to the western estuary. The actions also reflect major commitments to sewage treatment plant upgrades at Riverhead Town (approximately 85 percent of a $7 million project to be funded through NYS Clean Water/Clean Air Bond) and Sag Harbor (at least $500,000 in NYS Clean Water/Clean Air Bond Act funds for a $2 million project), as well as wastewater treatment enhancements at the Corwin Duck Farm (more than $270,000 in EPA and NYSDEC funding). The following actions include only the key PEP management recommendations and actions which require additional follow-up attention, commitments, actions, or time to complete.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

To minimize actions that require tracking, the PEP has not placed "completed" actions accomplished in early implementation actions in the following discussion and table.

NUTRIENTS MANAGEMENT ACTIONS

N-1. Continue to Use and Refine Water Quality Standards and Guidelines.

N-2. Preserve Water Quality East of Flanders Bay.

N-3. Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary.

N-4. Control Point Source Discharges from STPs and Other Dischargers.

N-5. Implement Nonpoint Source Control Plans.

N-6. Use Land Use Planning to Control Nitrogen Loading Associated with New Development.

N-7. Ensure that Funding Is Distributed Evenly Between Preservation and Mitigation Projects.

N-8. Integrate PEP Recommendations into Other Programs.

N-9. Sponsor and Coordinate Research and Information Gathering.

N-10. Monitor Conditions within the Estuary System to Determine the Effectiveness of Management Strategies.

N-1. Continue to Use and Refine Water Quality Standards and Guidelines.

Addresses Nutrients Management Objectives 1, 2, 3 and 6.

New York State has not adopted a general water quality standard for nitrogen. However, the NYSDEC has adopted a marine surface water total nitrogen guideline for the Peconic River/Flanders Bay of 0.5 mg/l based on 1988-90 conditions. This guideline forms the basis for the "no net increase" discharge policy for point sources of nitrogen in the western estuary.

One basis for the nitrogen criteria is achieving State dissolved oxygen standards. EPA is revising its criteria recommendations for dissolved oxygen in marine waters. The State and PEP will be evaluating EPA's criteria once proposed and issued. Any revision to the State standard for dissolved oxygen may affect future PEP recommendations for total nitrogen criteria.

For dissolved oxygen management, this action recommends evaluation of a modification of the NYSDEC's total nitrogen guideline to 0.45 mg/l, based on 1994-96 data. This guideline is exceeded in tidal portions of the Peconic River and western and central Flanders Bay and a few peripheral embayments. The total nitrogen guideline will be used as an assessment tool to screen relative water quality in various bays in relation to dissolved oxygen conditions for a given time period, a benchmark against which to evaluate model management alternative runs, and to evaluate the need to develop a TMDL under the Clean Water Act.

To optimize eelgrass habitat and preserve water quality in eelgrass habitat areas, a more stringent total nitrogen criterion of 0.4 mg/l is recommended for shallow estuary waters (three meters or less). The LISS eelgrass habitat criteria values were provisionally adopted as working guidelines for developing this criterion. A preliminary SCDHS analysis of mean seasonal water quality parameters and light extinction (Kd) with respect to existing SAV beds further refined the LISS parameters for the Peconic Estuary. Based on this analysis, the following criteria are proposed as working criteria for optimizing eelgrass habitat: Kd: 0.75 ± 0.05 (m^{-1}); chlorophyll-a: 5.5 ± 0.5 (µg/l); and TN: 0.4 (mg/l) (for "shallow waters," three meters deep or less). These proposed criteria are based on the fact that lower nutrient levels clearly relate to greater water column light penetration, an important factor for eelgrass, which needs adequate light to survive.

The shallow water criteria are particularly important for the eastern estuary, due to the potential for optimizing eelgrass habitat, as well as the opportunity for preservation of water quality in those areas. The costs and benefits of nitrogen reductions for the relatively small areas that exceed the more stringent 0.4 mg/l TN criterion will be carefully examined based on the results of ongoing studies.

For the time being, the shallow water criteria are being proposed as "interim" criteria because the scientific community has not come to consensus regarding the causal factors related to eelgrass decline. Substantial additional data from the SAV Long-Term Monitoring Program (Cornell Cooperative Extension) and the Eelgrass Habitat Criteria Study (EEA, Inc., 1999) will be synthesized shortly. When coupled with the expanded SCDHS monitoring program, with additional sites at eelgrass beds and additional years of data, a more exhaustive analysis will be performed to refine the "interim" criteria.

Steps

N-1.1 **Priority** Integrate monitoring and modeling data, studies, and reports to evaluate the application of the 0.45 mg/l total nitrogen guideline to the Peconic Estuary as a means of attaining and maintaining dissolved oxygen standards and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment, to attain and maintain the dissolved oxygen standard.

N-1.2 **Priority** Integrate monitoring and modeling data, studies, and reports to evaluate the use of the recommended 0.4 mg/l total nitrogen guideline for the shallow waters of the estuary to optimize eelgrass habitats and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment.

N-1.3 Review and revise as appropriate the marine dissolved oxygen standards based on LISS efforts to develop area-specific dissolved oxygen targets and EPA efforts to develop dissolved oxygen criteria for marine waters.

Responsible Entities

N-1.1 PEP Management Conference (lead), NYSDEC, SCDHS, and Contractor Tetra-Tech, Inc.

N-1.2 PEP Management Conference (lead), NYSDEC, SCDHS, and Contractor Tetra-Tech, Inc.

N-1.3 NYSDEC

N-2 Preserve Water Quality East of Flanders Bay.

Addresses Nutrients Management Objectives 4 and 6.

Eastern estuary waters (east of Flanders Bay) are of high quality. Preservation plans are needed to prevent degradation so these waters are maintained at their current high level of water quality. Therefore, in areas east of Flanders Bay, including embayments, water quality that meets or exceeds water quality standards, criteria, or guidelines should be maintained.

Preservation plans will be developed based on the nitrogen criteria guidelines discussed above and the recommendations of the nitrogen loading work groups.

Steps

N-2.1 **Priority** Develop and implement water quality preservation plans to protect existing water quality for waters east of Flanders Bay where water quality meets or exceeds established standards, criteria, or guidelines. Plans should address potential point and nonpoint pollutant sources as well as strategies for preventing and/or mitigating impacts.

Responsible Entities

N-2.1 NYSDEC, SCDHS (co-leads), EPA, SCPD, PEP Management Conference, and Towns

N-3 Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary.

Addresses Nutrients Management Objectives 1, 2, 4, 5 and 6.

Under the Federal Clean Water Act Section 303(d), States must estimate load allocations for point and nonpoint source pollutants for waterbodies that do not meet their designated uses. TMDLs are detailed technical water quality assessments, which determine the maximum amount of a given pollutant a waterbody can assimilate while still meeting water quality standards for designated uses.

The State will be evaluating data to determine waters of the Peconic system that should be included on the State's 2002 303(d) list submittal for violations/exceedances of the New York State dissolved oxygen criterion. The State will establish a schedule for the development of TMDLs for waterbody segments, if any, included on that list. This schedule will take into account the status of the PEP water quality computer model and any revisions to the State's water quality standard for dissolved oxygen (see Action N-1.1). The computer model, once calibrated and verified, will be used to evaluate management alternatives for point source and nonpoint source controls. The State will then develop a TMDL for any waterbodies listed on the 303(d) list and associated wasteload allocations for point sources and loading allocations for nonpoint sources.

A formal regulatory TMDL is not recommended for waters not included on the 303(d) list at this time. However, in the future, the PEP will establish a total nitrogen loading goal for the entire watershed, based on modeling results and nitrogen guidelines.

A variety of computer modeling exercises can be used to determine appropriate management actions for the estuary. For example, the PEP Hydrodynamic and Eutrophication Model will be a key tool in developing a nitrogen load control target for the overall estuary.

The surface water computer model can be used to evaluate management alternatives for land use and pollution control. The approach is to initially run "coarse" (best and worst-case runs) management alternatives. The results will be evaluated against the water quality guidelines currently in use. More detailed management alternatives will be developed to provide more specific guidance for regional load targets. These will include land use and pollution control alternatives and other management measures, such as reversing the Shinnecock Canal flow regimen. Once completed, options for load reductions, such as advanced treatment and outfall relocation in the case of a STP, can be evaluated, as well as the significance of atmospheric deposition as a source of nitrogen to the estuary.

United States Geological Survey (USGS) embayment modeling for West Neck Bay, Sag Harbor, and Meetinghouse Creek is complete, and the USGS is performing a North Fork modeling study. USGS seismic reflection work for Flanders Bay was completed this past summer and they are currently analyzing the data. A Camp, Dresser and McKee regional groundwater model, which will include the North and South Forks and Shelter Island, is ongoing. Results from these modeling efforts will need to be incorporated in PEP characterization, modeling, and management activities.

Steps

N-3.1 **Priority** Initiate the development of load allocation targets and implementation strategies for nitrogen loading to the entire estuary, with particular emphasis on subwatersheds for peripheral creeks and embayments (*e.g.*, Meetinghouse Creek, West Neck Bay, and Sag Harbor). Any subsequent Clean Water Act Section 303(d) listing and Total Maximum Daily Load (TMDL) established for the "western estuary," the Peconic River/Flanders Bay area (see following actions) can incorporate these interim steps. These load allocation targets will be based on surface water nitrogen guideline attainment. In addition, the appropriate Nitrogen Management Work Groups and the Management Committee, will evaluate nonpoint source pollution effects on groundwater quality, coupled with groundwater impacts on the surface water nitrogen guideline, and will thereby consider the viability of subregional groundwater quality targets as a means to protect surface water quality.

N-3.2 **Priority** Review all PEP data to identify water segments to be included in New York State's 2002 303(d) list.

N-3.3 **Priority** Establish schedule for development of TMDL for Peconic River/Flanders Bay segments included on 303(d) list based on completion of water quality model and adoption of revised dissolved oxygen standard.

N-3.4 Complete calibration and verification of hydrodynamic and eutrophication models to evaluate management alternatives for TMDL land use and pollution control.

N-3.5 Use PEP hydrodynamic and eutrophication models to evaluate management alternatives.

N-3.6 Develop, as appropriate, TMDL/wasteload allocation and load allocation for Peconic River and Flanders Bay watershed.

N-3.7 Evaluate the need for additional assessment and modeling to evaluate issues such as sedimentary denitrification.

Responsible Entities

N-3.1 Suffolk County with NYSDEC, Towns, and Nitrogen Management Work Groups

N-3.2 NYSDEC

N-3.3 NYSDEC

N-3.4 PEP

N-3.5 PEP

N-3.6 NYSDEC

N-3.7 PEP

N-4 Control Point Source Discharges from STPs and Other Dischargers.

Addresses Nutrients Management Objectives 1, 2, and 6.

Any new or incremental increases in point source nitrogen loading to surface waters should be prohibited if the discharge is to surface waters in the environmentally stressed region of the tidal Peconic River and western Flanders Bay. The surface water point source nitrogen freeze applies to all facilities, including the sewage treatment plants at Brookhaven National Laboratory and the former Grumman plant. Throughout the entire Peconic River groundwater-contributing area, any substantial new or incremental point source nitrogen loading should be limited if it discharges to surface waters. Substantial groundwater degradation, which adversely affects surface waters, should also be limited. This means that new groundwater-discharging sewage treatment plants in the Peconic River groundwater-contributing area generally should be carefully scrutinized.

As a long-range management goal, upgrades to the Riverhead STP (above and beyond those funded by the NYS Clean Water/Clean Air Bond Act) should be evaluated with respect to attainment of the surface water quality total nitrogen guideline of 0.45 mg/l. Such evaluations can be performed through modeling and nitrogen management work group assessments.

Long-range Riverhead STP upgrades could be in the form of a groundwater discharge (10 mg/l total nitrogen, using conventional denitrification), a relocated surface water discharge at central or eastern Flanders Bay (approximately 25 mg/l total nitrogen, the current discharge concentration), or a surface water discharge at the existing location (approximately four mg/l total nitrogen, using advanced denitrification); environmental impacts of these and other alternatives would require assessment before selection. Beneficial reuse of treated wastewater (*i.e.*, application on agricultural land**,** golf courses, or soccer fields, including seasonal application) should also be evaluated.

Recommendations and actions regarding groundwater discharges and the Riverhead STP will be consistent with any TMDL work and Clean Water Act section 303(d) listing (see Action N-3).

Steps

N-4.1 Evaluate the appropriateness of applying for a “Discharge Restriction Category” to prevent new nitrogen discharges from point sources in the Peconic River and the western portion of the Peconic Estuary.

N-4.2 Ensure continued implementation of the “no-net increase” policy for nitrogen loading from point sources to surface waters of the western estuary.

N-4.3 Determine the necessity of decreasing nitrogen loads from the Riverhead STP and other permitted discharges and develop nitrogen loading limits as needed to meet the site-specific nitrogen guideline and to protect against DO standard violations, based on TMDL work. (See Action N-3.5.)

N-4.4 Consider a groundwater application of the point source nitrogen freeze in the Peconic River/Flanders Bay watershed, (currently applied only to surface water discharges), based upon Nitrogen Management Work Group recommendations and TMDL work. (See Actions N-3.1 and N-3.5.)

N-4.5 Upgrade the Sag Harbor Sewage Treatment Plant and continue to monitor and model Sag Harbor Cove to assess impacts and track effectiveness of implementation.

N-4.6 Evaluate and consider implementing a beneficial reuse program where reclaimed STP water and/or sludge could be used on selected golf courses, playing fields, and farms.

Responsible Entities

N-4.1 SCDHS (lead for nomination) and PEP

N-4.2 NYSDEC (lead) and PEP

N-4.3 NYSDEC (lead) and PEP Management Conference

N-4.4 PEP (lead)

N-4.5 Sag Harbor Village, NYSDEC (co-leads), SCDHS (lead for monitoring), and PEP

N-4.6 SCDHS and NYSDEC (co-leads)

N-5 Implement Nonpoint Source Control Plans.

Addresses Nutrients Management Objectives 2, 4, and 6.

Many nonpoint sources contribute nutrients to the estuary system, including on-site disposal systems (cesspools or septic systems), domestic fertilizer use, agricultural fertilizer applications, and stormwater runoff. Section 6217(g) of the Coastal Zone Act Reauthorization Amendments (CZARA) requires States to develop management measures to address nonpoint sources of pollutants in coastal areas. In accordance with Section 6217(g), the PEP should ensure that appropriate nonpoint source control plans are developed for each nonpoint source category that the PEP identifies as contributing significantly to adverse ecosystem impacts (marinas/boating are addressed in the pathogens module). The control plan will include, but will not be limited to, identification and assessment of management practices and ways to implement the appropriate practices. In addition, the plan will determine whether the control measures are adequate to solve water quality problems and will identify additional control measures that may be necessary. The PEP will utilize the Base Program Analysis, Nonpoint Source Management Plan Inventory (PEP, 1995), in conjunction with the nitrogen management work group process to complete this action.

Substantial degradation of existing groundwater quality should be prevented, especially in the Peconic River area. On-site disposal systems or sanitary systems/cesspools, along with fertilizer applications, contribute most of the locally derived anthropogenic nitrogen load to the Peconic estuary.

A number of BMPs, restrictions, and incentives can be used to target nitrogen reduction from these nonpoint sources.

Mechanisms for sanitary system management may include:

- Tax credits (such as for upgrades) and other incentive programs;
- Mandatory system upgrades within defined districts on property transfers or on issuance of building permits for expansion;
- Use of innovative and alternative systems;
- General sanitary system regulation reviews to evaluate possible areas for improvement;
- Best management practices such as the proper and periodic maintenance of sanitary systems; and,
- Use of wastewater management districts or utilities.

The SCDHS already has policies that establish thresholds as to when existing sanitary systems should be upgraded or completely relocated (*e.g.*, when additional habitable area is being added to an existing dwelling as is the case with new bedrooms). In addition, the NYSDEC Region 1 Tidal Wetlands permitting program also applies similar strategies to existing sanitary systems. Consideration should be given to formalizing such policies at all levels of government for programs relevant to the Peconic Estuary.

Mechanisms for fertilizer management may include:

- Tax credits (such as for using native plants in landscaping) and other incentives;
- Restrictions on the sale and/or use of some products (*e.g*., liquid fertilizers);
- Land use management measures;
- Best management practices, such as low maintenance lawns, slow-release fertilizers, modification of fertilizer application rates; and,
- Organic and/or slow-release fertilizers (via a tax on inorganic fertilizers, public relation endorsements of "good" products, educational campaigns for retailers and consumers, etc.).

Agriculture also is a major nonpoint source of nitrogen to the estuary. The Agricultural Work Group has been charged with refining existing agricultural nitrogen loading estimates and developing an implementation plan for regional nitrogen load reductions. This effort will include:

- Expanding the Agricultural Environmental Management (AEM) Initiative;
- Considering "Purchase of Development Rights" links to farm management plans; and,
- Promoting organic farming methods.

Under the ambitious AEM Initiative program piloted in the Peconic Estuary, a comprehensive inventory and analysis was conducted for all the farms within one sub-watershed to assess the potential impact the farms may have on the Peconic Estuary and shallow aquifer. Plans were developed for the 13 farms and high priority BMPs were implemented. This program will be a model for agricultural environmental management at farms throughout the study area.

A recent SCDHS study investigating groundwater impacts entitled *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (1999) has found that the golf courses examined were not having major, adverse environmental impacts with respect to nutrient loading, particularly as compared with traditional row crop farms. The 1999 report documented the testing of 31 wells at 18 Long Island golf courses and found that the average nitrate concentration was 4.3 mg/l (the median nitrate concentration was 2.6 mg/l), which is the equivalent of a housing density of less than one residence per acre. At agricultural sites, the 1999 study found an average nitrate concentration of 11.7 mg/l and the SCDHS 1996 study entitled *Nitrate and Pesticide Impacts of Agriculture on Groundwater Quality Suffolk County, NY* found a 20 year nitrate average of 11.3 mg/l. Turf management practices at golf courses do effectively limit nitrogen inputs, however, monitoring should continue, as should aggressive golf course BMP implementation.

The SCDHS has done a follow-up study this year with an expanded list of analytes and with new monitoring wells at five more golf courses in the county, including Shinnecock, National, and Maidstone. Preliminary data suggest that nitrogen is generally relatively well controlled. The NYSDEC has been funding the monitoring program for three years at about $100,000 per year. The NYSDEC recently agreed to a three-year one million-dollar commitment with the SCDHS to expand the monitoring program.

Stormwater, although not one of the most significant inputs on a regular basis, may be locally important. Therefore, subwatershed management practices should also consider the management of stormwater nitrogen loads.

Steps

N-5.1 Ensure that the Section 6217(g) management measures of CZARA are appropriately implemented, in support of the overall nitrogen management plan.

N-5.2 **Priority** Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to domestic fertilizer use.

N-5.3 **Priority** Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to on-site disposal systems (sanitary systems).

N-5.4 **Priority** Develop a regional implementation plan for agricultural nitrogen load reductions which would include promoting agricultural best management practices, expanding agricultural environmental management (AEM) strategies, and promoting organic farming among other initiatives.

N-5.5 Manage stormwater runoff on a subwatershed basis to control nitrogen inputs.

Responsible Entities

N-5.1 NYDOS (lead), PEP, EPA, NOAA, and Nitrogen Management Work Groups

N-5.2 PEP Management Conference and Nitrogen Management Work Groups

N-5.3 PEP Management Conference and Nitrogen Management Work Groups

N-5.4 Nitrogen Management Work Groups, SCSWCD (co-leads), Cornell Cooperative Extension, and NYSDEC

N-5.5 PEP Management Conference (lead), Consultant Horsley and Witten, Inc., SCDHS, SCPD, and SCSWCD

N-6 Use Land Use Planning to Control Nitrogen Loading Associated with New Development.

Addresses Nutrients Management Objectives 2, 3, and 4.

Fully 40 percent of the Peconic Estuary is still subject to development, posing a substantial potential threat to water quality in the main bays as well as in the embayments. For proposed new development, residential development is the major concern on an estuary-wide basis, particularly in the western estuary and on the South Fork. Under a scenario in which 100 percent of farmland is also preserved, nitrogen loading could increase substantially in every major region of the estuary (see **Figures 3-12** and **3-13**). Overall, a total nitrogen increase for the estuary study area would be near 40 percent (about 41 percent in eastern estuary, and 34 percent in western estuary). In the eastern estuary, the increase on the South Fork would be most profound (over 60 percent).

A number of land use planning measures can be used to minimize surface water quality degradation related to nitrogen loading, including zoning restrictions, development plan review, open space preservation, and use of model ordinances.

The *Brown Tide Comprehensive Assessment Management Plan* and the Peconic Estuary Program *Action Plan* recommended that undeveloped land in unsewered areas of the Peconic River groundwater-contributing area should be upzoned to a minimum of two acres per unit (or its commercial, industrial, or institutional equivalent) where feasible, subject to exceptions where necessary, to attain even more substantial regional nitrogen controls (*e.g.*, "receiving area" and "Compatible Growth Area" parcels necessary to implement the Pine Barrens Land Use Plan). Additional natural resources benefits can be attained by even more stringent land use controls. The Nitrogen Management Work Groups will review coordination between the PEP and the Pine Barrens Plan and will evaluate the degree to which PEP *Action Plan* recommendations have been implemented.

Funding available for open space acquisition and farmland preservation along the East End has risen dramatically in recent years. A substantial part of a pool of funding totaling $361 million could be available, largely for the Suffolk County East End. These funding sources will be invaluable in open space acquisition, which will have important pollution prevention implications.

The public is extremely supportive of farmland preservation, as evidenced by the recent voter-approved farmland preservation programs. Also, the PEP Economic Value Assessment study found that the public was willing to pay more for farmland preservation than several other environmental programs. Thus, the PEP operates under the presumption that farmland preservation goals will be met, and deals with nitrogen loading issues associated with farmland through the Agricultural Nitrogen Management Work Group.

Several model ordinances, such as the Harbor Protection Overlay District and model stormwater runoff ordinances, exist and can be applied to the watershed. Such ordinances need to be coordinated on an interjurisdictional basis to maximize benefits to the estuary.

Steps

N-6.1 Continue and expand aggressive open space preservation programs that protect habitat and living resources, as well as groundwater and surface water quality (see **Chapter 7** for a description of how nitrogen stressed subwatersheds are factored into recommendations).

N-6.2 Evaluate the degree to which the *Brown Tide Comprehensive Assessment Management Plan* and Peconic Estuary Program *Action Plan* land use and zoning recommendations have been implemented.

N-6.3 Encourage evaluation of design alternatives for Pine Barrens credit "receiving area" parcels, (*e.g*., clustering away from the river, clearing limits, turf area restrictions, xeriscaping, etc.), where feasible to minimize nitrogen loading. (Subject to and recognizing the overarching provisions of the Pine Barrens Land Use Plan and New York State Environmental Conservation Law [ECL] Article 57.)

N-6.4 Review the Pine Barrens Land Use Plan "guidelines" (non-binding) for development in the Compatible Growth Area and develop proposals for additional "standards" (binding) for development based on Peconic River water quality protection goals.

N-6.5 Evaluate nitrogen loading impacts when reviewing Core Preservation Area hardship applications.

N-6.6 Ensure that the public acquisition of private, vacant lands in Core Preservation Areas within the Peconic River ground watershed is given high priority.

N-6.7 Utilize the strictest practicable standards when reviewing Peconic River Development Plans (*e.g*., require open space dedications, maximum practicable setbacks from the river, and natural landscaping to eliminate or minimize fertilizer use).

N-6.8 Evaluate the application of model ordinances such as the Harbor Protection Overlay District and model stormwater runoff ordinances.

Responsible Entities

N-6.1 Local governments, Suffolk County, and New York State

N-6.2 SCDHS (lead), NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)

N-6.3 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)

N-6.4 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)

N-6.5 SCDHS, NYSDEC, SCPD, PEP Management Conference, and local governments (to be coordinated with Nitrogen Management Work Group)

N-6.6 SCDHS, NYSDEC, SCPD, local governments (co-leads), and PEP Management Conference (to be coordinated with Nitrogen Management Work Group)

N-6.7 SCDHS, NYSDEC, SCPD, local governments (co-leads), and PEP Management Conference (to be coordinated with Nitrogen Management Work Group)

N-6.8 PEP Management Conference and Local Government Committee

N-7 Ensure that Funding is Distributed Evenly Between Preservation and Mitigation Projects.

Addresses Nutrients Management Objectives 2, 3, and 4.

The PEP is recommending a presumptively even split for funding of preservation and mitigation efforts (50 percent for preservation, 50 percent for mitigation). This is subject to feasibility within given programs, and would apply in the absence of detailed cost-benefit analyses, which would indicate other appropriate allocations.

Steps

N-7.1 **Priority** Evaluate programs in which a 50/50 split for funding of preservation and mitigation efforts can be applied (*e.g.*, Section 319 Nonpoint Source Implementation; NYS Clean Water/Clean Air Bond Act) and determine mechanisms for its implementation.

Responsible Entity

N-7.1 PEP Management Conference

N-8 Integrate PEP Recommendations into Other Programs.

Addresses Nutrients Management Objectives 1, 2, 3, 4, and 5.

Many regulatory and nonregulatory programs, such as the Pine Barrens Program, the East Hampton Harbor Protection Overlay District, the State Environmental Quality Review Act (SEQRA), and the Suffolk County Planning Commission review process may be important mechanisms for implementation of PEP recommendations. Some of these programs may need to be reviewed to ensure smooth coordination and determine whether any programmatic changes are needed to improve management of the Peconic Estuary.

Steps

N-8.1 **Priority** Integrate PEP recommendations into existing land use and regulatory programs, including the SEQRA regulations (6NYCRR Part 617), Article 8 of the Environmental Conservation Law, Suffolk County Water Quality Coordinating Committee, Suffolk County Planning Commission and Suffolk County Council on Environmental Quality reviews**,** the Southold Ground Watershed Protection and Water Supply Management Strategy, the Wild, Scenic and Recreational Rivers statute and regulations (6NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608).

Responsible Entities

N-8.1 PEP Management Conference (lead), Nitrogen Management Work Groups, Suffolk County Planning Commission, and NYSDEC

N-9 Sponsor and Coordinate Research and Information Gathering.

Addresses Nutrients Management Objectives 2, 3, 4, and 5.

The National Estuary Program is designed to develop effective management plans based on available or readily obtainable data, using measurable performance indicators such as ambient nitrogen levels, dissolved oxygen and light extinction. However, continued research and information gathering will be needed to evaluate the status of the estuary's water and sediment quality and ecology/living resources, to track the effectiveness of proposed actions, and to run computer modeling programs. Therefore, the PEP long-term monitoring and assessment effort will continue in a coordinated fashion with several other programs. The Brown Tide Research Initiative (see **Chapter 2**) is one key program that will be extremely useful with respect to ecosystem dynamics and nutrient budgets (*e.g.*, sediment nutrient flux). Another program sponsored or supported by the PEP includes the Living Resources Research and Monitoring Plan. Efforts such as this one will help to develop a strategy for assessing linkages between submerged aquatic vegetation habitat criteria and other water quality issues. They will also provide the long-term data necessary to assess subtle individual and synergistic ecosystem impacts, at various trophic levels. The PEP also supports efforts by the Suffolk County Planning Department and others to maintain up to date land use and land cover databases for use in continuing water quality and habitat/living resources assessments. These databases can be used to document trends in land use and land cover and characterize habitat types and pollution loading potential.

Also, PEP modeling has been focused on the estuary. However, the Peconic River itself is a significant freshwater resource well worth investigating and managing. Biological resources and processes, physical modifications (dams), and sedimentation (and possibility for dredging/removal) are all important and related topics. Integrated investigations of the river (nutrients, toxics, radionuclides, etc.) and modeling should be pursued. The PEP will continue to leverage its resources with respect to the River, where possible (*e.g.*, toxic monitoring), and other programs and sources of funding should be sought to expand freshwater investigations and management.

Steps

N-9.1 Continue to sponsor and coordinate research efforts addressing nutrient-related issues.

N-9.2 Establish a PEP land cover initiative to assist in nutrient loading analyses.

N-9.3 **Priority** Update the land use database on a regular basis and prepare a proposal outlining the objectives and needs for a long-term monitoring program.

N-9.4 Continue to integrate atmospheric deposition data into PEP modeling and management activities. Assess how reductions in atmospheric sources through the Clean Air Act will affect nitrogen loadings in the Peconic System.

N-9.5 Continue to incorporate groundwater information in PEP characterization, modeling, and management activities. This includes ongoing groundwater monitoring programs, as well as improvements to modeling.

N-9.6 Continue to incorporate PEP TAC and external peer review in the modeling development and application process, which includes dependent analyses of water quality and pollution input studies. As the model process is completed, continue to solicit and use TAC and external peer review in developing programs and interpreting and applying data.

Responsible Entities

N-9.1 PEP Technical Advisory Committee (TAC) (lead)

N-9.2 PEP Management Conference through contractor (lead) and NYSDOS

N-9.3 SCPD (lead) and PEP Management Conference

N-9.4 PEP (lead) and EPA

N-9.5 PEP Management Conference (lead)

N-9.6 Model Evaluation Group and PEP TAC (co-lead)

N-10 Monitor Conditions Within the Estuary System to Determine the Effectiveness of Management Strategies.

Addresses Nutrients Management Objectives 2, 3, 4, and 5.

Monitoring is critical for measuring water quality and determining the need for continued or expanded management efforts. A number of water monitoring efforts already exist within the Peconic Estuary. One such program monitors environmental conditions at Meetinghouse Creek. Continued monitoring at this site is needed to determine if and when remediation is technologically, economically, and environmentally feasible. The need for additional actions at the Corwin Duck Farm will be evaluated using modeling and nitrogen management work group assessments. Other efforts that are needed include a long-term surface water monitoring program, a triennial surface water quality report from the SCDHS, and the continuation of marine surface water quality monitoring. This last effort should be linked to other efforts, such as eelgrass monitoring.

Steps

N-10.1 Continue monitoring the effectiveness of remedial actions at the Corwin Duck Farm.

N-10.2 Develop and conduct a long-term surface water monitoring program, with input from the PEP TAC.

N-10.3 Issue a biannual update to the SCDHS surface water quality report.

N-10.4 Continue monitoring groundwater impacts of various land uses, such as residences, farms, and golf courses.

Responsible Entities

N-10.1 USDA-NRCS, SCSWCD (co-leads) and Nitrogen Management Work Groups

N-10.2 SCDHS (lead) and PEP

N-10.3 SCDHS (lead)

N-10.4 SCDHS (lead)

BENEFITS OF MANAGEMENT ACTIONS

Because the Peconic Estuary is generally of high quality with respect to dissolved oxygen, the chief benefit will be to prevent substantial degradation to surface water quality, thereby enhancing a healthy (oxygen-rich) marine habitat and promoting species abundance and diversity. Conditions in the stressed western estuary should be improved. Submerged aquatic vegetation habitat may be enhanced, and there could even be beneficial implications with respect to severity and frequency of future Brown Tide blooms.

Surface water model results will be evaluated against the nitrogen guideline as one measure of "benefits," and economic consultant input will be used to determine costs and financing methods. Programs for measuring ecosystem health and potential degradation with respect to submerged aquatic vegetation, benthic community structure, and other issues are being developed by the Habitat and Living Resources Plan. These are long-term programs, and may be helpful in better quantifying benefits of nutrient controls. However, useful results are not likely in the immediately foreseeable future. Moreover, documentation of severe and widespread adverse impacts due solely to nutrients is not likely. Therefore, immediate implementation of rational and cost-effective preservation policies and actions is critical, to avoid the need to document severe adverse impacts and implement more costly mitigation strategies. This is particularly critical, given the fact that about 40 percent of the watershed is subject to development, and development pressures are rapidly accelerating.

COSTS OF MANAGEMENT ACTIONS

Because the Peconic Estuary is generally of high quality with respect to nutrients, many management actions are currently targeted at preservation. Many of these actions rely on optimizing the pre-existing and emerging regulatory and non-regulatory programs discussed above with no immediate additional costs projected.

Costs of key individual management actions, such as sewage treatment plant upgrades and duck farm waste treatment systems, are included with individual management actions discussed in this chapter. Key implementation funding sources are also noted and are discussed in greater detail in the Financing Chapter.

The most important element in developing and implementing regional nitrogen load controls is the nitrogen work group process, which will be integrally coupled with the completion of the surface water modeling and economic value assessment/finance plan efforts. The work group process will be conducted using existing PEP resources.

Several detailed cost estimates could not be completed in time for inclusion. With respect to the Non-Agricultural Work Group, the costs and benefits of a wide variety of regulatory and incentive programs related to fertilizers and sanitary systems will be evaluated. Public input will be crucial in guiding these recommendations and actions. Open space targets and structural mitigation efforts also will be considered. The costs and benefits of additional modeling for the freshwater Peconic River will be evaluated.

The total cost of all actions proposed for nutrient management is $767,500 in new one-time costs and $1,372,500 in new annual costs. This estimate does not include the full estimated costs of

implementing agricultural best management practices. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

NUTRIENTS ACTIONS SUMMARY TABLE

Table 3-3 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed as dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits, and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 3-3. Nutrients Management Plan Actions.

Action		Responsible Entity	Timeframe	Cost	Status
N-1	**Continue to Use and Refine Water Quality Standards and Guidelines.** ***(Objectives 1, 2, 3, and 6)***				
N-1.1 **Priority**	Integrate monitoring and modeling data, studies, and reports to evaluate the application of the 0.45 mg/l total nitrogen guideline to the Peconic Estuary as a means of attaining and maintaining DO standards and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment, to attain and maintain the dissolved oxygen standard.	PEP Management Conference (lead), NYSDEC, SCDHS, Contractor Tetra-Tech, Inc.	2001	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE	C/N
N-1.2 **Priority**	Integrate monitoring and modeling data, studies, and reports to evaluate the use of the recommended 0.4 mg/l total nitrogen guideline for the shallow waters of the estuary to optimize eelgrass habitats and for use in developing regional load allocation strategies, a CWA Section 303(d) listing, and TMDL establishment.	PEP Management Conference (lead), NYSDEC, SCDHS, Contractor Tetra-Tech, Inc.	2001	Included in Step N-1.1	C/N
N-1.3	Review and revise as appropriate the marine DO standards based on LISS efforts to develop area-specific DO targets and EPA efforts to develop DO criteria for marine waters.	NYSDEC	Initiate after release of EPA criteria	NYSDEC – 0.1 FTE	C/N
N-2	**Preserve Water Quality East of Flanders Bay.** ***(Objectives 4 and 6)***				
N-2.1 **Priority**	Develop and implement water quality preservation plans to protect existing water quality for waters east of Flanders Bay where water quality meets or exceeds established standards, criteria, or guidelines. Plans should address potential point and nonpoint pollutant sources as well as strategies for preventing and/or mitigating impacts.	NYSDEC, SCDHS (co-leads), EPA, SCPD, PEP Management Conference, Towns	December 2001	EPA – 0.2 FTE NYSDEC – 0.2 FTE SCDHS – 0.2 FTE SCPD – 0.2 FTE Towns – 0.2 FTE each of five towns	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-3	**Implement a Quantitative Nitrogen Load Allocation Strategy for the Entire Estuary. *(Objectives 1, 2, 4, 5, and 6)***				
N-3.1 **Priority**	Initiate the development of load allocation targets and implementation strategies for nitrogen loading to the entire estuary, with particular emphasis on subwatersheds for peripheral creeks and embayment (*e.g*., Meetinghouse Creek, West Neck Bay, and Sag Harbor). Any subsequent Clean Water Act Section 303(d) listing and Total Maximum Daily Load (TMDL) established for the "western estuary," the Peconic River/Flanders Bay area (see following actions) can incorporate these interim steps. These load allocation targets will be based on surface water nitrogen guideline attainment. In addition, the appropriate Nitrogen Management Work Groups and the Management Committee, will evaluate nonpoint source pollution effects on groundwater quality, coupled with groundwater impacts on the surface water nitrogen guideline, and will thereby consider the viability of subregional groundwater quality targets as a means to protect surface water quality.	Suffolk County with NYSDEC, Towns, Nitrogen Management Workgroups	2000 - 2001 (Nitrogen Management Workgroups convene; 2001 (strategy produced)	Included in Actions N-1 and N-2.	C/N
N-3.2 **Priority**	Review all PEP data to identify water segments to be included in New York State's 2002 303(d) list.	NYSDEC	2001	NYSDEC – 0.05 FTE	C/N
N-3.3 **Priority**	Establish schedule for development of TMDL for Peconic River/Flanders Bay segments included on 303(d) list based on completion of water quality model and adoption of revised dissolved oxygen standard.	NYSDEC	Develop schedule: 2001 Complete TMDL: December, 2002 Implementation schedule: To be determined	Included in Step N-3.2	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-3.4	Complete calibration and verification of hydrodynamic and eutrophication models to evaluate management alternatives for TMDL land use and pollution control.	PEP	2001	(Contractor – part of $225,000 contract)	C/O
N-3.5	Use PEP hydrodynamic and eutrophication models to evaluate management alternatives.	PEP	2001	Included in Actions N-1 and N-2	C/O
N-3.6	Develop, as appropriate, TMDL/wasteload allocation and load allocation for Peconic River and Flanders Bay watershed.	NYSDEC	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Action N-1 and Step N-3.2	C/N
N-3.7	Evaluate the need for additional assessment and modeling to evaluate issues such as sedimentary denitrification.	PEP	2001	Included in Actions N-1 and N-2	C/O
N-4	**Control Point Source Discharges from STPs and Other Dischargers.** ***(Objectives 1, 2, and 6)***				
N-4.1	Evaluate the appropriateness of applying for a "Discharge Restriction Category" to prevent new nitrogen discharges from point sources in the Peconic River and the western portion of the Peconic Estuary.	SCDHS (lead for nomination), PEP	2001	Included in Actions N-1 and N-3	R
N-4.2	Ensure continued implementation of the "no-net increase" policy for nitrogen loading from point sources to surface waters of the western estuary.	NYSDEC (lead), PEP	Ongoing	Included in Actions N-1 and N-2	C/O
N-4.3	Determine the necessity of decreasing nitrogen loads from the Riverhead STP and other permitted discharges and develop nitrogen loading limits as needed to meet the site-specific nitrogen guideline and to protect against DO standard violations, based on TMDL work. (See Action N-3.5.)	NYSDEC (lead), PEP Management Conference	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Actions N-1 and N-3	C/N
N-4.4	Consider a groundwater application of the point source nitrogen freeze in the Peconic River/Flanders Bay watershed, (currently applied only to surface water discharges), based upon Nitrogen Management Work Group recommendations and TMDL work. (See Actions N-3.1 and N-3.5)	PEP (lead)	Contingent upon actions N-1.1, N-3.3, and N-3.4	Included in Actions N-1 and N-3	R

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-4.5	Upgrade the Sag Harbor Sewage Treatment Plant and continue to monitor and model Sag Harbor Cove to assess impacts and track effectiveness of implementation.	Sag Harbor Village, NYSDEC (co-leads), SCDHS (lead for monitoring), PEP	2001	(Implementation: $2 million upgrade, using at least $500,000 in NYS Clean Water/Clean Air Bond Act funds) Monitoring: Base Program	C/O
N-4.6	Evaluate and consider implementing a beneficial reuse program where reclaimed STP water and/or sludge could be used on selected golf courses, playing fields, and farms.	SCDHS, NYSDEC (co-leads)	2001	NYSDEC – 0.1 FTE SCDHS – 0.1 FTE $50,000	R
N-5	**Implement Nonpoint Source Control Plans.** ***(Objectives 2, 4, and 6)***				
N-5.1	Ensure that the Section 6217(g) management measures of CZARA are appropriately implemented, in support of the overall nitrogen management plan.	NYDOS (lead), PEP, EPA, NOAA, Nitrogen Management Work Groups	Ongoing	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE NYSDOS – 0.1 FTE NOAA – 0.1 FTE	C/O
N-5.2 **Priority**	Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to domestic fertilizer use.	PEP Management Conference, Nitrogen Management Work Groups	Strategy: 2001 Implementation: Post-CCMP	Plan Development: EPA – 0.2 FTE NYSDEC – 0.2 FTE SCDHS – 0.2 FTE Implementation: To be determined	C/N
N-5.3 **Priority**	Investigate feasible implementation mechanisms and develop a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to on-site disposal systems (sanitary systems).	PEP Management Conference, Nitrogen Management Work Groups	Strategy: 2001 Implementation: Post-CCMP	Included in Step N-5.2	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-5.4 **Priority**	Develop a regional implementation plan for agricultural nitrogen load reductions which would include promoting agricultural best management practices, expanding agricultural environmental management (AEM) strategies, and promoting organic farming among other initiatives.	Nitrogen Management Work Groups, SCSWCD (co-leads), Cornell Cooperative Extension, NYSDEC	Strategy: December 2000 Implementation: Post-CCMP	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE SCSWCD - $175,000/yr for staff CCE - $175,000/yr for staff $250,000 - $500,000 for program development $1 million annually for implementation, start up	C/N (Strategy) R (Imple-mentation)
N-5.5	Manage stormwater runoff on a subwatershed basis to control nitrogen inputs.	PEP Management Conference (lead), Consultant Horsley and Witten, Inc., SCDHS, SCPD, SCSWCD	Post-CCMP	SCDHS – 0.2 FTE SCPD – 0.2 FTE SCSWCD – 0.2 FTE (Contractor – Part of $191,600 contract (Regional Stormwater Runoff Management Plan and Subwatershed Plan))	R
N-6	**Use Land Use Planning to Control Nitrogen Loading Associated with New Development.** ***(Objectives 2, 3, and 4)***				
N-6.1	Continue and expand aggressive open space preservation programs that protect habitat and living resources, as well as groundwater and surface water quality (see **Chapter 7** for a description of how nitrogen stressed subwatersheds are factored into recommendations).	Local governments, Suffolk County, New York State	Ongoing	(Part of $361 million (sum of 1/4 % sales tax, East End Land Bank, Greenway Fund, and Community Preservation Fund monies))	C/O
N-6.2	Evaluate the degree to which the *Brown Tide Comprehensive Assessment Management Plan* and Peconic Estuary Program *Action Plan* land use and zoning recommendations have been implemented.	SCDHS (lead), NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	2001	Included in Actions N-1, N-2, N-3, and N-5	R

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Table 3-3. Nutrients Management Plan Actions (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-6.3	Encourage evaluation of design alternatives for Pine Barrens credit "receiving area" parcels, (*e.g.*, clustering away from the river, clearing limits, turf area restrictions, xeriscaping, etc.), where feasible to minimize nitrogen loading (Subject to and recognizing the overarching provisions of the Pine Barrens Land Use Plan and New York State Environmental Conservation Law [ECL] Article 57).	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1, N-2, N-3, and N-5	C/O
N-6.4	Review the Pine Barrens Land Use Plan "guidelines" (non-binding) for development in the Compatible Growth Area and develop proposals for additional "standards" (binding) for development based on Peconic River water quality protection goals.	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Post-CCMP	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE SCPD – 0.1 FTE	R
N-6.5	Evaluate nitrogen loading impacts when reviewing Core Preservation Area hardship applications.	SCDHS, NYSDEC, SCPD, PEP Management Conference, local governments (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1 and N-2	C/O

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-6.6	Ensure that the public acquisition of private, vacant lands in Core Preservation Areas within the Peconic River ground watershed are given high priority.	SCDHS, NYSDEC, SCPD, local governments (co-leads), PEP Management Conference (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1 and N-2, and Step N-6.1	R
N-6.7	Utilize the strictest practicable standards when reviewing Peconic River Development Plans (*e.g.*, require open space dedications, maximum practicable setbacks from the river, and natural landscaping to eliminate or minimize fertilizer use).	SCDHS, NYSDEC, SCPD, local governments (co-leads), PEP Management Conference (to be coordinated with Nitrogen Management Work Group)	Ongoing	Included in Actions N-1, N-2, and N-3	R
N-6.8	Evaluate the application of model ordinances such as the Harbor Protection Overlay District and model stormwater runoff ordinances.	PEP Management Conference, Local Government Committee	Post-CCMP	LGC – 0.1 FTE for each town	R
N-7	**Ensure that Funding is Distributed Evenly Between Preservation and Mitigation Projects.** ***(Objectives 2, 3, and 4)***				
N-7.1 **Priority**	Evaluate programs in which a 50/50 split for funding of preservation and mitigation efforts can be applied (*e.g.*, Section 319 Nonpoint Source Implementation; NYS Clean Water/Clean Air Bond Act) and determine mechanisms for its implementation.	PEP Management Conference	Post-CCMP	Base Program	C/N

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-8	**Integrate PEP Recommendations into Other Programs.** ***(Objectives 1, 2, 3, 4, and 5)***				
N-8.1 **Priority**	Integrate PEP recommendations into existing land use and regulatory programs, including the SEQRA regulations (6NYCRR Part 617), Article 8 of the Environmental Conservation Law, Suffolk County Water Quality Coordinating Committee, Suffolk County Planning Commission reviews, the Southold Ground Watershed Protection and Water Supply Management Strategy, the Wild, Scenic and Recreational Rivers statute and regulations (6NYCRR Part 666), the Freshwater Wetlands regulations (6 NYCRR Part 663), the Tidal Wetlands Land Use regulations (6 NYCRR Part 661), and the Protection of Waters regulations (6 NYCRR Part 608).	PEP Management Conference (lead), Nitrogen Management Work Groups, Suffolk County Planning Commission, NYSDEC	Post-CCMP	No new FTEs	R
N-9	**Sponsor and Coordinate Research and Information Gathering.** ***(Objectives 2, 3, 4, and 5)***				
N-9.1	Continue to sponsor and coordinate research efforts addressing nutrient-related issues.	PEP Technical Advisory Committee (TAC) (lead)	Ongoing	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE	C/N
N-9.2	Establish a PEP land cover initiative to assist in nutrient loading analyses.	PEP Management Conference through contractor (lead), NYSDOS	Begun Fall 1999	($75,000 initial effort)	C/O
N-9.3 **Priority**	Update the land use database on a regular basis and prepare a proposal outlining the objectives and needs for a long-term monitoring program.	SCPD (lead), PEP Management Conference	2002	SCPD – 0.2 FTE/yr	R
N-9.4	Continue to integrate atmospheric deposition data into PEP modeling and management activities. Assess how reductions in atmospheric sources through the Clean Air Act will affect nitrogen loadings in the Peconic System.	PEP (lead), EPA	Ongoing	EPA – 0.1 FTE	C/O

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Table 3-3. Nutrients Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
N-9.5	Continue to incorporate groundwater information in PEP characterization, modeling, and management activities. This includes ongoing groundwater monitoring programs, as well as improvements to modeling.	PEP Management Conference (lead)	Ongoing	SCDHS – 0.1 FTE	C/O
N-9.6	Continue to incorporate PEP TAC and external peer review in the modeling development and application process, which includes dependent analyses of water quality and pollution input studies. As the model process is completed, continue to solicit and use TAC and external peer review in developing programs and interpreting and applying data.	Model Evaluation Group, PEP TAC (co-leads)	Ongoing	Included in Actions N-1 and N-3	C/O
N-10	**Monitor Conditions Within the Estuary System to Determine the Effectiveness of Management Strategies.** ***(Objectives 2, 3, 4, and 5)***				
N-10.1	Continue monitoring the effectiveness of remedial actions at the Corwin Duck Farm.	USDA-NRCS, SCSWCD (co-leads), Nitrogen Management Work Groups	Ongoing	USDA-NRCS – 0.05 FTE SCSWCD – 0.05 FTE	C/O
N-10.2	Develop and conduct a long-term surface water monitoring program, with input from the PEP TAC.	SCDHS (lead), PEP	Post-CCMP	See Environmental Monitoring Plan	C/O
N-10.3	Issue a biannual update to the SCDHS surface water quality report.	SCDHS (lead)	Post-CCMP	SCDHS – 0.1 FTE/ year	R
N-10.4	Continue monitoring groundwater impacts of various land uses, such as residences, farms, and golf courses.	SCDHS (lead)	Ongoing	SCDHS – 0.2 FTE	C/O

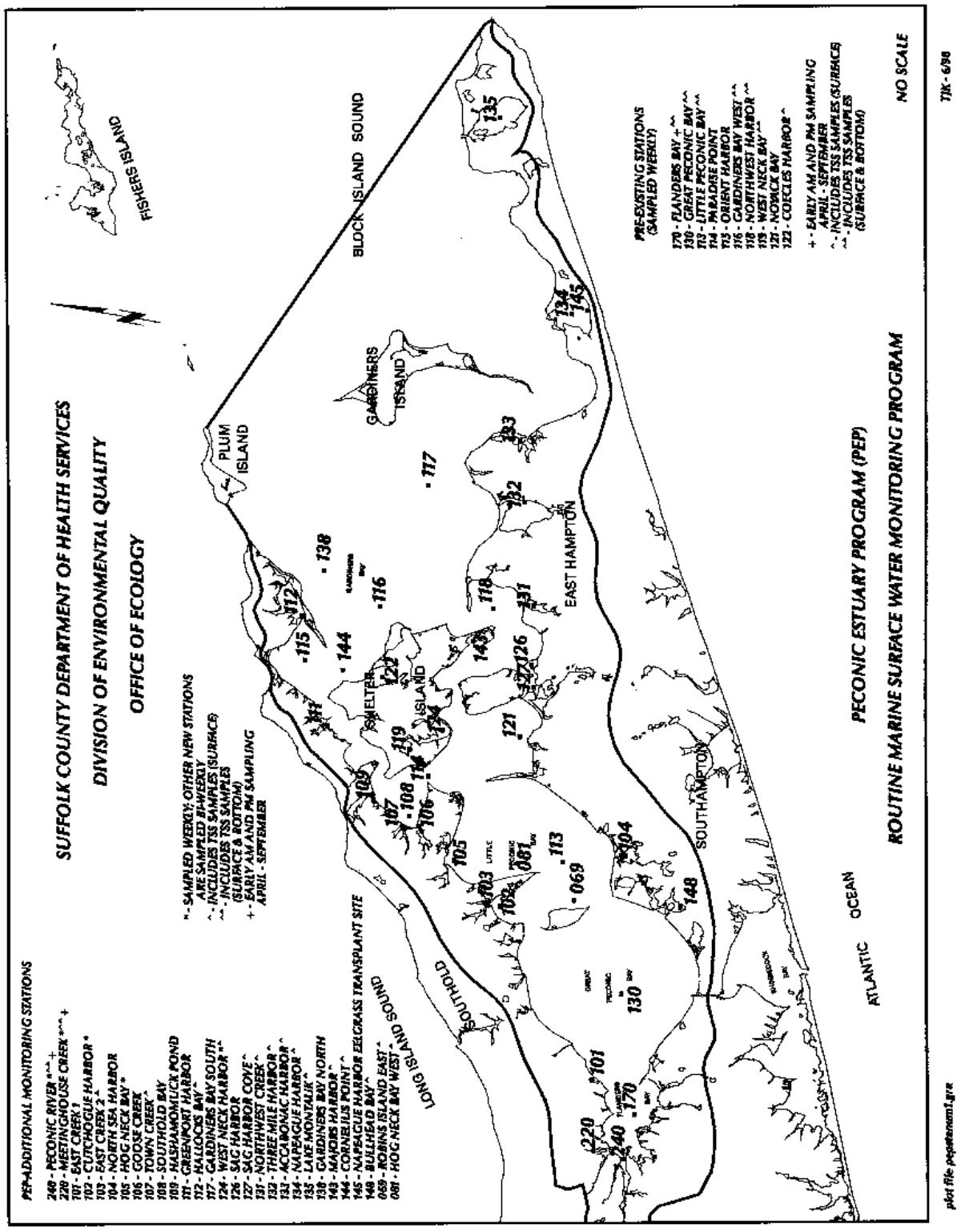


Figure 3-1. Location of Eelgrass Beds & Routine Marine Surface Water Monitoring Stations.

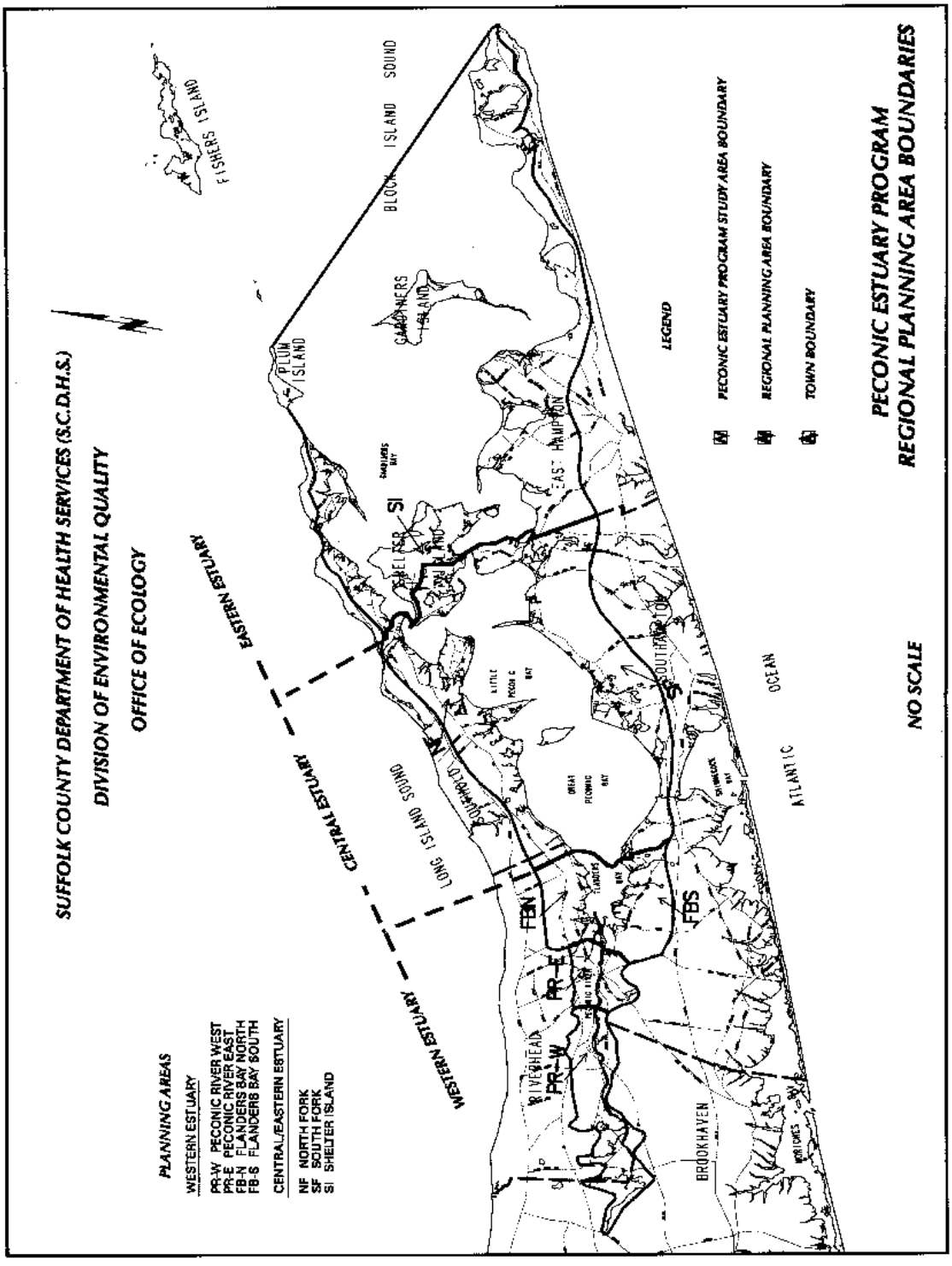


Figure 3-2. Regional Planning Area Boundaries.

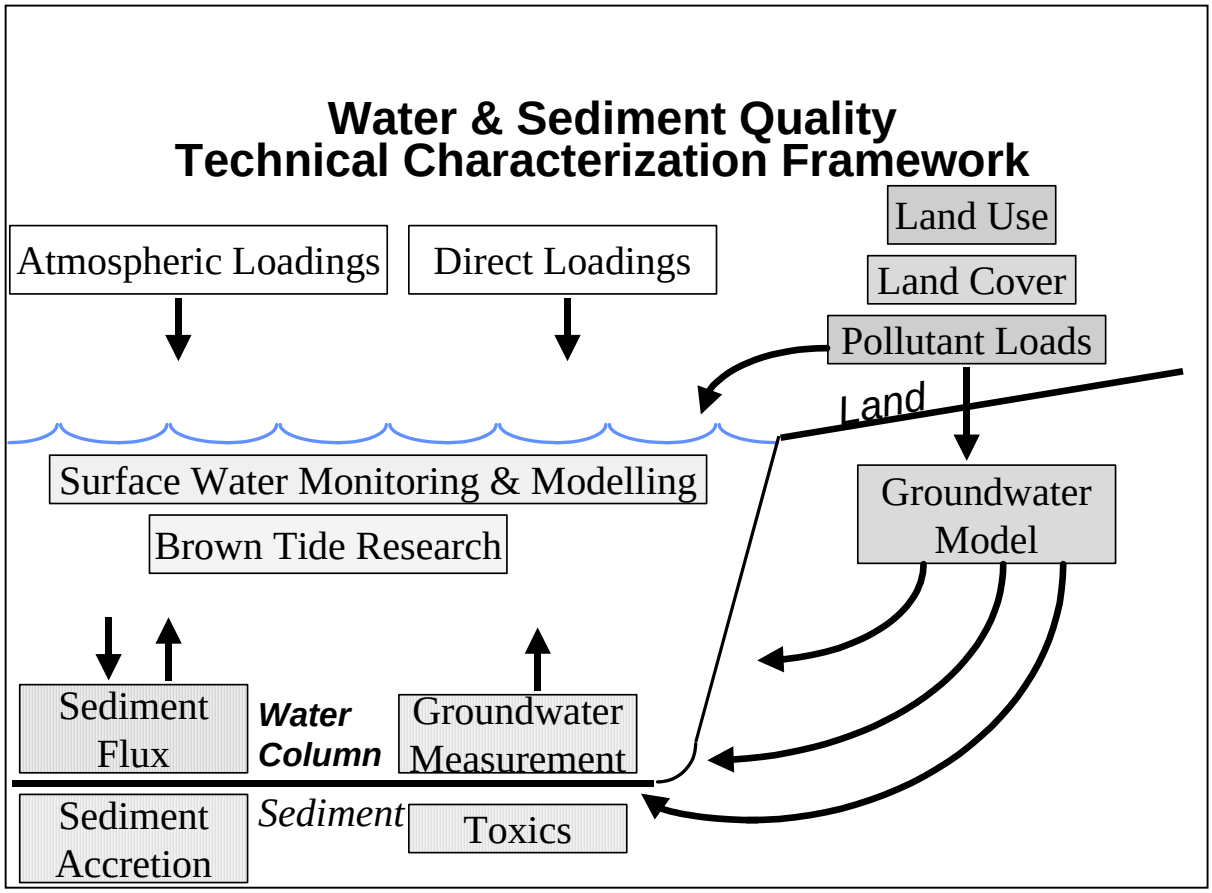


Figure 3-3. Water and Sediment Quality Technical Characterization Framework.

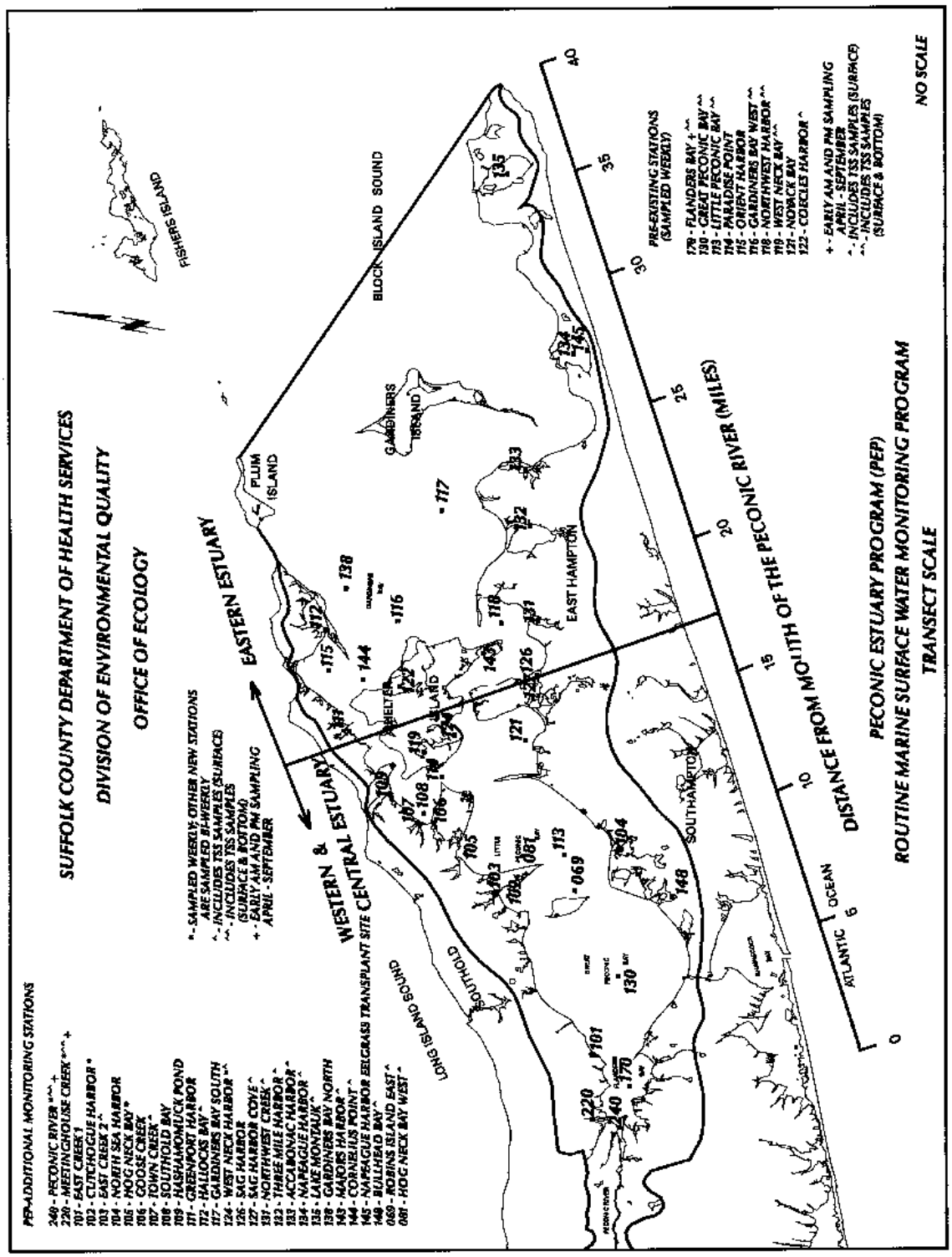


Figure 3-4. Routine Marine Surface Water Monitoring Program.

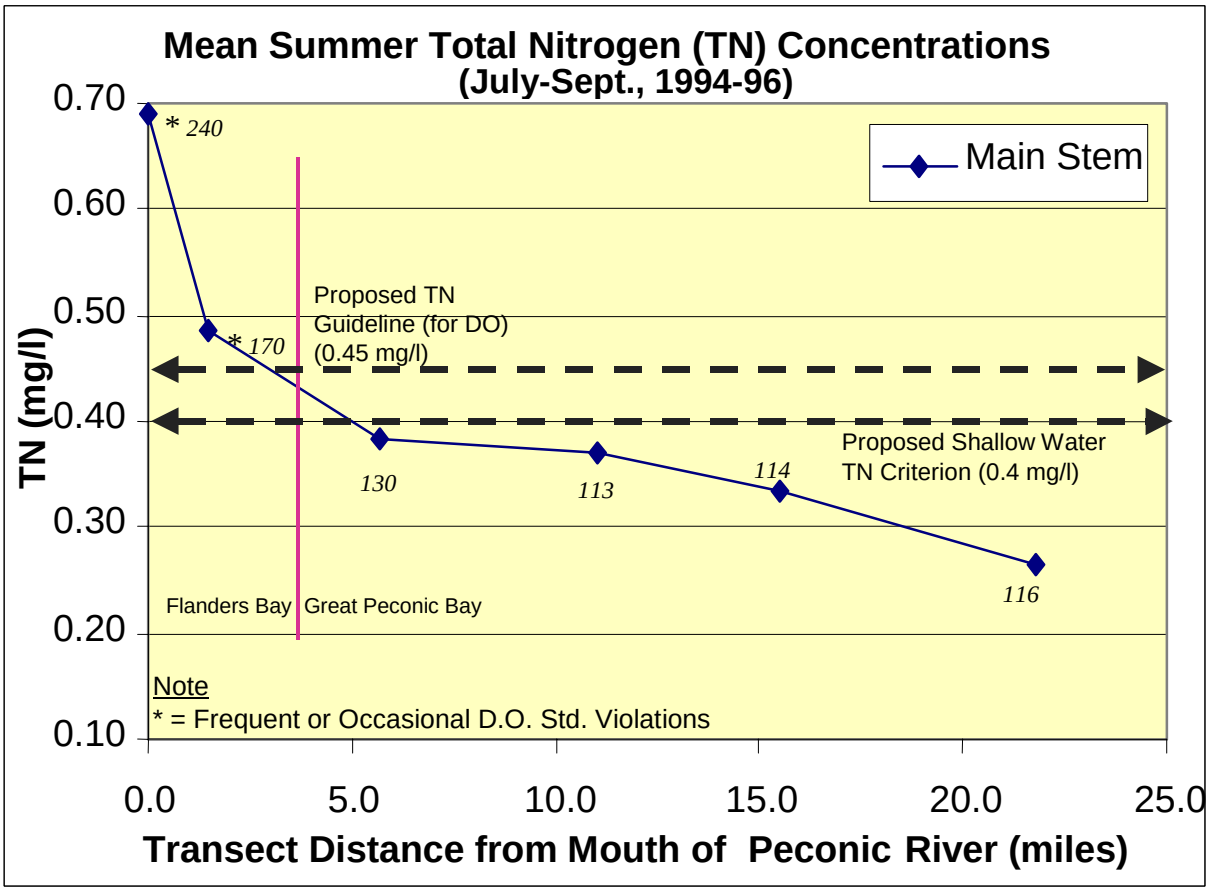


Figure 3-5. Mean Summer Total Nitrogen Concentrations.

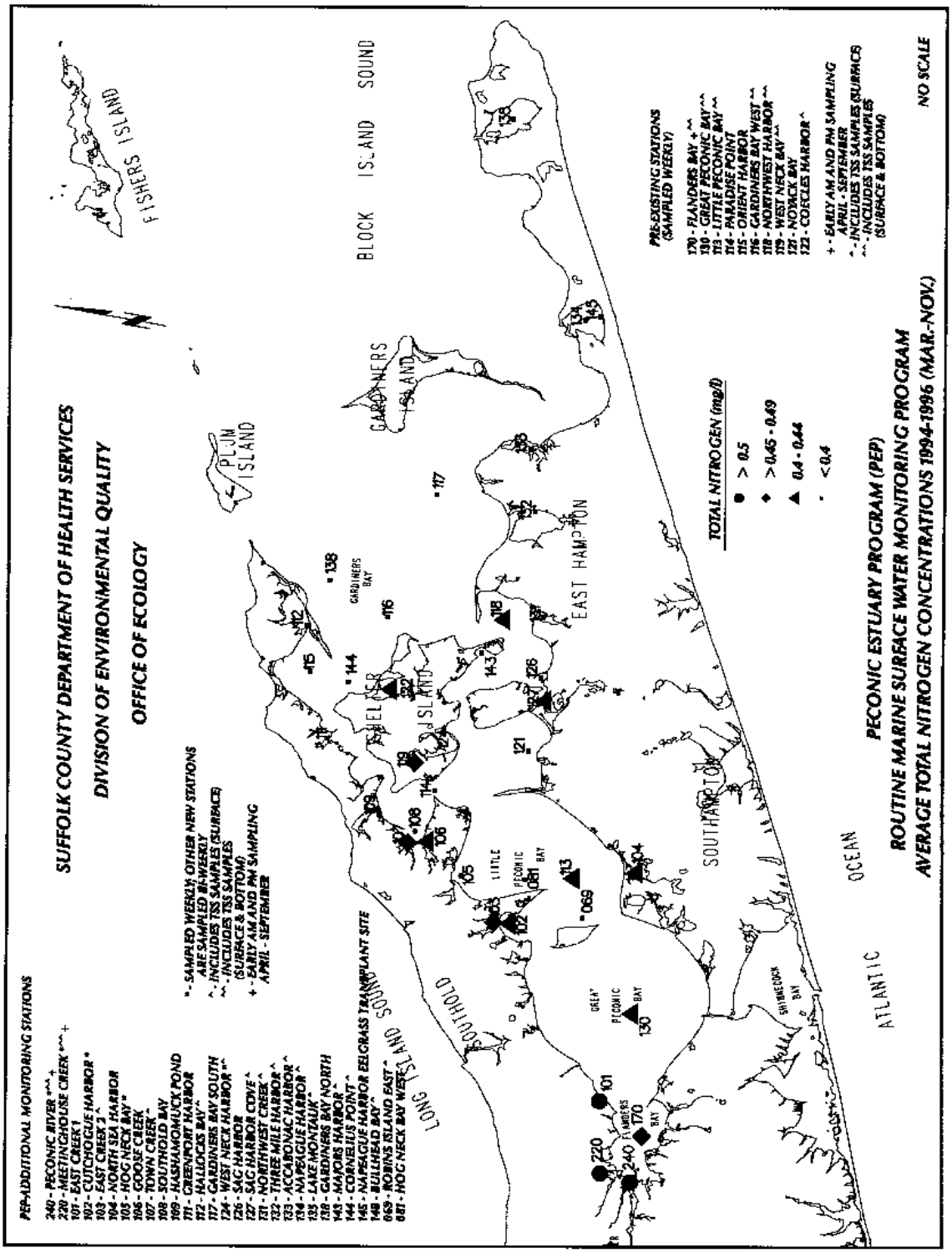


Figure 3-6. Average Summer Light Extinction Coefficients.

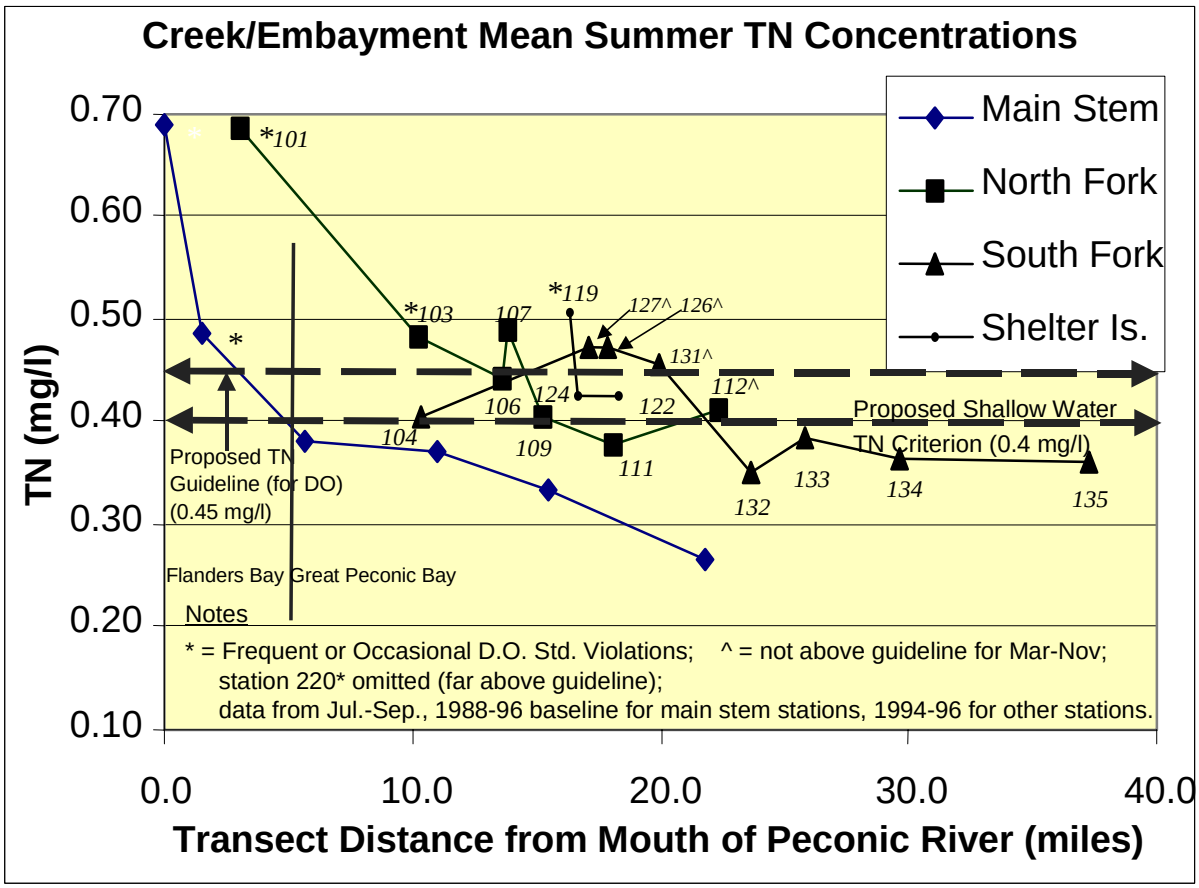


Figure 3-7. Creek Embayment Mean Summer Total Nitrogen Concentrations.

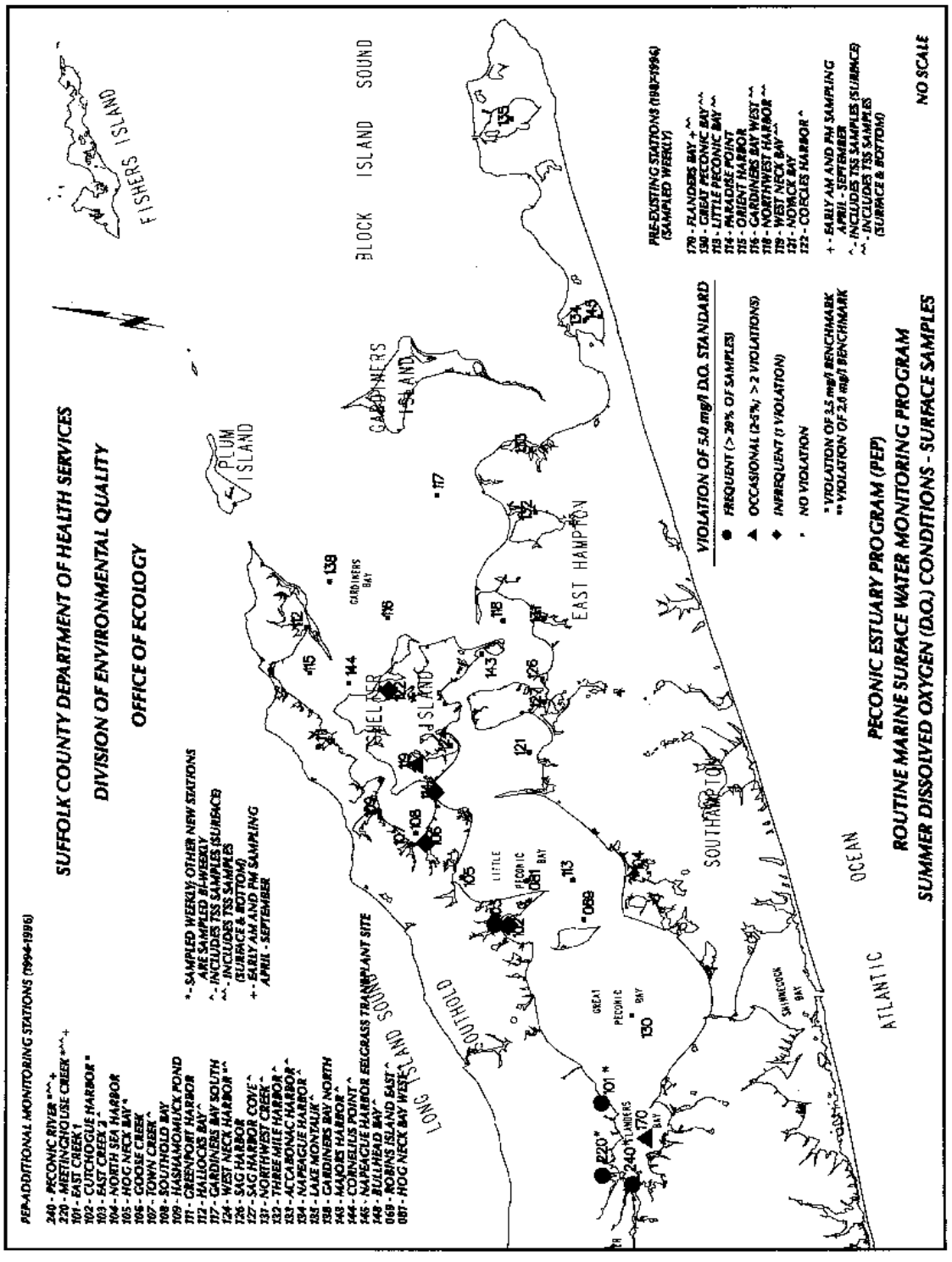


Figure 3-8. Routine Marine Surface Water Monitoring Program Summer Dissolved Oxygen (DO) Conditions — Surface Samples.

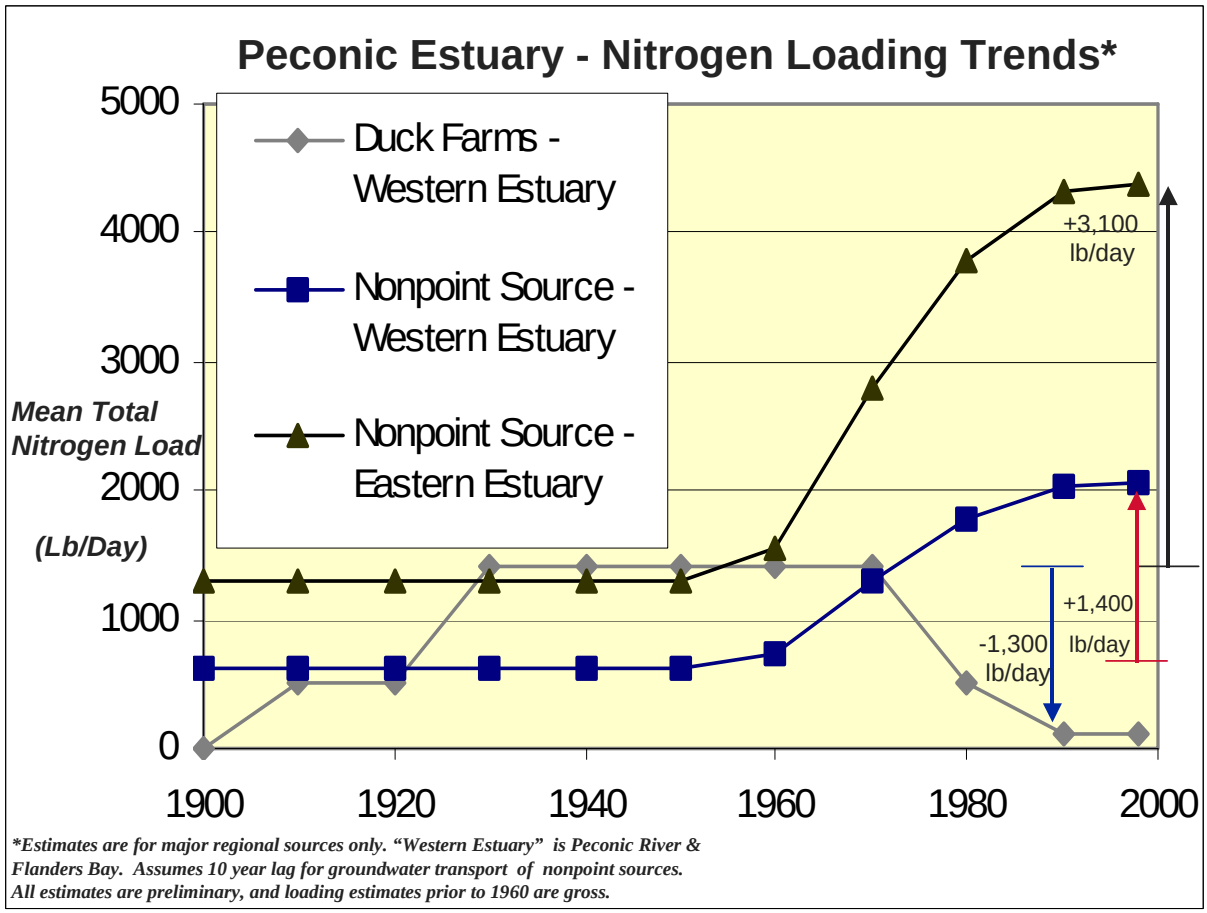


Figure 3-9. Nitrogen Loading Trends.

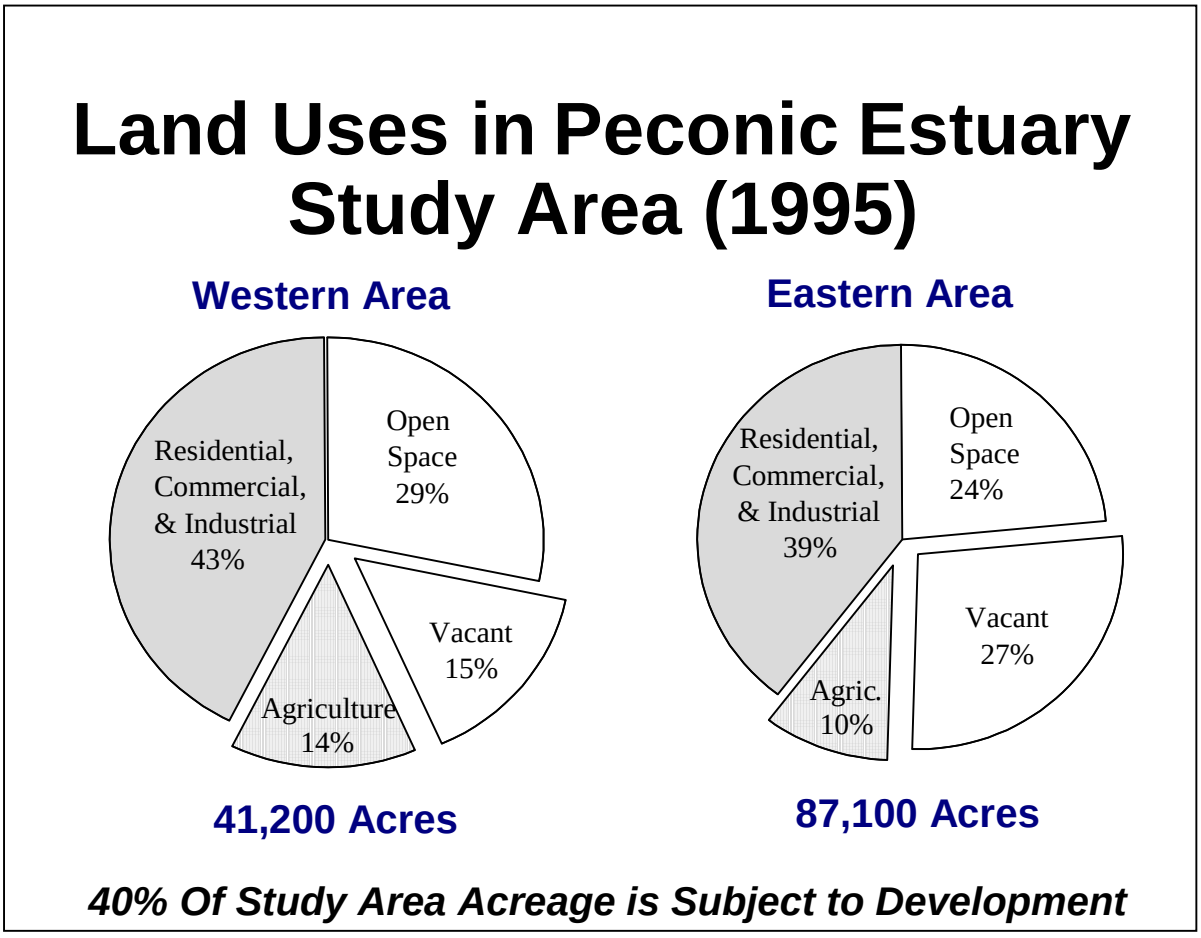


Figure 3-10. Land Uses in Peconic Estuary Study Area (1995).

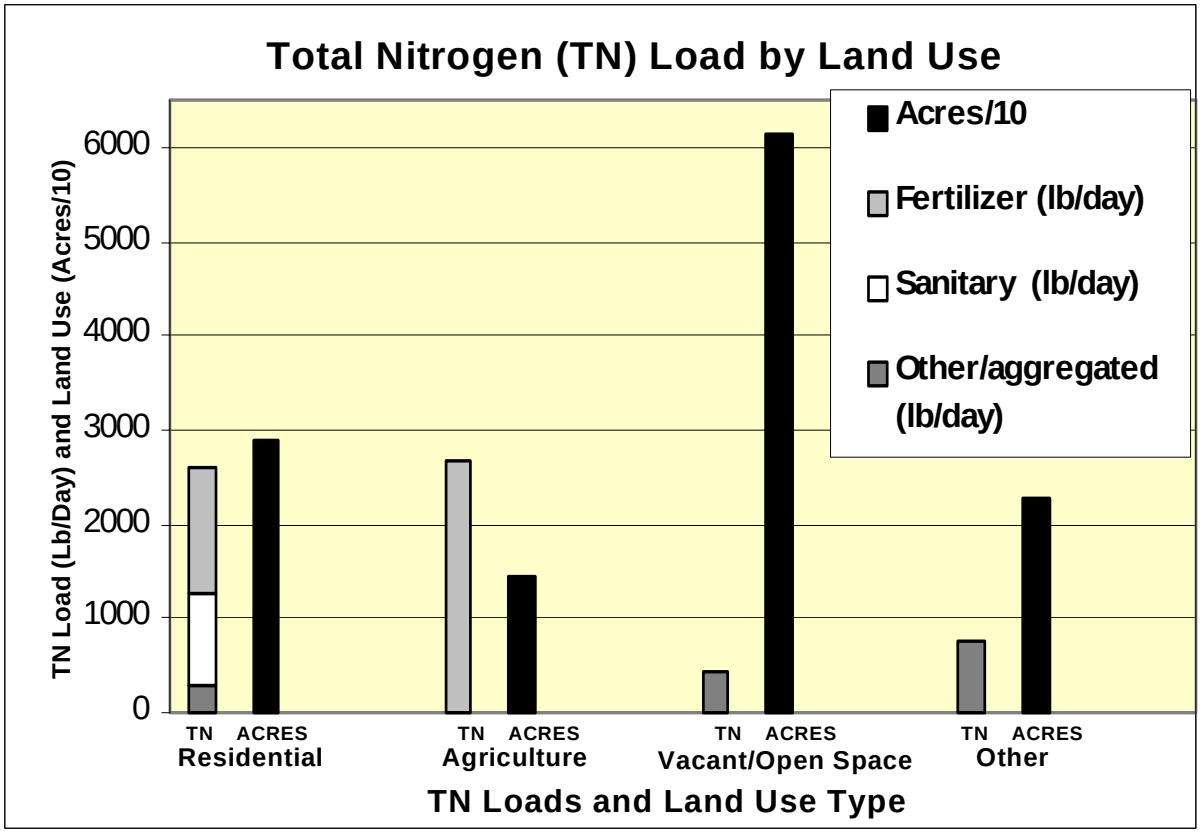


Figure 3-11. Total Nitrogen Load by Land Use.

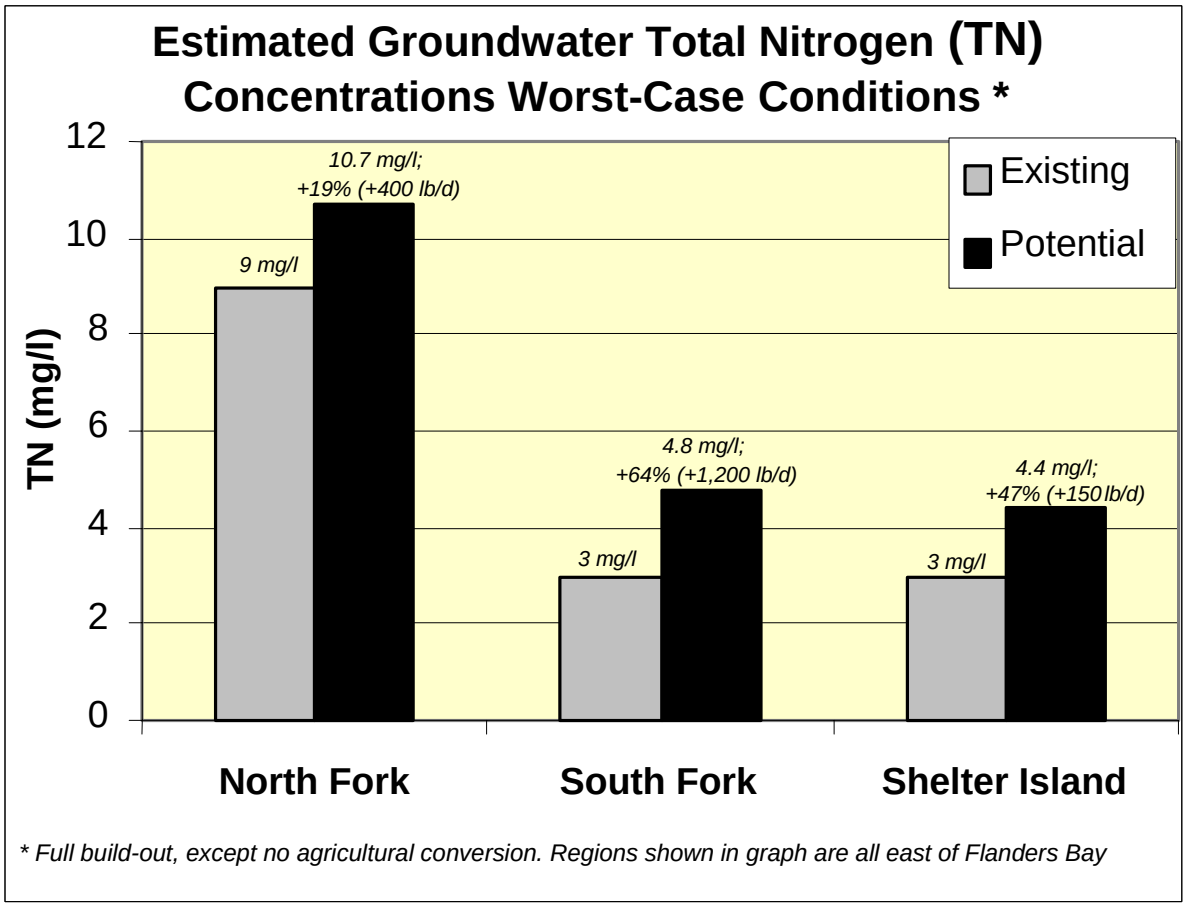


Figure 3-12. Estimated Groundwater Total Nitrogen Concentrations Worst-Case Conditions.

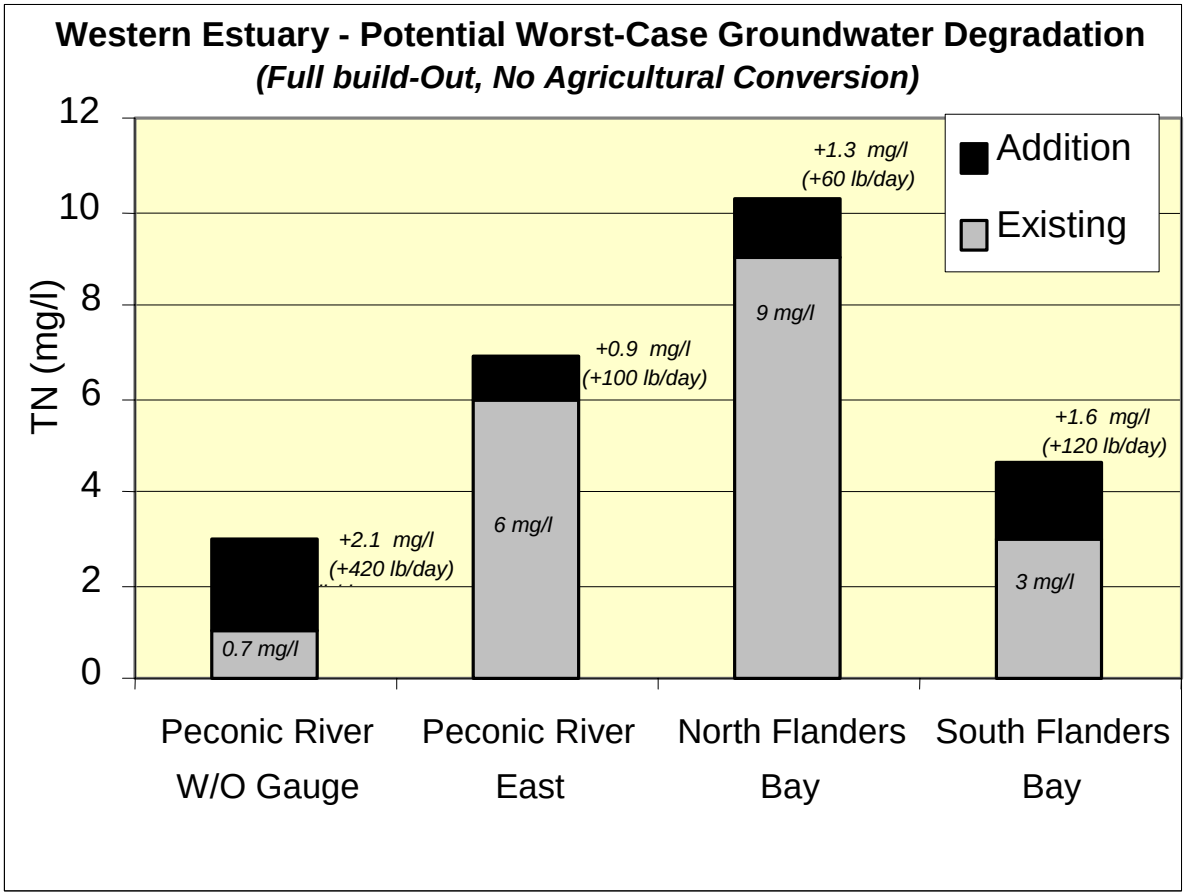


Figure 3-13. Western Estuary - Potential Worst-Case Groundwater Degradation.

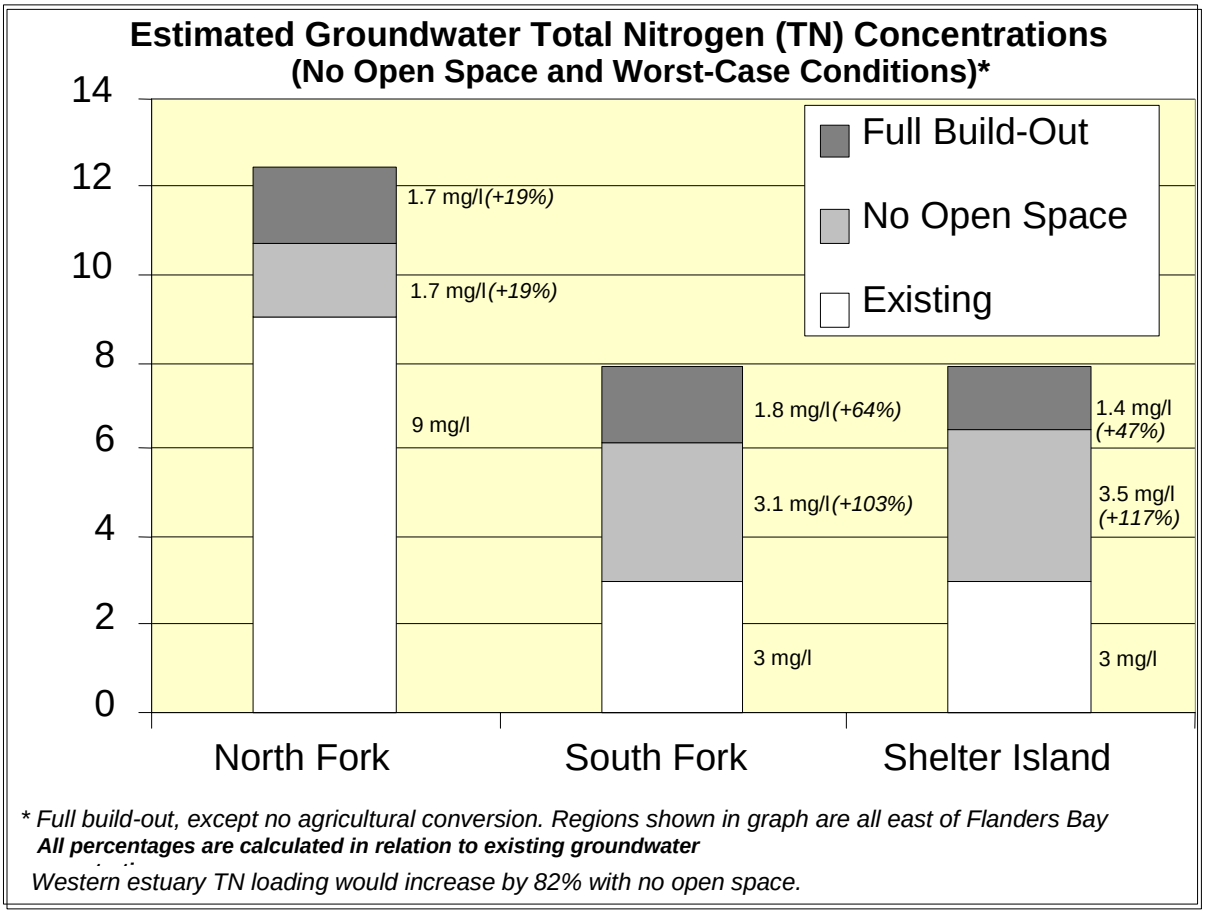


Figure 3-14. Estimated Groundwater Total Nitrogen Concentrations No Open Space and Worst-Case Conditions.

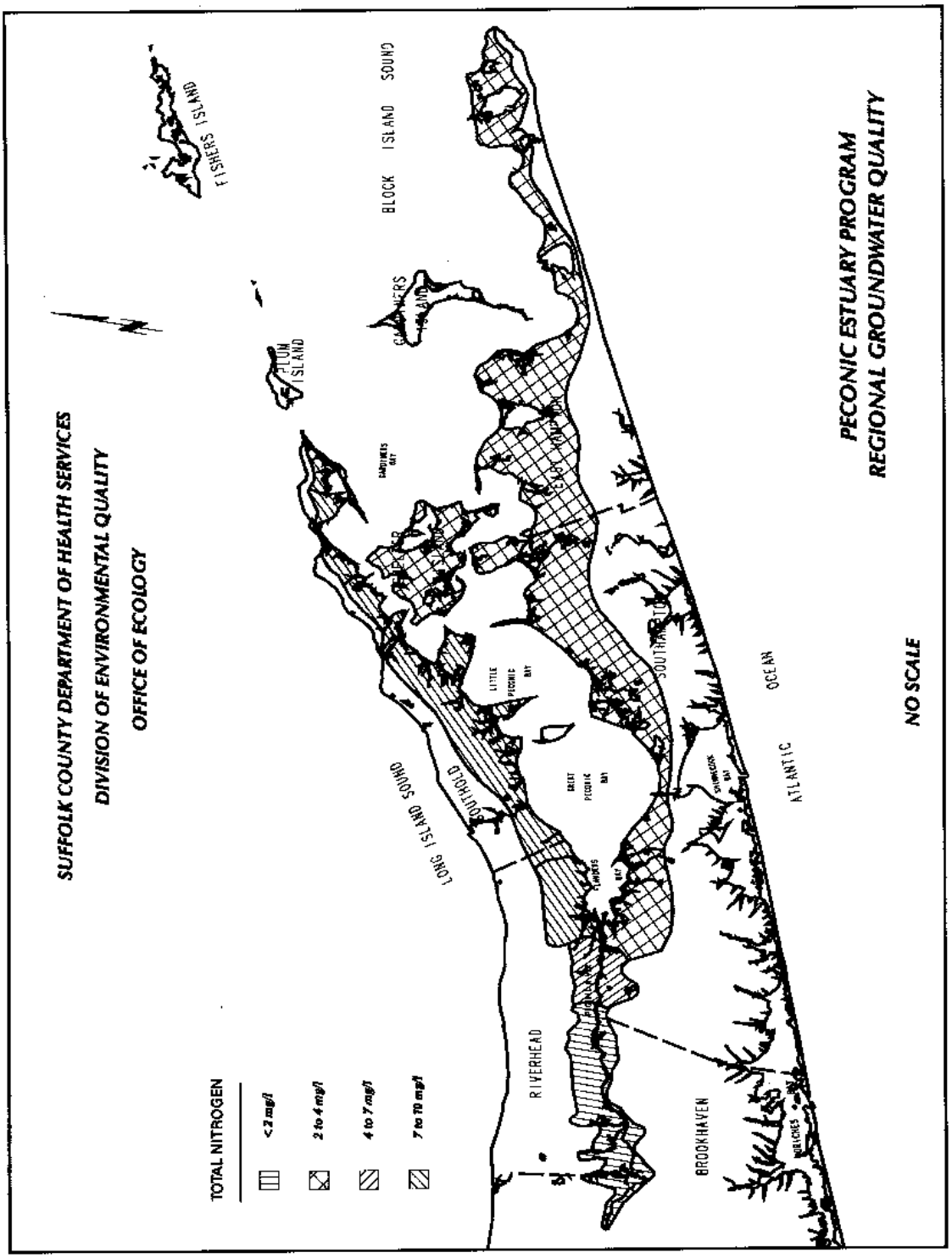
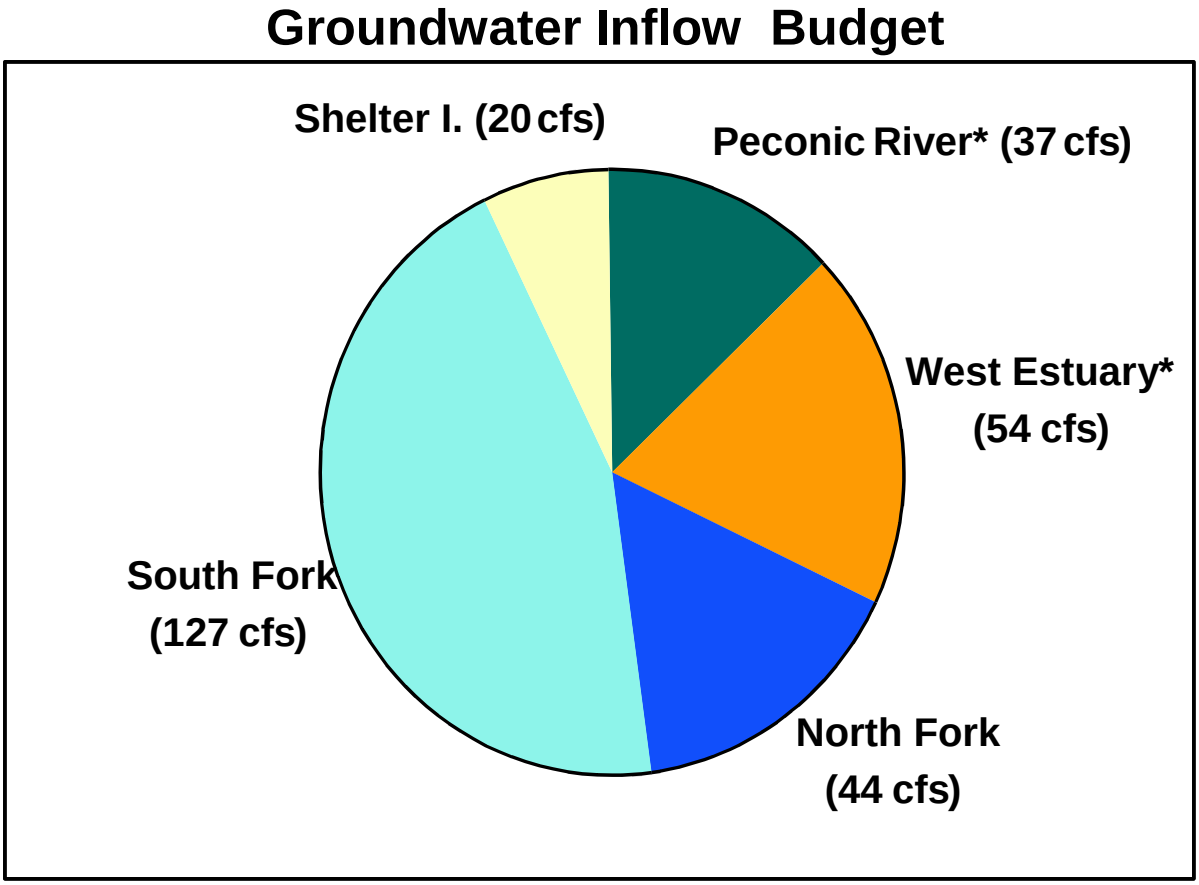


Figure 3-15. Regional Groundwater Quality.



* Peconic River long-term mean flow as measured at USGS gauge.
** West Estuary is downstream of USGS gauge, and includes Flanders Bay & western Great Peconic Bay.
cfs = cubic feet per second

Figure 3-16. Groundwater Inflow Budget.

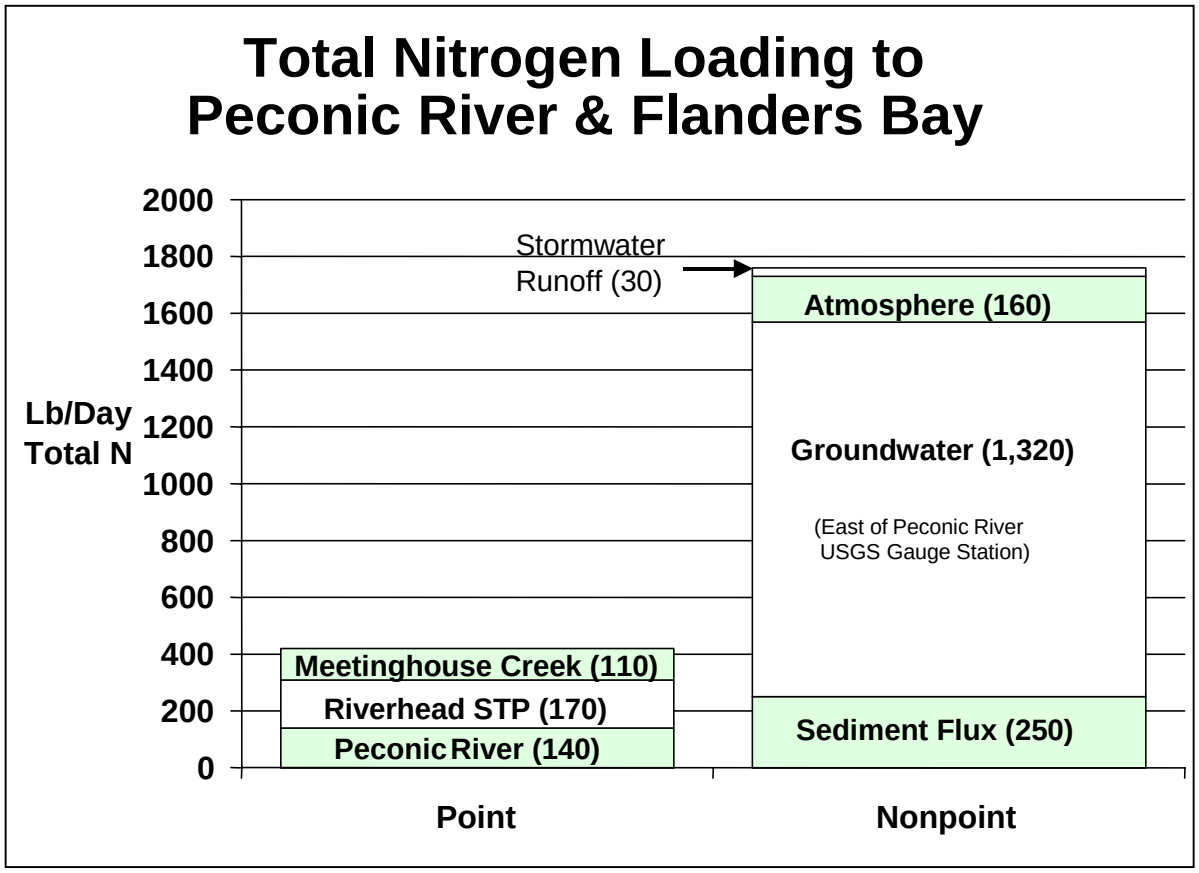


Figure 3-17. Total Nitrogen Loading to Peconic River and Flanders Bay.

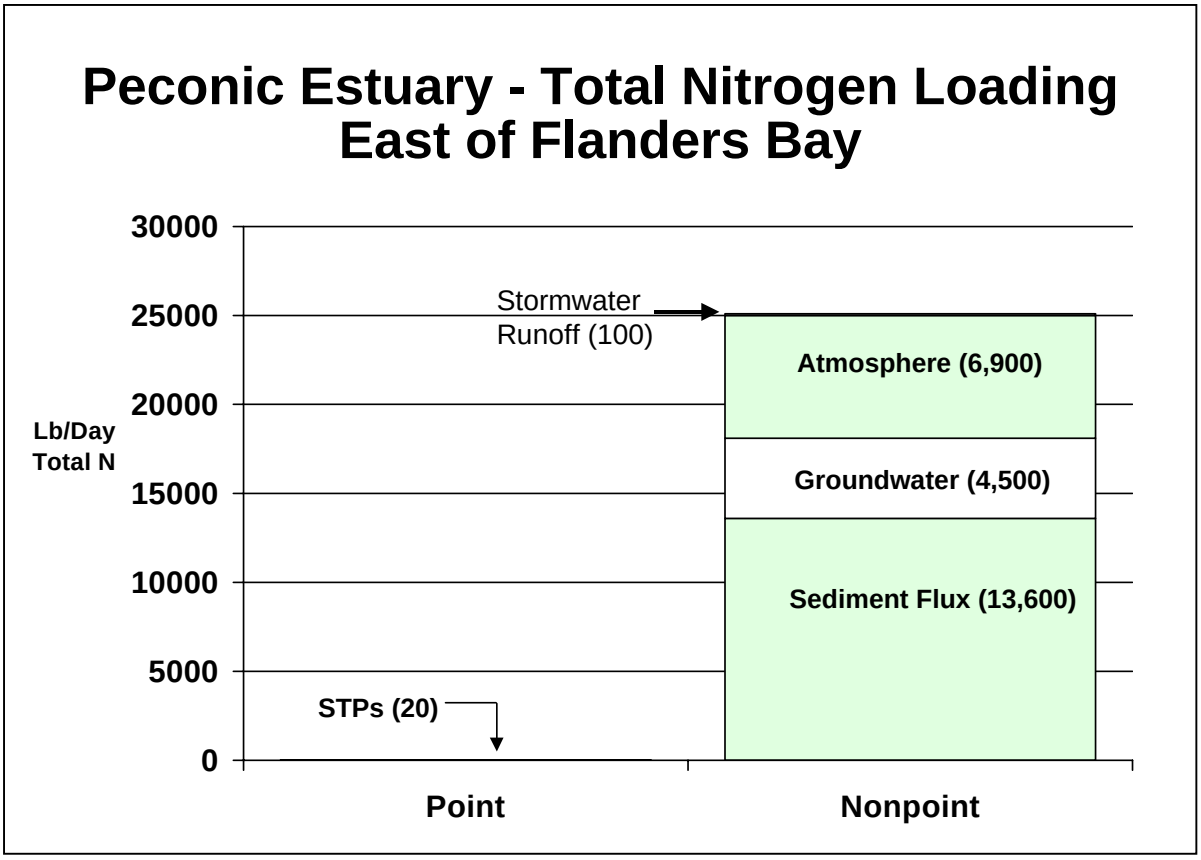


Figure 3-18. Total Nitrogen Loading East of Flanders Bay.

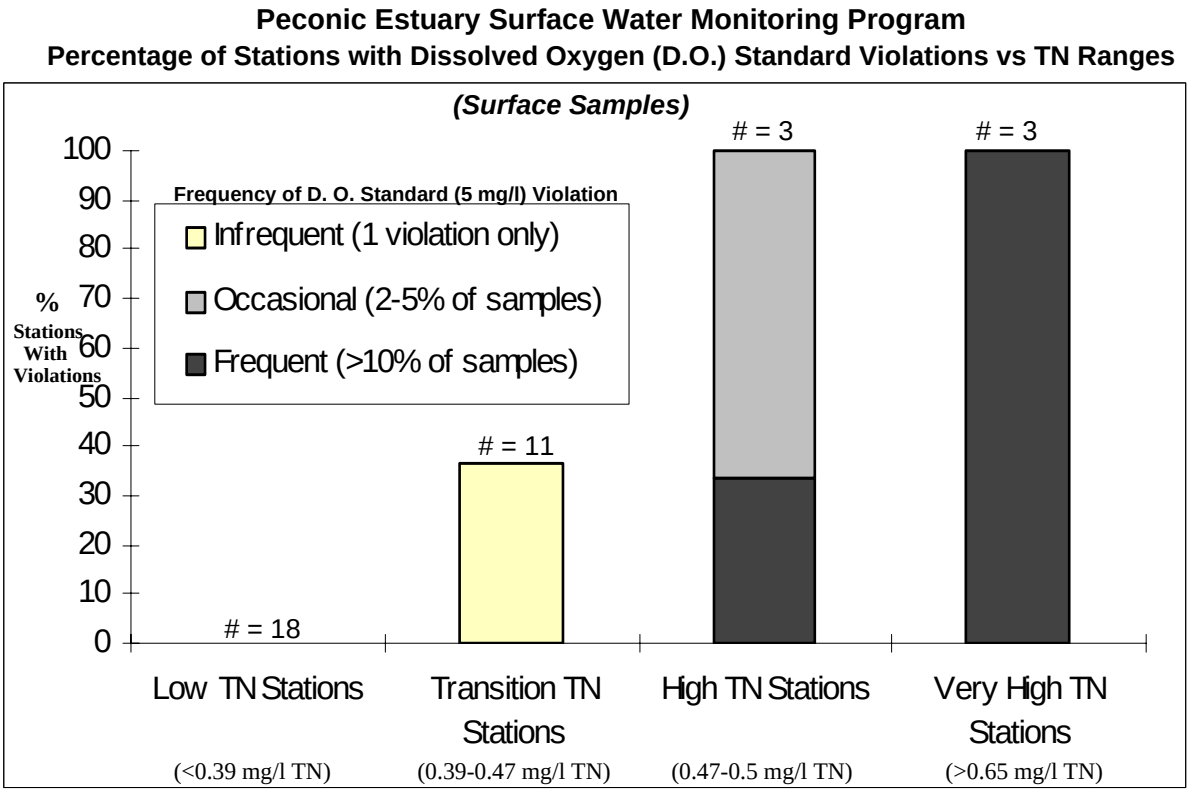


Figure 3-19. Surface Water Monitoring Program Percentage of Stations with Dissolved Oxygen (DO) Standard Violations vs. Total Nitrogen (TN) Ranges.

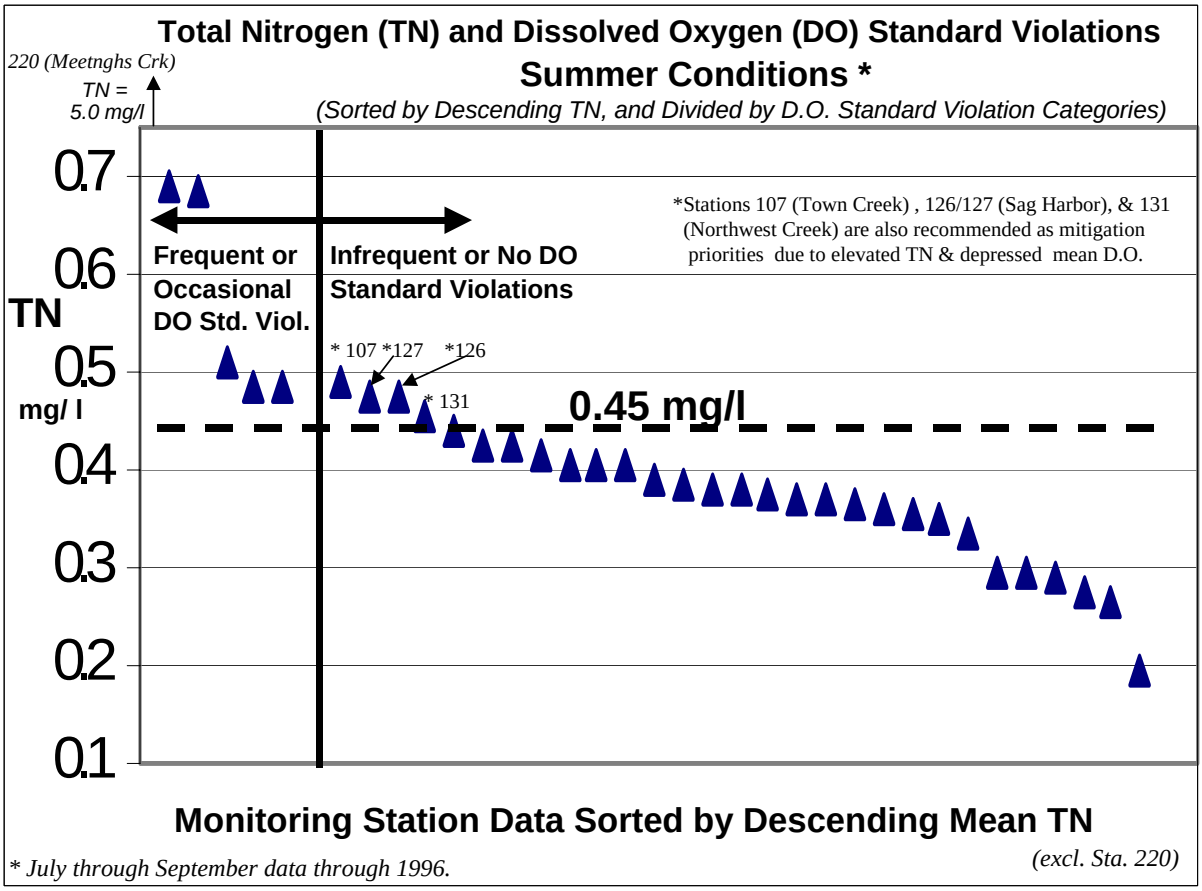


Figure 3-20. Total Nitrogen (TN) and Dissolved Oxygen (DO) Standard Violations Summer Conditions.

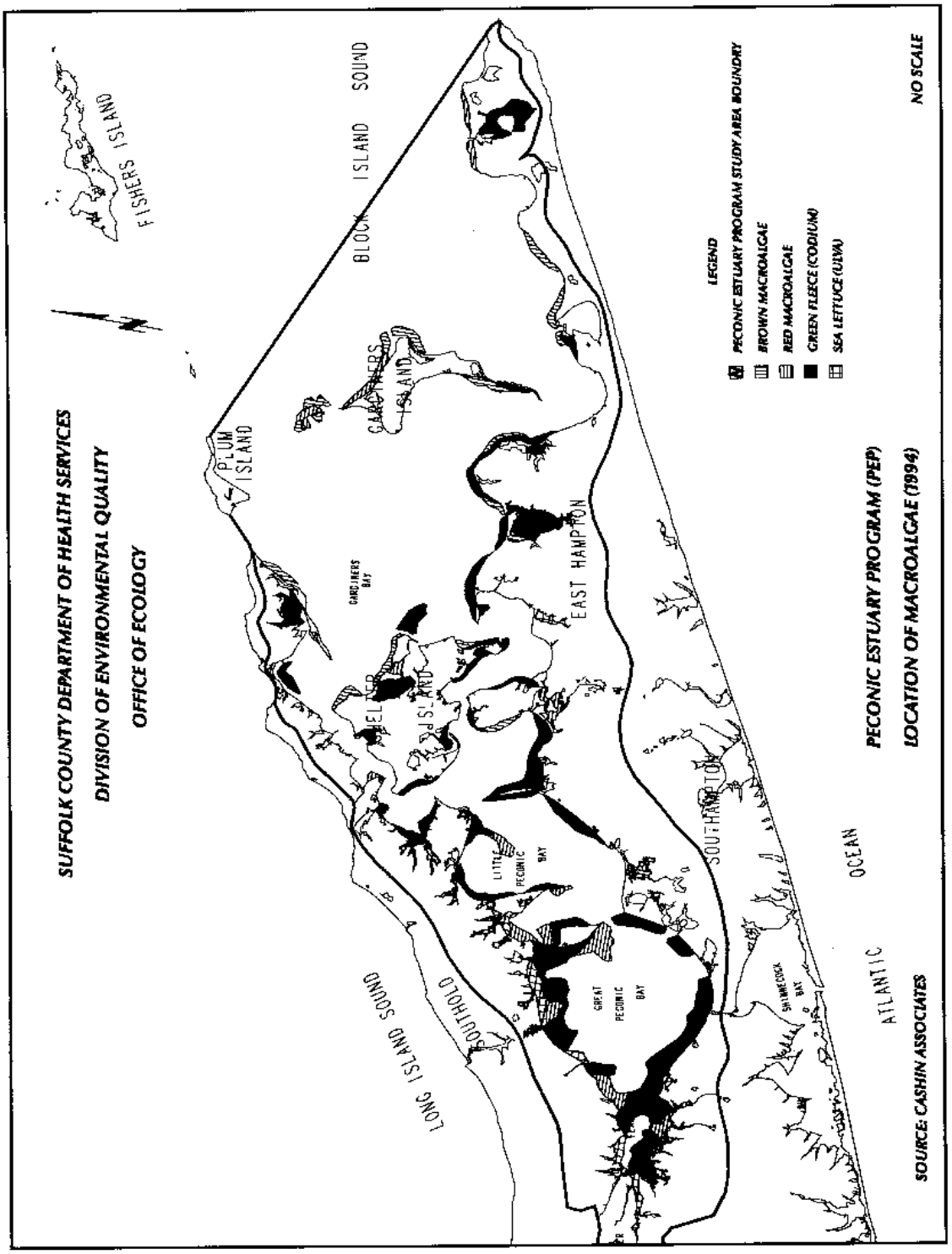


Figure 3-21. Location of Macroalgae (1994).

Peconic Estuary Program
NITROGEN MANAGEMENT WORK GROUPS

General Process and Charges

- Timing 2000-2001 (initial meetings): 2001 (strategy)
- Leads: Office of the Suffolk County Executive (Agricultural Work Group); EPA (Non-Agricultural Work Group); SCDHS (West Estuary TMDL Work Group)
- Start-up: Review PEP background & nitrogen management process
  Establish committee membership list, charges, and goals/timelines
- Process/Charges:
  - Use existing PEP guidance/data (land use, water quality, pollution loading, model results, etc.)
  - Evaluate existing programs, as needed (land use and pollution control)
  - Develop strategy (including timeline, responsibilities, and cost evaluation) for setting and attaining loading targets and implementing load controls (considering alternatives, cost & benefits)
  - Coordinate management and monitoring with other efforts (*e.g.*, critical natural resource areas)

(1) Agricultural Work Group (*Leads*: Office of Suffolk County Executive and PEP Citizens' Advisory Committee representative)

Core Membership:
- Cornell Coop. Ext., SCSWCD/NRCS, CCE, L.I. Farm Bureau, NYS Dept. of Ag. & Markets
- NYSSWCC
- NYSDEC, EPA, SC, Town Reps
- Also: Other interested MC, TAC, & CAC reps

Specific Goals:
- Refine agricultural total nitrogen (TN) loading estimates
- Develop implementation plan for regional TN load reductions, and possibly other pollutants
  - Expand Agricultural Environmental Management Initiative
  - Consider "Purchase of Development Rights" link to farm management plans

(2) Non-Agricultural (*mainly residential*) Work Group (Leads: EPA and Local Government Committee designee)

Core Membership:
- EPA, NYSDEC, SC, Town Reps
- Also: Other interested MC, TAC, & CAC reps

Specific Goals:
- Develop implementation plan strategy for:
  - existing TN loading (*primarily residential BMP-type abatement)*
  - potential new development TN loading (*primarily residential land use planning)*
  - possibly other pollutants (toxics, coliforms, etc.)
- May include recommendations on land use and pollution control, including model programs, zoning, clearing restrictions, clustering, fertilizer controls, etc.

(3) West Estuary Total Maximum Daily Load (TMDL) Work Group (SCDHS lead)

Core Membership:
- SC, NYSDEC, EPA, Brookhaven, Riverhead, and Southampton Towns
- Other interested MC, TAC, & CAC reps

Specific Goals:
- Refine TN loading estimates in westernmost Peconic Estuary
- Develop strategy for setting and implementing regional TN load reductions
  - Provide support for including dissolved oxygen-impaired waters on the New York State 2002 Clean Water Act Section 303(d) list and the establishment of a TMDL as a management tool; consider Peconic River (freshwater) model
  - Additional industrial/commercial land use/pollution control planning is required

Figure 3-22. Proposed Nitrogen Management Work Groups.

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CHAPTER
FOUR

HABITAT AND LIVING RESOURCES MANAGEMENT PLAN

OBJECTIVES

1) Preserve and enhance the integrity of the ecosystems and natural resources present in the study area so that optimal quantity and quality of fish and wildlife habitat and diversity of species can be assured and conservation and wise management of the consumable, renewable natural resources of the estuary are promoted and enhanced.

2) Protect and enhance biogeographical areas within the Peconic watershed with concentrations of high quality spawning, breeding, feeding, and wintering or seasonal habitat for shellfish, finfish, waterfowl, shorebirds, anadromous fish, and rare plant, animal, and natural communities.

3) Protect and enhance the ecosystems and the diversity of ecological communities and habitat complexes throughout the system, particularly tidal wetlands, eelgrass meadows, and beaches and dunes by preventing or minimizing loss, degradation, and fragmentation and by maintaining and restoring natural processes essential to the health of the estuary and its watershed.

4) Restore degraded habitats to maintain or increase native species and community diversity, provide connectivity of natural areas, and expand existing natural areas.

5) Foster recreational and commercial uses of the Peconic Estuary that are sustainable and compatible with protection of biodiversity.

6) Protect and enhance species which are endangered, threatened, or of special concern throughout the system by mitigating stresses to these species and ensuring essential habitats crucial for their survival.

7) Promote coordination and cooperation among Federal, state, and local governments and stakeholders to maximize protection, stewardship, and restoration of the Peconic Estuary.

8) Develop and carry out an estuary-wide research, monitoring, and assessment program to guide and evaluate management decisions concerning the estuary and to ensure management and policy decisions are based on the best available information.

MEASURABLE GOALS

Priority living resource issues for the Peconic Estuary include submerged aquatic vegetation, shellfish, finfish habitat, and "critical areas" (areas of particular ecological significance). The PEP has designated Critical Natural Resource Areas (CNRAs: geographically specific locations that have significant biodiversity) and has convened a Habitat Restoration Work Group to address the enhancement of existing resources and the restoration of habitats. While the list of threatened and impaired natural resources is extensive, the PEP has established management priorities focused on protecting existing resources, restoring damaged habitats, and enhancing the integrity of the ecosystem so that the quantity and quality of fish and wildlife can be assured.

The PEP's measurable goals with respect to habitat and living resources include:

- Protect the high quality habitats and concentrations of species in the Critical Natural Resource Areas (measured by acres of open space protected and development of model ordinances). [See Actions HLR-1, HLR-6, HLR-10, HLR-11, HLR-13, HLR-14, HLR-15, HLR-16]
- Maintain current linear feet of natural shoreline and over the next 15 years reduce shoreline hardening structures by five percent (measured by the percent change of natural vs. hardened shorelines through GIS mapping). [See Actions HLR-1, HLR-2, HLR-5, HLR-8, HLR-13, HLR-15]
- Maintain current eelgrass acreage (2,100 acres in main stem of the estuary) and increase acreage by ten percent over 10 years (measured by inter-annual aerial surveys with GIS and SCUBA assessments). [See Actions HLR-1, HLR-3, HLR-4, HLR-6, HLR-9, HLR-10, HLR-15, HLR-16]
- Maintain and increase current tidal and freshwater marsh acreage, and restore areas that have been degraded (*e.g.*, restricted flow, *Phragmites australis* dominated, hardened shoreline) (measured as number of acres of marsh with GIS). [See Actions HLR-1, HLR-2, HLR-4, HLR-5, HLR-7, HLR-8]
- Maintain a policy of no new mosquito ditches and not re-opening ditches that have filled-in by natural processes; and restore 10-15 percent of mosquito ditched marshes through Open Marsh Water Management (measured by the number of acres of restored tide marsh using Open Marsh Water Management). [See Actions HLR-1, HLR-2, HLR-5, HLR-7, HLR-8]
- Increase the number of piping plover pairs to 115 with productivity at 1.5 (over a three-year average), distributed across the nesting sites in the Peconic Estuary (measured by annual piping plover surveys). [See Actions HLR-1, HLR-8, HLR-13**,** HLR-15, HLR-16]
- Develop recommendations and guidelines to reduce impacts to marine life from dredging-related activities (measured by amount of reduced dredging volumes and protected benthic habitat acreage). [See Actions HLR-1, HLR-3, HLR-5, HLR-6, HLR-15]
- Foster sustainable recreational and commercial finfish and shellfish uses of the Peconic Estuary that are compatible with biodiversity protection (measured by juvenile finfish trawl surveys, bay scallop landings, and identifying, protecting, and restoring key shellfish and finfish habitat). [See Action HLR-1, HLR-11, HLR-12]

- Enhance the shellfish resources available to harvesting through reseeding, creation of spawning sanctuaries and habitat enhancement (measured by scallop and clam abundance/landings). [See Actions HLR-4, HLR-7, HLR-8, HLR-9, HLR-10, HLR-12, HLR-16, HLR-17]
- Link land usage with habitat quality in tidal creeks (measured by continued funding of benthic and water quality surveys to measure the quality/impacts to the habitats within selected tidal creeks).
- Ensure that the existing and future aquaculture (shellfish and finfish) and transplanting activities are situated in ecologically low-productive areas of the estuary and that they are mutually beneficial to the aquaculture industry, natural resources, and water quality (measured by the extent and location of aquaculture/transplant facilities, water quality measures, and natural resource data). [See Actions HLR-1, HLR-3, HLR-4, HLR-6, HLR-10, HLR-15, HLR-17]
- Annually initiate five percent of the projects identified in the Habitat Restoration Workgroup Plan for the Peconic Estuary (measured by the number of projects funded and implemented annually). [See Actions HLR-7, HLR-8]

INTRODUCTION

The eastern end of Long Island, New York and the Peconic Estuary contain a large variety of natural communities, from dwarf pitch pine forests to soft-bottom benthos in the main bays; all of which are important to the ecology and productivity of this ecosystem. There is a larger percentage of undisturbed habitats and a greater diversity of natural communities within this watershed, on a per unit area basis, than anywhere else in the coastal zone of New York State. These communities are home to a number of species that are endangered or threatened globally, nationally, and locally. According to the New York State Natural Heritage Program, there are 111 endangered, threatened, rare, or special concern terrestrial and freshwater species documented in the Peconic Estuary and its watershed — 13 insects, one freshwater fish, two amphibians, one reptile, 12 birds, and 82 vascular plants. There are a total of 553 separate, confirmed occurrences of these 111 species in the watershed. Another 45 rare species — one amphibian and the rest plants — have been historically reported in the Peconics but have not been documented recently. In addition to these, there are four species of endangered or threatened sea turtles and eight species of marine mammals (seals, porpoises, and whales) which are found in or migrate through the Peconic Estuary.

Many economically important species spend all or part of their lives in the estuary. These species enhance the productivity of the estuary and its contiguous waters. The Peconic Estuary provides important habitat, as well as spawning and nursery grounds, to a wide variety of marine organisms—most notably shellfish, such as bay scallops, hard clams, and fish, such as bay anchovy, Atlantic silverside, scup (also called porgy), summer flounder (also called fluke), winter flounder, windowpane flounder, weakfish (also called grey sea trout), and tautog (also called blackfish). One of the most important underwater habitats of the estuary is the meadows of eelgrass found along the edges of the eastern end of the Peconic Estuary. These eelgrass beds provide food, shelter, and nursery grounds to many marine animals including worms, shrimp, scallops and other bivalves, crabs, and fish. Eelgrass beds stabilize the bay bottom and are also an important component of the nutrient cycle in the estuary.

In addition to individual species, there are entire habitats or natural communities rarely found on the east coast of the United States and only found in this region of the State, such as the Pine Barrens. Some of these habitats are currently in danger of being reduced to remnants or of being lost completely. It is for these reasons that The Nature Conservancy designated the Peconic Bioreserve as one of the Last Great Places in the Western Hemisphere.

HABITATS AND LIVING RESOURCES OF THE PECONIC ESTUARY SYSTEM

The Peconic Estuary Program (PEP) identified species of “special emphasis” which are plants and animals that have been identified as Federal trust, endangered or threatened, State protected, natural heritage listed, and of commercial and recreational importance.

For convenience in discussing the variety of habitats and species found in the Peconic Estuary System, this chapter has divided the estuary system into several zones. Each of these zones are discussed individually—first in terms of the habitat and living resources associated with the zone, and second in relation to observed impacts and impairments. These zones consist of the: 1) deep water; 2) shallow water (including embayments); 3) intertidal-shoreline; 4) Peconic River, freshwater wetlands, and coastal ponds; and 5) terrestrial zones. A detailed description of the ecology of these

areas has also been described in the separate Living Resources of the Peconic Estuary Characterization Report.

Deep Water Zone

The deep-water zone is defined for this program as that portion of the main stem of the estuary in which the water depth is greater than three meters (approximately 10 feet). These open waters of the Peconic Estuary include most of Flanders, Great Peconic, Little Peconic, Noyack, Southold, and Gardiners Bays; portions of Northwest and Orient Harbors; and Shelter Island Sound. This zone includes everything from the overlying water column to the bottom communities.

Finfish

The deep, open waters contain a large portion of the adult finfish, which are harvested commercially or recreationally in the Peconic Estuary System. To assess the use of deep waters of the Peconic Estuary by juvenile finfish, the NYSDEC has conducted trawl surveys for juveniles in the open waters west of Shelter Island over the past decade. Results from these trawl surveys indicate that these waters contain juveniles of many species of finfishes and are an especially important nursery area for tautog, weakfish, scup, winter flounder, bay anchovy, Atlantic silversides, butterfish, bluefish, and northern puffer. Many of these species are found at locations throughout the estuary and may seasonally or diurnally move back and forth between the deep and shallow water zones.

Shellfish

Natural populations of commercially and recreationally important shellfish species have never been abundant in the deep-water zone of the Peconic Estuary System according to NYSDEC shellfish surveys. Natural populations of hard clams in waters greater than approximately four feet (1.2 m), which were never very high, have declined in abundance as have the levels of other, non-commercial shellfish species. Fishermen have reported, though, that scallops are common in greater than ten feet of water. At one time, oysters were the most valuable commercial species in the Peconic Estuary System. The populations were not natural, but came from the seeding of bottom waters for grow-out (primarily in the deep-water zone). This practice has been discontinued, and oysters are rarely found in this zone.

Other shellfish, which are found in the deep waters in relatively great abundance (in both surveys), include channeled and knobbed whelks (colloquially called conchs or winkles), slipper shells (locally called quarterdecks), blood arks, oyster drills, and jingle shells.

Other Invertebrates

The results of the NYSDEC juvenile finfish trawl survey and the PEP deep water shellfish survey have provided evidence of the presence of a large variety of other invertebrates inhabiting the system. Species found in this zone include green, lady, and blue crabs, spider crabs, horseshoe crabs, mantis shrimp, and long-finned squid. There are also areas of the bottom in which the sediment is completely bound up in dense mats of tubes built by amphipods and populations of polychaete and oligochaete worms, which are common members of benthic communities throughout the estuary.

Birds

The deep-water zone is used by a variety of birds for feeding, notably sea ducks such as red-breasted mergansers, three species of scoters (*Melanitta perspicillata, fusca,* and *nigra),* and common eiders.

Sea ducks are so-called because they feed and rest in deep, open coastal waters and rarely, if ever, come to shore while in the Peconics. The sea ducks do not breed and rear their young in the Peconic system but use it exclusively as an over-wintering site. These waterfowl are found in high concentrations during the early months of the year at a number of sites (see **Figure 4-1**). They feed primarily on shellfish such as blue mussels and benthic invertebrates. For example, diving ducks such as scaup and canvasbacks are found in 2-18 meters of water and feed on submerged aquatic vegetation, bivalves and hard clams.

Sea Turtles and Marine Mammals

Deep waters are the preferred habitat of the four species of sea turtles, two species of cetaceans, (whales, dolphins, and porpoises), and five species of pinnipeds (seals) that are found regularly in the estuary. All of these animals feed on a variety of marine organisms in the open waters. The most common species of pinnipeds are harbor seals and less common are the harp seals and grey seals. These seals are found in association with a number of haul-out areas around the eastern Peconics and Block Island Sound. The number of seals in the New York region has increased dramatically in the past decade, and these animals are now found year round in the Peconics instead of only in winter.

Only two species of cetacean—the bottle-nosed dolphin and the harbor porpoise—have been sighted in the Peconics in recent history. Occurrences of these animals in New York waters also have increased greatly in the past decade. Occasionally, a right whale has been sighted in Block Island Sound and at the eastern end of Gardiners Bay.

Three of the four sea turtle species found in the Peconics use the system extensively at the end of April through October and a number are found in waters greater than 10 feet (three meters). Kemp's ridleys, the smallest and most endangered of all sea turtles, use the Peconics as juveniles for feeding on spider crabs. Loggerhead turtles and green sea turtles also feed in the system as juveniles and are found throughout the Peconics. Studies have found that the Peconic bays are important developmental habitat during the early life stages of Kemp's ridley and green turtles. Leatherback turtles are only occasionally found in the estuary.

Shallow Water Zone

This zone is defined as those waters in the main bays with a depth of less than three meters (approximately 10 feet) that remain submerged through the tidal cycle. This zone also includes subtidal portions of all tidal creeks, ponds, and large embayments in the Peconic Estuary.

Finfish

Many juvenile forms of finfish are found to feed in the shallow water zone. Some species of adult finfish move in close to shore to spawn and reproduce (*e.g.*, weakfish, winter flounder, and Atlantic silversides). Others spawn in the ocean and the larvae move inshore, metamorphose, and the juveniles feed in the shallow areas (*i.e.*, nursery areas) until they are large enough to migrate back offshore (*e.g.*, bluefish, summer flounder). Because of these differential uses by a number of species, the entire shallow water zone appears to be crucial to local populations of breeding finfish. Past surveys have indicated that, for some species (*e.g.*, weakfish, winter flounder, and scup), the area from Great Peconic Bay to Montauk Point, both deep and shallow waters, appears to be much more productive than other estuaries and embayments around Long Island.

Shellfish

A survey of shellfish in shallow, subtidal waters was performed by the PEP in summer 1997. Results of this study determined that although shallow water regions make up only 6.6 percent of the estuary, they contribute the majority of the commercial shellfish harvest. Both scallops and hard clams are harvested from the shallow water zone, although bay scallop populations are extremely susceptible to the recurring Brown Tide algae bloom. With the crash of the scallops in the 1980s due to the Brown Tide, East End fishermen began to harvest hard clams in greater numbers. There is also a thriving transplant industry in the Peconic Estuary System with private harvesters transferring thousands of hard clams from uncertified waters of Raritan Bay in New York Harbor to the Peconic Estuary for biological cleansing before later reharvest and sale. Despite greater numbers in shallow waters, PEP research has found an overall low abundance of clams, indicating the possibility of low recruitment**,** high mortality, and/or preferential harvesting of small size classes.

Birds

There are more birds feeding in the shallow water zone than in the deep-water zone. These birds consist of waders, such as herons and egrets, and waterfowl such as puddle and bay ducks. Puddle ducks (also called dabbling ducks) are usually found in shallow embayments and frequently feed on land as well as in the water. Black ducks and mallards are examples of puddle ducks. Bay ducks are similar to sea ducks in that they spend most of their time offshore in deep waters, although they remain in fairly sheltered embayments rather than the open ocean. Examples of bay ducks include greater and lesser scaup, canvasbacks, and redheads. Raptors such as osprey and shorebirds such as the terns (*e.g.*, least tern and roseate tern) also depend on fish in these areas for food. Critical areas for puddle and bay ducks are shown in **Figure 4-1**. Wading birds are found throughout the estuary.

Submerged Aquatic Vegetation

Most of the beds of estuarine submerged aquatic vegetation are found in the shallow water zone according to a PEP study performed by Cashin Associates. Submerged aquatic vegetation is defined as beds of rooted vascular plants or macroalgae, both of which require complete immersion for all or most of the day to survive. Submerged aquatic vegetation, particularly eelgrass, is of great ecological importance in shallow environments. Eelgrass beds provide shelter and food for a variety of juvenile finfish and shellfish as well as many other invertebrates. Shelter is provided not only by the actual structure of the eelgrass blades but also by the fact that eelgrass beds dampen currents, resulting in a low velocity zone among the blades. Food for the resident species is provided by epiphytes and their associated grazers on grass blades as well as increased suspended material which falls to the bottom as a result of the slow currents within the beds. These rooted plants also stabilize the underlying substrate and prevent scouring and erosion.

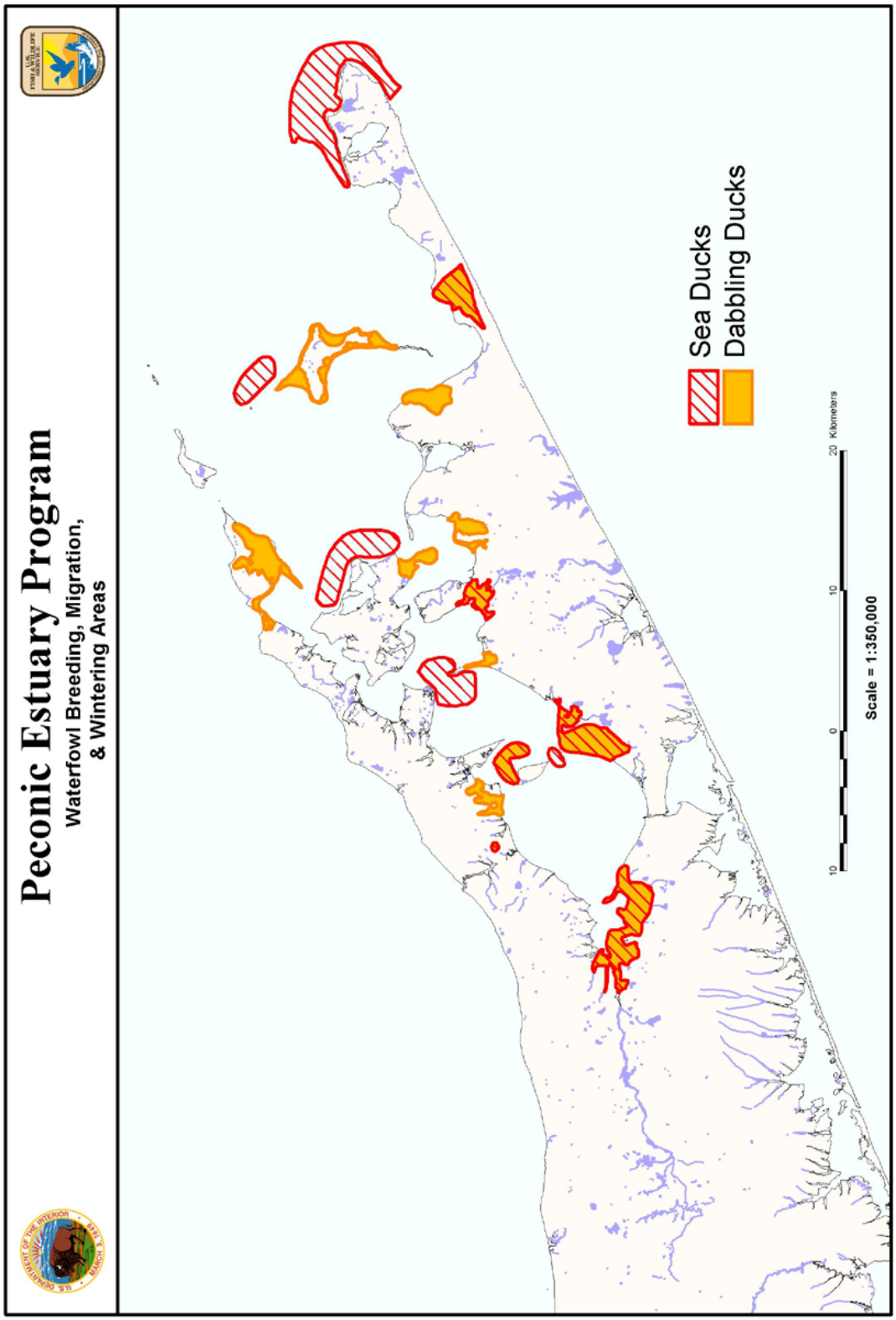

Figure 4-1. Waterfowl Breeding, Migration, & Wintering Areas.

Macroalgae beds are generally considered poorer habitat compared to eelgrass. Since macroalgae are not rooted, they do not stabilize soft bottoms. Rather, they are easily uprooted and can be carried some distance where they foul eelgrass beds, beaches, and bare bottoms.

The most abundant species of rooted vascular plant in the shallow water zone is eelgrass, although some small areas of widgeon grass are also found in brackish waters. Eelgrass beds are found around Shelter Island and to the east along the fringes of Gardiners Bay and within a few small embayments and creeks (see **Figure 4-2**). Critical areas for eelgrass are currently considered to be all those areas where this species currently exists. More areas may be identified for restoration purposes after eelgrass habitat criteria studies have been completed. The macroalgae species that occur in greatest abundance throughout the system are green fleece, an invasive species, and sea lettuce. Fishermen have reported sets of scallops in areas of green fleece in the western portion of Peconic Bay.

Intertidal/Shoreline Zone

As suggested by the name, this zone includes all areas around the edge of the estuary that are periodically inundated by tides or are found upland of the mean high tide line. This includes all tidal wetlands, mud and sand flats, beaches, and dunes. The location of tidal wetlands in the Peconics is shown in **Figure 4-3**.

Data from the NYSDEC aerial photographs taken in 1974 indicate there were roughly 12,466 acres (5,049 hectares) of vegetated and unvegetated tidal wetlands in the Peconic Estuary. Approximately 3,898 acres of this is vegetated salt marsh of different types. According to the NYSDEC's tidal wetlands trends analysis program, approximately 33 acres of high marsh have been created in Great Peconic Bay when comparing the original 1974 inventory to present conditions. According to the USFWS, approximately 256 acres of all types of wetlands were lost between 1972 and 1994. The definitions for wetlands were different for both of these analyses. A comparison of these analyses is being conducted by NYSDEC.

Because of tidal fluctuations, this zone is home to a wide variety of organisms, which are adapted to the twice-daily inundations of seawater. There is an entire invertebrate community, which is associated almost exclusively with the intertidal area. Organisms found only in these areas include several species of snails and bivalves, fiddler and other crabs, various species of polychaete and oligochaete worms, and a huge variety of microorganisms.

Marshes

Marshes play an important role in estuarine ecology. The vegetated areas stabilize the shoreline and protect small tidal ponds and creeks, which are ideal areas for juvenile fish and invertebrates to grow and reproduce. The vegetated areas are also prime nesting areas for some species of waterfowl and waterbirds, such as puddle ducks, which rely on the physical protection and abundant food sources provided by these areas. Marshes also provide food for large herbivores, such as deer, and omnivores, such as raccoons. Salt marshes are home to the diamondback terrapin, an exclusively estuarine reptile. These animals live in the marsh, but lay their eggs in soft sand, usually at the upper margins of the marsh and beaches.

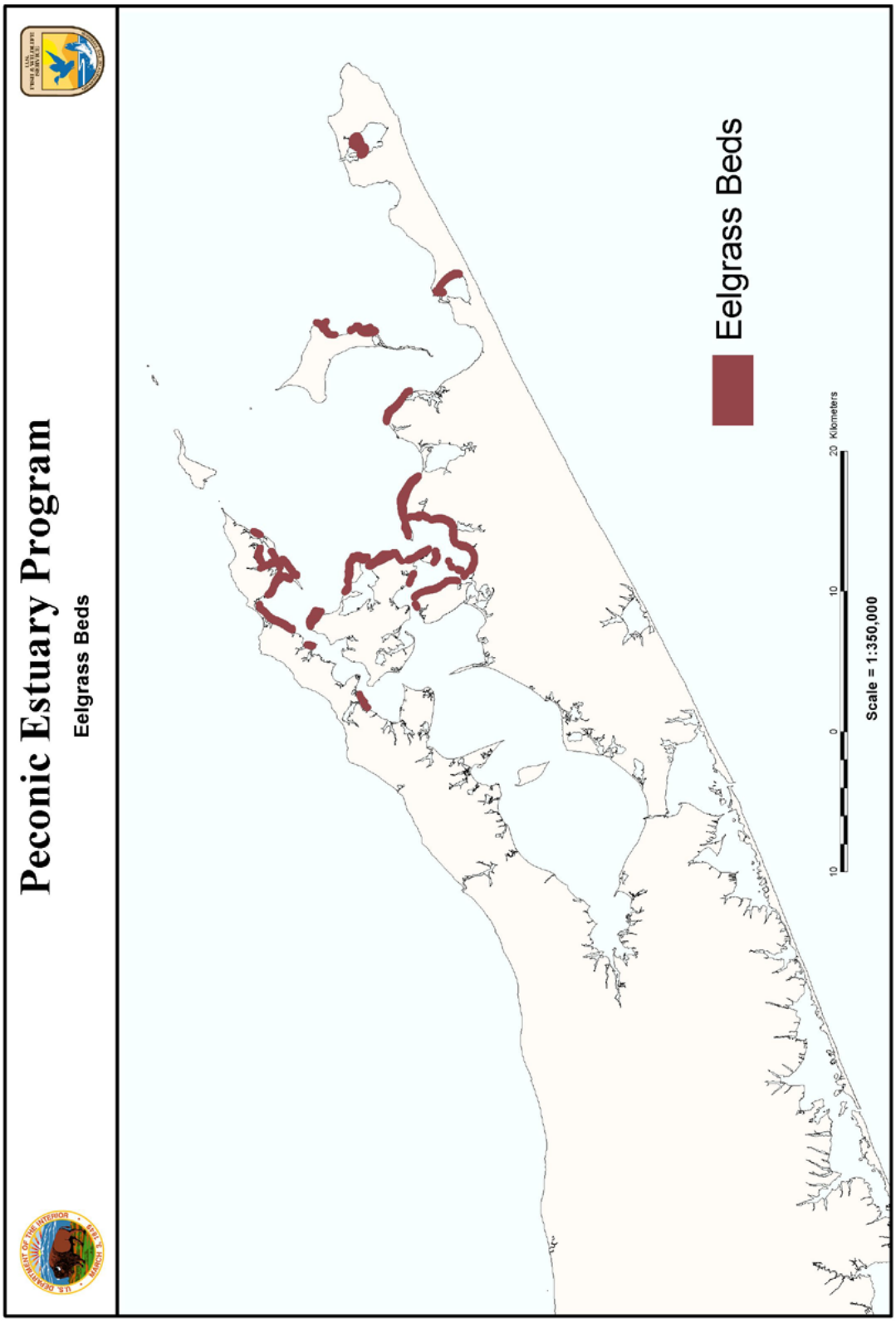

Figure 4-2. Eelgrass.

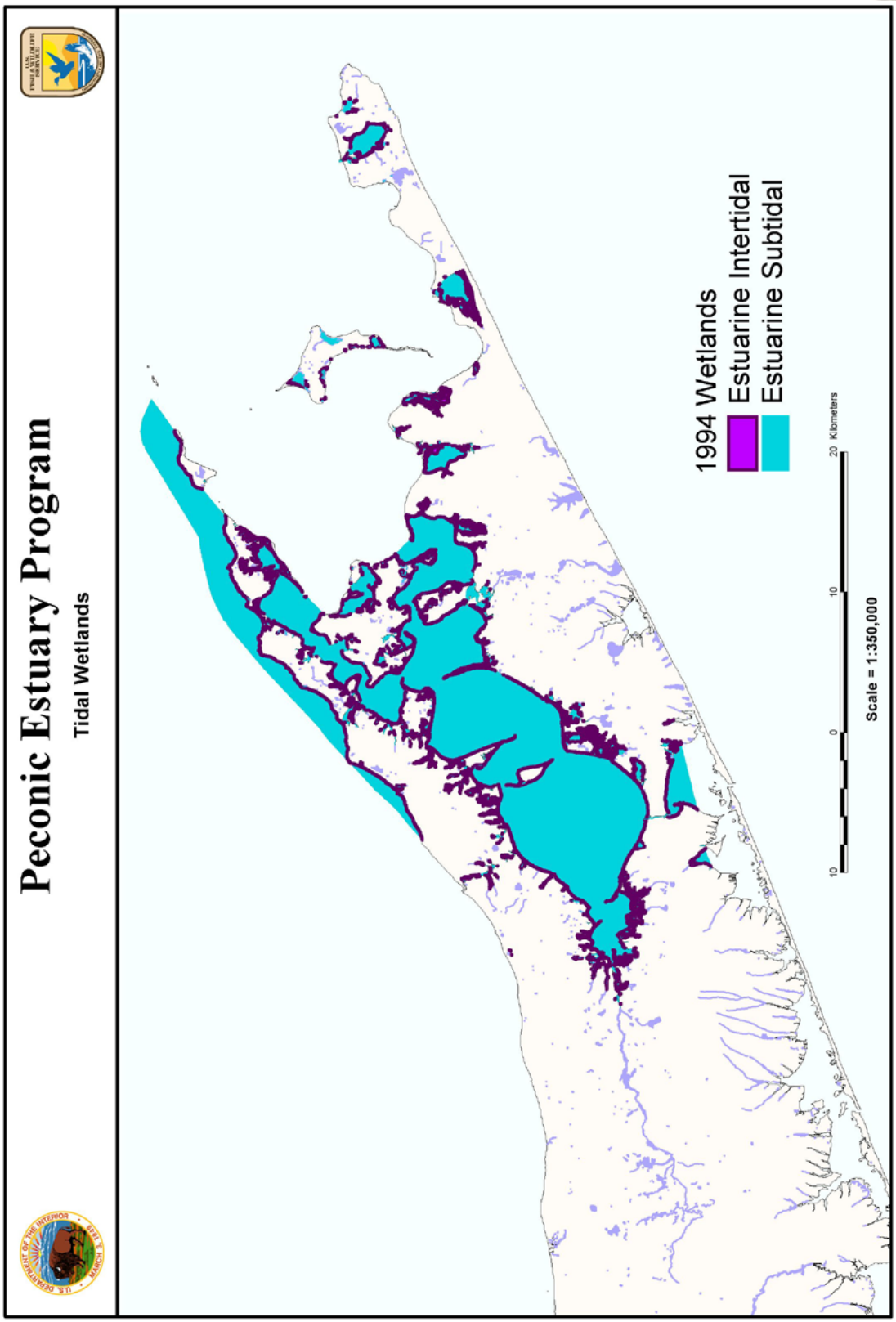

Figure 4-3. Tidal Wetlands.

The marshes also play a role beyond that of habitat for birds and fishes and invertebrates. They provide a hydrologic buffer zone that acts in two ways. These habitats are capable of filtering a large amount of surface runoff from land, buffering the estuarine waters from excess nutrients and contaminants that might be contained in stormwater runoff. Conversely, they can absorb a large amount of floodwater from the estuary during storm surges. In this way, they are vital as a transition zone between the estuary and the terrestrial environment.

Mud and Sand Flats and Sandy Beaches

Several species of commercially important bivalves are found on intertidal mudflats, including hard clams and soft clams. These areas are also used by finfish for spawning and nursery grounds with the adults, larvae, and juveniles moving on and off these unvegetated areas with the tides.

The estuary margins are extremely important to birds. Wading birds and raptors feed over the mud and sand flats at high tide. Sandy beach strands are used for nesting by shorebirds, such as terns and plovers. The proximity to saltwater and a reliable food source are key for these species.

Sandy beaches are found throughout the system. In addition to the endangered beach sand-nesting birds previously mentioned, beaches are home to a variety of rare plants that are exclusively adapted to these nutrient-poor environments. These are all found upland of the mean high tide and include various succulents and grasses, such as seabeach knotweed. Horseshoe crabs also actively use the sandy beaches.

Coastal Bluffs and Islands

Another habitat found along open shorelines is coastal bluffs. This habitat is not as abundant around the Peconic Estuary System as on the northern shore of Long Island, but a few areas exist in the Peconic Estuary System. These habitats are vulnerable to erosion by wind and waves. Coastal bluffs can support some vegetation, which stabilizes them to some extent but are eventually eroded inland. There are few species adapted exclusively to these areas; erosion is of concern for areas immediately landward of the bluff. Bluffs are an important part of the beach system and are an excellent source of sand for the beaches. In addition to the edges of the estuary around the forks, there are several small coastal islands (exclusive of Gardiners and Robins Islands) which could be considered to fall within the intertidal/shoreline zone. Although not strictly within the PEP study area, they are included here because of their significance to the region. These small, rocky islands lie east of Plum Island. They serve as haul-out areas for marine pinnipeds, and support large colonies of terns (Great Gull Island in particular).

Peconic River, Freshwater Wetlands, and Ponds

This zone comprises the entire freshwater surface drainage of the Peconic Estuary including freshwater creeks and coastal ponds. The Peconic River and its basin make up the largest fraction of this zone in the study area.

The freshwater environment is crucial to the Peconic system, because it is the influx of fresh water that makes the system estuarine. A mix of fresh and salt water is vital for the growth and development of many species, some of which cannot survive in highly saline seawater. As with salt marshes, freshwater swamps, bogs, and vernal ponds are also important as areas that absorb and filter stormwater runoff and support a variety of fish, invertebrate, and bird species.

There are approximately 3,739 acres of freshwater wetlands in the Peconic Estuary System, which are hydrologically connected via permanent surface water to the estuary (as compared to those that are connected via groundwater or are ephemeral wetlands). Approximately 55 percent of these are associated with the Peconic River and its tributaries, comprising a total of 2,079 acres. There are also a number of small pockets of freshwater wetlands that do not connect to the Peconic River but are within the boundaries of the Peconic Estuary study area. These pocket wetlands contain many rare and endangered species and represent important habitats.

Fresh water ponds connected to the Peconic River and the upper reaches of the river itself are home to a New York State listed "special concern" fish, the banded sunfish, found only in pine barren ponds in the eastern United States. There are also two species of rare amphibians found in the Peconic River basin, the tiger salamander, which requires quiet ponds with good water quality to reproduce, and the southern leopard frog. The river and a few other streams in the Peconic region continue to sustain runs of alewife, an anadromous fish. Although the Peconic River has been dammed, each spring these fish can be found at the base of the first dam, attempting to move upstream. A temporary fish ladder was installed in the spring of 2000 to provide fish passage above the first dam in downtown Riverhead. Puddle ducks are also found in abundance at several freshwater ponds around the eastern end of the Island.

Terrestrial Zone

Although this zone makes up the remainder of the habitats within the study area, a major focus in this Management Plan will be on natural terrestrial communities that are directly adjacent to or heavily influenced by the presence of the estuary.

The terrestrial zone starts landward of habitats that are inundated by tides but not including the Peconic River, freshwater wetlands, and ponds. There are a number of characteristic plant communities, which occur in this upland coastal zone around the Peconic Estuary. Soil type, hydrology, and microclimates determine the occurrence of these communities. Forest types include maritime red cedar (found on the long, narrow peninsula of Orient State Park), maritime oak (found on the exposed bluffs of Jessups Neck and Mashomack Preserve), oak-holly (on the Montauk peninsula), and pitch-pine oak (the dominant community in the central Long Island Pine Barrens). The Peconic watershed may also contain significant examples of other communities such as the chestnut-oak forest.

Other significant coastal upland communities include remnant maritime grasslands (found in the Peconics at Conscience Point, Montauk, and the Shinnecock Hills) and maritime heathlands (found at Montauk Mountain). These communities consist of tall grasses and shrubs and are notable for their lack of large trees and diversity of specialized plants and insects.

All these plant communities contain insects, birds, and other organisms, which are specifically adapted to them. In recent years, nine of 13 insect species, two of 12 bird species, and many of the 82 vascular plants identified as threatened, endangered, or species of special concern have been documented in the terrestrial zone.

OVERALL QUALITY AND USE IMPAIRMENTS

Impacts to most of the habitats and species in the estuary system are the result of either physical alteration of the land and seascape or chemical contamination of waterways from compounds deriving primarily from land-based sources. Examples of the former include channel dredging, filling of low-lying areas, hardening of the shoreline (*e.g.*, bulkheads, docks, and groins) and clearing of land for human uses. Chemical contamination occurs when excessive amounts of natural compounds, elements, or toxic anthropogenic compounds are released into the system.

Environmental Criteria (Laws & Regulations)

Since habitat and living organisms are resources to be protected rather than pollutants to be controlled and discouraged, it is difficult to describe them in terms of standards or guidelines. There are numerous laws that regulate the human use of, or interaction with, these resources. They have been promulgated at Federal, State, County, and town levels. Most of these regulations are aimed at individual species or a particular habitat type or natural community. An overview of these laws and regulations can be found in ***Appendix K****.*

Invasive species are another threat to habitat and living resources of the estuary system. Non-indigenous species are of particular concern because these species often have no natural predators and, thus, either parasitize and kill or out-compete the native species for food and space.

Physical Alteration

Physical alteration has occurred throughout the Peconic Estuary and its watershed. Low-lying marshes and swamps historically have been ditched and drained for mosquito control or filled for construction or agriculture. Dredging has been carried out on most of the inlets and navigation channels in the embayments and surrounding creeks. Bulkheads, rip-rap and other structures have been widely used to stabilize waterfront property throughout the estuary. These structures have altered shoreline erosion and accretion patterns and reduced the amount of natural shoreline available to living organisms. Roads have also disconnected and degraded many tidal wetland systems in the past. Although culverts have been installed to reconnect these wetlands, they are often poorly maintained and do not flush properly. Hence they often block migratory fish from spawning and further reduce habitat quality. Much of the uplands have been cleared, historically for agriculture and recently for residential developments. In this respect the Peconic Estuary is no different from other parts of the country, although such clearing has not occurred to the degree that it has around other estuaries in the region. Natural communities most affected by development include wetlands, beaches, grasslands, forests, and coastal ponds.

In addition to direct impacts, development and land use have also led indirectly to the degradation of habitat and changes in natural communities. Filling for roads and railroads has cut off the flow of water to a number of tidal wetlands. Over time, the vegetation has changed (including invasion of nuisance species), and the marsh has either become a freshwater wetland or it has gradually filled in and become upland. Dams have been built on a number of the streams emptying into the Peconics, preventing the movement of anadromous fish into fresh water for spawning. It is believed that dredging has changed the current patterns in small embayments and creeks, which has led to changes in sediment distribution, suspended solids in the water column, and community composition. The use of hard structures along the shoreline has led to the loss of wetlands and beaches as well as the scouring of shallow areas with impacts to the shallow water benthic communities. In many cases, the changes associated with bulkheads may have been quite localized and subtle, with no apparent

impairment to human uses of the area. However, many small changes can lead to widespread cumulative damage of natural communities throughout the system.

Chemical Contamination

Chemical contamination can have a variety of effects. The addition of toxic substances can have an acute or chronic toxic effect on many species. Extensive contamination of the surface water in the Peconics with toxic substances, however, has been rare, and long-term impacts on populations of living organisms have probably been minimal (see **Chapter 6**). One of the most significant chemical contaminants in the Peconics has been excess nitrogen (see **Chapter 3**). Inputs of nitrogen can lead to phytoplankton blooms, the loss of rooted macrophytes, such as eelgrass, or hypoxic conditions that can kill sedentary benthic organisms and cause mobile species to relocate. Sediment loading may also be included in this category since many contaminants attach to particles. Such loading also results in siltation, which is a physical alteration. Resources most affected by chemical contamination include eelgrass beds, soft-bottom benthic communities, wetlands, and plankton communities.

Invasive Species

Invasive species can impact native plant and animal communities around the estuary. For example, *Phragmites australis* is an invasive species that forms monotypic stands in disturbed tidal wetland areas. While recent evidence suggest that Phragmites australis has some habitat value (*e.g.,* fish and bird habitat), these stands have generally decreased the overall habitat value for native species, alter nutrient cycling regimes, and are a fire hazard. Non-indigenous plant and animal species, which have been either accidentally or purposefully introduced to Long Island, can also represent a threat. These species can out-compete indigenous populations, causing irreparable damage to the local ecosystem. There are already non-indigenous species in the Peconics (*e.g*., the marine macroalgae *Codium fragile* or Green Fleece) whose impact on the environment is unknown. Green Fleece is abundant throughout the estuary. Because fishermen have reported sets of scallops in areas of *Codium fragile* in the western portion of Peconic Bay, its significance needs further evaluation.

Deep Water Zone

Water quality in the deep water zone east of Flanders Bay is generally excellent with respect to dissolved nutrients, oxygen, and suspended solids. There are no significant concentrations of toxic contaminants or pathogens found in this zone. The Brown Tide algae bloom was found in these areas and in shallow waters and enclosed embayments. The effects on finfish and benthic communities is unknown.

Finfish

Populations of many species of finfish that inhabit the deep water zone of the Peconics have been greatly reduced in the past few decades. The major cause of this impairment is probably overfishing by both commercial and recreational participants on the entire Atlantic coast. Other causes may include the loss of feeding and reproductive habitat. Some fishermen believe that it might be juvenile mortality. With the data available, it is impossible to determine how much of the decline in finfish populations in the Peconic Estuary is due to habitat losses as compared to overfishing. It is not clear at all how previous activities such as commercial trawling, recreational fishing, oyster culturing**,** recreational boating, and dredging may have affected local populations through habitat disturbance and modification in this zone.

Shellfish

A shellfish survey conducted in the deep water (greater than three meters) of the Peconic Estuary showed this zone to have a low abundance of commercially important species, despite supporting a rich benthic fauna overall. For example, a comparison between a 1979-80 open water shellfish survey conducted by the NYSDEC and a 1995 survey conducted by the PEP and the NYSDEC at the same sites show that natural populations of hard clams in waters greater than approximately four feet (1.2 m), which were never very high, have declined in abundance as have the levels of other, non-commercial shellfish species. It is not clear if these communities have changed or became impaired in recent years. A number of historical activities may have seriously affected these bottom communities, including trawling for fish and dredging of oysters. Boating activities and the use of lime for starfish control may also be responsible for bay bottom impacts.

Oysters were originally the most valuable commercial species in the Peconic Estuary system. The populations were not natural, however, but came from the seeding of bottom waters for grow-out (primarily in the deep water zone). These cultivated populations were the basis for the reputation of Peconic Bay oysters in the past. The oyster industry began declining in the 1960s due to the loss of seed in Connecticut, and by the 1980s, landings of this species accounted for only a small percentage of the shellfish harvested from the Peconic Estuary system. The 1979/1980 NYSDEC survey yielded no oysters; the 1995 PEP survey found only one.

Commercial trawling for finfish existed in the estuary until the State imposed a ban on this activity in 1994. There is anecdotal information that, in addition to soft bottoms, trawling may have damaged or destroyed hard bottom substrates such as shell hash, along with the communities that depend on them. Widespread oyster culturing in soft-bottom areas also may have affected benthic communities. In this process, juvenile oysters were laid out in deep water areas and then dredged up, an activity that repeatedly rakes up the bottom. There are no data, however, on the impacts of these activities on benthic communities before, during, or after the most intensive period of oyster aquaculture, trawling, or boating activities in the Peconic Estuary.

Most of the oyster grow-out activities and clam cleansing that currently takes place in the estuary is done on trays or shellfish cages. The State-sponsored transplant program transfers hard clams from Raritan Bay in New York Harbor to deep water portions of the Peconics for cleansing before they are marketed. Most of the transplanted shellfish are not placed on the bottom for later dredging, but on racks or cages which are pulled up after a 21-day cleansing period. It is not clear how these ongoing activities are affecting benthic communities. Possible benefits could include spawning of naturally occurring populations and improved local water quality through the shellfish's natural seawater filtration process.

Birds

Sea ducks are found in the estuary primarily from November to April. They use the deep water portions of the estuary for feeding and resting. There are no obvious impairments to these populations aside from local impairments by either hunting, which is permitted at certain times of the year, or damage to their food supply (shellfish and other benthic invertebrates).

Sea Turtles and Marine Mammals

Marine mammal and sea turtle populations in the Peconics are increasing. The reasons for these increases are likely the result of the protection of these animals from hunting and, in the case of turtles, protection of their breeding grounds outside of the region. The main potential for impairment to these populations in the Peconic Estuary is damage to or loss of feeding grounds (in the case of all species of marine mammals and sea turtles) or loss of or damage to haul-out areas (in the case of

seals). Since the sea turtles subsist on certain macrocrustacean species or macroalgae, damage or modification of their habitat or their food species could adversely or positively affect the species. Threats to individual animals include collisions with motorboats or possibly with trawls, entanglements, and attacks on hauled-out seals.

Shallow Water Zone

Shellfish

Shellfish populations in the Peconics have fluctuated over time. Most of these fluctuations have been the result of natural variations in the environment. The algae bloom known as Brown Tide wiped out the scallop populations in the mid-1980s and again in the mid-1990s, but it is not known if anthropogenic factors played a role in the appearance of these recurring blooms (see **Chapter 2**). The scallop populations have never regained levels seen during pre-Brown Tide years. Aside from Brown Tide, the greatest limitation to shellfish harvesting in the shallow water zone at the current time is the closure of shellfish beds due to pathogen contamination. These closures may prevent over-harvesting of some species of shellfish and provide spawning sanctuaries for future stocks. Despite that, pathogens are a threat to human health and closures are an impairment to the shellfish industry.

Submerged Aquatic Vegetation

The PEP recognizes that some of the most important underwater habitats of the estuary are the meadows of eelgrass found along the eastern end of the Peconic Estuary. These eelgrass beds provide food, shelter, and nursery grounds to many marine animals including the commercially important bay scallop. Eelgrass beds are also an important contributor to the detrital food web by providing carbon and nutrients to bacteria and fungi, which in turn are prey for numerous marine invertebrates and fish. Many of the eelgrass beds along the East Coast were wiped out by a mysterious "wasting disease" in the 1930s. It is believed now that the disease was caused by the slime mold *Labyrinthula zosterae*. The beds were extremely slow to recover and many areas have not been recolonized to this day.

According to anecdotal information, eelgrass was once found throughout the estuary and may have been lost, in part, to effects from Brown Tide that first occurred in Peconic waters in 1985. The PEP study performed by Cashin Associates in 1996 confirmed a decline in eelgrass beds. The Cashin survey estimated that there are 8.5 square km of eelgrass in the estuary, while Dennison estimated in 1989 13.5 square km of eelgrass in Gardiners Bay alone. Cashin Associates also reported a decline in eelgrass beds from March to October 1994 that was unrelated to a Brown Tide bloom. Poor water quality, including high levels of nitrogen and suspended sediments, have been implicated as causes leading to declines in eelgrass beds in the Peconics as well as other estuaries along the Atlantic seaboard. In addition to these factors, which operate on relatively large scales, eelgrass beds can also be damaged by scallop dredging and motorboat traffic, both of which snag and uproot the plants. But according to fishermen, if a scallop dredge is catching eelgrass roots, it means it is not catching scallops and hence not worthwhile.

Intertidal/Shoreline Zone

The impairments to tidal wetlands, mudflats, and shoals are among the best documented and well known in the region. In an effort to improve and increase agricultural land, prevent local flooding, improve waterways for use by vessels, and control mosquitoes, these intertidal habitats have been dredged, filled, ditched, and diked. Considered for years to be "useless" property, it has only been in

the last few decades that governments and the general public have come to realize the important role that these habitats play in nurturing many of the estuarine species valued by humans.

As discussed earlier in this chapter, actual loss of tidal wetlands in the Peconics has been close to zero in the past few decades. Unfortunately, there are few reliable estimates of the percentage of vegetated salt marsh loss prior to the 1970s, let alone any estimates of the loss of unvegetated intertidal habitats. Nevertheless, it is probably safe to say that there was a significant loss of these habitats in certain locations around the estuary, particularly in those areas that have been occupied by humans for generations.

Although wetland loss has been minimal in the past few decades, many areas of salt marsh have been degraded by adjacent land use practices. The State Tidal Wetlands Law and Federal Clean Water Act prohibit physical alteration of wetlands and require a permit for all activities in areas adjacent to the wetlands. If the activity will cause significant harm to the wetland, a permit may be modified or denied. Because this law allows development and dredging in areas adjacent to wetlands, there is the risk of habitat degradation over time. Even though these activities may not cause direct loss of wetlands, there is the danger that they will impair the ability of these habitats to function as they should. Therefore, while the extent of wetlands may not decrease in the future, the quality of those wetlands may become very poor. Such impaired marshes often appear to be functioning wetlands, but are, in fact, unable to support the extensive wildlife communities they once did, or to absorb and filter the same amount of water and contaminants in surface runoff. Fragmentation is also a problem where marshes are parsed into small pieces interrupted by filled areas, docks, roads, culverts or bulkheads. These small fragments are incapable of functioning the way larger tracts of marsh do, although they may still provide habitat for a limited variety of organisms. Additionally, leaching of toxic chemicals from wood preservatives in bulkheads (*e.g.*, creosote, copper-chromium-arsenic) may have adverse effects on the biota of shallow-water habitats that are adjacent to these structures (see **Chapter 6**).

Over the long term, it is estimated that the current laws protecting tidal wetlands will effectively protect only about 60 percent of the existing, privately-owned areas. The biggest long-term threat is the development of small waterfront lots (existing before the tidal wetlands law was taken into account when subdivision plans were approved). Under existing State law, if an owner is not able to build a structure on his/her property that is compatible with existing zoning due to the existence of wetlands, the State will either have to permit the filling of the marsh to accommodate the structure or compensate the owner for the property. The economically feasible choice in most cases is to allow filling rather than purchasing the property.

The placement of bulkheads and other hard structures at the water line represents another long-term threat to the tidal wetlands fragmentation. If sea-level continues to rise, these structures will prevent the natural shoreward migration of the wetlands. In time, the wetlands will be submerged and cease to exist.

Tidal wetlands around the Peconic Estuary System have also been adversely affected by the invasion of huge colonies of the common reed *Phragmites australis*. This plant can successfully colonize tidal marshes that have been disturbed, as well as areas that are undisturbed, replacing *Spartina* species. The addition of impervious areas such as roads, parking lots, and driveways increases stormwater runoff and can result in lowered salinity—a condition favored by this plant, which propagates in water with reduced salinity. Because *Phragmites* colonies are clonal (*i.e.*, they propagate as individual plants from a single rhizome root system), as long as part of a rhizome is in fresh or brackish water, a colony can propagate into higher salinity waters. This accounts for the presence of

these plants in the salt marsh far from fresh water. Despite its invasive nature, researchers have found that tidal marsh invertebrates (*e.g*., snails, amphipods, and isopods), which are prey species for mummichogs, were common to abundant in reed grass-dominated regions, as well as in areas covered by typical tidal marsh vegetation along a salinity gradient of the lower Connecticut River. Therefore, the potential value of *Phragmites* also needs to be ascertained.

Many species of birds are vulnerable to loss of intertidal habitat in the Peconic Estuary System. Puddle ducks, Canada geese, and black ducks use these areas for feeding, breeding, and rearing young, particularly since wetlands and tidal creeks have historically been reduced in size and physically altered. Loss of wetland and intertidal habitat has had the effect of concentrating overwintering ducks and geese into the remaining unaltered areas around the estuary. Increased concentrations of these birds in poorly flushed embayments may lead to increased loading of pathogen indicators into the waters, which may in turn result in closure of adjacent shellfish beds to harvesting (see **Chapter 5**).

Beaches and dunes, as well as wetlands have been adversely impacted by human activities, primarily through direct or indirect physical alteration. Dunes act as barriers, which protect areas behind them from overwash and erosion by wind and storms; they are stabilized by vegetation adapted to the exposed environment. Dune habitats have been destroyed throughout the region as vegetation has been removed or when they have been irreparably damaged by pedestrian and vehicular traffic. Dunes also have been excavated to make way for parking lots and summer homes. Conversely, dunes migrate naturally, and over-stabilization of these land forms with non-indigenous vegetation or hard structures such as fencing or groins, has also led to a loss of habitat. Species which use beaches or dunes for nesting, such as diamondback terrapins and shorebirds, have been forced to abandon many sites due to human disturbance (from foot traffic, off-road vehicles, boats and jet-skis in the shallow zones, and construction), as well as poaching and predation by gulls, crows, foxes, raccoons, and feral cats. Dredging and construction of bulkheads and jetties also have caused loss of beaches. These activities change current patterns, altering erosion and transport processes. In some cases, beaches have been nourished and maintained by dredging/placement operations.

The protection from chemical degradation afforded to marshes and mudflats under the Tidal Wetlands Law is limited. Stormwater runoff from roads, private property, and marinas is a common problem around the Peconic Estuary. This flow can carry toxic substances such as motor oil, polynuclear aromatic hydrocarbons (PAHs) from engine exhaust, and heavy metals from tire and engine wear as well as lawn and garden herbicides, pesticides, and fertilizers. In addition, road sand and sediment from improperly-contained construction sites are washed into these low-lying areas. Regulations generally do not allow the direct discharge of this runoff into tidal wetlands, but indirect inputs are common.

Peconic River, Freshwater Wetlands, and Ponds

Threats to freshwater wetlands are potentially greater than to tidal wetlands because the laws protecting these habitats are weaker. Specifically, wetlands less than 12.4 acres in size are not protected under the New York State Environmental Conservation Law (ECL) Article 24, the Freshwater Wetlands Protection Program, unless they are shown to be of local importance. This State law provides for the preservation and protection of freshwater marshes, swamps, sloughs, bogs and flats over 12.4 acres (five hectares) that support aquatic or semi-aquatic vegetation. Smaller wetlands may also be protected if deemed to be of local importance. Additionally some local governments also have regulations that protect freshwater wetlands. Permits are required for almost all activities within

or adjacent to wetlands [within 100 ft (30.5 m) of a wetland boundary]. Activities requiring permits include: 1) construction of buildings, roadways, septic systems, bulkheads or dams; 2) placement of fill, excavation or grading; 3) modification or restoration of existing structures; 4) drainage; and 5) application of pesticides. All agricultural activities are exempted from this law. Most of the freshwater wetlands in the Peconic Estuary drainage basin are smaller than 12.4 acres, but they have all been designated as being of local importance and any activities in these areas require a State permit.

Freshwater wetlands and ponds are threatened by the same activities as tidal wetlands and creeks, including sedimentation, hardening of the shoreline, and stormwater runoff, as well as groundwater draw-down and dams. Even wetlands in the Peconic River drainage basin, which are protected by being in parkland or in the Pine Barrens Core Preservation Area, are impaired due to erosion caused by vehicular and foot traffic, runoff, and groundwater draw-down by drinking water wells for nearby housing developments. The loss of these small wetlands would result in the extinction of local populations of organisms dependent on these swamps and ponds. These species include the banded sunfish, several species of amphibians, and a variety of aquatic plants and insects.

Another potential threat to small freshwater ponds and wetlands is toxic contamination. These areas may receive this contamination from a variety of sources, including runoff and aerosol deposition from agricultural and residential application of pesticides and herbicides. Unlike the Tidal Wetlands Law, the Freshwater Wetlands Law does have a provision, which prevents the use of herbicides and pesticides in the vicinity of these areas as a protective measure for finfish. Unfortunately, the NYSDEC Division of Fish and Wildlife does not have the staff to enforce this provision except in cases of gross and obvious contamination. For this reason, low-level, chronic impacts from these toxic sources remain a threat to these habitats.

Several stretches of the Peconic River have been designated as scenic or recreational under the State Wild, Scenic, and Recreational Rivers Act, which means that permits are required for activities that take place along the banks in those sections. These activities may be limited if they violate the scenic or recreational nature of the river. The Peconic River, however, has already been extensively modified in the past through damming, bulkheading and toxic contaminants from Brookhaven National Laboratory (see **Chapter 6**). Runoff and erosion have also caused some degradation in the water quality. Further indirect impacts to the upstream portion of the river from changes in land use should be minimized by the implementation of the Pine Barrens Plan, which will preserve land around the Peconic River.

Terrestrial Zone

The most significant threats to terrestrial communities are: 1) outright loss to agriculture or residential development; 2) fragmentation of remaining communities; 3) fire suppression; and 4) invasive species. Larger continuous areas of terrestrial habitat are more biologically diverse and have higher densities of individuals. Reducing the size of natural areas or dividing them up into pieces with barriers such as roads or developments will result in fewer species and individuals living in the pieces, even if the total area is not reduced. Overall size and continuity are especially critical for species which are territorial, including many birds and mammals. Other species, such as neo-tropical warblers, require large tracts of woodland for successful reproduction. In the case of these birds, their small open nests are vulnerable to predation by foxes and domestic cats or parasitism by cowbirds. Because predators and cowbirds only penetrate woodlands to a certain distance, survival of viable

populations of warblers depends on the existence of forests, which are large enough to exclude predator species and cowbirds from a significant portion of the habitat.
The dwarf pitch pine forests in the Pine Barrens depend on fire for survival. Periodic burnings initiate germination in the pitch pine seeds and also destroy undergrowth species. Without fire, these trees and their associated plant and animal communities will not reproduce and will be replaced by scrub oaks. Grassland habitats also depend on fire to some extent. Successful long-term maintenance of these communities depends on periodic burnings to prevent plant succession to shrubs and trees. The native grasses are drought tolerant, so burning which destroys young trees only removes above-ground stems and shoots of these species, without damaging the deep root systems, and allows regeneration.

All native plant communities around the estuary are threatened by the invasion of non-indigenous plant and animal species, which have been either accidentally or purposefully introduced to Long Island. Often these species have no natural predators and, thus, they either parasitize and kill or out-compete the native species for food and space. Although nuisance species are a problem in all environments, their impacts in terrestrial environments have been particularly well-documented.

MANAGEMENT STRATEGY AND ACTIONS

The Peconic Estuary and its watershed are sites of human activity of all kinds. In addition to residential, commercial, and agricultural land uses, the area supports a significant tourism industry. Fishing, shellfishing, boating, swimming, hiking, and hunting are only some of the recreational uses actively pursued in the estuary and surrounding watershed. Many of these activities depend on the existence of high quality water and healthy living resources. Shellfish, such as bay scallops and hard clams, and finfish, such as winter flounder and weakfish, support large groups of commercial and recreational enthusiasts. Upland habitats sustain many species that are recreationally important, such as deer and birds. Undisturbed habitat also provides aesthetic benefits, which add to the enjoyment of other activities. All these resources need to be conserved and enhanced as much as possible for these purposes and future, currently unforeseen uses of the system. It is also important to remember that living communities other than our own are valuable and necessary in their own right and not just as they are directly useful to humans. Humans are part of the overall ecology of the planet and need to conserve all components of our ecosystem. The PEP has tried to develop recommendations for the management of the estuary and its watershed that will foster recreational and commercial uses of the Peconic Estuary that are sustainable and compatible with protection of biodiversity. It is possible that through the implementation of these recommendations there will be an enhancement of economically and ecologically important species.

Good water quality is extremely important for the protection and restoration of estuarine and maritime communities. However, since water quality is addressed through other chapters of this draft Management Plan, the management actions in this chapter will not focus on actions linked to the impacts of contaminants on habitat and living resources. The actions will be focused primarily on the impacts of habitat fragmentation and habitat degradation on living organisms, and the protection and restoration of natural communities in and around the estuary from causes other than poor water quality. Since the Peconic Estuary is in excellent health compared to neighboring estuaries, these actions are aimed at prevention of incremental and cumulative problems.

Critical Natural Resource Areas

Although it is clear that the entire estuary is ecologically important, the PEP has chosen to apply the concept of "critical natural resource areas" to focus protection efforts on the variety of species and natural communities that exist within the PEP study area. Critical Natural Resource Areas (CNRAs) are geographically-specific locations that currently have significant biodiversity and may require an extra level of protection (management and/or regulation) to preserve their unique characteristics. Many of these areas are presently threatened by development or uses that could degrade their quality.

In March 1996, the U.S. Fish and Wildlife Service (USFWS) Coastal Ecosystems Program generated a list of species and species habitats for the watershed (referred to as species of special emphasis). This list was reviewed by the PEP Natural Resources Committee and used as the basis for examining the waters and watershed of the Peconics. The list included USFWS trust species, threatened and endangered species, anadromous and migratory species, New York State Natural Heritage Program species and communities of concern, and important commercial and recreational species.

The PEP, together with area stakeholders, followed a two-step process to identify potential CNRAs. First, the PEP and stakeholders identified 97 "hot spots" in the system that represented (1) feeding, breeding, and over-wintering areas for species of special emphasis; (2) key reproductive areas (spawning, breeding colonies, nest sites) for species of special emphasis; (3) areas with significant concentrations and co-occurrence of species of special emphasis; and (4) imperiled natural communities or exemplary examples of common natural coastal communities. Once these hotspots were identified and mapped, larger CNRAs were delineated to encompass multiple proximate and overlapping hot spots. Through this process, 17 CNRAs have been defined which encompass most of the hot spots. These 17 CNRAs are roughly outlined in **Figure 4-4**.

Now that these CNRAs have been very broadly delineated on a purely technical basis, additional personnel, including natural resource managers and planners from all levels of government will be consulted. Based on these discussions, recommendations and commitments for management and/or regulation of the CNRAs will be developed**.**

In addition to management actions directed at CNRAs, the PEP is developing management actions, which are focused on specific habitats or species that exist throughout the estuarine system, whether they are contained in critical areas or not (*i.e.*, deep water and shallow water management zones). This approach recognizes the interconnected and interdependent nature of the estuary system.

Therefore, there will be many areas in and around the estuary, which are worthy of protection and, more importantly, of restoration, which will not fall within one of the critical areas. It is not the intent of the PEP to protect only certain high-quality areas at the expense of areas with poorer quality habitat which have the potential to improve or which may yet serve important ecosystem functions. The management of habitats and living resources in the Peconics will require a blend of protecting existing natural areas and restoring or enhancing others in an effort to achieve the best natural, sustainable ecosystem possible.

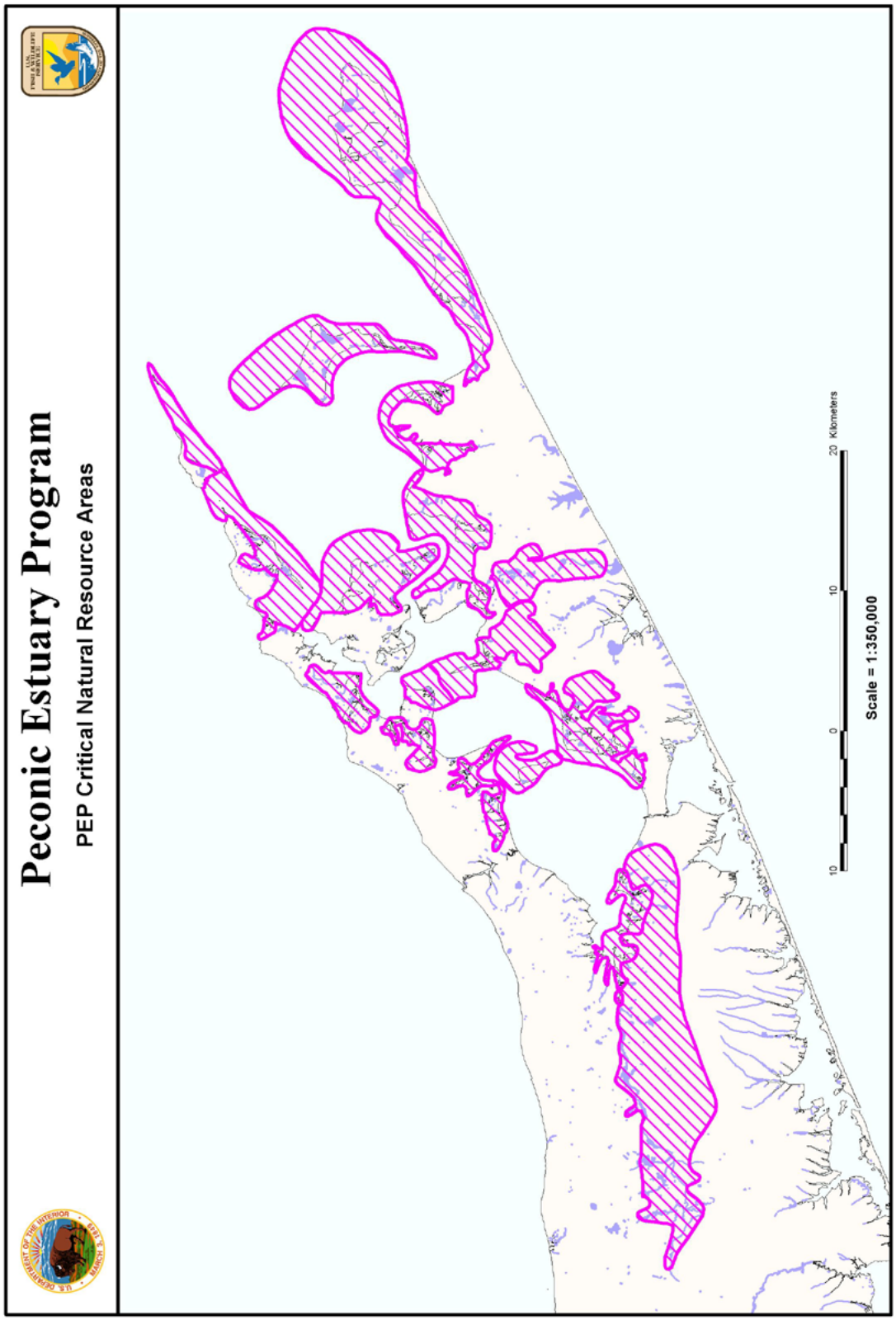

Figure 4-4. PEP Critical Natural Resource Areas (CNRAS).

Habitat Restoration Work Group

To address the enhancement of existing resources or restoration of habitats, which have been lost or degraded, the PEP has convened a Habitat Restoration Work Group (HRWG). The purpose of this group is to identify and prioritize the significant natural habitats of the system, develop overall habitat restoration goals, identify locations where these habitats can be restored, and develop, in conjunction with public and private landowners, specific restoration projects.

The short-term goal of the HRWG is to identify specific habitat restoration projects within the Peconic Estuary and Peconic River and their watersheds, which are ready for immediate funding. The voters of New York, in November 1996, passed the Clean Water/Clean Air Bond Act, which has the restoration of aquatic habitats as one of it goals. This Act, which was pioneered by Governor George E. Pataki, provides $30 million jointly for the Peconic Estuary and South Shore Estuarine Reserve. It is the expectation of the PEP that a portion of those funds will be used for aquatic habitat restoration projects. The long-term (2-3 years) goal of the work group, to be carried out in parallel with the short-term goal, is to identify the natural habitats throughout these areas, which are most in need of restoration as well as to develop criteria for inclusion of projects in a prioritized restoration list. It is hoped that, eventually, the two goals will merge after a year so that projects which are submitted for Bond Act funding incorporate identified habitats and restoration criteria developed for the Peconic Estuary study area as a whole. The HRWG also will develop habitat-specific restoration criteria as well as criteria for monitoring restoration projects.

MANAGEMENT ACTIONS

The designation of critical areas and the identification and prioritization of habitat restoration sites will be two of the most significant efforts carried out by the PEP. These efforts, although done separately and through different processes, are intended to compliment each other and, in some cases, will be done in coordination. The implementation of measures recommended by PEP to protect and restore natural habitats will be crucial in the management of the entire system.

The actions listed below have been developed in consensus by the PEP Management Conference to meet the natural resources objectives listed at the beginning of this chapter. These proposed actions reflect the best measures that can be taken to preserve the habitats and living resources of the estuary.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

HABITAT AND LIVING RESOURCES ACTIONS

HLR-1 Use Critical Natural Resource Areas (CNRAs) to Develop and Implement Management Strategies to Protect High Quality Habitats and Concentrations of Species of Special Emphasis.

HLR-2 Manage Shoreline Stabilization, Docks, Piers, and Flow Restriction Structures to Reduce or Prevent Additional Hardening and Encourage Restoration of Hardened Shorelines to a Natural State.

HLR-3 Assess the Impacts of Dredging Activities on Habitat and Natural Resources and Develop Recommendations and Guidelines for Reducing those Impacts.

HLR-4 Examine and Promote Methods of Shellfish Harvesting that are Most Compatible with Establishment and Growth of Eelgrass Beds and Vegetated Salt Marshes.

HLR-5 Implement, Enforce, and Encourage the Continuation of Current Policies and Regulations Protective of Wetlands.

HLR-6 Evaluate the Effectiveness of Current Policies in Preserving Eelgrass Habitat and Develop Ways to Provide Increased Protection for all Extant Eelgrass.

HLR-7 Develop and Implement an Estuary-Wide Habitat Restoration Plan (HRP).

HLR-8 Develop and Implement Specific Restoration Projects.

HLR-9 Monitor and Evaluate the Success of Restoration Efforts.

HLR-10 Develop an Aquaculture Plan for the Peconic Estuary.

HLR-11 Determine the Suitability of Artificial Reefs in the Peconic Estuary.

HLR-12 Foster Sustainable Recreational and Commercial Finfish and Shellfish Uses of the Peconic Estuary that are Compatible with Biodiversity Protection.

HLR-13 Protect Nesting and Feeding Habitat of Shorebirds.

HLR-14 Protect Sea Turtles and Marine Mammals.

HLR-15 Utilize Land Use Planning, BMPs, and Other Management Measures to Reduce the Negative Impacts of Human Uses and Development on the Estuary System.

HLR-16 Develop and Implement a Living Resources Research, Monitoring, and Assessment Program.

HLR-17 Establish a Working Group to Examine the Role of Grazers and Filter Feeding Organisms in Influencing Water Quality and Productivity to Better Understand Food Web Dynamics and to Develop Management Applications.

HLR-1 Use Critical Natural Resource Areas (CNRAs) to Develop and Implement Management Strategies to Protect High Quality Habitats and Concentrations of Species of Special Emphasis.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 6, 7, and 8.

Delineate CNRAs

There are many natural areas within the Peconics that are of very high ecological quality and provide important spawning, breeding, nursery, and feeding habitats for a diversity of rare, keystone, and commercially important species of fish, shellfish, birds, sea turtles, and sea mammals. Many of these areas are comprised of interconnected marine, estuarine, and upland systems. To further protect these existing high quality natural areas, CNRAs were delineated in two expert workshops and refined at meetings with the Towns. Known data sets were acquired and digitized using a geographic information system (GIS). Using these maps further, non-mapped data were collected by convening a scientific group meeting on March 26, 1996. Twenty-eight biologists with expertise in a wide variety of specialties used the USFWS species and species habitat list and the USFWS mapped natural resources GIS data and identified 97 "hotspots" within the Peconics.

Seventeen CNRAs were identified on July 30, 1996 by a second group of biologists who combined the already mapped data and the "hot spots" to delineate the "critical areas." These areas encompassed terrestrial, tidal, and subtidal lands and waters, and, in many cases, included protected areas within the watershed where Federal, State, town, and other organizations have acquired property for conservation purposes. The boundaries of the CNRAs also closely correlate to existing Federal, State, and town designations.

Further meetings were conducted during the Spring of 1998 with town planners, conservation boards, and other interested officials from the Towns of East Hampton, Southampton, Riverhead, Southold, and Shelter Island to finalize the CNRAs. Adjustments were completed during the summer of 1998, and ArcInfo/GIS map files were created. Twenty-nine ArcInfo/GIS files containing CNRA data and maps are available on CD-ROM at the PEP Office.

Most of these areas are undeveloped and primarily in public ownership, but there are developed areas within or adjacent to the CNRAs. Although the entire estuary is important to natural resources and many of the species found in the CNRAs are also found outside of the CNRAs, it is recognized that these high quality areas require special attention to prevent incremental and cumulative ecological degradation.

The draft boundaries with assessment of each area need to be finalized (*e.g.*, benthic/underwater mapping). Analyses of existing data sets should be performed to identify any information gaps that need to be filled and to evaluate individual and cumulative threats to the CNRAs. Compilation of data sets is necessary to obtain a comprehensive inventory of information. These data sets include the USFWS Federal trust listings, Federally listed endangered and threatened species, State protected species, biological conservation statistics of the NY Natural Heritage Program, water quality data collected by SCDHS, NYSDOS Significant Coastal Fish and Wildlife Habitats (SCFWH), land use data collected by the Suffolk County Planning Department (land use and change inventory, population and population saturation inventory, water dependent uses, land available for development) biological data collected by NYSDEC, and marine data collected in surveys for the

PEP. GIS analyses will be used to integrate these data sets and evaluate impacts. This information will strengthen our understanding of the CNRAs and lay the groundwork for developing implementation strategies to manage and protect these areas.

Protect CNRAs

There are already a variety of programs in existence that seek to preserve, protect, restore, or call attention to coastal resources in conjunction with human activities around the Peconic Estuary System. These include the Significant Coastal Fish and Wildlife Habitats, Local Waterfront Revitalization Plans, the New York Open Space Conservation Plan, the Peconic Bioreserve, and others. Many of these efforts, however, are focused on specific habitats or communities or are very small in scope geographically. The CNRAs encompass whole ecosystems and include portions of the estuary as well as freshwater and terrestrial zones. The designated CNRAs will merge a variety of existing efforts into the management of large areas containing a range of valuable natural resources. Specific protection efforts for the CNRAs are emphasized, including zoning, land use planning, environmental review, land acquisition and other protection tools, limitations on marina construction and expansion, and installation of shoreline hardening structures.

As part of the designation process for CNRAs, the PEP has identified and mapped (very broadly) the resources at these sites that require protection. Land in the Peconic watershed available for development has been mapped by the Suffolk County Planning Department based on current use and zoning. Through these two efforts, specific parcels of land that contain significant habitats and species to be protected can be identified (see **Chapter 7**).

Protection of open space should be a key component, although other zoning and land use controls should be applied. The most decisive means of protecting these resources is for a government or private conservation organizations to acquire the property and manage it for preservation purposes. Currently, the New York State Open Space Preservation Plan identifies priority parcels for acquisition by the State. Open space acquisition programs funded by local governments or other groups largely use this document to guide their acquisition decisions. The purchase of conservation easements is a less expensive alternative and may be equally protective of the resources. If direct acquisition or conservation easements are not possible, local governments should work with landowners and developers to create site plans that maximize protection of the resources while allowing suitable use of properties (see **Chapter 7**).

Many current and potential activities within the CNRAs may affect their long-term viability. The following activities may have serious individual and potential cumulative impacts: docks, shoreline stabilization structures, dredging, marinas, artificial reefs, fish farms, fishing, pesticides, golf courses, jet skis, swimming pools, sewage treatment and disposal, building and adjacent upland development, and clearing of vegetation. As boundaries are finalized, additional threats may be recognized that need to be addressed.

Coordinate CNRA Activities with the Significant Coastal Fish and Wildlife Habitat Program

As part of the Coastal Zone Management Program, which is managed by the NYSDOS, Significant Coastal Fish and Wildlife Habitats (SCFWH) were designated more than ten years ago. Many of these sites overlap with or are contained within the large CNRAs identified by PEP. Narratives for

these sites are in the process of being updated with current natural resources information, and the designation and scoring of these sites are being revised on the basis of this new information. In order to foster consistency and coordination, the PEP, NYSDOS, and NYSDEC should work together to review updated Peconics region SCFWH designations, and to ensure that the CNRA initiative complements existing protection and management mechanisms, including the SCFWH and Local Waterfront Revitalization Plan programs. In addition, all governmental agencies should use the SCFWH guidelines to evaluate potential impacts that may occur when development and other activities are considered in these areas.

Steps

HLR-1.1 **Priority** Collect and interpret natural resource, water quality, and land use data sets. Use GIS technology to finalize a comprehensive inventory of species, natural communities and water quality, refine maps (including development of maps of each CNRA), and evaluate individual and cumulative threats within each CNRA.

HLR-1.2 **Priority** Finalize CNRA boundaries and adopt CNRAs by appropriate levels of government.

HLR-1.3 **Priority** Develop management recommendations and plans to protect CNRAs in each town in coordination with existing Federal, State, county, and municipal programs that address individual and potential cumulative impacts including, but not limited to, docks, shoreline stabilization structures, dredging, marinas, artificial reefs, fish farms, shellfish culture, fishing, pesticides, golf courses, motorized personal watercraft, swimming pools, sewage treatment and disposal, building and adjacent upland development, and clearing of vegetation.

HLR-1.4 **Priority** Protect the CNRAs through land acquisition and other protection tools (*e.g.,* clearing restrictions, setback requirements, zoning, Transfer of Development Rights) principally within the areas themselves and including essential watershed buffers (see **Chapter 7**).

HLR-1.5 Prohibit the installation of new shoreline hardening structures within CNRAs. Investigate ecologically enhancing, innovative designs to replace or use as an alternative to hard structures.

HLR-1.6 Coordinate PEP recommendations for CNRAs with the NYSDOS Significant Coastal Fish and Wildlife Habitat Program and Local Waterfront Revitalization Plan Programs.

HLR-1.7 Encourage increased use of the NYSDOS Significant Coastal Fish and Wildlife Habitat Program guidelines by appropriate Federal, State, county, and municipal agencies.

HLR-1.8 Examine the possibility of establishing marine reserves (*e.g.*, protect eelgrass beds) within the CNRAs.

HLR-1.9 Discourage expansion of existing marinas and the creation of new ones within the PEP CNRAs. The marina expansion and creation issue will be further evaluated as part of a comprehensive strategy dealing with shoreline hardening, marinas, docks, and public access (see HLR-1.3).

Responsible Entities

HLR-1.1 NYSDEC, The Nature Conservatory (TNC) (co-leads) with towns and USFWS assistance

HLR-1.2 NYSDEC, The Nature Conservatory (co-leads); PEP Natural Resources Subcommittee; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; NYSDEC; OPRHP; Suffolk County Parks Department; USFWS; and NYSDOS

HLR-1.3 NYSDEC, and The Nature Conservatory (co-leads) to assist local governments in coordination with PEP Management Conference, EPA, SCDHS

HLR-1.4 NYSDEC; NYS Office of Parks; Recreation and Historic Preservation; Suffolk County Planning Department; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven

HLR-1.5 Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, villages, and NYSDEC, TNC, SCDHS, EPA, Peconic BayKeeper

HLR-1.6 NYSDOS (lead), NYSDEC, and PEP Natural Resources Subcommittee

HLR-1.7 NYSDOS (lead), NYSDEC, towns, USACE, USFWS, and NMFS

HLR-1.8 PEP Natural Resources Subcommittee, EPA, NYSDEC, SCDHS

HLR-1.9 Contingent upon adoption of CNRAs (see HLR-1.2)

HLR-2 Manage Shoreline Stabilization, Docks, Piers, and Flow Restriction Structures to Reduce or Prevent Additional Hardening and Encourage Restoration of Hardened Shorelines to a Natural State.

Addresses Habitat and Living Resources Management Objectives 1, 3, 4, 6, 7, and 8.

Hardened Shorelines and Physical Barriers

Bulkheads can result in erosion or deposition of sediments up or downstream of the structure, which may result in the destabilization of the shoreline and encourage adjacent landowners to install hardening structures along the shoreline. The scour in front of hardened structures could also eliminate the productive and protective features of intertidal and shallow water areas. Loss of shallow-water habitats will negatively impact shellfish, forage and juvenile fish and other species that use these areas for spawning, feeding, or mating (*e.g*., horseshoe crabs and birds). This "domino effect" of replacing natural shoreline with human-made structures in a relatively short period of time is increasing in some areas and resulting in considerable risk to remaining natural, vegetated shoreline. Furthermore, hardened shorelines prevent the natural shoreward migrations of salt marshes, which is particularly important to consider with respect to rising sea-level. In addition to the loss of beach and inter-tidal habitats, bulkheads can adversely impact the living resources from the leaching of toxins such as copper, chromium and arsenic that are used to treat lumber (see **Chapter 6**).

Past construction of physical barriers to tidal flow, such as tide gates, culverts, and dams, may have resulted in significant changes to hydrography, such as reduced flushing and decreased salinity in various bodies of water. Such structures also have blocked the passage of anadromous fish such as alewives, into creeks and the Peconic River. Decreased salinity can result in a change to the system from salt marsh to fresh or brackish wetlands or to conditions which favor the invasion of the nuisance species, *Phragmites australis*. Lower flow and exchange of water may lead to increased sedimentation and accumulation of toxic compounds, subsidence of the marsh surface, drying of marsh substrates, and increased erosion. Over the long term, these conditions may result in the conversion of the marsh to terrestrial habitat.

Many of these restrictions have been in place for a considerable period of time and the surrounding habitats have adjusted to the new flow regime. In some cases, these equilibrations may have resulted in conversion of one type of habitat to another of equal value (*e.g*., estuarine or brackish tidal marshes to nontidal freshwater wetlands), and removing the structure may not result in a gain in habitat. In other cases, the habitats upstream from the structure may have become severely degraded and may no longer support a biological community of comparable diversity and quality.

An inventory of hardened shorelines and physical barriers is the first step to assess the impacts that these structures may have on local natural resources. An inventory of hardened shorelines will also establish a baseline from which estimates can be made regarding the rate at which natural shorelines are being replaced by hard structures. Such an inventory is currently underway for all shoreline hardening structures in the Peconic Estuary. Dams have already been mapped in the PEP Geographic Information System by the USFWS, but the status of other structures is unknown. All watershed creeks should be inventoried for physical barriers. This information can then be used in the development of site-specific recommendations for these practices.

The PEP CAC has recommended, "ideally," a no net increase in hardened shoreline and no loss in habitat policy. State policy, while permitting hard structures under some circumstances, gives preference to non-structural measures where possible. East End local governments can further this policy through the adoption of local laws. A potential alternative is for the East End Towns to create and adopt local regulations that further control the installation of such structures in the Peconics. A recent example of how shoreline hardening structures can be managed by local governments is the Town of East Hampton's proposed Coastal regulations. The Town of East Hampton has developed different management zones for its coastlines to reduce impacts to natural resources resulting from shoreline hardening structures. If adopted, the proposed regulations would prohibit new shoreline hardening structures from being installed in certain zones, while other zones would require a natural resources permit from the town. Similar regulations could also be adopted by the other East End towns.

In order to encourage property owners to remove existing structures, incentive programs should be developed under which owners would get some financial benefit for removing structures and replacing them with a natural shoreline. This program, coupled with a public education program on the benefits of natural shorelines and a program that disallows additional hardening in certain areas, could lead, in time, to restoration of habitats. Extensive legal research would be required to implement this action and may require legislation. Exploration of natural, softer-solution alternatives to shoreline protection are also encouraged. Possible incentives could include the following:

- "Bulkhead removal districts" where groups of property-owners could have removal costs subsidized by local governments (alternatively, the cost to the municipality of removal could be reimbursed by land owners over a period of time through property taxes);
- A local property tax reduction for a period of time to encourage property-owners to remove hard structures at their own expense; and,
- A program for purchasing conservation easements on shorefront property (or that portion of properties within a certain distance of the water).

Docks and Marinas

Marinas provide a valuable service to the boating public and allow for a concentration of boats such that individual docks and mooring areas are not needed throughout the estuary. They also represent a significant portion of the economic value generated by the estuary. However, the structures and activities associated with marinas may cause damage or degradation to local water quality and living organisms. Improperly sited and designed marinas may also cause unnecessary damage to adjacent communities.

The best management practices (BMPs) documented in the Coastal Nonpoint Source Control Program (CZARA, Section 6217) are protective of natural communities and habitats while allowing the continued operation of marina facilities. The PEP has funded a demonstration project of a model marina, which implements a number of the CZARA BMPs. These BMPs should be implemented throughout the estuary in order to minimize the overall impacts of marina operations on the system.

The cumulative impacts of docks will eventually contribute to the degradation of local water quality and natural communities through fragmentation of habitats, shading of submerged aquatic vegetation and other potential impacts. It is not clear just how many of these structures exist in the Peconics and exactly where they are located. A concentrated effort to identify all of them and to assess the impacts

that they have had and are having on adjacent natural communities will help in the development of recommendations on how to manage them in the future.

Steps

HLR-2.1 **Priority** Quantify and map all hardened shoreline, docks and piers, and flow-restriction structures in the Peconic Estuary and assess the overall impacts of stabilization structures on natural resources. Develop recommendations to promote alternative shoreline management and incentives for maintaining and restoring natural shorelines.

HLR-2.2 Review existing regulations for shoreline hardening structures at all levels of government, encourage consistent policies and strengthen regulations where appropriate.

HLR-2.3 **Priority** Establish and enforce a policy of "no net increase" of hardened shoreline in the Peconic Estuary and, if possible, a net decrease in hardened shoreline. Use HLR-1 and HLR-2 as a mechanism to establish this strategy.

HLR-2.4 **Priority** Develop a variety of financial incentives and programs to encourage property owners to remove or modify hardened shoreline structures and replace them with natural vegetation and other vegetated (bioengineered) alternatives to restore the natural shoreline of the estuary.

Responsible Entities

HLR-2.1 Contract with Cornell and USFWS; NYSDEC, EPA, SCDHS, NYSDOS, Towns

HLR-2.2 PEP Natural Resources subcommittee through contract

HLR-2.3 PEP Management Conference (lead); NYSDEC; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; villages; NYSDOS; USACE; PEP; SCDHS; EPA

HLR-2.4 Peconic BayKeeper (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; HRWG; NYSDEC; SCDHS; PEP

HLR-3 Assess the Impacts of Dredging Activities on Habitat and Natural Resources and Develop Recommendations and Guidelines for Reducing those Impacts.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 6, and 7.

The Suffolk County Department of Public Works (SCDPW) periodically dredges approximately 62 sites, with 12 of these dredged on a yearly basis. About 50,000 cubic yards of sediment are dredged by SCDPW in the Peconics every year (see: Suffolk County's Generic Environmental Impact Statement for dredging in the Peconic Estuary). All SCDPW dredging is done to maintain Federal, State, and town navigational channels. Permission for new dredging has not been granted for years; only maintenance dredging has been permitted. Dredging is usually done because of the accumulation of sediment that fills in channels and basins, effectively reducing the depth and the draft of vessels that can use these areas. Sediment accumulation at these sites may be the result of changes in the shoreline or in adjacent land uses, such as increases in impervious surfaces (and a corresponding increase in stormwater runoff); the loss of buffering vegetation along the shoreline; hardening of the shoreline by the replacement of natural vegetation with bulkheads and rip-rap; historical hydrological modifications from diking, draining, and filling of shoreline areas or creation of dredge spoil islands; and loss of submerged aquatic vegetation which would normally stabilize bottom sediments. These changes can alter currents and the effects of tides, allowing erosion or scouring and subsequent resuspension of particles. The need for repeated dredging may be reduced or eliminated in the long term if some of these problems are remediated.

A variety of concerns have arisen over the years about the impacts of dredging on natural communities. One concern is that dredging disturbs habitat used by different species during various life stages, such as reproduction. For example, it is possible that the current window of time during which dredging is allowed may not be sufficiently protective of winter flounder, which spawn in mid- to late winter in shallow embayments and creeks and have demersal eggs. Endangered shorebirds, which nest on beaches from April through August, also are vulnerable to disturbance. Other possible impacts include damage to existing eelgrass beds or the creation of water quality conditions that are not favorable to eelgrass (high turbidity). The re-suspension of toxic chemicals, including metals, PAHs, PCBs, and pesticides, which tend to be found in association with particles in aquatic systems, is another concern. In the past, dredged material from the Peconic Estuary System has shown very little contamination; however, examination of sediments in the Peconic Estuary System by PEP contractors has shown that some chemicals can be found in a few sites at concentrations above background. For that reason, it may be useful to have newly-dredged material tested occasionally. The NYSDEC is drafting marine dredging and disposal protocols, which will provide guidance on testing requirements.

In order to foster public discussion about dredging and its impacts, the PEP will sponsor a workshop for all interested parties to define specific concerns. The workshop should result in the production of a report containing consensus-based dredging recommendations and guidelines. The guidelines should be specific for each site dredged in the Peconic Estuary System and should include descriptions of each site and the natural resources of concern at each site, including endangered species. The guidelines should also include recommendations on timing, frequency, and equipment, as well as dredged material placement.

Steps

HLR-3.1 **Priority** Hold a "Dredging Summit" for the Peconic Estuary System to address specific concerns (*i.e.*, impacts on shorebird nesting, demersal fish eggs, benthic communities, and the potential release of contaminants) and develop dredging guidance on an embayment-specific basis and for identified CNRAs. Integrate dredging guidance into existing regulatory programs.

HLR-3.2 **Priority** Assess navigational dredging in tidal creeks and embayments (utilizing Suffolk County's Generic Environmental Impact Statement) for damages or impacts to eelgrass beds and other habitats and develop permit conditions to minimize impacts that potentially could result in habitat loss and degradation. Determine if navigational dredging locally impairs water quality to the point of precluding restoration of eelgrass.

HLR-3.3 Determine the need for frequency of maintenance dredging and develop recommendations to reduce runoff and erosion in creeks to reduce the need for maintenance dredging.

Responsible Entities

HLR-3.1 NYSDEC (lead) through contractor; USACE; NYSDOS; SCDPW; EPA; SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; and other interested stakeholders

HLR-3.2 PEP through contractor, NYSDEC, DOS, SCDHS

HLR-3.3 Frequency of dredging: SCDPW (lead); Runoff recommendations: NYSDEC, NYSDOS (co-leads), PEP, SCDHS

HLR-4 Examine and Promote Methods of Shellfish Harvesting that are Most Compatible with Establishment and Growth of Eelgrass Beds and Vegetated Salt Marshes.

Addresses Habitat and Living Resources Management Objectives 1, 3, 5, 6, and 8.

Eelgrass beds are the preferred habitat of bay scallops, and dredging for scallops is frequently done near the few remaining eelgrass beds in the estuary. Certain types of dredges or improper operation of dredges can result in uprooting or damaging the plants, which may, over time, lead to permanent damage to the beds. In other areas of the country, beds of seagrasses are frequently damaged and scarred by boat propellers, which become tangled in the seagrass when the boats are run at high speed through the beds. It is not clear if the potential damage caused by either scallop dredges or boat propellers from commercial and recreational vessels is significant in Peconic Estuary eelgrass beds. This issue should be investigated to determine if further recommendations should be made regarding types of equipment or methods of dredging, or recommendations regarding the speed and manner at which boats should be operated when over eelgrass beds.

The Towns of Riverhead and Southampton permit the use of a method of shellfish harvesting known as propeller dredging. In this method, the propeller of a boat engine (either attached to a boat or not) is used to churn away soft sediments where soft clams are found. The New York State Environmental Conservation Law allows for "churning" for soft clams only below the low tide mark. The method can be a faster, less labor-intensive method of removing sediment and finding the buried shellfish. Unfortunately, this method also disturbs much larger areas and may be more damaging to certain communities over the long term. Fishermen contend that churning is not done near eelgrass beds, only in mudflats and subtidal areas, where it is believed to increase productivity. Communities of particular concern include eelgrass beds, mudflats, and shallow subtidal areas adjacent to vegetated tidal wetlands. This potential for permanent damage to sensitive communities should be examined in comparison to disturbance and damage caused by other methods of harvesting shellfish before recommendations are developed regarding this method. The State permits the use of rakes and tongs on public bottom for hard clams while dredges are allowed on private lands.

Hard clams, soft clams, and oysters are found in unvegetated mudflats (usually where mud and sand meet) and harvesters typically concentrate in these areas. In many cases, however, harvesters may work their way in the mudflats right up to the edge of the vegetated zone, where the salt marsh peat forms. These commercial species of shellfish are not found in the vegetated or peat areas. Digging for shellfish right at this edge destabilizes the vegetation and renders these areas vulnerable to erosion with subsequent loss of *Spartina*. This may contribute over time to loss of the vegetated wetlands. Therefore, this practice should be discouraged or banned.

Steps

HLR-4.1 Examine methods of harvesting clams, scallops, and other shellfish and determine which are most compatible with eelgrass establishment and growth. Develop recommendations for harvesting methods, frequency, and timing, which will allow recovery of eelgrass throughout the estuary and enhance shellfish productivity.

HLR-4.2 Discourage harvesting of shellfish at the edge of vegetated salt marshes and encourage the use of methods that minimize impacts to vegetated habitats.

Responsible Entities

HLR-4.1 NYSDEC (lead) through contract

HLR-4.2 NYSDEC (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; PEP Public Education and Outreach program; and shellfishermen

HLR-5 Implement, Enforce, and Encourage the Continuation of Current Policies and Regulations Protective of Wetlands.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 4, 6, and 7.

The protection from draining, filling, and dredging of all wetlands by section 404 of the Clean Water Act and tidal wetlands by Article 25 of the NYS ECL has been very successful. It is important that no matter what additional preservation and restoration activities are undertaken to increase the quality and quantity of the wetland resources in the Peconic Estuary System, these existing programs must remain intact and continue to be supported by the public and elected officials. These programs represent the most fundamental level of protection that these habitats have.

In the past, tidal wetlands were extensively ditched in order to facilitate the drainage of the wetlands at low tide. The purpose of this was to minimize the amount of standing water in the marsh, which could be used as mosquito breeding areas. However, these ditches caused excessive drainage of tidal wetlands at low tide, disturbing the natural functioning of the marsh, which supports a wide variety of other species in the standing pools of water which are left on the marsh at low tide. Although diminution of standing water was thought to reduce the populations of mosquitoes, it is now thought that the pools actually provide habitat for small finfish (killifish) which eat mosquito larvae. Over the past few years, Suffolk County Vector Control (SCVC) has discontinued its practice of creating new ditches and implementing Open Mash Water Management to restore marshes to their former State and control mosquito populations. This policy should be supported. Additionally, the PEP encourages better coordination among SCVC and all other agencies and towns for maintenance of existing ditches and planning of mosquito control practices in wetlands.

Steps

HLR-5.1 Ensure continued protection of freshwater and tidal wetlands through the implementation and enforcement of current regulations under the Federal Clean Water Act and the State Wetlands Protection Programs, local government regulations and local land use practices.

HLR-5.2 Review existing tidal wetlands protection policies to determine if they provide for maintenance of tidal wetlands with respect to future sea-level rise.

HLR-5.3 Maintain and enforce the policy of creating no new mosquito ditches in tidal wetlands and establish a policy for not re-opening ditches that have filled-in by natural processes.

HLR-5.4 Ensure that SCVC works cooperatively with all government agencies, East End towns and local conservation organizations in the planning of wetland mosquito ditch maintenance and pesticide spraying.

Responsible Entities

HLR-5.1 NYSDEC (lead), USACE, East End Towns

HLR-5.2 PEP- Natural Resources Subcommittee through contractor

HLR-5.3 SCVC (lead), NYSDEC, EPA, SCDHS, NYSDOS, East End Towns

HLR-5.4 SCVC (lead), SCDHS, EPA, NYSDEC, East End Towns

HLR-6 Evaluate the Effectiveness of Current Policies in Preserving Eelgrass Habitat and Develop Ways to Provide Increased Protection for all Extant Eelgrass.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 5, 6, and 8.

Eelgrass beds are an important marine habitat for finfish and invertebrates which use them for foraging, shelter and nursery areas. Unfortunately, many of the eelgrass beds in Peconic Estuary have been declining and the causal factors responsible for this decline remain somewhat elusive. The remaining eelgrass beds therefore, should be protected from direct human threats such as: propeller scarring and anchor dragging, while further research on the factors contributing to the health of eelgrass beds in the Peconics should be encouraged for future management recommendations. The NYS Tidal Wetlands Act (NYS ECL, Article 25) gives the NYSDEC authority over lands under tidal waters to a depth of six feet below mean low water. This means that eelgrass located in water of six feet or less are protected from activities such as excavation, dumping, erection of pilings or any other activity that may substantially impair or alter natural conditions. Eelgrass located at a depth of six feet below mean low water also are protected by NYS Use and Protection of Waters (NYS ECL, Article 15, Title 5) for activities involving excavation and placement of fill and docks and moorings. However, because eelgrass beds have not been thoroughly mapped and sometimes may not be visible with the naked eye, they could be overlooked during a permit application review.

Steps

HLR-6.1 **Priority** Evaluate the effectiveness of current policies in preserving eelgrass habitat and develop ways to provide increased protection for all extant eelgrass.

HLR-6.2 Monitor and protect extant eelgrass (*Zostera marina*) beds, and restore degraded eelgrass beds.

HLR-6.3 Evaluate anchor dragging, propeller scarring, dredging and other known impacts to extant eelgrass beds in the Peconic Estuary and develop recommendations to reduce them.

HLR-6.4 Hold a workshop to evaluate the factors that regulate the health and extent of eelgrass beds in the Peconic Estuary and develop management recommendations based on these findings.

Responsible Entities

HLR-6.1 NYSDEC (lead) through contract

HLR-6.2 NYSDEC (lead), Cornell Cooperative Extension, PEP-Natural Resources Subcommittee, and PEP HRWG

HLR-6.3 NYSDEC and Habitat Restoration Workgroup (co-leads) through contract

HLR-6.4 NYSDEC, PEP-NRSC, and PEP HRWG (co-leads)

HLR-7 Develop and Implement an Estuary-Wide Habitat Restoration Plan (HRP).

Addresses Habitat and Living Resources Management Objectives 1, 2, 4, and 7.

Areas where resources are under stress or no longer exist need to be identified for restoration. To ensure a comprehensive and coordinated approach to restoration activities, the PEP advocates formulating an overall strategy for restoration: an estuary-wide Habitat Restoration Plan (HRP).

The PEP has committed to the formation of a Habitat Restoration Work Group (HRWG) which will articulate the overall goals of restoration in the Peconic Estuary, identify and prioritize the types of habitats in need of restoration, identify the specific locations in the Peconic Estuary where restoration of these habitat types is feasible, and develop a process and criteria for project selection as well as prioritization of selected sites.

Not all estuarine, intertidal, or terrestrial habitats found in the Peconic watershed are in need of restoration, are considered important to restore, or can be successfully restored given current levels of knowledge and technology. As the first step in developing the restoration plan, the HRWG will develop a list of the habitats it considers most important for restoration. A draft list has already been developed and will be discussed and reviewed prior to acceptance into the final plan. These habitats currently include:

- Coastal Grasslands;
- Beaches and Dunes;
- Riverine Migratory Corridors and Habitat;
- Tidal Wetlands;
- Non-tidal Freshwater Wetlands;
- Submerged Aquatic Vegetation;
- Estuarine Embayments;
- Coastal Forest Communities; and,
- Intertidal Flats.

The next step in the development of an overall restoration plan is the assessment of the current quantity of identified priority habitats. Information collected for this inventory would include the quantity of habitat, the subjective condition in which it exists, whether it is in need of restoration, and what level of restoration can be achieved. In some cases, there have been inventories done on particular lands for certain types of habitat (*e.g.*, Town of Southampton-owned properties have been identified which once were estuarine wetlands and could be restored). The HRWG will compile inventories that have been done and will solicit additional site nominations from Federal, state, and local governments and interest groups.

The third step in the HRP creation process is the development of criteria for the selection of restoration sites. There are a number of factors which must be considered when selecting sites to be restored, including: 1) the general level of knowledge about the specific habitat type; 2) the history of success of restorations of each habitat type; and 3) historical information for each site, including

causes of loss or degradation of the habitat and the current status of those stressors. Other factors to be considered in site selection are cost and ease of restoration, community acceptance of restoration, and surrounding land uses, all of which affect the likelihood of success. To assist in the final selection of restoration sites, information about ongoing and completed restoration projects needs to be compiled and assessed as to cost, success, and other parameters. Restoration projects that are completed or ongoing include tidal wetland restorations at a variety of locations, a freshwater wetland restoration in Southold (*e.g.*, Cassidy Preserve), and a maritime grassland restoration at Orient Point.

The HRWG will encourage municipalities to develop plans for identified restoration opportunities and will assist municipalities who have completed restoration planning in obtaining funding and implementing their restoration projects. The PEP HRWG and its member agencies will develop the HRP and a variety of planning efforts associated with it, but it will be up to local governments and other groups to implement restoration projects through the NYS Clean Water/Clean Air Bond Act and with other funds (*e.g.*, Suffolk County 1/4% sales tax). Because projects that are eligible for NYS Bond Act funds must involve actual implementation of habitat restoration projects, Bond Act funds cannot be spent on planning or other activities done in preparation for implementation. Therefore, the NYSDOS has targeted the EPF funds over which it has jurisdiction towards inventory and planning projects in order to complement the Bond Act funds. Local governments that have the desire to restore habitats but have not yet developed plans may use these funds for that initial work.

There are already existing habitat inventories and sites targeted for habitat restoration by groups participating in the PEP HRWG. If these efforts meet the criteria being developed by the HRWG, they should not be held up by the development of the entire Habitat Restoration Plan, but should be allowed to move forward for funding. These projects should be reviewed and discussed by the HRWG with regard to the priority habitat list and the monitoring criteria to be developed. Based on these discussions, recommendations for funding under the NYS Bond Act should be prepared for forwarding to NYSDEC Bond Act staff. Not all of these projects will be able to be funded through the Bond Act, so other sources of restoration funds should also be sought and application should be encouraged.

Steps

HLR-7.1 **Priority** Develop and implement an estuary-wide Habitat Restoration Plan (HRP).

HLR-7.2 Identify and list priority habitat types for the HRP.

HLR-7.3 **Priority** Inventory and prioritize a list of restoration projects for which planning is underway and recommend these for “fast-tracking” towards Bond Act funding.

HLR-7.4 Inventory and list restoration opportunities in the PEP area and estimate costs.

HLR-7.5 Develop and include in the HRP criteria for selection of restoration sites.

HLR-7.6 Inventory and list completed, ongoing, and proposed restoration projects for inclusion in the HRP. Include all restoration sites on GIS maps.

HLR-7.7 Develop and include in the HRP a list of funding sources available for habitat restoration in the PEP area.

HLR-7.8 Develop model guidelines for habitat restoration planning for use by municipalities in applying for Environmental Protection Fund (EPF) monies.

Responsible Entities

HLR-7.1 PEP HRWG (lead)

HLR-7.2 PEP HRWG (lead)

HLR-7.3 NYSDOS (lead), NYSDEC, and PEP HRWG

HLR-7.4 PEP HRWG (lead) and East End Towns

HLR-7.5 PEP HRWG (lead)

HLR-7.6 PEP HRWG (lead)

HLR-7.7 PEP HRWG (lead)

HLR-7.8 NYSDEC and NYSDOS (co-leads); PEP HRWG; EPA; Towns; CCE

HLR-8 Develop and Implement Specific Restoration Projects.

Addresses Habitat and Living Resources Management Objectives 1, 3, 4, 6, 7, and 8.

Tidal wetlands, beaches, and submerged aquatic vegetation are three priority habitats designated for restoration by the PEP HRWG. A number of effective actions can be taken by the HRWG and others to ensure that restoration plans are created and implemented for these important habitats.

Tidal wetlands have been altered by mosquito ditching and the growth of the invasive species *Phragmites australis*. Mosquito ditches cause excessive drainage of tidal wetlands at low tide. Although the diminution of standing water was thought to reduce the populations of mosquitoes, it is now thought that those pools actually provide habitat for small finfish which eat mosquito larvae. In addition, the ditches allowed pathogens contained in the water to enter the system and be taken up by shellfish. Damming or otherwise maintaining the water on the marsh allows time for the pathogens to die off before entering the estuary (see **Chapter 5**). These ditches should be dammed or modified, through a series of practices known as Open Marsh Water Management (OMWM), so as to restore the marshes to a condition similar to that which existed prior to ditching.

Tidal wetlands and beaches have been negatively impacted by the construction of hard shoreline structures and the removal of native plants. Restoration of tidal wetlands and beaches could be accomplished through the removal of hard shoreline structures and regrading and planting of the areas with wetland or beach plants.

Eelgrass beds are declining in the Peconic Estuary. Exact causes are not known, but it is believed that the beds have been impacted by the effects of the Brown Tide as well as poor water quality conditions, including high levels of nitrogen and suspended sediment and possibly terrestrial applications of pesticides and herbicides. Actions to implement this additional goal of protecting, restoring, and enhancing eelgrass habitat supports the overall vision of what the CCMP hopes to achieve with water quality, habitat, and living resources.

Not all habitat restoration projects require large amounts of funding and highly technical work plans in order to mitigate the impacts of stress and encourage the return of plant and animal communities. Many areas are only slightly degraded and can be restored with the aid of relatively untrained individuals. Examples include dune restoration through the planting of beach grasses; *Phragmites australis* and other exotic or nuisance species removal by physically cutting or digging out the plants in areas of minimal invasion and replanting with native species; or simply removing garbage and trash from beaches, wetlands, and clogged waterways. Some of these efforts have already been organized and, if possible, should be expanded. Citizen restoration projects should be identified and local groups should be encouraged to work with technical experts to implement restoration and post-restoration monitoring. This kind of effort not only saves money, but also fosters a sense of stewardship and caring for the environment in the public. Therefore, three steps should be taken: 1) identify simple restoration actions appropriate for local volunteers; 2) identify and contact appropriate local groups to participate; and 3) develop an outreach effort to solicit additional projects and volunteers.

Steps

HLR-8.1 Encourage cooperation among governmental agencies to plan and implement Open Marsh Water Management (OMWM) to manage tidal wetlands with grid ditches for mosquito control with the goal of also restoring more natural conditions.

HLR-8.2 Develop recommendations in the PEP Habitat Restoration Plan for control of *Phragmites australis* by restoration of natural processes such as removal or modification of flow-restriction devices, removal of hardened shorelines, and revegetation of bay and creek shorelines or by other means.

HLR-8.3 **Priority** Develop a quantitative goal for eelgrass restoration based on ongoing monitoring and mapping efforts.

HLR-8.4 Identify and prioritize locations where restoration of eelgrass is most feasible based on water quality and environmental criteria which are being developed for eelgrass in the Peconic Estuary System and elsewhere in its range.

HLR-8.5 Develop and/or utilize cooperative programs with the public for simple, local habitat improvements and enhancements.

Responsible Entities

HLR-8.1 Cornell Cooperative Extension (CCE), SCVC, USFWS, East Hampton Department of Natural Resources, and NYSDEC (co-leads), PEP

HLR-8.2 PEP HRWG (lead) through contractor

HLR-8.3 PEP HRWG (lead), NYSDEC, SCDHS, CCE, DOS, Towns

HLR-8.4 PEP HRWG (lead), PEP, NYSDEC, and NYSDOS

HLR-8.5 PEP HRWG (lead), NY Sea Grant, and Cornell Cooperative Extension

HLR-9 Monitor and Evaluate the Success of Restoration Efforts.

Addresses Habitat and Living Resources Management Objective 8.

Restoration activities have been conducted in the past which may not have actually resulted in a long-term recovery of the targeted habitat. These projects were frequently done with little or no follow-up monitoring, an activity that might have helped determine if the restored habitat was able to maintain itself or if the conditions causing loss or degradation of the habitat still existed, leading to the failure of the restoration. If restored areas are monitored, factors affecting the success of the project over the long term can be identified and steps can be taken to mitigate or "correct" the restoration so that the habitat can flourish. It is important to develop sets of criteria or guidelines for restoration monitoring for each priority habitat type that are relatively easy to measure, can be tailored to projects of differing conditions and goals, and employed by groups of various levels of technical expertise. The above facts have been recognized by the Habitat Restoration Committee of the Long Island Sound Study, by the NYSDOS Coastal Resources Program, and by the NYSDEC, particularly with respect to the NYS Clean Water/Clean Air Bond Act Aquatic Habitat Restoration projects to be funded. The PEP HRWG can work with all of these entities to develop a set of criteria for each habitat type.

Monitoring data and other information collected from restoration projects are most useful if collected in a standardized fashion, stored in a central repository, and made accessible to managers, interested groups, academic researchers, and other programs conducting and evaluating restoration. Project information not collected and stored in this manner may be lost over time as a result of staff turnover or student graduation, among other factors. Also, lack of access to information from prior projects may hinder regional planning efforts and result in the repetition of mistakes. Therefore, the PEP should develop an appropriate collection procedure and storage format for restoration project information, and identify a location for a long-term repository of such information for the PEP area.

Steps

HLR-9.1 Develop and implement procedures to track and evaluate restoration efforts using success criteria and monitoring protocols in the PEP area.

HLR-9.2 Develop procedures for the management and storage of habitat restoration project and monitoring information for the Peconic Estuary.

HLR-9.3 Identify a regional set of reference sites to assist in habitat restoration evaluation and monitoring and provide a framework for long-term habitat and living resources research and monitoring.

Responsible Entities

HLR-9.1 PEP HRWG (lead)

HLR-9.2 PEP HRWG (lead) and PEP

HLR-9.3 PEP HRWG and PEP Natural Resources Subcommittee

HLR-10 Develop an Aquaculture Plan for the Peconic Estuary.

Addresses Habitat and Living Resources Management Objectives 1, 2, 5, 6, 7, and 8.

Historically, the Peconic Estuary has supported successful shellfish aquaculture. Aquaculture activities can vary widely in scale and therefore, in the potential impacts they may have on the environment. In an estuarine system such as the Peconic Estuary, which is relatively shallow and fairly enclosed, especially west of Shelter Island, it is important to determine the amount and type of aquaculture that should be permitted without causing adverse impacts to the entire estuary or to local embayments. An estuary-wide aquaculture plan could be used to develop guidelines and criteria for aquaculture operations, identify suitable areas where aquaculturing can be employed, develop monitoring protocols, and control the commercial culture of non-indigenous and imported species.

The NYSDEC has responsibility for developing and enforcing State-wide aquaculture policy, however, Suffolk County has been given certain specific rights to develop such policies in the Peconic Estuary. An overall plan has not yet been developed, but could be facilitated through input from the PEP and other interested groups. For this reason, it is important to begin to develop a comprehensive aquaculture policy for the Peconic Estuary Program by sponsoring a workshop to which all interested parties are invited so that all of the concerns can be discussed and incorporated into the estuary-wide aquaculture plan. At this workshop, the development of guidelines or criteria for aquaculture can be initiated based on the different kinds of operations which currently exist and which may be proposed for this body of water. These criteria will include scale of operation, methods of culturing, amount and type of inputs into the environment, genotypes and species used, location, and amount and type of artificial structure to be used.

Depending on the nature, scale, and intensity of the operation, aquaculture activities in natural waters can have a significant impact on local water quality, living resources, and habitats. For example, small-scale shellfish culturing, which is a common type of culturing that exists in the Peconic Estuary, is probably associated with lesser impacts to the estuary than large-scale fish farms. Shellfish culturing can also be beneficial to water quality through their filtering of particles, however, they should not be located in naturally productive shellfish or finfish areas *(e.g.*, eelgrass beds, finfish spawning/nursery areas, etc.). In order to ensure that neither water quality nor the natural communities of organisms will be adversely impacted, aquaculture sites should be carefully selected, the use of culture stocks should be regulated, and water quality monitoring should be conducted for a variety of parameters.

Location of Facilities

The habitat, food sources, and general health and behavior of species such as sea turtles and marine mammals, and habitats that are important to the recruitment of natural stocks of finfish and shellfish could be impacted by aquaculture facilities. Based on existing information on the ways in which species of concern use the estuary system, it should be possible to identify embayments or other areas where large-scale culturing or grow-out operations and associated activities may be detrimental to these species and therefore, avoided. For example, one concern is the potential impact of culturing operations, such as fish pens, on the interaction between spider crabs populations and sea turtles. Kemp's ridley sea turtles feed primarily on spider crabs. If either spider crabs or sea turtles are attracted to aquaculture operations, there is a potential for adverse interactions between the cultured organisms, the structure or materials of the operation, and the species of concern. Conversely, if

spider crabs are driven from an area by the presence of aquaculture activities, this could potentially have either an adverse or positive impact on the turtles. Seals are another concern. Seals may be attracted to fish pens because of the proximity to their haul-out areas and because of their attraction to concentrations of finfish. If this happens, there is the potential for adverse interactions between the structure and materials associated with the aquaculture and these animals. To date, there have been no known or reported takes of marine mammals at the net pens located off Plum Island; whereas at net pens off the coast of Washington and British Columbia there have been major incidents. The impacts of the presence of net pens off Plum Island are not known on the population dynamics of marine mammals. The CNRAs identified by the PEP need to be surveyed to assess potential impacts to marine organisms and habitats from existing and future aquaculture activities.

Culture Stocks

Research has been done on the genetic differences between local populations and stocks of the same species. Often, local populations are better adapted to local conditions and prey species which makes them better able to function in the local ecosystem. In order to minimize concerns about the impact of culture stocks on natural waters and maximize their successful culture, all aquaculture operations should try to use culture stock taken from the Peconic Estuary rather than from other areas of the country. This is the case for certain shellfish seeding operations. Other stock may be necessary if the Peconic Estuary System stock is not available. However, a State importation permit is required of all products used for aquaculture that are brought in from another State. Shellfish stock only from certain locations north of New York are acceptable for importation into New York.

Another concern about importing organisms into the Peconic Estuary System for the purpose of culturing them commercially is the parasites or diseases that may be brought in with them. These pests may be transmitted to wild populations if not detected in the cultured animals soon enough. As part of developing an aquaculture plan for the entire system, a plan of action for dealing with unforeseen outbreaks should be developed. NYSDEC should maintain the policy of not allowing the importation of southern shellfish.

The transplanting of shellfish into Peconic Estuary waters for cleansing presents a similar concern. New York's shellfish transplant program has been administered by the NYSDEC Bureau of Marine Resources, Shellfisheries Section since 1964. The primary goals of the transplant program are to protect public health and provide a long-term opportunity for utilization of shellfish resources which are presently unusable due to coliform contamination (see **Chapter 5**). In this program, shellfish are placed in certified waters for cleansing and reharvested after 21 days. Some of these transfers are carried out within the estuary itself, but a large segment of the New York transplant program involves the transfer of hard clams from Raritan Bay in New York Harbor to the clean near shore waters of the Peconic Estuary System. It is generally believed that the potential difference between shellfish in both bodies of water in terms of genetics, disease, or parasites is negligible; therefore, no monitoring of the harvested shellfish is done. Also, there have been no reported diseases or parasites in hard clams in New York waters. With the occurrence of oyster diseases such as *Perkinsus marina* (dermo) and *Haplosporidium nelsoni* (MSX) in other waters, however, it may be useful to monitor for these and other known parasites in oysters in order to determine if they may be transferred to the Peconic Estuary should a transplant program for oysters commence (although dermo has already been documented in the Peconics [summer 1997] and MSX may already exist there as well).

Non-Indigenous Species

There are many documented cases of non-indigenous species (finfish, shellfish, ad other invertebrates) introduced into natural waters for culturing and subsequently released either accidentally or intentionally beyond the culturing facility (though, there are no documented cases in New York). In many of these cases, the species quickly outcompete and outnumber indigenous populations, causing irreparable damage to the local ecosystem. There are already non-indigenous species in the Peconic Estuary System (*e.g*., the marine macroalga *Codium fragile*) whose impact on the environment is unknown. The NYSDEC does not permit the importation or introduction of non-indigenous species for aquaculture whether they are proposed to be maintained in an upland facility or in marine waters. It is important that NYSDEC continue to prohibit the introduction of exotic species and require indigenous genotypes for aquaculture. If non-indigenous species are maintained on land in tanks, measures should be taken to prevent the introduction of these species into the wild as well as into surface water discharges containing waste or disease.

Monitoring

Reduction of water quality associated with culturing, particularly that of large-scale finfish culture, has been documented in other areas throughout the world. In order to maintain high water quality in the Peconic Estuary, ambient monitoring (by the permittee or by others) should be implemented when aquaculture permits are granted. Examples of water quality parameters which have been incorporated in these permits include dissolved oxygen, nitrogen compounds, total suspended solids, and chemicals found in conjunction with food for the cultured organisms (*e.g*., antibiotics). Biological parameters which are measured include chlorophyll a, changes in adjacent benthic populations and interactions with turtles, marine mammals, finfish, and large mobile epifauna (*e.g*., crabs, whelks). A protocol for monitoring of aquaculture sites should be matched to the scale, location and type of culturing operation (*e.g*., finfish vs. shellfish). For example, the one net pen finfish operation off Plum Island does have a water and sediment quality monitoring program and a marine mammal and avian reporting requirement. This net pen operation also conducts daily monitoring of dissolved oxygen inside and outside the pens to ensure good water quality for the caged farm fish. Complementary monitoring by an independent agency or entity could be conducted if funded.

Steps

HLR-10.1 Assist in the development and implementation of an estuary-wide aquaculture plan.
Priority Include criteria regarding scale, location, assessment, monitoring, and methodologies of shellfish and finfish aquaculture which would be ecologically beneficial and would help sustain aquaculture as a beneficial estuarine use when performed in a manner that is sensitive to the natural conditions**,** productivity and ecology of the Peconic Estuary.

HLR-10.2 Identify suitable areas for shellfish and finfish aquaculture activities that are compatible with the water quality and habitat protection objectives in the CCMP to ensure that a balance is maintained between cultivated and wild stocks, and include in the estuary-wide aquaculture plan.

HLR-10.3 Investigate the need to require monitoring of imported cultured organisms and intrastate transplant of shellfish for disease and parasites and determine if a requirement should be established to certify that they are disease free.

HLR-10.4 Continue to support the prohibition of commercial culture or introduction of non-indigenous species in New York's waters and require that all aquaculture operations in the estuary use indigenous genotypes.

HLR-10.5 Develop water quality and natural resource monitoring protocols for existing and future shellfish and finfish aquaculture projects

Responsible Entities

HLR-10.1 Organize workshop: Suffolk County Planning Department; SCDHS (co-leads); NYSDEC; PEP - Natural Resources Subcommittee; NYSDOS; NY Sea Grant; NYSOGS; USACE; EPA; NOAA/NMFS; Suffolk County; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; Cornell Cooperative Extension; fish farmers; other groups; and individuals interested in aquaculture; Aquaculture Plan: Suffolk County with input from PEP and other stakeholders (NYSDEC, Long Island Sound Study, and New York-New Jersey Harbor Estuary Program)

HLR-10.2 Suffolk County Planning Department, SCDHS, NYSDEC (co-leads), NYSDOS, USACE, USFWS, PEP-Natural Resources Subcommittee, and Suffolk County Planning Department

HLR-10.3 Monitoring assessment: NYSDEC (lead); Disease and parasite screening: PEP; NYSDEC; NYSDOS; NYSOGS; USACE; EPA; NOAA/NMFS; Suffolk County; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; Cornell Cooperative Extension; other groups; and individuals interested in aquaculture (co-leads)

HLR-10.4 NYSDEC (lead) to implement legislation and NYS legislature

HLR-10.5 SCDHS, NYSDEC (co-leads), USACE, NYSDOS, NYSOGS, USFWS, PEP, NOAA, and fish farmers (permittees)

HLR-11 Determine the Suitability of Artificial Reefs in the Peconic Estuary.

Addresses Habitat and Living Resources Management Objectives 1, 3, 4, 6, and 8.

Unintentional artificial reefs have existed as long as humans have used seagoing vessels and lost them at sea. The deliberate placement of structures in the water for the purpose of attracting finfish is a more recent phenomenon. It is clear from anecdotal and more rigorous, quantitative research that these areas of relief do indeed attract finfish, some of which use the structures as refuges from predators or for breeding and feeding. What is less clear are the impacts of these structures on local benthic populations and regional finfish populations. Topics that need further investigation, either through literature research or actual studies, include the following:

- Benefits of the structure beyond attracting finfish and providing "good fishing;"
- Effects on finfish stocks (*i.e*., Do the reefs concentrate fish into a small area and then cause them to be depleted through fishing or render them more vulnerable to predators, or do they provide additional refuge and feeding areas, thus increasing populations over time? Does the concentration of finfish at reef sites result in a decrease in the populations elsewhere or result in a shift in finfish community structure?);
- Specific effects of artificial reefs on sea turtle, marine mammals, shark, and other large marine species populations;
- The potential for and extent of habitat and species displacement and a determination of how many reefs could be supported in the estuary without causing adverse effects such as those mentioned above; and
- A definition of areas where artificial reefs should not be located due to the presence of sensitive species or habitats of concern, and areas that may be suitable for reef structures *(i.e.,* are consistent with the water quality and habitat objectives in the CCMP).

The NYSDEC Artificial Reef Plan and GEIS was prepared in the late 1980s and approved through a public process in 1991. Since that time, marine mammal use of the system has been increasing. Since all artificial reef sites require a full evaluation (including public input and the collection of relevant information) prior to decision making, special attention should be given to marine mammal and sea turtle issues and addressed in a pre-placement/siting monitoring program. The Reef Plan outlines the process for this decision making.

One concern related to sea turtles is the potential impact of artificial reefs on populations of spider crabs. Kemp's ridley sea turtles feed primarily on spider crabs. If either spider crabs or sea turtles are attracted to artificial reefs, there is a potential for adverse interactions between the reef structure or materials and these organisms. Conversely, if spider crabs are driven from an area by the presence of a reef, this could have an adverse impact on the turtles. Seals are another concern. Seals may be attracted to reefs in the eastern end of the Peconics because of the proximity to their haul-out areas and because of their attraction to concentrations of finfish. If this happens, there is the potential for adverse interactions between the reef structure and materials or fishermen and these animals. Locations where these interactions might occur have been identified by some researchers and these

sites should be avoided for the placement of artificial reefs, but this information needs to be documented. These potential sites include:

- Orient Harbor;
- Waters off Plum Island and Great Gull Island;
- Waters off Jessups Neck, within three-quarters of a mile around the entire peninsula; and
- Waters off shore from Three Mile Harbor to Accabonac Harbor, including those embayments.

At least one site recommended for reefs in the Peconics is located in a prime feeding area for Kemp's ridley sea turtles (Orient Harbor). Presently, an evaluation for placement of a demonstration reef is proceeding in areas to the east (where there is an unverified wreck) and the west (where there is a known wreck) off Robin's Island. The information developed from this evaluation and others should be used to evaluate potential sites. Sea turtle and marine mammal monitoring is recommended for known wrecks and natural reef areas and where artificial reefs are sited.

Steps

HLR-11.1 Evaluate the use of natural reefs, wrecks, artificial reefs, and aquaculture facilities by finfish, sea turtles, diving birds, marine mammals, and other estuarine organisms. Develop recommendations to minimize the impact on resources by these structures.

HLR-11.2 Determine environmental and habitat criteria (*e.g.*, productivity, etc.) for site selection of different reef structures, and evaluate the potential for the extent of habitat and species displacement and the number of reefs that could be supported in the estuary without causing adverse effects.

HLR-11.3 Evaluate the potential placement of artificial reefs in known sea turtle and marine mammal feeding areas as part of the siting process outlined in the NYSDEC Artificial Reef Plan.

Responsible Entities

HLR-11.1 PEP Natural Resources Subcommittee (lead) (long-term research plan) through contractor

HLR-11.2 PEP Natural Resources Subcommittee and NYSDEC (co-leads)

HLR-11.3 NYSDEC (lead); and Towns of East Hampton, Southampton, and Southold

HLR-12 Foster Sustainable Recreational and Commercial Finfish and Shellfish Uses of the Peconic Estuary that are Compatible with Biodiversity Protection.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 5, 6, 7, and 8.

Habitat degradation, pollution, overfishing, and improper fishing practices can all lead to depletions of commercial and recreational fish and shellfish populations. Data collection on stocks and harvests, regulation of fishing and shellfish harvesting practices, habitat protection, and pollution prevention are all needed to ensure the sustainable use of these stocks by humans.

Data Collection

New York is one of 23 partners in the Atlantic Coastal Cooperative Statistics Program. The goal of this program is to cooperatively collect, manage, and disseminate fishery statistical data. Data on commercial fishing are compiled by NMFS. A certain amount of information is also periodically compiled and analyzed by NYSDEC fisheries staff. In fact, new State reporting requirements have been developed which will require commercial fishermen to report on all species caught. As long as this commercial data continues to be collected at the estuary level, this increased information should prove useful for better understanding the volume and distribution of landings for finfish and certain crustacean (lobster) and shellfish (squid) species in the Peconic Estuary. For recreational fishing, there is extensive data on catch, harvest, and discard for New York, but it is not available specific to the Peconics. Better information on both of these types of fishing at the estuary level would enable better understanding and ultimately, better management of the resources.

Fisheries for bait and for shellfish, such as conch, have existed for a long time. Although reliable statistics on most of these species are unavailable, scientific research on a few species indicates that they may be in some danger of being depleted. To ascertain the stocks of bait fish, a multi-gear and temporal study of bait fish populations should be performed on a variety of tributaries, and regulations should be developed to prevent overfishing of these populations. For horseshoe crabs, NYSDEC has collected harvest data informally from lobster fishermen, juvenile anadromous fish seine surveys, and the Peconic Trawl Survey. This information will be collected under the proposed Atlantic Coastal Cooperative Statistical Program and incorporated into the Horseshoe Crab Fishery Management Plan (FMP) (approved in October 1998). Based on the recommendations in the FMP, NYSDEC will develop appropriate regulations for horseshoe crabs. Recently adopted regulations for horseshoe crabs include a 25 percent reduction of current landings coastwide and the recommendation that additional harvest control measures be considered for future reductions.

Regulation and Management

Overfishing of finfish stocks that are highly desirable has been a concern for decades. Both commercial and recreational fishermen contribute to this problem. Fishery management plans and fishery regulations have been designed to allow for sustainable use of these stocks by humans. State and Federal agencies, including NYSDEC and NMFS, are responsible for developing plans for managing coastal migratory finfish stocks, which are then implemented by individual States. The PEP has recognized the fact that many of the species of finfish taken in the Peconic Estuary System that are commercially and recreationally valuable are migratory in nature and, therefore, cannot be

managed by efforts exclusive to the Peconic Estuary. Regulations on the taking of these fishes are promulgated at the Federal and State level and must be implemented over large areas by the appropriate government entities. Therefore, the best way that the PEP can hope to protect from overfishing the coastal, migratory species of finfish which use the estuary is for all members of the Management Conference, not just the NYSDEC, to support these management plans and regulations. This support would include consistent enforcement of regulations, public education and outreach regarding fishery regulations and management practices, and development of new regulations when necessary to protect the sustainable use of a fishery resource.

New regulations and management practices may be warranted to protect water quality and to protect species in the estuary system from injury, death, and overfishing. Four issues proposed for action include management of fishing gear, implementation of BMPs regarding fish waste, regulations for fish used as bait, horseshoe crabs, and whelks, and identification and regulation of spawner sanctuaries.

Fishing gear can result in permanent injury or death to unintended species. For example, fishing gear which is lost in the estuary may continue to "ghost fish" for a long period of time. Pots, traps, fishing lines, and nets lost during storms or due to cut lines may remain in the water column or on the bottom in a functional form. Finfish and other organisms that are caught by this gear may be permanently injured trying to escape or may not escape and will eventually die. In addition, certain types of gear may be very effective at catching not only the target species but other, non-target species which may be injured or die before the gear is retrieved and they can be released. Regulations and management measures should be implemented that will reduce injury and death to non-target species.

The waste generated by fishermen from cleaning fish is often discarded back into the water in the mistaken belief that, because it is biodegradable and came from the estuary, it is acceptable to return it there. In fact, this material attracts scavengers, both aquatic and terrestrial, and adds to the organic matter already decaying in the sheltered embayments where marinas are usually located. A number of simple practices can be implemented to minimize this problem, including:

- Establishing fish-cleaning areas with proper waste receptacles;
- Developing and implementing rules governing the conduct and location of fish-cleaning stations;
- Implementing fish composting where appropriate; and
- Educating boaters and fishermen regarding the importance of proper fish-cleaning procedures.

Research on hard clams in the Great South Bay of Long Island has indicated that the hydrographic regime associated with certain tributaries provides prime habitat for shellfish reproduction. These areas usually contain concentrations of coliform bacteria introduced from stormwater runoff and are uncertified for shellfish harvesting due to coliform contamination. Because shellfish in these areas are not routinely harvested, the populations are often larger and the reproductive output higher than in other areas of the estuary system. Thus, these areas may be supplying a disproportionate share of larval hard clams to the Great South Bay. It is not clear if there are any areas in the Peconic Estuary system which function similarly. This should be studied because if similar de facto spawner sanctuaries exist in the Peconic Estuary, some harvesting restrictions should be considered, particularly if efforts to improve water quality and reduce pathogen contamination are successful and these areas could be re-opened to shellfishing. Certified areas should also be examined for potential

designations as spawner sanctuaries. Spawner sanctuaries for scallops are viewed by NYSDEC as having more potential to succeed in the Peconic Estuary System.

Habitat Protection and Pollution Prevention

A variety of habitats are important to different finfish species that use the Peconic Estuary System. A number of coastal migratory species use the system as spawning, nursery, or feeding grounds. These include weakfish, tautog, winter flounder, scup, bluefish, butterfish, and summer flounder. Habitats which are of importance to these species for a variety of reasons include shallow subtidal areas, both vegetated (eelgrass) and unvegetated, deep subtidal areas (sandy and muddy substrate), and intertidal salt marshes (feeding over both vegetated *Spartina* beds and unvegetated flats). These habitats should be identified, protected, and restored to enhance shellfish and fish stocks. Principal threats to these include: physical and chemical impacts from shoreline hardening structures; physical and chemical inputs from runoff; and physical, chemical and biological impacts to eelgrass beds.

Steps

HLR-12.1 **Priority** Collect better statistical data on commercial and recreational fishing landings and by-catch specific to the Peconic Estuary System.

HLR-12.2 **Priority** Identify, protect, and restore key shellfish and finfish spawning, nursery, and feeding habitats in the Peconic Estuary to enhance shellfish and fish stocks and incorporate this data into the on-going Essential Fish Habitat work being conducted under the Atlantic States Marine Fisheries Commission (ASMFC).

HLR-12.3 Support the Atlantic Coastal Cooperative Statistics Program.

HLR-12.4 Support the fishery management plans which have been and are being developed by the Mid-Atlantic Fishery Management Council (MAFMC) and the ASMFC.

HLR-12.5 Ensure the enforcement of existing regulations on both commercial and recreational fisheries.

HLR-12.6 Support NMFS Essential Fish Habitat Designations within the Peconic Estuary.

HLR-12.7 Develop a public education program about the value of fish and fishing and the importance of commercial and recreational fishing regulations and compliance with the regulations.

HLR-12.8 Support the prevention, or at least minimization, of the effects on finfish and non-target species by lost or incorrectly-designed fishing gear. Measures to be supported include: (1) developing a program to encourage commercial and recreational fishermen to retrieve and properly dispose of fishing line, nets, traps, pots, and other gear; (2) work with the AMI to develop a campaign for dockside recovery and recycling programs; (3) support implementation of fishery regulations requiring escape vents and degradable panels in fish and lobster pots; (4) implementing fishery regulations requiring minimum mesh size for gill, fyke, and otter trawl nets; and (5) promoting the use of fishing gears that minimize by-catch and discard (*e.g.*, pound nets).

HLR-12.9 Implement CZARA section 6217 BMPs regarding fish waste at marinas and on docks. Develop public education materials for distribution at marinas, bait and tackle shops, and other related businesses detailing these BMPs.

HLR-12.10 Expand the monitoring and analysis of the NYSDEC finfish trawl survey to the east of Shelter Island and coordinate with PEP Living Resources Research, Monitoring, Assessment Plan.

HLR-12.11 Examine the role of areas uncertified for shellfishing as "spawner sanctuaries" for shellfish species.

HLR-12.12 On a biennial cycle, perform deep- and shallow-water shellfish abundance surveys.

Responsible Entities

HLR-12.1 NOAA/NMFS and NYSDEC (co-leads)

HLR-12.2 PEP, NOAA/NMFS, ASMFC, New York Sea Grant Institute, NYSDEC, and local universities and colleges

HLR-12.3 NMFS, NYSDEC, and PEP (co-leads)

HLR-12.4 NYSDEC, PEP (co-leads), ASMFC, NMFS, and MAFMC

HLR-12.5 NYSDEC Division of Law Enforcement (lead), Suffolk County Marine Police, and town bay constables

HLR-12.6 PEP-MC, NYSDEC, and NMFS.

HLR-12.7 PEP Public Education and Outreach program (lead), NYSDEC, Sea Grant, CCE - Marine Program, AMI, and marina and fishing business-owners

HLR-12.8 NMFS, NYSDEC, NYS Sea Grant (co-leads), CCE, AMI, and commercial and recreational fishing community

HLR-12.9 PEP Public Education and Outreach program (lead), AMI, marina owners, other business owners, NYSDEC, Sea Grant, and CCE - Marine Program

HLR-12.10 NYSDEC (lead) and PEP Natural Resources Subcommittee

HLR-12.11 PEP Natural Resources Subcommittee (lead), NYSDEC, and CCE

HLR-12.12 PEP through contractor

HLR-13 Protect Nesting and Feeding Habitat of Shorebirds.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 6, 7, and 8.

Shorebird nests and chicks on open beaches are vulnerable to disturbance, injury, and death from vehicles, humans, and unleashed dogs, predators such as foxes, crows, raccoons, gulls, and cats, and flooding. However, many of these impacts can be reduced through careful habitat management and public education. For example, research and monitoring has shown that shorebird chicks and eggs are extremely vulnerable to off-road vehicles and noise from motorized watercraft near or within their nesting and feeding habitat. Vehicular disturbance can lead to abandonment of nests, injury or death of eggs and chicks, or reduced ability to feed, leading to malnourishment. Seasonally restricting the use of vehicles and watercraft on or in the vicinity of nesting and feeding shorebirds can aid in the recovery of these species. Therefore, the current county and town practice of selling beach-driving permits may not be compatible with a management goal of protecting critical nesting and feeding habitat of rare shorebirds.

Plovers and terns are so vulnerable to disturbance that they need annual management. Since it is unreasonable to ban the public from beaches, signs and fences should be placed around nesting and feeding habitat to protect the birds during the breeding season. Since the plovers begin nesting in mid to late April, every effort should be made to find and fence each pair's early season nest to ensure a high rate of fledglings before the Fourth of July. Fencing and posting also protects the landowner from a "taking" under the Federal Endangered Species Act. Terns that are protected by New York State need their nesting habitat protected from mid-May to mid-August. Existing state and local programs generally are underfunded and understaffed to carry out the recommended fencing and monitoring.

The USFWS has developed guidelines to manage recreational activities in piping plover breeding habitat. Compliance with these guidelines will assist in the recovery of threatened and endangered species and conservation of other coastal species. Implementing these guidelines will also ensure that violations of Section 9 of the Endangered Species Act are avoided. The guidelines provide a variety of management options intended to prevent mortality, harm, and/or harassment of piping plovers and their eggs due to recreational activities.

Management is best accomplished when the cause for bird mortality is known and qualified with documentation so that the management actions can be targeted to site specific threats. Therefore, intensive monitoring and threat documentation is very important.

Steps

HLR-13.1 **Priority** Strengthen existing municipal shorebird (terns and plovers) management programs to ensure timely fencing and erection of enclosures, adequate monitoring and reporting, and management of recreation and other activities within nesting and feeding habitat. Implement the 1997 Suffolk County Department of Parks, Recreation and Conservation Piping Plover Protection Program and the NYSDEC Bureau of Wildlife 1998 Action Plan for Piping Plover Conservation in New York.

HLR-13.2 Restrict the use of off-road vehicles and small watercraft in shorebird nesting areas during breeding season (April – August).

HLR-13.3 Consult with the USFWS to comply with Federal guidelines for managing recreational activities in piping plover breeding habitat.

HLR-13.4 Document threats to nesting shorebirds (plovers and terns) such as off-road vehicles, predation, and recreation, and develop and implement measures that lead to higher productivity and larger nesting populations.

Responsible Entities

HLR-13.1 NYSDEC; Suffolk County Parks Department; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; Trustees; The Nature Conservancy; and USFWS (co-leads)

HLR-13.2 OPRHP, Suffolk County Parks Department; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; and NYSDEC for DEC-owned properties (co-leads)

HLR-13.3 Beach managers including Federal (USFWS), State, Suffolk County, towns, and property owners (co-leads)

HLR-13.4 East End towns and NYSDEC

HLR-14 Protect Sea Turtles and Marine Mammals.

Addresses Habitat and Living Resources Management Objectives 1, 3, 4, 6, 7, and 8.

The Kemp's ridley, loggerhead, and green sea turtles use the Peconic Estuary as important developmental habitat when they are juveniles. Leatherback turtles are found to a much lesser extent in the estuary. All of these species of turtles are Federally-listed as either endangered or threatened. Therefore, any activities that kill, injure, or significantly disturb the behavior of these organisms are of concern.

Sea turtles are most frequently sighted in Southold Bay, Orient Harbor, Noyack Bays, the waters from Accabonac Harbor to Napeague Harbor, including the embayments, and the waters off Plum Island, Great Gull Island, Gardiners Island, and Jessup's Neck. Current activities that may directly or indirectly kill, injure, or disturb turtles include boating and dredging. Activities in the system which are not of concern yet, but which have the potential to expand and result in more frequent turtle encounters, are large-scale, intensive aquaculture projects or relatively large-scale, poorly-designed artificial reefs. All the current activities and all proposed activities in these areas should be reviewed with the impact on sea turtles in mind.

Under New York State Environmental Conservation Law Article 11, Section 0107, it is illegal to injure or cause the death of harbor seals. It is also illegal under this law to buy, sell, transport, or have possession of these animals. The law was implemented a number of years ago when the harbor seal was the only species of pinniped found in New York waters. Currently, there are five species of seals that are found in these waters, of which three have become fairly common. In order to protect these species, as well as other marine mammals, such as the bottlenose dolphin and the harbor porpoise, this law should be expanded.

Steps

HLR-14.1 Review uses of areas which have been identified as sea turtle and marine mammal feeding areas and consider what restrictions may be necessary to be more protective of these species and their food resources.

HLR-14.2 Evaluate the expansion of existing laws to ensure that all species of seals as well as other marine mammals are protected from intentional injury or death.

HLR-14.3 Expand New York State law protecting harbor seals (ECL Article 11, Section 0107) to include all species of seals in NYS marine waters.

Responsible Entities

HLR-14.1 NYS agencies (*e.g.*, NYSDEC, NYSDOS, NYS Office of Parks, Recreation and Historic Preservation, NYS Office of General Services) (co-leads), Suffolk County, and Towns

HLR-14.2 NYS agencies (*e.g.*, NYSDEC, NYSDOS, NYS Office of Parks, Recreation and Historic Preservation, NYS Office of General Services) (co-leads), SCDHS, and towns

HLR-14.3 New York State Legislature and NYSDEC (co-leads)

HLR-15 Utilize Land Use Planning, BMPs, and Other Management Measures to Reduce the Negative Impacts of Human Uses and Development on the Estuary System.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 4, 6, 7, and 8.

Measures are needed to counteract the effects of increasing human populations and development of the lands and waters of the watershed surrounding the estuary. The pressure on the natural system, if not controlled or mitigated, will result in replacement or loss of natural habitats (conversion to lawns and gardens, hardening of the shoreline resulting in lost wetlands, increased siltation and lowered salinity from runoff); increased introduction of toxic chemicals and excess nutrients to surface and ground waters as a result of increases in impervious surface areas and other inputs (pesticides, herbicides, household chemicals, septic systems, fertilizers); and displacement of wildlife (shorebirds, diamondback terrapins, small mammals, indigenous plant communities). With proper planning and management, residents and visitors will be able to continue to use and enjoy the many resources the estuary has to offer for generations to come; the finfishery and shellfishery resources of the estuary can also be sustained and improve as viable economic resources. Otherwise, the estuary risks becoming unproductive ecologically and economically.

Planning

Coordinated land use planning and comprehensive planning on a local level can be used to ensure protection of natural resources and habitats from cumulative impacts. A master plan, especially when developed in conjunction with those of other towns, is a powerful tool for managing the way in which an area is developed. The East End of Long Island is under increasing pressure for development. It will require careful planning and uniform implementation to ensure that increases in population do not overwhelm the natural resources that make the East End such a desirable place to live. The development of a master plan in each town and minimization of variances allowed are good measures for achieving such control. Towards this action, the Towns of East Hampton, Southold, and Southampton are in the process of developing Local Waterfront Revitalization Plans. The Villages of Greenport and Sag Harbor have already adopted such plans. These types of plans can be used to address the need for public access and the impacts associated with public demands for open space. Providing well-sited and well-planned public access points protects habitat and meets the public's demand while building a constituency for enhanced protection of natural habitat and species populations. Planning is needed to ensure that access points are coupled with the right kind of space to accommodate different uses: places to fish, places to swim, places close to wildlife habitat for observation, safe places for boating including support facilities, and places to walk along the water. People must be able to enjoy and appreciate a clean estuary for there to be continuing support for further investments to improve water quality and coastal habitats. PEP supports maintaining a balance between the needs and opportunities for public access and the requirements for sustaining living resources.

One local plan that has been used successfully in the estuary is the Harbor Protection Overlay District (HPOD). The Town of East Hampton created the HPOD to address developments on waterfront property. The HPOD imposes restrictions on newly-developed or redeveloped waterfront property. A number of these restrictions are particularly useful in the protection of living resources, such as

requirements that the shoreline be maintained with a natural buffer made up of native vegetation. The PEP encourages other towns to adopt similar planning measures.

Regulations already exist that protect natural resources of the estuary from human impacts (*e.g.*, NYS freshwater and tidal wetland regulations that require minimum setbacks for house and sanitary systems and vegetated buffer zones). Statewide plans are also useful tools for protecting estuary resources. New York has developed a State Coastal Nonpoint Management Plan in response to CZARA Section 6217. This plan addresses all of the categories of nonpoint source pollution which have been identified as being of concern in the Peconic Estuary System and recommends BMPs or management measures for controlling sources of nonpoint pollution in coastal waters. Many of these BMPs are protective of habitat and living resources. The PEP should work with local governments and other agencies to implement BMPs and encourage or require land owners to adopt BMPs.

Another plan that is protective of the Peconic Estuary is the Areawide Contingency Plan for dealing with large oil spills. This plan, which was developed by the U.S. Coast Guard (USCG), in conjunction with other Federal and State agencies, is periodically revised and updated. The review period provides an opportunity for the PEP to contribute information with regard to critical areas and species of concern in the estuary such as waterfowl (ducks and geese), waterbirds (herons, terns, etc.), sea turtles, and marine mammals. In addition, this plan could be a conduit for including PEP stakeholders in clean-up efforts for large spills. At this time, there are no trained wildlife rehabilitators to care for the species most at risk from a large-scale oil spill. In order to be prepared for this contingency, local rehabilitators should be encouraged to take training in handling oiled wildlife. The NYSDEC and USCG could then include them in the clean-up effort for a large spill.

The use of town councils or planning boards for reviewing actions that affect public lands and open space is another tool for minimizing cumulative impacts of development and population growth. Currently, the Town of Southampton has a Conservation Advisory Board; the Towns of East Hampton, Southold, and Shelter Island have Conservation Advisory Councils. State legislation exists which enables towns to increase the status of these councils in order to provide them with a role in reviewing Town Board actions. Any action that may be taken by a Board, which would have an effect on the overall open space of a town, is reviewed by the Conservation Advisory Board and appropriate recommendations are made. Such reviews may provide the Town Board with important information on the impacts of individual actions on the entire inventory of open space and its management in the town.

All of these planning and management efforts will not be successful if they are not conducted in a coordinated manner. One way to ensure that these protection and conservation efforts are implemented in a coordinated manner is to develop a group such as the Protected Lands Council, which has been established for the management of the Pine Barrens. The Council includes all groups that manage the Pine Barrens for preservation and ensure that uses are managed equitably. The Council fosters communication and cooperation among the managers in order to use staff and financial resources more efficiently. It may be possible to expand this group to include the management of lands throughout the Peconic River and estuary watershed. Alternatively, it may be more feasible to establish a similar group for the estuary that includes different entities, since the PEP CCMP and the Pine Barrens Plan have different goals.

Steps

HLR-15.1 **Priority** Each town should develop a master or comprehensive management plan, coordinated with plans of other towns that increases the level of protection of natural resources and habitats and accounts for cumulative impacts.

HLR-15.2 **Priority** Increase public access to the estuary consistent with other ecosystem objectives.

HLR-15.3 Develop and implement a Harbor Protection Overlay District such as that developed by the Town of East Hampton and include it in the master plan for each town.

HLR-15.4 Develop implementation mechanisms for all measures required by Section 6217(g) of CZARA that are applicable to the Peconic Estuary. These measures would include BMPs for the use of natural vegetation, minimization of impervious surfaces, safe and reasonable use of lawn, garden, and household chemicals, and minimization of stormwater runoff. Incorporate these BMPs into the site plan requirements for all newly-developed and redeveloped property, particularly along the shoreline.

HLR-15.5 Use the Protected Lands Council of the Central Pine Barrens Comprehensive Land Use Plan as a model for developing a similar coalition of public agencies and conservation organizations to address common issues of concern throughout the estuary.

HLR-15.6 Encourage towns with existing Conservation Advisory Councils or planning staff**,** to be given the responsibility as Conservation Advisory or Planning Boards to review proposed Town Board actions as they affect public lands and open space concerns.

HLR-15.7 Review and provide comments to NYSDEC on any revisions to the Statewide Oil Spill Areawide Contingency Plan for the Peconic Estuary relating to waterfowl, marine mammals, and sea turtles and their rehabilitation if oiled. Develop and distribute information on reporting and responding to small-scale spills.

HLR-15.8 Develop regulations for new marinas or expansion of existing marinas which include the following (from CZARA section 6217): (1) assessment of water quality conditions during and after construction; (2) site and design such that tides and/or currents will aid in the flushing of the site or renew its water regularly; (3) site and design to protect against adverse effects on shellfish resources, wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas as designated by local, State, or Federal governments; (4) designate and enforce no-wake zones and ensure that shoreline areas are stabilized effectively by vegetative means; and (5) require effective stormwater runoff control measures to reduce sediment and toxic inputs.

Responsible Entities

HLR-15.1 Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; and NYSDOS (co-leads); EPA, NYSDEC, SCDHS

HLR-15.2 All Federal, state, and local governmental agencies in the PEP watershed (co-leads); NYSDEC

HLR-15.3 NYSDOS (lead); Towns of Southampton, Southold, Shelter Island, and Riverhead

HLR-15.4 NYSDEC, NYSDOS, PEP Education and Outreach Program (co-leads), Suffolk County Soil and Water Conservation District, SCDHS, USDA NRCS, CCE, NY Sea Grant, Peconic BayKeeper, SCDHS

HLR-15.5 PEP and Pine Barrens Commission and Protected Lands Council (co-leads); Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; NYSDEC; SCDHS

HLR-15.6 Towns of East Hampton, Southold, Shelter Island, and Riverhead (co-leads)

HLR-15.7 PEP Natural Resources Subcommittee in conjunction with the USCG, NYSDEC, USFWS (co-leads); Rehabilitation: local wildlife rehabilitators (licensed); Education: PEP Public Education and Outreach program in conjunction with the USCF, NYSDEC, and USFWS; BMPs: NYSDOS; AMI; Towns of East Hampton, Southampton, Southold, Shelter Island; and Riverhead; and villages

HLR-15.8 NYSDEC (lead); SCDHS; EPA; PEP; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; AMI; and private marina owners

HLR-16 Develop and Implement a Living Resources Research, Monitoring, and Assessment Program.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 5, 6, 7, and 8.

Although humans have lived around and worked in the Peconic Estuary for thousands of years, a relatively small amount of scientific research has been performed on the living resources of this system. To understand the impacts of humans and their activities on this system, there must be a better understanding of how the estuary functions ecologically. This understanding can only be achieved through a focused research, monitoring, and assessment effort (RM&A).

Monitoring involves the multi-year collection of data on living resources and water quality to understand natural variability of populations over time as well as changes in those populations which result from human influences. Monitoring certain sensitive species or communities as overall indicators of ecosystem health can be a valuable tool in keeping track of conditions which may stress a system. Data from monitoring programs can provide an "early warning" about the declining health of the estuary. Monitoring living resources is needed for the estuary system.

As part of the process of developing this CCMP, the PEP identified and performed a number of priority characterization projects. Many of the important questions about the system could not be answered, however, due to time and funding constraints. The PEP now needs to identify and prioritize all of the remaining research and monitoring needs and develop an RM&A Program. The RM&A Program will define the critical research questions that need to be answered, facilitate coordination among various new and ongoing research, monitoring, and assessment programs, and identify private and public sources of funding. The RM&A Program would outline monitoring needs, agencies, and organizations responsible for conducting monitoring activities, funding sources, and methods for coordination with ongoing programs. The development of integrated water quality and living resource indicators should also be included in the RM&A Program. The PEP sponsored a workshop in 1998 involving scientists and participants of the PEP Management Conference to develop a framework for the RM&A Program.

Topics already identified by the PEP Natural Resources Subcommittee for inclusion in the Program poses questions regarding finfish spawning, larval development, and recruitment to the fishery; population dynamics of the benthic communities of the system; distribution, abundance, and growth, including habitat use and preference, by juvenile and forage fish; and the links among these different components of the food web.

One of the monitoring needs identified by the PEP includes monitoring eelgrass by aerial photographic interpretation, appropriate groundtruthing, periodic mapping, and other surveillance techniques to adequately assess trends in eelgrass distribution, abundance and overall health. Given the recent decline in eelgrass beds over the last decade, a long-term commitment to eelgrass monitoring is essential to provide adequate management, preservation, and restoration measures.

Additional research, monitoring, and assessment needs identified by the PEP include the following:

1) impacts of macroalgae and toxic contaminants on eelgrass distribution and abundance;
2) distribution, abundance, habitat preferences, and life stage requirements of forage fish species, horseshoe crabs, slipper shells, bay scallops and hard clams;
3) critical spawning habitats for local populations of winter founder;
4) basic food web ecology;
5) benthic habitat mapping;
6) assessing and monitoring the impacts of shoreline hardening on habitat and living resources; and,
7) effects of sea level rise on saltmarsh distributions and shallow water habitats.

Information sharing, coordination of research and monitoring efforts, and funding and incentives for increased research and monitoring are needed to ensure that research, monitoring, and assessment activities within the Peconic Estuary System are successful.

Dissemination of research and monitoring information is essential to evaluate progress made in restoration and conservation efforts and develop improved methods for research, monitoring, and stewardship of our important natural resources. A biennial conference would provide an opportunity for scientists to meet together with managers and the public to review and discuss findings. By creating an accessible database of natural resources, data would be available in a standard, meaningful format that could be used by managers, researchers, and stewards of the Peconic Estuary.

Although the Peconic Bays are an excellent estuarine laboratory for basic and applied research by universities (*e.*g., SUNY Stony Brook), colleges (*e.g.*, LIU-Southampton College), institutions (*e.g.*, Brookhaven National Laboratory), and public and private schools, very little basic and applied research takes place here. Necessary incentives to encourage researchers to focus their scientific inquiries here need to be identified, developed, and promoted. Establishing a research center/scientific platform and targeting funding are two incentives which can support cutting edge marine research and monitoring.

Other National Estuary Programs have embarked on research projects, which have resulted in significant findings about marine systems that are applicable to many estuaries. The PEP should participate in coordinated research and information exchange with other National Estuary Programs.

Steps

HLR-16.1 **Priority** Develop and implement a research program for the Peconic Estuary and its watershed to investigate natural processes, impairments, and links to water quality, maintenance of systems and species, and effects of recreation and pollution on biodiversity, among other research needs. Investigate and seek funding sources for supporting implementation of the program (*e.g.*, National Estuarine Research Reserve Systems)

HLR-16.2 **Priority** Develop a long-term program for monitoring and assessment of living resources in the Peconic Estuary that is coordinated with the development of a research plan and ongoing research and monitoring efforts.

HLR-16.3 Support research on the interactions between eelgrass and the dominant macroalgae species in the Peconic Estuary to determine impacts of macroalgae on eelgrass distribution and abundance.

HLR-16.4 Perform research and monitoring of forage fish species, horseshoe crabs, and conch in the Peconic Estuary to understand their distribution (temporal and spatial), abundance, habitat preferences, and different life stage requirements to develop management strategies.

HLR-16.5 Perform research on the ecology of food sources of sea turtles to evaluate the importance of the Peconic Estuary to them and potential threats to these endangered and threatened species.

HLR-16.6 Research the lethal, sublethal, and synergistic effects of elevated nutrients, toxic chemicals, and Brown Tide on the reproduction and behavior of finfish and invertebrate species.

HLR-16.7 Determine the effects of navigational dredging on shallow water communities and the recovery time of benthic communities exposed to dredging.

HLR-16.8 Ensure implementation of adequate mapping and monitoring programs to track trends in the extent and quality of eelgrass, and to evaluate progress towards reaching restoration goals.

HLR-16.9 Establish a scientific panel to review research, monitoring, and assessment data, and to offer guidance in management of the habitats and living resources in the Peconics.

HLR-16.10 Organize an annual or biennial conference to report research, monitoring, and assessment results to the public and guide management decisions.

HLR-16.11 Establish and maintain an accessible database of natural resources in the Peconic Estuary.

HLR-16.12 Promote research and monitoring opportunities in the Peconic Estuary to local schools, colleges, universities, and institutes by establishing funding and scientific platforms and other incentives to facilitate basic and applied marine research.

HLR-16.13 Seek opportunities to link research and monitoring in the Peconic Estuary System to related estuaries and regional studies.

HLR-16.14 Support priorities listed in the Living Resources Research, Monitoring, and Assessment Plan including research on ecosystem productivity and ecosystem structure, bioindicators, and effects of global climate change on wetlands.

Responsible Entities

HLR-16.1 Plan development and coordination: PEP Natural Resources Subcommittee and the Marine Conservation Planner (co-leads) in consultation with other members of the PEP Management Conference and technical experts; Plan implementation: PEP Management Conference, NYSDEC, NYSDOS, New York Sea Grant Institute, and SCDHS (co-leads)

HLR-16.2 Monitoring plan: PEP Natural Resources Subcommittee and Marine Conservation Planner (co-leads) in conjunction with NYSDEC; SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; Plan implementation: PEP in conjunction with NYSDEC (co-leads); SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; Cornell Cooperative Extension; local universities and colleges; and NY Sea Grant

HLR-16.3 Plan development: PEP Natural Resources Subcommittee and the Marine Conservation Planner (co-leads) in consultation with other members of the PEP Management Conference and technical experts; Plan implementation: PEP Management Conference, NYSDEC, NYSDOS, New York Sea Grant Institute, and SCDHS (co-leads)

HLR-16.4 PEP Natural Resources Subcommittee, NYSDEC, Marine Conservation Planner (co-leads), and technical experts through the PEP long-term research plan

HLR-16.5 PEP Natural Resources Subcommittee (lead) and technical experts through the PEP long-term research plan

HLR-16.6 PEP Natural Resources Subcommittee (lead) and technical experts through the PEP long-term research plan, NY Sea Grant

HLR-16.7 PEP Natural Resources Subcommittee (lead) and technical experts to define specific research questions, USACE, SCDPW, and NYSDEC

HLR-16.8 PEP Natural Resources Subcommittee (lead) and PEP Management Council (co-leads)

HLR-16.9 PEP Natural Resources Subcommittee (lead)

HLR-16.10 PEP Natural Resources Subcommittee in conjunction with EPA, NYSDEC (co-leads), SCDHS, and local universities and colleges

HLR-16.11 PEP Natural Resources Subcommittee (lead)

HLR-16.12 PEP, NY Sea Grant, EPA (co-leads), NOAA, NYS Marine Educators Association (MEA), and Cornell Cooperative Extension - Marine Program

HLR-16.13 Association of NEPs, EPA, PEP (co-leads), NY Sea Grant, and NOAA

HLR-16.14 PEP Natural Resources Subcommittee

HLR-17 Establish a Working Group to Examine the Role of Grazers and Filter Feeding Organisms in Influencing Water Quality and Productivity, and to Better Understand the Food Web Dynamics and to Develop Management Applications.

Addresses Habitat and Living Resources Management Objectives 1, 2, 3, 4, and 8.

Grazer and filter-feeding organisms, such as zooplankton, clams, scallops, menhaden, and sponges, are vital to the estuary ecosystem. Filter feeders, particularly shellfish, filter large volumes of bay water over relatively short time periods. They can affect water quality and exert significant influence on the size, type, and abundance of phytoplankton. Conversely, changes in phytoplankton species composition can affect the diversity and abundance of grazers and filter-feeders. For example, preliminary Brown Tide research findings by Caron and Lonsdale have resulted in a working hypothesis that reduced shellfish populations prior to the first Brown Tide in the Peconics may have led to significant reduction in grazing pressure on phytoplankton, thereby allowing the onset of Brown Tide. Brown Tide, changes in the nutrient regime, and harvesting of shellfish and finfish can shift the abundance, diversity, and temporal and spatial distribution of grazers and filter-feeders. Understanding the food web dynamics and "top-down" control of productivity can therefore, be equally important to the management of the Peconic Estuary as that of nutrient cycling ("bottom-up"). A working group is needed to examine these issues more closely and evaluate the relationship between filter-feeders and water quality, as well as to link other PEP efforts and to identify potential management applications.

The work group should include Brown Tide researchers, shellfish and fishery scientists, marine ecologists, baymen, aquaculturists, water quality modelers, resource managers and regulators.

Issues:

1) Understanding the relationship of grazer and filter-feeder diversity and abundance with phytoplankton diversity and abundance;
2) How to enhance shellfish and finfish stocks to accommodate harvesting while also maintaining sufficient populations that are adequate to fulfill ecological functions; and
3) Need for collaboration between related Peconic Estuary efforts, such as the Brown Tide Research Initiative (BTRI), water quality modeling, estuary-wide aquaculture plan work group, and finfish monitoring.

Steps

HLR-17.1 Review appropriate scientific literature, identify information gaps, and develop research recommendations regarding how shellfish, finfish and other "top-down" predators influence water quality and the planktonic community.

HLR-17.2 Develop research, monitoring, and assessment needs for quantifying food web dynamics.

HLR-17.3 Develop food web sub-models to be included in the nutrient model to evaluate the sensitivity of productivity to anthropogenic changes in nutrient supply.

HLR-17.4 Consult with the BTRI and the estuary-wide aquaculture plan work group to develop management recommendations for "top-down" regulation of water quality and Brown Tide in the Peconic Estuary.

HLR-17.5 Facilitate communication among BTRI, water quality managers and the estuary-wide aquaculture plan work group.

Responsible Entities

HLR-17.1 PEP Natural Resources Subcommittee (lead) through contractor

HLR-17.2 PEP Natural Resources Subcommittee (lead) and marine conservation planner

HLR-17.3 PEP Natural Resources Subcommittee through contractor (lead) in consultation with other members of the PEP Management Conference and technical experts

HLR-17.4 PEP Natural Resources Subcommittee (lead) in consultation with other members of the PEP Management Conference and technical experts; NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS, BTRI researchers, SUNY Stony Brook, Cornell, and commercial aquaculture facilities in the Peconics

HLR-17.5 PEP Natural Resources Subcommittee (lead) in consultation with other members of the PEP Management Conference and technical experts; NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS, BTRI researchers, SUNY Stony Brook, Cornell, and commercial aquaculture facilities in the Peconics

BENEFITS OF THE MANAGEMENT ACTIONS

Implementation of these management actions will greatly benefit the Peconic Estuary by protecting rare and endangered species, enhancing ecological communities throughout the system, restoring degraded habitats to increase biodiversity, protecting high quality areas where there are concentrations of exemplary examples of natural communities, improving our understanding and assessment of impacts on natural resources, and providing sustainable commercial and recreational fisheries. These management recommendations also include important actions that can be taken to mitigate stress by minimizing impacts to living resources and habitats crucial to their survival.

The estuary is on the brink of being seriously impacted by overuse. By setting management actions that foster commercial and recreational use that is sustainable and compatible with protection of biodiversity, stakeholders can ensure an important balance between preservation and the wise use of the bays' natural resources. EAI's Economic Value Assessment and Finance Plan may contain quantifiable benefits to highlight these claims.

COSTS OF THE MANAGEMENT ACTIONS

The individual cost for each management action is provided in **Table 4-1**.

The total cost of all new actions proposed for the Habitat and Living Resources management in this chapter is $9,088,750 in one-time costs and $1,881,250 annually. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

HABITAT AND LIVING RESOURCES ACTIONS SUMMARY TABLE

Table 4-1 provides the following summary information about each of the actions presented in this chapter. Priority Habitat and Living Resources steps are also identified in the table. These priorities were decided by the PEP Natural Resources Subcommittee.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides a expanded explanation of base programs and action costs.

Table 4-1. Habitat and Living Resources Management Plan Actions.

Action		Responsible Entity	Timeframe	Cost	Status
HLR-1	**Use Critical Natural Resource Areas (CNRAS) to Develop and Implement Management Strategies to Protect High Quality Habitats and Concentrations of Species of Special Emphasis.** ***(Objectives 1, 2, 3, 6, 7, and 8)***				
HLR-1.1 **Priority**	Collect and interpret natural resource, water quality, and land use data sets. Use GIS technology to finalize a comprehensive inventory of species, natural communities and water quality, refine maps (including development of maps of each CNRA), and evaluate individual and cumulative threats within each CNRA.	NYSDEC, The Nature Conservatory (co-leads) with towns and USFWS assistance	Post-CCMP	$150,000 for contractor assistance NYSDEC – 1.0 FTE TNC – 1.0 FTE Towns – 0.1 FTE USFWS – 0.2 FTE	R
HLR-1.2 **Priority**	Finalize CNRA boundaries and adopt CNRAs by appropriate levels of government.	NYSDEC; The Nature Conservancy (co-leads); PEP Natural Resources Subcommittee; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; NYSDEC; OPRHP; Suffolk County Parks Department; USFWS; NYSDOS	Post-CCMP	NYSDEC – 0.3 FTE SCDHS – 0.3 FTE PEP – 0.3 FTE TNC – 0.3 FTE USFWS – 0.3 FTE Towns – 0.2 FTE each SC Parks – 0.3 FTE	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-1.3 **Priority**	Develop management recommendations and plans to protect CNRAs in each town in coordination with existing Federal, State, county, and municipal programs that address individual and potential cumulative impacts including but not limited to docks, shoreline stabilization structures, dredging, marinas, artificial reefs, fish farms, shellfish culture, fishing, pesticides, golf courses, motorized personal watercraft, swimming pools, sewage treatment and disposal, building and adjacent upland development, and clearing of vegetation.	NYSDEC, The Nature Conservancy (co-leads) to assist local governments in coordination with PEP Management Conference, EPA, SCDHS .	Post-Completion of HLR-1.1 and HLR-1.2	EPA – 0.05 FTE NYSDEC – 0.9 FTE SCDHS – 0.5 FTE TNC – 0.5 FTE Towns – 1.0 FTE each	R
HLR-1.4 **Priority**	Protect the CNRAs through land acquisition and other protection tools (*e.g.*, clearing restrictions, setback requirements, zoning, Transfer of Development Rights) principally within the areas themselves and including essential watershed buffers (see **Chapter 7**).	NYSDEC; NYS Office of Parks, Recreation and Historic Preservation; Suffolk County Planning Department; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven	Ongoing	(Significant funding has been allocated for acquisition estuary-wide. See **Chapters 7 and 9**.	C/O

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-1.5	Prohibit the installation of new shoreline hardening structures within CNRAs. Investigate ecologically enhancing, innovative designs to replace or use as an alternative to hard structures.	Prohibit installation: Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, villages, NYSDEC; Investigate new designs: NYSDEC, TNC, EPA, SCDHS, Peconic BayKeeper	Subsequent to completion of HLR-1.2	Prohibit installation: Base Program; Investigate new designs: $50,000 EPA – 0.1 FTE NYSDEC – 0.8 FTE SCDHS – 0.5 FTE TNC – 0.5 FTE Towns – 0.5 FTE each Peconic BayKeeper – 0.2 FTE	R
HLR-1.6	Coordinate PEP recommendations for CNRAs with the NYSDOS Significant Coastal Fish and Wildlife Habitat Program and Local Waterfront Revitalization Plan Programs.	NYSDOS (lead), NYSDEC, PEP Natural Resources Subcommittee	Fall 1999	NYSDEC – 0.1 FTE PEP – 0.1 FTE NYSDOS – 0.2 FTE	C/O
HLR-1.7	Encourage increased use of the NYSDOS Significant Coastal Fish and Wildlife Habitat Program guidelines by appropriate Federal, State, county, and municipal agencies.	NYSDOS (lead), NYSDEC, Towns, USACE, USFWS, NMFS	Ongoing	NYSDOS – 0.2 FTE NYSDEC – 0.1 FTE	C/O
HLR-1.8	Examine the possibility of establishing marine reserves (*e.g.*, protect eelgrass beds) within the CNRAs.	PEP Natural Resources Subcommittee, EPA, NYSDEC, SCDHS	Post-CCMP	EPA – 0.05 FTE NYSDEC – 0.05 FTE SCDHS – 0.05 FTE PEP – 0.05 FTE	R
HLR-1.9	Discourage expansion of existing marinas and the creation of new ones within the PEP CNRAs. The marina expansion and creation issue will be further evaluated as part of a comprehensive strategy dealing with shoreline hardening, marinas, docks, and public access (see HLR-1.3).	Contingent upon adoption of CNRAs (see HLR-1.2)	Post- completion of HLR-1.2	Base Program	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-2	**Manage Shoreline Stabilization, Docks, Piers, and Flow Restriction Structures to Reduce or Prevent Additional Hardening and Encourage Restoration of Hardened Shorelines to a Natural State.** ***(Objectives 1, 3, 4, 6, 7, and 8)***				
HLR-2.1 **Priority**	Quantify and map all hardened shoreline, docks and piers, and flow-restriction structures in the Peconic Estuary and assess the overall impacts of stabilization structures on natural resources. Develop recommendations to promote alternative shoreline management and incentives for maintaining and restoring natural shorelines.	Contract with Cornell and USFWS Develop recommendations: NYSDEC, EPA, SCDHS, NYSDOS, Towns	Due: Spring 2001 Post-CCMP	($65,000 NEP funds allocated) Develop recommendations: NYSDEC – 0.2 FTE EPA – 0.1 FTE SCDHS – 0.1 FTE NYSDOS – 0.2 FTE Towns – 0.1 FTE each	C/O R
HLR-2.2	Review existing regulations for shoreline hardening structures at all levels of government, encourage consistent policies and strengthen regulations where appropriate.	PEP-Natural Resources subcommittee through contractor	Post-CCMP	$50,000	R
HLR-2.3 **Priority**	Establish and enforce a policy of "no net increase" of hardened shoreline in the Peconic Estuary and, if possible, a net decrease in hardened shoreline. Use HLR-1 and HLR-2 as a mechanism to establish this strategy.	PEP Management Conference (lead); NYSDEC; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; villages; NYSDOS; USACE; PEP, SCDHS, EPA	Post-CCMP	Establishing the policy could be done with Base program funds but implementation of such a policy could be substantial EPA – 0.3 FTE NYSDEC – 0.3 FTE SCDHS – 0.3 FTE PEP – 0.3 FTE Towns – 0.3 FTE NYSDOS – 0.3 FTE	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-2.4 **Priority**	Develop a variety of financial incentives and programs to encourage property owners to remove or modify hardened shoreline structures and replace them with natural vegetation and other vegetated (bioengineered) alternatives to restore the natural shoreline of the estuary.	Peconic BayKeeper (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; villages; HRWG; NYSDEC; SCDHS; PEP	Post-CCMP	NYSDEC – 0.1 FTE SCDHS – 0.1 FTE PEP – 0.1 FTE Towns – 0.2 FTE each Peconic BayKeeper – 0.3 FTE	R
HLR-3	**Assess the Impacts of Dredging Activities on Habitat and Natural Resources and Develop Recommendations and Guidelines for Reducing those Impacts.** ***(Objectives 1, 2, 3, 6, and 7)***				
HLR-3.1 **Priority**	Hold a "Dredging Summit" for the Peconic Estuary System to address specific concerns (*i.e.*, impacts on shorebird nesting, demersal fish eggs, benthic communities, and the potential release of contaminants) and develop dredging guidance on an embayment-specific basis and for identified CNRAs. Integrate dredging guidance into existing regulatory programs.	NYSDEC (lead) through contractor; USACE; NYSDOS; SCDPW; EPA; SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; other interested stakeholders	Post- CCMP	Dredging Summit: $15,000 Develop Guidance: NYSDEC – 0.4 FTE NYSDOS – 0.2 FTE SCDHS – 0.2 FTE EPA – 0.1 FTE	R R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-3.2 **Priority**	Assess navigational dredging in tidal creeks and embayments (utilizing Suffolk County's Generic Environmental Impact Statement) for damages or impacts to eelgrass beds and other habitats and develop permit conditions to minimize impacts that potentially could result in habitat loss and degradation. Determine if navigational dredging locally impairs water quality to the point of precluding restoration of eelgrass.	PEP through contractor, NYSDEC, DOS, SCDHS	Post-CCMP	Assessment: $50,000 Determination: NYSDEC – 0.2 FTE NYSDOS – 0.2 FTE SCDHS – 0.2 FTE	R R
HLR-3.3	Determine the need for frequency of maintenance dredging and develop recommendations to reduce runoff and erosion in creeks to reduce the need for maintenance dredging.	Frequency of dredging: SCDPW (lead); Runoff recommendations: NYSDEC, NYSDOS (co-leads); PEP, SCDHS	Post-CCMP	Frequency of dredging: Base Program Runoff recommendation: NYSDEC – 0.1 FTE SCDHS – 0.1 FTE PEP – 0.2 FTE	R R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-4	**Examine and Promote Methods of Shellfish Harvesting that are Most Compatible with Establishment and Growth of Eelgrass Beds and Vegetated Salt Marshes.** ***(Objectives 1, 3, 5, 6, and 8)***				
HLR-4.1	Examine methods of harvesting clams, scallops, and other shellfish and determine which are most compatible with eelgrass establishment and growth. Develop recommendations for harvesting methods, frequency, and timing which will allow recovery of eelgrass throughout the estuary and enhance shellfish productivity.	NYSDEC (lead) through contract	Post-CCMP	$50,000 for contractor support NYSDEC – 0.3 FTE	R
HLR-4.2	Discourage harvesting of shellfish at the edge of vegetated salt marshes and encourage the use of methods that minimize impacts to vegetated habitats.	NYSDEC (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; PEP Public Education and Outreach program; shellfishermen	Post-CCMP	Base program and $10,000 for education and outreach NYSDEC – 0.2 FTE PEP – 0.2 FTE	R
HLR-5	**Implement, Enforce, and Encourage the Continuation of Current Policies and Regulations Protective of Wetlands.** ***(Objectives 1, 2, 3, 4, 6, and 7)***				
HLR-5.1	Ensure continued protection of freshwater and tidal wetlands through the implementation and enforcement of current regulations under the Federal Clean Water Act and the State Wetlands Protection Programs, local government regulations and local land use practices.	NYSDEC (lead), ACOE, East End Towns	Ongoing	Base program Enhance existing programs NYSDEC – 2.0 FTE/yr	C/O R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-5.2	Review existing tidal wetlands protection policies to determine if they provide for maintenance of tidal wetlands with respect to future sea-level rise.	PEP — Natural Resources Subcommittee through contractor	Post-CCMP	$25,000	R
HLR-5.3	Maintain and enforce the policy of creating no new mosquito ditches in tidal wetlands and establish a policy for not re-opening ditches that have filled-in by natural processes.	SCVC (lead), NYSDEC, EPA, SCDHS, NYSDOS, East End Towns	Ongoing	EPA – 0.1 FTE NYSDEC – 0.2 FTE SCDHS – 0.2 FTE PEP – 0.2 FTE SCVC – 0.3 FTE Towns – 0.1 FTE each	C/O
HLR-5.4	Ensure that SCVC works cooperatively with all government agencies, East End towns and local conservation organizations in the planning of wetland mosquito ditch maintenance and pesticide spraying.	SCVC (lead), SCDHS, NYSDOS, EPA, NYSDEC, East End Towns	Post-CCMP	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE PEP – 0.1 FTE SCVC – 0.1 FTE	R
HLR-6	**Evaluate the Effectiveness of Current Policies in Preserving Eelgrass Habitat and Develop Ways to Provide Increased Protection for all Extant Eelgrass.** ***(Objectives 1, 2, 3, 5, 6, and 8)***				
HLR-6.1 **Priority**	Evaluate the effectiveness of current policies in preserving eelgrass habitat and develop ways to provide increased protection for all extant eelgrass.	NYSDEC (lead) through contract	Ongoing	$25,000	R
HLR-6.2	Monitor and protect extant eelgrass (*Zostera marina)* beds, and restore degraded eelgrass beds.	NYSDEC, (lead), Cornell Cooperative Extension, PEP-Natural Resources Subcommittee PEP-HRWG	Ongoing	(Monitor: $75,000 biennially, included in Environmental Monitoring Plan.) Protect and Restore: to be determined	C/O R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-6.3	Evaluate anchor dragging, propeller scarring, dredging and other known impacts to extant eelgrass beds in the Peconic Estuary and develop recommendations to reduce them.	NYSDEC, Habitat Restoration Workgroup (co-leads) through contract	Post-CCMP	Evaluation through contractor: $50,000 Develop recommendations: NYSDEC – 0.2 FTE	R
HLR-6.4	Hold a workshop to evaluate the factors that regulate the health and extent of eelgrass beds in the Peconic Estuary and develop management recommendations based on these findings.	NYSDEC, PEP-NRSC, PEP HRWG (co-leads)	Post-CCMP	Workshop costs: $10,000 Develop recommendations: NYSDEC – 0.4 FTE	R R
HLR-7	**Develop and Implement an Estuary-Wide Habitat Restoration Plan (HRP).** ***(Objectives 1, 2, 4, and 7)***				
HLR-7.1 **Priority**	Develop and implement an estuary-wide Habitat Restoration Plan (HRP).	PEP HRWG (lead)	Initiate in Fall 1998, complete in 2001	Costs for implementation in PEP Habitat Restoration Plan NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr PEP – 0.1 FTE/yr Towns – 0.1 FTE each/yr Cornell – 0.2 FTE/yr NYSDOS – 0.2 FTE/yr	C/O
HLR-7.2	Identify and list priority habitat types for the HRP.	PEP HRWG (lead)	Completed	Included in HLR-7.1	C/O
HLR-7.3 **Priority**	Inventory and prioritize a list of restoration projects for which planning is underway and recommend these for "fast-tracking" towards Bond Act funding.	NYSDOS (lead), NYSDEC, PEP HRWG	Annually, prior to Spring announcement of available funds	Included in HLR-7.1	C/O
HLR-7.4	Inventory and list restoration opportunities in the PEP area and estimate costs.	PEP HRWG (lead), East End Towns	Completed	Included in HLR-7.1	C/O

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-7.5	Develop and include in the HRP criteria for selection of restoration sites.	PEP HRWG (lead)	Completed	Included in HLR-7.1	C/O
HLR-7.6	Inventory and list completed, ongoing, and proposed restoration projects for inclusion in the HRP. Include all restoration sites on GIS maps.	PEP HRWG (lead)	Completed	Included in HLR-7.1	C/O
HLR-7.7	Develop and include in the HRP a list of funding sources available for habitat restoration in the PEP area.	PEP HRWG (lead)	Completed	Included in HLR-7.1	C/O
HLR-7.8	Develop model guidelines for habitat restoration planning for use by municipalities in applying for EPF monies.	NYSDOS, NYSDEC (co-leads), PEP HRWG, EPA, Towns, CCE	2001	EPA – 0.1 FTE PEP – 0.1 FTE Towns – 0.1 FTE each Cornell – 0.2 FTE NYSDOS – 0.2 FTE	C/N
HLR-8	**Develop and Implement Specific Restoration Projects.** ***(Objectives 1, 3, 4, 6, 7, and 8)***				
HLR-8.1	Encourage cooperation among governmental agencies to plan and Implement Open Marsh Water Management (OMWM) to manage tidal wetlands with grid ditches for mosquito control with the goal of also restoring more natural conditions.	Cornell Cooperative Extension, SCVC, USFWS, East Hampton Department of Natural Resources, NYSDEC (co-leads), PEP	Post-CCMP	NYSDEC – 0.1 FTE PEP – 0.1 FTE Cornell – 0.3 FTE SCVC – 0.3 FTE USFWS – 0.3 FTE Towns – 0.2 FTE each	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-8.2	Develop recommendations in the PEP Habitat Restoration Plan for control of *Phragmites australis* by restoration of natural processes such as removal or modification of flow-restriction devices, removal of hardened shorelines, and revegetation of bay and creek shorelines or by other means.	PEP HRWG (lead) through contractor	2001	Base Program and $10,000 for contractor	C
HLR-8.3 **Priority**	Develop a quantitative goal for eelgrass restoration based on ongoing monitoring and mapping efforts.	PEP HRWG (lead), NYSDEC, SCDHS, CCE, DOS, Towns	2001	NYSDEC – 0.05 FTE SCDHS – 0.05 FTE PEP – 0.1 FTE Towns – 0.05 FTE each Cornell – 0.2 FTE NYSDOS – 0.2 FTE	C/N
HLR-8.4	Identify and prioritize locations where restoration of eelgrass is most feasible based on water quality and environmental criteria which are being developed for eelgrass in the Peconic Estuary System and elsewhere in its range.	PEP HRWG (lead), PEP, NYSDEC, NYSDOS	2001	Included in HLR-8.3	C/N
HLR-8.5	Develop and/or utilize cooperative programs with the public for simple, local habitat improvements and enhancements.	PEP HRWG (lead), NY Sea Grant, Cornell Cooperative Extension	Post-CCMP	$25,000 per year	R
HLR-9	**Monitor and Evaluate the Success of Restoration Efforts.** ***(Objective 8)***				
HLR-9.1	Develop and implement procedures to track and evaluate restoration efforts using success criteria and monitoring protocols in the PEP area.	PEP HRWG (lead)	Post-CCMP	HRWG – 0.2 FTE	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-9.2	Develop procedures for the management and storage of habitat restoration project and monitoring information for the Peconic Estuary.	PEP HRWG (lead), PEP		HRWG – 0.2 FTE	R
HLR-9.3	Identify a regional set of reference sites to assist in habitat restoration evaluation and monitoring and provide a framework for long-term habitat and living resources research and monitoring.	PEP HRWG, PEP Natural Resources Subcommittee	2001	Included in HLR-8.3	C/N
HLR-10	**Develop an Aquaculture Plan for the Peconic Estuary.** ***(Objectives 1,2, 5, 6, 7, and 8)***				
HLR-10.1 **Priority**	Assist in the development and implementation of an estuary-wide aquaculture plan. Include criteria regarding scale, location, assessment, monitoring, and methodologies of shellfish and finfish aquaculture which would be ecologically beneficial and would help sustain aquaculture as a beneficial estuarine use when performed in a manner that is sensitive to the natural conditions, productivity and ecology of the Peconic Estuary.	Organize workshop: Suffolk County Planning Department; SCDHS (co-leads); NYSDEC; PEP– Natural Resources Subcommittee; NYSDOS; NY Sea Grant; NYSOGS; USACE; EPA; NOAA/NMFS; Suffolk County; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; villages; Cornell Cooperative Extension; fish farmers; other groups and individuals interested in aquaculture; Aquaculture Plan: Suffolk County with input from PEP and other stakeholders (NYSDEC, Long Island Sound Study, New York-New Jersey Harbor Estuary Program)	Post-CCMP Plan: within one year of workshop	Workshop: $5,000 Plan: EPA – 0.2 FTE NYSDEC – 1.0 FTE S.C. – 1.0 FTE	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-10.2	Identify suitable areas for shellfish and finfish aquaculture activities that are compatible with the water quality and habitat protection objectives in the CCMP to ensure that a balance is maintained between cultivated and wild stocks and include in the estuary-wide aquaculture plan.	Suffolk County Planning Department, SCDHS, NYSDEC (co-leads), NYSDOS, USACE, USFWS, PEP-Natural Resources Subcommittee	Post-CCMP	$500,000 for a survey Enhance existing programs: NYSDEC – 0.5 FTE/yr SCDHS – 0.5 FTE/yr	R R
HLR-10.3	Investigate the need to require monitoring of imported cultured organisms and intrastate transplant of shellfish for disease and parasites and determine if a requirement should be established to certify that they are disease free.	Monitoring assessment: NYSDEC (lead); Disease and parasite screening: PEP; NYSDEC; NYSDOS; NYSOGS; USACE; EPA; NOAA/NMFS; Suffolk County, Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; villages, Cornell Cooperative Extension; other groups and individuals interested in aquaculture (co-leads)	Post-CCMP	$50,000 per year Enhance existing programs: NYSDEC – 1.0 FTE/yr	R R
HLR-10.4	Continue to support the prohibition of commercial culture or introduction of non-indigenous species in New York's waters and require that all aquaculture operations in the estuary use indigenous genotypes.	NYSDEC (lead) to implement legislation, NYS legislature	Ongoing	Base Program Enhance existing programs: NYSDEC – 1.0 FTE/yr	C/O R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-10.5	Develop water quality and natural resource monitoring protocols for existing and future shellfish and finfish aquaculture projects.	SCDHS, NYSDEC (co-leads), USACE, NYSDOS, NYSOGS, USFWS, PEP, NOAA, fish farmers (permittees)	Post-CCMP	Enhance existing programs: NYSDEC – 1.0 FTE SCDHS – 1.0 FTE	R
HLR-11	**Determine the suitability of Artificial Reefs in the Peconic Estuary.** ***(Objectives 1, 3, 4, 6, and 8)***				
HLR-11.1	Evaluate the use of natural reefs, wrecks, artificial reefs, and aquaculture facilities by finfish, sea turtles, diving birds, marine mammals, and other estuarine organisms. Develop recommendations to minimize the impact on resources by these structures.	PEP Natural Resources Subcommittee (lead) (long-term research plan) through contractor	Post-CCMP	$100,000 through contractor	R
HLR-11.2	Determine environmental and habitat criteria (*e.g.*, productivity, etc.) for site selection of different reef structures, and evaluate the potential for the extent of habitat and species displacement and the number of reefs that could be supported in the estuary without causing adverse effects.	PEP Natural Resources Subcommittee & NYSDEC (co-leads)	Post-CCMP	$100,000 through contractor	R
HLR-11.3	Evaluate the potential placement of artificial reefs in known sea turtle and marine mammal feeding areas as part of the siting process outlined in the NYSDEC Artificial Reef Plan.	NYSDEC (lead); Towns of East Hampton, Southampton, Southold	Post-CCMP	$50,000 through contractor	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-12	**Foster Sustainable Recreational and Commercial Finfish and Shellfish Uses of the Peconic Estuary that are Compatible with Biodiversity Protection.** ***(Objectives 1, 2, 3, 5, 6, 7, and 8)***				
HLR-12.1 **Priority**	Collect better statistical data on commercial and recreational fishing landings and by-catch specific to the Peconic Estuary System.	NOAA/NMFS, NYSDEC (co-leads)	Post-CCMP	Enhance existing programs: NYSDEC – 2.0 FTE/yr	R
HLR-12.2 **Priority**	Identify, protect, and restore key shellfish and finfish spawning, nursery, and feeding habitats in the Peconic Estuary to enhance shellfish and fish stocks and incorporate this data into the on-going Essential Fish Habitat work being conducted under the Atlantic States Marine Fisheries Commission (ASMFC).	PEP, NOAA/NMFS, ASMFC, New York Sea Grant Institute, NYSDEC, local universities and colleges	Post-CCMP	$100,000	R
HLR-12.3	Support the Atlantic Coastal Cooperative Statistics Program.	NMFS, NYSDEC, PEP (co-leads)	Ongoing	Base Programs	C/N
HLR-12.4	Support the fishery management plans which have been and are being developed by the Mid-Atlantic Fishery Management Council (MAFMC) and the ASMFC.	NYSDEC, PEP (co-leads), ASMFC, NMFS, MAFMC	Ongoing	Base Programs	C/O
HLR-12.5	Ensure the enforcement of existing regulations on both commercial and recreational fisheries.	NYSDEC Division of Law Enforcement (lead), Suffolk County Marine Police, town bay constables	Ongoing	Base Program Enhance existing programs: NYSDEC – 2.0 FTE /yr	C/O R
HLR-12.6	Support NMFS Essential Fish Habitat Designations within the Peconic Estuary.	PEP — MC, NYSDEC, NMFS	Ongoing	Base Program NYSDEC – 0.1 FTE /yr	C/O

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-12.7	Develop a public education program about the value of fish and fishing and the importance of commercial and recreational fishing regulations and compliance with the regulations.	PEP Public Education and Outreach program (lead), NYSDEC, Sea Grant, Cornell Cooperative Extension - Marine Program, AMI, marina and fishing business-owners	Post-CCMP	$15,000	R
HLR-12.8	Support the prevention, or at least minimization, of effects on finfish and non-target species by lost or incorrectly designed fishing gear. Measures to be supported include: (1) developing a program to encourage commercial and recreational fishermen to retrieve and properly dispose of fishing line, nets, traps, pots, and other gear; (2) work with the AMI to develop a campaign for dockside recovery and recycling programs; (3) support implementation of fishery regulations requiring escape vents and degradable panels in fish and lobster pots; (4) implementing fishery regulations requiring minimum mesh size for gill, fyke, and otter trawl nets; and (5) promoting the use of fishing gears that minimize by-catch and discard (*e.g.*, pound nets).	NMFS, NYSDEC, NYS Sea Grant (co-leads), CCE, AMI, commercial and recreational fishing community	Post-CCMP	Base Program and additional funding (to be determined) for outreach and education Enhance existing programs: NYSDEC – 2.0 FTE/yr Cornell – 0.1 FTE/yr	C/N R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-12.9	Implement CZARA Section 6217 BMPs regarding fish waste at marinas and on docks. Develop public education materials for distribution at marinas, bait and tackle shops, and other related businesses detailing these BMPs.	PEP Public Education and Outreach program (lead), AMI, marina owners, other business owners, NYSDEC, Sea Grant, Cornell Cooperative Extension – Marine Program	Post-CCMP	$15,000 for education and outreach materials	R
HLR-12.10	Expand the monitoring and analysis of the NYSDEC finfish trawl survey to the east of Shelter Island and coordinate with the PEP Living Resources Research, Monitoring, and Assessment Plan.	NYSDEC (lead), PEP Natural Resources Subcommittee	Post-CCMP	(Included in Environmental Monitoring Plan: Start-up: $500,000 Annually: $300,000	R
HLR-12.11	Examine the role of areas uncertified for shellfishing as "spawner sanctuaries" for shellfish species.	PEP Natural Resources Subcommittee (lead), NYSDEC, Cornell Cooperative Extension	Post-CCMP	$50,000	R
HLR-12.12	On a biennial cycle, perform deep- and shallow-water shellfish abundance surveys.	PEP through contractor	Post-CCMP	$150,000	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-13	**Protect Nesting and Feeding Habitat of Shorebirds.** ***(Objectives 1, 2, 3, 6, 7, and 8)***				
HLR-13.1 **Priority**	Strengthen existing municipal shorebird (terns and plovers) management programs to ensure timely fencing and erection of enclosures, adequate monitoring and reporting, and management of recreation and other activities within nesting and feeding habitat. Implement the 1997 Suffolk County Department of Parks, Recreation and Conservation Piping Plover Protection Program and the NYSDEC Bureau of Wildlife 1998 Action Plan for Piping Plover Conservation in New York.	NYSDEC; Suffolk County Parks Department; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; Trustees; The Nature Conservancy; USFWS (co-leads)	Ongoing and Post-CCMP	Base Program Enhance existing programs: NYSDEC – 1.0 FTE/yr TNC – 1.0 FTE/yr Towns – 0.3 FTE each/yr	C/O R
HLR-13.2	Restrict the use of off-road vehicles and small watercraft in shorebird nesting areas during breeding season (April – August).	OPRHP; Suffolk County Parks Department; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages; NYSDEC for DEC-owned properties (co-leads)	Ongoing and Post-CCMP	Enhance existing programs: Towns – 0.3 each/yr	R
HLR-13.3	Consult with the USFWS to comply with Federal guidelines for managing recreational activities in piping plover breeding habitat.	Beach managers including Federal (USFWS), state, Suffolk County, the towns, property owners (co-leads)	Ongoing and Post-CCMP	Base Program USFWS – 0.2 FTE/yr	C/O

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-13.4	Document threats to nesting shorebirds (plovers and terns) such as off-road vehicles, predation, and recreation, and develop and implement measures that lead to higher productivity and larger nesting populations.	East End towns and NYSDEC (co-leads)	Post-CCMP	$10,000	R
HLR-14	**Protect Sea Turtles and Marine Mammals.** ***(Objectives 1, 3, 4, 6, 7, and 8)***				
HLR-14.1	Review uses of areas which have been identified as sea turtle feeding and marine mammal areas and consider what restrictions may be necessary to be more protective of these species and their food resources.	NYS agencies (*e.g.*, NYSDEC, NYSDOS, NYS Office of Parks, Recreation and Historic Preservation, NYS Office of General Services) (co-leads), Suffolk County, towns	Post-CCMP	Enhance existing programs: NYSDEC – 1.0 FTE NYSDOS – 0.2 FTE Parks – 0.2 FTE SCDHS – 0.2 FTE Towns – 0.1 FTE each	R
HLR-14.2	Evaluate the expansion of existing laws to ensure that all species of seals as well as other marine mammals are protected from intentional injury or death.	NYS agencies (*e.g.*, NYSDEC, NYSDOS, NYS Office of Parks, Recreation and Historic Preservation, NYS Office of General Services) (co-leads), SCDHS, towns	Post-CCMP	Included in HLR-14.1	R
HLR-14.3	Expand New York State law protecting harbor seals (ECL Article 11, section 0107 to include all species of seals in NYS marine waters.	New York State Legislature, NYSDEC (co-leads)	Post-CCMP	Included in HLR-14.1	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-15	**Utilize Land Use Planning, BMPs, and Other Management Measures to Reduce the Negative Impacts of Human Uses and Development on the Estuary System.** ***(Objectives 1, 2, 3, 4, 6, 7, and 8)***				
HLR-15.1 **Priority**	Each town should develop a master or comprehensive management plan, coordinated with plans of other towns that increases the level of protection of natural resources and habitats and accounts for cumulative impacts.	Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead; NYSDOS (co-leads), EPA, NYSDEC, SCDHS	Post-CCMP	Enhance existing programs: NYSDEC – 0.1 FTE EPA – 0.1 FTE SCDHS – 0.1 FTE Towns – 1.0 FTE each	R
HLR-15.2 **Priority**	Increase public access to the estuary consistent with other ecosystem objectives.	All Federal, state, and local governmental agencies in the PEP watershed (co-leads); NYSDEC	Post-CCMP	Base Program and site-specific costs for each access opportunity to be determined Enhance existing programs: NYSDEC – 1.0 FTE/yr	C/N R
HLR-15.3	Develop and implement a Harbor Protection Overlay District such as that developed by the Town of East Hampton and include it in the master plan for each town.	NYSDOS (lead); Towns of Southampton, Southold, Shelter Island, and Riverhead	Post-CCMP	$50,000 per town Towns – 1.0 FTE each	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-15.4	Develop implementation mechanisms for all measures required by Section 6217(g) of CZARA that are applicable to the Peconic Estuary. These measures would include BMPs for the use of natural vegetation, minimization of impervious surfaces, safe and reasonable use of lawn, garden, and household chemicals, and minimization of stormwater runoff. Incorporate these BMPs into the site plan requirements for all newly-developed and redeveloped property, particularly along the shoreline.	NYSDEC, NYSDOS, PEP Education and Outreach Program (co-leads), Suffolk County Soil and Water Conservation District, SCDHS, USDA NRCS, Cornell Cooperative Extension, NY Sea Grant, Peconic BayKeeper, SCDHS	Post-CCMP	Base Program Enhance existing programs: NYSDEC – 0.1 FTE SCDHS – 0.1 FTE PEP – 0.1 FTE	C/N R
HLR-15.5	Use the Protected Lands Council of the Central Pine Barrens Comprehensive Land Use Plan as a model for developing a similar coalition of public agencies and conservation organizations to address common issues of concern throughout the estuary.	PEP; Pine Barrens Commission and Protected Lands Council (co-leads); Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; NYSDEC; SCDHS	Post-CCMP	NYSDEC – 0.05 FTE/yr SCDHS – 0.05 FTE/yr Enhance existing programs: Towns – 0.5 FTE each/yr	C R
HLR-15.6	Encourage towns with existing Conservation Advisory Councils or planning staff, to be given the responsibility as Conservation Advisory or Planning Boards to review proposed Town Board actions as they affect public lands and open space concerns.	Towns of East Hampton, Southold, Shelter Island, and Riverhead (co-leads)	Post-CCMP	Enhance existing programs: Towns – 0.5 FTE each/yr	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-15.7	Review and provide comments to NYSDEC on any revisions to the Statewide Oil Spill Areawide Contingency Plan for the Peconic Estuary relating to waterfowl, marine mammals, and sea turtles and their rehabilitation if oiled. Develop and distribute information on reporting and responding to small-scale spills.	PEP Natural Resources Subcommittee in conjunction with the USCG, NYSDEC, USFWS (co-leads); Rehabilitation: local wildlife rehabilitators (licensed); Education: PEP Public Education and Outreach program in conjunction with the USCF, NYSDEC, USFWS; BMPs: NYSDO; AMI; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; villages	Post-CCMP	Base Program NYSDEC – 0.05 FTE/yr SCDHS – 0.05 FTE/yr PEP – 0.05 FTE/yr	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-15.8	Develop regulations for new marinas or expansion of existing marinas which include the following (from CZARA section 6217): (1) assessment of water quality conditions during and after construction; (2) site and design such that tides and/or currents will aid in the flushing of the site or renew its water regularly; (3) site and design to protect against adverse effects on shellfish resources, wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas as designated by local, State, or Federal governments; (4) designate and enforce no-wake zones and ensure that shoreline areas are stabilized effectively by vegetative means; and, (5) require effective stormwater runoff control measures to reduce sediment and toxic inputs.	NYSDEC (lead); Suffolk County; DHS; EPA; PEP; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; AMI; private marina owners.	Post-CCMP	EPA – 0.3 FTE NYSDEC – 0.5 FTE SCDHS – 0.3 FTE PEP – 0.3 FTE Enhanced Programs: NYSDEC – 1.0 FTE/yr	R R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-16	**Develop and Implement a Living Resources Research, Monitoring, and Assessment Program.** ***(Objectives 1, 2, 3, 5, 6, 7, and 8)***				
HLR-16.1 **Priority**	Develop and implement a research program for the Peconic Estuary and its watershed to investigate natural processes, impairments, and links to water quality, maintenance of systems and species, and effects of recreation and pollution on biodiversity, among other research needs. Investigate and seek funding sources for supporting implementation of the program (*e.g.*, National Estuarine Research Reserve Systems).	Plan development and coordination: PEP Natural Resources Subcommittee and the Marine Conservation Planner (co-leads) in consultation with other members of the PEP Management Conference and technical experts; Plan implementation: PEP Management Conference, NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS (co-leads)	Plan development and peer-review: 2001 Plan implementation: After the plan is developed, adopted, and funding is allocated.	Plan development: Base Program Plan implementation: $3 million over 3 to 5 years NYSDEC – 0.2 FTE/yr SCDHS – 0.05 FTE/yr TNC – 0.7 FTE/yr	Plan Dev.: C/N; Implement.: R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-16.2 **Priority**	Develop a long-term program for monitoring and assessment of living resources in the Peconic Estuary that is coordinated with the development of a research plan and ongoing research and monitoring efforts.	Monitoring and assessment plan: PEP Natural Resources Subcommittee and Marine Conservation Planner (co-leads) in conjunction with NYSDEC; SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; Plan implementation: PEP in conjunction with NYSDEC (co-leads); SCDHS; Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; Cornell Cooperative Extension; local universities and colleges; NY Sea Grant	Plan development and peer-reviewed: By 2001 Plan implementation: After the plan is developed, adopted, and funding is allocated	Plan development: Base Program Plan implementation: To be determined. Included in HLR-16.1	C/N R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-16.3	Support research on the interactions between eelgrass and the dominant macroalgae species in the Peconic Estuary to determine impacts of macroalgae on eelgrass distribution and abundance.	Plan development: PEP Natural Resources Subcommittee and the Marine Conservation Planner (co-leads) in consultation with other members of the PEP Management Conference and technical experts; Plan implementation: PEP Management Conference, NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS (co-leads)	Post-CCMP	$150,000 (estimate)	R
HLR-16.4	Perform research and monitoring of forage fish species, horseshoe crabs, and conch in the Peconic Estuary to understand their distribution (temporal and spatial), abundance, habitat preferences, and different life stage requirements to develop management strategies.	PEP Natural Resources Subcommittee, NYSDEC, Marine Conservation Planner (co-leads), technical experts through the PEP long-term research plan	Post-CCMP and adoption of HLR-16.1	$500,000 (estimate)	R
HLR-16.5	Perform research on the ecology of food sources of sea turtles to evaluate the importance of the Peconic Estuary to them and potential threats to these endangered and threatened species.	PEP Natural Resources Subcommittee (lead) and technical experts through the PEP long-term research plan	Post-CCMP and adoption of HLR-16.1	$75,000 through contractor	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-16.6	Research the lethal, sublethal, and synergistic effects of elevated nutrients, toxic chemicals, and Brown Tide on the reproduction and behavior of finfish and invertebrate species.	PEP Natural Resources Subcommittee (lead) and technical experts through the PEP long-term research plan, NY Sea Grant	Post-CCMP and adoption of HLR-16.1	To be determined	R
HLR-16.7	Determine the effects of navigational dredging on shallow water communities and the recovery time of benthic communities exposed to dredging.	PEP Natural Resources Subcommittee (lead) and technical experts to define specific research questions, USACE, Suffolk County SCDPW, NYSDEC	Post-CCMP and adoption of HLR-16.1	To be determined	R
HLR-16.8	Ensure implementation of adequate mapping and monitoring programs to track trends in the extent and quality of eelgrass, and to evaluate progress toward reaching restoration goals.	PEP Natural Resources Subcommittee, PEP Management Council (co-leads)	Post-CCMP	$45,000 per year	R
HLR-16.9	Establish a scientific panel to review research, monitoring and assessment data, and to offer guidance in management of the habitats and living resources in the Peconics.	PEP Natural Resources Subcommittee (lead)	Post-CCMP and adoption of HLR-16.1	To be determined	R
HLR-16.10	Organize an annual or biennial conference to report research, monitoring, and assessment results to the public and guide management decisions.	PEP Natural Resources Subcommittee in conjunction with EPA, NYSDEC (co-leads), SCDHS, local universities and colleges	Post-CCMP; Biennial	$10,000 per conference	R
HLR-16.11	Establish and maintain an accessible database of natural resources in the Peconic Estuary.	PEP Natural Resources Subcommittee (lead)	Ongoing	NYSDEC – 0.1 FTE/yr SCDHS – 0.05 FTE/yr PEP – 0.1 FTE/yr Enhance existing programs: NYSDEC – 0.5 FTE/yr	C/O

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-16.12	Promote research and monitoring opportunities in the Peconic Estuary to local schools, colleges, universities, and institutes by establishing funding and scientific platforms and other incentives to facilitate basic and applied marine research.	PEP, NY Sea Grant, EPA (co-leads), NOAA, NYS Marine Educators Association (MEA), Cornell Cooperative Extension – Marine Program	Post-CCMP	Funding needs for research center/scientific platform to be determined	R
HLR-16.13	Seek opportunities to link research and monitoring in the Peconic Estuary Program to related estuaries and regional studies.	Association of NEPs, EPA, PEP (co-leads), NY Sea Grant, NOAA	Post-CCMP	NYSDEC – 0.2 FTE/yr EPA – 0.1 FTE/yr PEP – 0.1 FTE/yr	R
HLR-16.14	Support priorities listed in the Living Resources Research, Monitoring, and Assessment Plan including research on ecosystem productivity and ecosystem structure, bioindicators, and effects of global climate change on wetlands.	PEP Natural Resources Subcommittee	Ongoing	Base Programs	C/O
HLR-17	**Establish a Working Group to Examine the Role of Grazers and Filter Feeding Organisms in Influencing Water Quality and Productivity, and to Better Understand the Food Web Dynamics and to Develop Management Applications.** ***(Objectives 1, 2, 3, 4, and 8)***				
HLR-17.1	Review appropriate scientific literature, identify information gaps, and develop research recommendations regarding how shellfish, finfish and other "top-down" predators influence water quality and the planktonic community.	PEP Natural Resources Subcommittee (lead) through contractor	Post-CCMP	$50,000 for review	R

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Table 4-1. Habitat and Living Resources Management Plan Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
HLR-17.2	Develop research, monitoring and assessment needs for quantifying food web dynamics.	PEP Natural Resources Subcommittee (lead) and marine conservation planner	Post-CCMP	NYSDEC – 0.1 FTE TNC – 0.5 FTE PEP – 0.2 FTE	R
HLR-17.3	Develop food web sub-models to be included in the nutrient model to evaluate the sensitivity of productivity to anthropogenic changes in nutrient supply.	PEP Natural Resources Subcommittee through contractor (lead) in consultation with other members of the PEP Management Conference and technical experts	Post-CCMP	$100,000 for model development	R
HLR-17.4	Consult with the BTRI and the estuary-wide aquaculture plan work group to develop management recommendations for “top-down” regulation of water quality and Brown Tide in the Peconic Estuary.	PEP Natural Resources Subcommittee (lead) in consultation with other members of the PEP Management Conference and technical experts; NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS, BTRI researchers, SUNY Stony Brook, Cornell, commercial aquaculture facilities in the Peconics	Post-CCMP	Enhance existing programs: NYSDEC – 0.2 FTE EPA – 0.2 FTE SCDHS – 0.2 FTE	R
HLR-17.5	Facilitate communication among BTRI, water quality managers and the estuary-wideaquaculture plan work group.	PEP Natural Resources Subcommittee (lead) in consultation with other members of the PEP Management Conference and technical experts; NYSDEC, NYSDOS, New York Sea Grant Institute, SCDHS, BTRI researchers, SUNY Stony Brook, Cornell, and commercial aquaculture facilities in the Peconics	Post-CCMP	Included in HLR-17.4	R

CHAPTER
FIVE

PATHOGENS MANAGEMENT PLAN

OBJECTIVES

1) To minimize heath risks due to human consumption of shellfish.

2) To promote, to the maximum practicable extent, the social and economic benefits which have been associated with the Peconic Estuary system.

3) To maintain the current status of certified (seasonally and year-round) shellfish beds and re-open uncertified beds by eliminating or reducing pathogen (indicator) inputs to the Peconic Estuary System.

4) To minimize the closure of bathing beaches in the Peconic Estuary while adequately protecting human health.

MEASURABLE GOALS

The PEP's measurable goals for pathogens include:

- Maintain current level of bottom lands available to shellfish harvesting, with the ultimate aim of re-opening lands currently closed to harvesting (measured through coliform levels and numbers of acres of shellfish beds available to harvest). [See Actions P-1, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-10, P-11, P-12, P-13, P-14, P-15]
- Maintain and improve water quality of the estuary through a reduction of overall stormwater runoff, particularly key areas identified through the Regional Stormwater Runoff Study (measured through the number of stormwater remediation projects implemented). [See Actions P-1, P-2, P-3, P-4, P-12, P-13, P-14]
- Eliminate all vessel waste discharges to the estuary (measured by the adoption/ implementation of a Vessel Waste No Discharge Area in the Peconic Estuary, the number of pump-out facilities and the volume of waste pumped annually). [See Actions P-6, P-7, P-8, P-9]
- Attain a zero discharge of stormwater runoff in new subdivisions (measured by site plans for new developments that achieve this goal and the development of new ordinances and Habitat Protection Overlay Districts). [See Actions P-1, P-2, P-3, P-4]

INTRODUCTION

Pathogens are viruses, bacteria, algae, and protozoans that cause diseases in humans, plants, and other animals. Pathogens that may be found in marine waters in the United States include those causing gastroenteritis, salmonellosis, and hepatitis A. Pathogens can enter marine waters in untreated or partially treated human sewage and in wild and domestic animal waste. Humans may encounter the pathogens through direct contact with or ingestion of contaminated water or by eating raw or partially cooked bivalve shellfish harvested from contaminated waters.

Pathogen loadings to the Peconic Estuary System are of concern because of the potential health risks associated with consumption of contaminated shellfish, health risks associated with direct water contact and/or ingestion, and the economic losses associated with the closure of shellfish beds and beaches.

The only significant non-human pathogen known in the Peconics is wasting disease in eelgrass, Zostera marina, caused by the slime mold, Labyrinthula zosterae. This has been a problem in the Peconics in the past and continues to be a concern. This pathogen is discussed further in ***Chapter 4****.*

In order to protect shellfish consumers and beach goers from the human health risks associated with pathogens, the State of New York regularly monitors water quality in the marine waters of New York State and the Suffolk County Department of Health Services (SCDHS) monitors for pathogen indicators at public beaches. When water quality parameters fail to meet the established human health criteria, beaches and shellfish beds are closed.

ENVIRONMENTAL CRITERIA

It is difficult to directly measure the concentration of specific pathogens in seawater due to the variable nature of their occurrence. Instead, the potential for the presence of human pathogens in the water is measured using bacterial indicator species. Fecal indicator bacteria originate in the intestines of warm-blooded animals. They are easily measured, and their presence in the water indicates that the wastes of a warm-blooded animal, which may contain pathogens, has entered the water. The most commonly used indicators for human sewage and animal waste are total and fecal coliform bacteria.

Each State adopts an established uniform water quality standard for total and fecal coliforms that indicate the safety of the water for bathing and for consumption of bivalve shellfish. These guidelines are based on U.S. Environmental Protection Agency (EPA) recommendations and guidelines developed by the National Shellfish Sanitation Program. The U.S. Food and Drug Administration (USFDA) evaluates State programs annually to ensure that recommended guidelines are uniformly applied. For the Peconic Estuary, monitoring of bathing beaches is conducted by the SCDHS; monitoring and classification of shellfish growing areas is conducted by the New York State Department of Environmental Conservation (NYSDEC), Division of Fish, Wildlife, and Marine Resources Shellfish Sanitation Unit.

The standard utilized for bathing beaches in the Peconic Estuary is based on Section 6-2.15(1) of the New York State Sanitary Code: "the total number of organisms of the coliform group shall not exceed a logarithmic mean of 2400/100 ml for a series of five or more samples in any 30-day period, nor shall 20 percent of total samples during the period exceed 5000/100 ml." The SCDHS, however, also requests closure of a beach if the fecal coliform level exceeds 400/100 ml, which almost always occurs before the total coliform standard is exceeded.

Shellfish Bed Closures

The NYSDEC Shellfish Sanitation Program classifies shellfish growing areas using two methods: ***water quality based closures*** *and* ***administrative closures****.*

WATER QUALITY *based closures are determined when a growing area fails to meet the National Shellfish Sanitation Program (NSSP) criteria for (open) certified shellfish growing areas. There are three categories of water quality based closures*: ***year-round, conditional, and seasonal closures****.*

Year-round closures *are areas that do not meet the NSSP criteria for any portion of the year and are closed to shellfish harvesting.*

Conditional closures *apply to shellfish growing areas that fail to meet the certified criteria following rainfall events. The historic water quality database has documented that conditional areas can be open for shellfish harvesting under a restricted rainfall "trigger amount" during the cold weather months (usually December through April). The "trigger amount" for each conditional area varies and is based on historical water quality data. All conditional areas are evaluated annually prior to the start of the conditional program.*

Seasonal closures *are used when a shellfish growing area fails to meet the certified criteria for a portion of the year. In general, a majority of the seasonal areas are open for harvesting during the cold weather months (November through April) and are closed for the warm weather months (May through October).*

Temporary Emergency Rainfall Closures *are put into effect when shellfish growing areas are affected by greater than three (3) inches of rainfall in a continuous thirty-six hour period. The Shellfish Sanitation Program uses these closures to protect public health by temporarily closing the affected areas to shellfish harvesting based on historical water quality data which documents that rainfall events of this magnitude degrade water quality below the acceptable criteria for shellfish harvesting. These temporary closures are rescinded when the laboratory analysis of the samples collected during the closure determine that water quality has returned to certified criteria.*

ADMINISTRATIVE *closures are used in shellfish growing areas as buffer zones around known potential sources of pathogens such as sewage treatment plant (STP) outfalls, marinas and mooring areas. For example, administrative closures result from the potential for an unpredictable release of pathogens from insufficient treatment at a STP, or from the discharge of untreated waste from marine sanitation devices.*

Since the start of the Peconic Estuary Program, several shellfish beds have been upgraded in classification to year-round or seasonally certified for harvesting. Some of these areas include all, or a portion of, East Creek, Fish Cove, North Sea Harbor, Wooley Pond, Accabonac Harbor, Shelter Island Sound near Stirling Basin, and Hashamomuck Pond. These changes came about primarily as a result of increased water quality sampling in these areas, which was done cooperatively between the NYS Shellfish Sanitation Program and East End towns.

*Several towns (*e.g.*, Southampton and Southold) have conducted stormwater remediation work to improve water quality by installing catch basins adjacent to shellfish growing areas. It is important to note that only shellfish beds closed due to water quality violations have the potential to be re-opened due to remediation efforts. Administrative closures are mandated on the basis of potential contamination and will not be reduced or eliminated based on remediation efforts.*

Shellfish may be harvested for direct human consumption in areas where the median or geometric mean total coliform most probable numbers (MPN) do not exceed 70 per 100 milliliters (70/100 ml) of water with not more than 10 percent of the samples exceeding an MPN value of 230/100 ml (5-tube test) or 330/100 ml (3-tube test), or the fecal coliform median or geometric mean MPN does not exceed 14/100 ml, with not more than 10 percent of the samples exceeding an MPN of 43/100 ml (5-tube test) or 49/100 ml (3-tube test). This determination is based on a minimum of 15 samples collected under adverse pollution conditions. Adverse pollution conditions are defined as the collection of water samples on an ebbing tide within 96 hours of a rainfall event of 0.25 to 3.00 inches in a given 24-hour period. These criteria are defined in the *National Shellfish Sanitation Program (NSSP) Guideline for the Control of Molluscan Shellfish*.

In January 1997, the NYSDEC Shellfish Sanitation Unit modified its Routine Water Quality Monitoring Program from Adverse Pollution Condition (APC) Sampling to Systematic Random Sampling (SRS). APC focuses sampling efforts exclusively on rainfall events during an ebbing tide. SRS sampling is also done on ebbing tide, but sampling runs are scheduled randomly in advance. Sampling runs are preplanned throughout the year to develop a historic database that includes a mixture of warm and cold weather as well as wet and dry conditions. Because SRS is conducted under various hydrographic conditions (dry conditions and runoff conditions), thirty (30) sets of water quality data are statistically analyzed to determine water quality.

QUALITY/IMPAIRMENTS

Beach Closures

Excessive quantities of coliform bacteria are generally found in areas where the water exchange or flushing is significantly limited and runoff from the surrounding land is high. For a variety of reasons, beaches are typically not situated in areas with these characteristics. Only one bathing beach in the Peconics, which is in such an area, has been closed due to excessive coliform values — the East Hampton town beach on the south end of Lake Montauk. Samples taken in the water just off the beach by the SCDHS have frequently indicated exceedences of the State standard for bathing beaches. Several possible sources of this contamination have been suggested, including waterfowl and other wildlife, as well as overflow from the shallow sanitary systems in the Ditch Plains community south of the Lake. These systems sit on top of a clay lens, which may not allow sufficient filtration of the waste. The Town of East Hampton has obtained funds for a project to remediate this potential source of contamination. Under this project, stormwater runoff will be directed through a series of ditches and freshwater wetlands for filtration before being discharged into the embayment. In order to minimize the possibility of pathogens getting into south Lake Montauk in the future, the Town of East Hampton has constructed public restrooms at the beach, which compost waste material rather than discharging it to a conventional septic system. Over time, it is hoped that this facility will demonstrate the feasibility of using such systems and result in the construction of other such facilities at public locations near bodies of water that are particularly sensitive to pathogen contamination.

Shellfish Bed Closures

Closure of shellfish beds due to pathogens is a problem in the Peconics. In the Peconics, including Gardiners Bay, 121,390 acres of bottom are available for shellfishing. Just over four percent (5,172 acres) are closed to shellfishing. Of these 5,172 acres, 1,960 acres are seasonally certified or open only during the winter, and 3,212 acres are closed year-round.

Although only about four percent of the total bottom area is closed to shellfishing, a much greater percentage of the total productive shellfishing acreage is closed. Based on the NYS Shellfish Sanitation Program estimates, 121,390 acres of bay bottom are technically available for shellfishing. Of these, only 20,880 acres are estimated to be as productive shellfishing areas. Within this productive area, 2,952 acres (14 percent) are closed to shellfishing. These beds are closed because water quality fails to meet the criteria established for certified shellfish growing areas by the NSSP and New York State Regulations.

Most shellfishing in the Peconics is not done in deep waters. In fact, shellfish surveys done by the NYSDEC in 1979–1980 and again through the Peconic Estuary Program in the fall of 1995 have shown that the deep, open waters of the Peconics that were surveyed contain very low numbers of hard clams or any other commercially and recreationally important shellfish species.

An assessment of shellfish growing area classifications in the Peconic Estuary from 1970 to 1995 indicates that, over time, there has been a net increase in shellfish bed closures every year (**Figure 5-1**). The greatest increase in uncertified acreage occurred from 1980 to 1992. The increase in shellfish growing area closures is most likely a result of increased water quality monitoring of the Peconic Estuary following the expansion of the NYSDEC Shellfish Sanitation Program in the late 1980s. During this time, the number of uncertified acres increased by an average of 151 acres per year. However, from 1992 to 1995, the rate of increase decreased to 39 acres per year. The most probable reason for the deceleration in new closures is that many of the shallow, relatively enclosed areas in the Peconic Estuary, which tend to be the most poorly flushed and heavily impacted by pathogens, have already been restricted for shellfish harvesting.

At present, the percentage of "productive" shellfish beds closed in the Peconics is relatively low in comparison to other bodies of water in the New York marine district. For example, in the early 1990s, 75 percent of the productive beds in New York waters of the Long Island Sound were restricted to shellfish harvesting (year-round and seasonal); currently, 100 percent of the bottom in the New York-New Jersey Harbor core area is closed to the direct harvesting of shellfish, although transplants are permitted out of this area (see the PEP *Pathogens Characterization Report* for more details on the transplant program).

Without further action to reduce pathogen loading to the estuary, additional shellfish beds in the Peconics may be closed to harvesting each year.

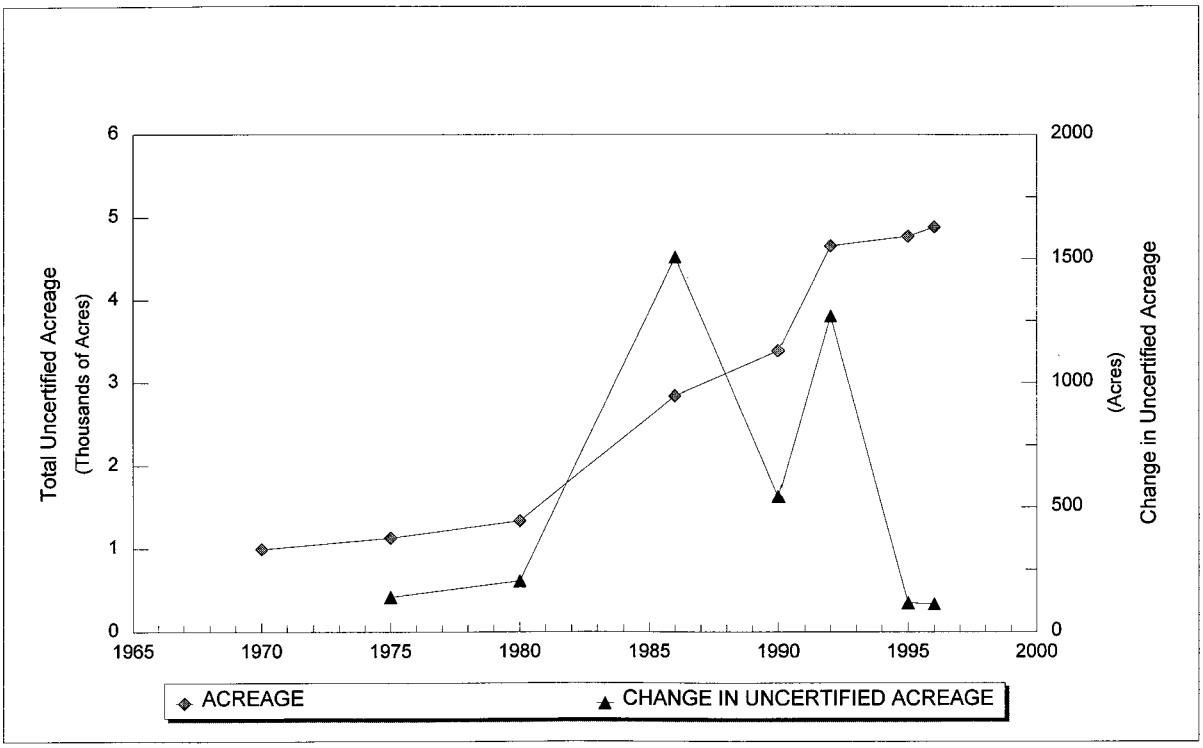

Figure 5-1. Uncertified Shellfish Growing Area Acreage in the Peconic Estuary System, 1970-1996.

Harmful Algal Blooms

Paralytic Shellfish Poisoning

Paralytic shellfish poisoning (PSP) caused by the organism *Alexandrium tamarense* has been a problem mainly in the northern New England states. The organism produces a neurotoxin that can be concentrated by shellfish which, when consumed by humans (or other mammals), can result in PSP and could be lethal. In a four-year monitoring study, from 1986 to 1989, the SCDHS found that a spring bloom of *A. tamarense* consistently occurred in Reeves Bay and also noted blooms in Terry's and East Creeks in 1989, the one year in which they were investigated. No other stations in the Peconic Estuary were sampled.

Although *A. tamarense* has been detected on the north and south shores of Long Island and the East End bays, PSP is not believed to be a significant human health threat in Suffolk County. However, the SCDHS believes the presence of *A. tamarense* in our waters merits further screening, and has requested $35,000 from Suffolk County Capital Funds for PSP organism investigations this year (2000). This investigation will be limited to nine sites in the Peconic Estuary, with other areas of the county being investigated in future years. Water samples will be analyzed for phytoplankton, and mussels will be deployed and later analyzed for PSP toxins.

Pfiesteria

In the summer of 1999, the NYSDEC and the Nassau and Suffolk County Health Departments and the Town of Hempstead undertook a comprehensive monitoring effort to assess the marine waters of the State for the presence of *Pfiesteria* cells. *Pfiesteria piscicida* is a complex microorganism that lives in brackish coastal waters and has been associated with fish kills and possibly with human health effects in other states. The exact conditions to trigger toxin production by *Pfiesteria* are poorly understood. *Pfiesteria* normally occurs in non-toxic forms unless triggered to develop into a toxic form. In a preliminary 1998 screening survey by the Suffolk County Department of Health Services, *Pfiesteria* was present in a few water samples. The test, using a molecular probe in the laboratory, detects the presence of *Pfiesteria* but not the toxicity. Water samples are shipped to Dr. Parke Rublee of the University of North Carolina where they are analyzed for *Pfiesteria*.

In 1999, water samples were collected for *Pfieseria* and at the same stations dissolved oxygen, temperature and salinity were also measured. In Peconic Estuary, Suffolk County also analyzed for a full suite of water quality parameters, including nutrients, total suspended solids and *chlorophyll a.* Stations were sampled from one to three times starting in July. **Table 5-1** lists the areas sampled for the presence of *Pfiesteria* in the PEP.

Table 5-1. Areas Sampled for the Presence of *Pfiesteria* in the PEP.*

1998 Sites	Test Results
Meetinghouse Creek	+
River Avenue	
Reeves Bay	+
1999 Sites	
Reeves Bay	
Meetinghouse Creek	
Three Mile Harbor	+
Northwest Creek	+
Sag Harbor cove	
North Sea Harbor	
Mill Creek	
Hashamomuck Pond	
East Creek in Cutchogue	
East Creek in South Jamesport	
Peconic River	

+ = Positive Test
*Additional sampling is planned in 2000.

SOURCES OF PATHOGENS IN THE PECONIC ESTUARY SYSTEM

Both point sources and nonpoint sources of pollution contribute pathogens to the Peconic Estuary system. Point sources are discrete, easily identifiable sources of pollution, such as a discharge from a STP. Point sources that may contribute pathogens to the estuary include sewage treatment plant discharges and discharge from the Corwin Duck Farm on Meetinghouse Creek. Nonpoint sources refer to diffuse sources of pollution which are spread throughout the watershed and which have no easily discernable source or point of discharge or consist of many discrete sources. Stormwater runoff, which carries a multitude of pollutants from developed land, is the largest contributor of pathogens to the Peconic Estuary System.

Nonpoint Sources of Pathogen Contamination

Monitoring and research done as part of the Long Island Comprehensive Waste Treatment Management Plan (1978), the Long Island segment of the Nationwide Urban Runoff Program (1982), and the Brown Tide Comprehensive Assessment and Management Plan (1992) have shown that the major sources of pathogens to marine waters of the Peconic Estuary are nonpoint in nature. The largest nonpoint source is stormwater runoff from roads and open areas, including undeveloped land and farmland. Pathogen contributions to stormwater are dependent upon the characteristics of the land over which the water flows. Fecal coliforms running off undeveloped land are likely to have originated from wildlife (including waterfowl) while those from developed areas may be due to domestic animals and/or poorly-functioning on-site disposal systems (OSDS), including septic tanks and cesspools.

In addition to stormwater runoff, another small but possibly locally significant nonpoint source of pathogens is waste from boats, particularly in the enclosed waters around marinas and mooring areas. Boater waste includes raw or inadequately treated sewage from boat waste receptacles. Concerns about boater waste disposal in enclosed waters has led to seasonal administrative closures of shellfish beds and temporary closures of beds during times of particularly high use (*i.e.*, holiday weekends in the summer). An agreement has been reached by the East End towns, New York State and the Marine Industries for designating the entire Peconic Estuary a Vessel Waste No Discharge Area, and will be adopted in the near future.

On-site Disposal Systems

Properly functioning on-site disposal systems (OSDS) collect solid domestic wastes in a septic tank where they are decomposed by microbial activity. The liquid overflows into a cesspool and then leaches through the soil, which filters out any pathogens that might be present. Older systems may consist of only a cesspool with no septic tank. If OSDS are poorly constructed or are not maintained and the leaching field is compromised, effluent can contribute pathogens to groundwater or break through the surface and contribute pathogens directly to runoff. Studies done in the early 1980s showed that groundwater samples from around Long Island did not contain numbers of coliform bacteria exceeding State drinking water standards. Therefore, it is assumed that groundwater in general, except perhaps in some highly localized situations, is not a significant source of pathogen contamination to marine surface waters. Localized contamination most often occurs if sanitary systems have not been properly sited, and there is not an adequate separation between the leaching pool and the groundwater. While current standards for separation distances between OSDS and groundwater and surface waters are believed to be adequate with respect to protection from bacterial

contamination, historic, improper siting of OSDS may result in pathogen loadings to the estuary system.

Stormwater Runoff

The PEP has funded a regional stormwater management project to establish a comprehensive, coordinated, intergovernmental stormwater strategy. This project, which began in the summer of 2000, will capitalize on previous efforts and construct a framework for continuing management. The goal is to evaluate the entire watershed, with a very high level of detail afforded to a few key sub-watersheds. Some of the primary outputs from the project will include:

- Characterization of stormwater inputs, identification of areas impacted by stormwater runoff, and assessment of the extent of those impacts;
- Several high-quality GIS overlays and a report which will serve as a continuing management resource;
- Identification of areas in need of preservation;
- Identification of mitigation priorities based on cost-effectiveness;
- Production of a regional stormwater strategy;
- Recommendations for additional monitoring, investigations, and demonstrations; and,
- Development of inputs to the PEP computer models, and recommendations for additional investigations.

BMPs for Controlling Stormwater Runoff

Numerous Best Management Practices, or BMPs, can be used to minimize and treat stormwater runoff before it reaches a receiving body of water. Some of the ongoing projects in the Peconics are detailed below.

***Grass Filter Strip**. Runoff may enter a stream or bay as a direct discharge from a pipe collecting drainage from a nearby road. Often this discharge is very intense during rainfall events and can act as a significant source of coliforms. In addition, such a powerful discharge can erode streambanks and add to the sediment load of a body of water. Filter strips are areas of natural vegetation between the road and the water, which are designed to slow flow and allow time for infiltration of the runoff before it reaches the stream. There are many spots in the Peconics where stormwater runoff from roads enters bays and streams forcefully, carrying high levels of coliforms. A filter strip, such as the one constructed at Gardiners Creek on Shelter Island, may be the best solution in such areas.*

***Artificial Wetlands**. These constructed areas of natural vegetation may be used to filter effluent from concentrated animal feeding operations, as is being demonstrated at the Corwin Duck Farm in Riverhead. Artificial wetlands also may be effective in treating stormwater moving into the estuary. As with the grass filter strip, these wetlands act to capture and filter runoff and slow the flow of water, which also eases erosion.*

***Open Marsh Water Management**. Tidal wetlands around the Peconics were extensively ditched for mosquito control in the last century. Since mosquitoes breed in standing water, it was thought that ditching marshes to facilitate drainage would result in less standing water at low tide. However, it is now believed that the increased drainage has allowed stormwater runoff coming into the marsh to enter the main bodies of water without adequate detention time, resulting in high loading of coliform bacteria to subtidal shellfish beds. Diking the mosquito ditches will result in the retention of a greater amount of runoff. Greater retention times will result in fewer live pathogens reaching the shallow-subtidal regions of the estuary. In this way, the impacts of stormwater runoff with respect to pathogen contamination will be minimized. Demonstrations of this technique, known as Open Marsh Water Management (OMWM), are being carried out by Cornell Cooperative Extension in cooperation with the Town of East Hampton. In addition, the NYSDEC has received a grant from the US Fish and Wildlife Service (USFWS) National Coastal Wetlands Restoration Program for implementation of OMWM on state-owned tidal wetlands in the Town of Southold.*

Best Management Practices

Because of its nature, nonpoint source pollution is not easy to quantify or control. Often, it is difficult to collect and treat stormwater runoff due to space restrictions and the high costs associated with remediation projects. OSDS problems are difficult to track and remediate due to the cost and the lack of enforceable requirements for operation and maintenance. Boater waste is equally difficult to document and prevent. Nevertheless, protecting human health as well as maintaining the remaining certified shellfish beds and re-opening those currently closed will depend on the identification and implementation of effective measures to control these sources of pathogens. A number of projects aimed at minimizing or treating stormwater runoff have been implemented throughout the Peconics, including a grass filter strip, artificial wetlands, and Open Marsh Water Management.

Point Sources of Pathogen Contamination

Point sources of pathogens in the Peconics include STPs, as well as one duck farm in the watershed that may discharge effluent directly into Meetinghouse Creek. The Corwin duck farm's NYSDEC SPDES permit allows the facility to discharge to surface waters only in the event of an extraordinary rainfall (*e.g.*, "ten-year storm"). The effluent from the sewage treatment plants is treated year-round to kill pathogens. The need for and extent of disinfection of the effluent is determined by the classification of the waters into which the effluent is discharged (**Table 5-2**). All of the sewage treatment plants in the Peconics are required to employ year-round

disinfection. The total coliform most probable number (MPN) limit on effluent discharged by these plants is 700 coliforms/100 ml. The average monthly MPN limit on fecal coliforms discharged in effluent from Peconic STPs is 200 coliforms/100 ml, and the maximum MPN concentration is 400 coliforms/100 ml.

Table 5-2. Sewage Treatment Plants in the Peconic Estuary System.

Sewage Treatment Plant	Receiving Waterbody	Surface Water Classification and Description[1]
Brookhaven National Lab	Headwaters of the Peconic River	Class C — Best usage is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Riverhead	Tidal Peconic River	Class SC — Best usage is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Shelter Island Heights	Shelter Island Sound	Class SA — Best usages are shellfishing for market purposes, primary and secondary contact recreation, and fishing. These waters shall be suitable for fish propagation and survival.
Sag Harbor	Sag Harbor	
Plum Island	Gardiners Bay	
Calverton (former Grumman Facility)	Headwaters of the Peconic River	Class C — Best usage is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

[1]These classifications are for general usage and not for the harvest of shellfish, *e.g.*, portions of Shelter Island Sound, Sag Harbor, and Gardiners Bay are closed to shellfish harvesting.

Chlorination has traditionally been the disinfection method used by STPs to treat effluent because it has always been assumed that pathogens, like coliform bacteria, are killed by chlorination. There is evidence, however, that viruses are not effectively eliminated by exposure to chlorine. A second concern related to the use of chlorine is the toxicity of chlorine to marine life. For this reason, there are limits set on the concentration of chlorine discharged in effluent from STPs. The Brookhaven National Lab (BNL) and the Plum Island STPs now uses an ultraviolet (UV) disinfection process. UV has been proposed for use at Riverhead and Sag Harbor and was being pilot tested in Shelter Island Heights.

The discharge of duck waste from the Corwin Duck Farm is also considered a point source and the farm is required to have a State Pollutant Discharge Elimination System permit. In an attempt to lower the levels of coliforms in the effluent, a freshwater wetland was constructed on-site at the duck farm and is being used to filter the effluent prior to discharge. Studies elsewhere have shown that the

sediment/plant associations of freshwater wetlands are effective in removing contaminants from runoff as it flows across and through them. It is believed that the system acts as a filter that captures pathogens and retains them until they die rather than allowing them to move into a body of water along with the runoff.

There are a number of alternatives that STPs can pursue in an effort to alleviate the concern over chlorination. One alternative is to use a different, non-chemical disinfectant. The Peconic Estuary Program is demonstrating the use of ultraviolet light for pathogen removal from STP effluent. Research has shown this treatment to be deadly to viruses as well as bacteria and it leaves no residue in the effluent. This study is being conducted at the Shelter Island Heights STP. This demonstration project hopes to show that ultraviolet treatment can serve as a safe and effective replacement for, or as an adjunct to, chlorination.

MANAGEMENT ACTIONS

The actions in this chapter are categorized by point sources and nonpoint sources of pathogen contamination. Of these two, the vast majority of the actions are directed at nonpoint sources. Point sources and nonpoint sources of pollution contribute many harmful materials other than pathogens to the estuary. For this reason, the approach of the Peconic Estuary Program in formulating these actions has involved research on a variety of topics, including water quality modeling, sediment accretion and flux dynamics, and groundwater underflow and discharge determinations. So, while the actions in this chapter are primarily designed to minimize or prevent the movement of waste material and pathogen indicators into the estuary, many of the actions will also serve to reduce other forms of pollution.

The most significant sources of pathogens are stormwater runoff from roads and open land, on-site disposal systems, and domestic and wild animal waste. Another small but possibly locally significant source of pathogens is waste from boats. Actions to mitigate stormwater runoff include best management practices in construction, road-building, and storm drain construction and maintenance. Measures to mitigate waste from on-site disposal systems include tracking and upgrading failing systems and best management practices for siting, construction, and maintenance of new systems. Mitigation of pathogen input from animal waste can be addressed through best management practices for stormwater runoff. Boater waste will be addressed through the construction of pump-outs and through designation and implementation of vessel waste no discharge areas at locations throughout the estuary.

Public education about boater waste, on-site disposal systems, animal waste, and other types of nonpoint source pollution is an extremely important tool for reducing pathogens entering the estuary. The Public Education and Outreach chapter of this Plan includes actions that will address the need for education regarding the control and reduction of pathogen loadings to the estuary. The Pathogen Management Actions are listed and discussed in the pages that follow. Additional information on costs and implementing entities is contained in **Table 5-5** at the end of this chapter.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

PATHOGENS MANAGEMENT ACTIONS

Stormwater Runoff

P-1. Use Existing or Implement New Stormwater Management Regulations to Control Pathogen Loading and Other Forms of Nonpoint Source Pollution.

P-2. Develop Land Use Regulations that Eliminate or Minimize New Sources of Stormwater Runoff.

P-3. Use Construction Site Guidelines which Eliminate or Minimize Stormwater Runoff.

P-4. Demonstrate and Implement Technologies to Remediate Stormwater Runoff.

On-site Disposal Systems

P-5. Enhance Existing Septic System Controls and Implement New Best Management Practices.

Assess and Manage Vessel Wastes and Marinas

P-6. Provide Pumpout Facilities and Encourage Their Use.

P-7. Establish Vessel Waste No Discharge Areas.

P-8. Use Administrative and Regulatory Measures to Control Pollution from Boaters and Marinas.

P-9. Promote the Use of Best Management Practices to Control Pathogen Loadings from Marinas, Mooring Areas, and Boatyards.

Point Sources

P-10. Ensure Adequate Disinfection at Sewage Treatment Plants.

P-11. Monitor Effluent from the Corwin Duck Farm.

Assess and Manage Nonpoint Sources

P-12. Identify Sources and Loadings of Nonpoint Sources of Pathogens.

P-13. Develop and Implement Nonpoint Source Control Plans for Pathogens.

P-14. Obtain Funding to Address Stormwater Runoff.

Water Quality Monitoring

P-15. Conduct Water Quality Monitoring.

P-1. Use Existing or Implement New Stormwater Management Regulations to Control Pathogen Loading and Other Forms of Nonpoint Source Pollution.

Addresses Pathogen Management Objectives 1, 3, and 4.

The National Pollutant Discharge Elimination System (NPDES) program requires certain activities obtain authorization (via a permit) to discharge pollutants via stormwater runoff to surface waterways. In New York, this requirement is covered under two General Stormwater Permits through the State Pollutant Discharge Elimination System (SPDES) program. One permit covers activities associated with construction activities (> five acres in size) and the second covers the remaining activities listed in the NPDES regulations. Unless covered by a separate individual SPDES permit, the only other alternative for dischargers that need a permit is one of the general permits. The general permit requires the development and implementation of a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (*e.g.*, regular street sweeping, reduction in use of pesticides or street salt, or frequent catch-basin cleaning). The plan need not be submitted to the NYSDEC unless asked, but must be kept on-site and continually updated. The NYSDEC may request to see these plans and may require changes in practices if adverse impacts on receiving waters have, or may have occur (red). Significant fines for violations face violators.

Phase II of the EPA Stormwater regulations were finalized in October 1999. This set of regulations contains important changes and requirements for construction activities and certain municipal separate storm sewer systems serving populations less than 100,000 and construction activities that disturb areas between one and five acres. These regulations will potentially have a significant impact on stormwater management in the Peconic Estuary. NYSDEC is currently evaluating the program changes necessary to comply with the new regulations.

Steps

P-1.1 Continue to implement general stormwater permit programs to control the discharge of stormwater from industrial, construction, and municipal activities.

P-1.2 Determine if general stormwater permits adequately regulate pollution from activities subject to national stormwater regulations.

P-1.3 Investigate the need to regulate, for general stormwater management, communities with populations less than 100,000 in the Peconic Estuary watershed in order to control coliform discharges.

Responsible Entities

P-1.1 NYSDEC (lead) and EPA (data management system)

P-1.2 PEP (lead for assessment) and NYSDEC (permit issuance)

P-1.3 NYSDEC (lead)

P-2. Develop Land Use Regulations that Eliminate or Minimize New Sources of Stormwater Runoff.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Much of the runoff to the estuary from private property enters from land directly adjacent to the water. Commercial operations along the waterfront may require a large area of hard surfaces such as parking lots, which often result in the removal of natural vegetation. These conditions can result in increased stormwater runoff. The impact of this runoff in terms of erosion and pathogens can be mitigated by permit conditions (*e.g.*, Articles 24 and 25, NYSDEC wetland regulations), use restrictions, or other controls on activities taking place on waterfront property. Controlling stormwater runoff from non-waterfront property and vacant lands can be accomplished through a variety of land use regulations, such as protective zoning, transfer of development rights to limit density, and standards for stormwater discharges from lands developed or redeveloped in the future.

Local legislation that is highly protective of the coastal zone, such as the East Hampton Harbor Protection Overlay District (HPOD), has proven very effective on a relatively discrete, enclosed body of water entirely within local jurisdiction. However, in order for such a measure to be protective of a regional body of water such as the entire Peconic Estuary, this type of legislation must be enacted on a system-wide basis.

Steps

P-2.1 **Priority** Evaluate existing, and develop model land use regulations that eliminate or minimize new sources of stormwater runoff.

P-2.2 Review the East Hampton HPOD legislation and the results of its implementation; adopt similar regulations for other East End towns and villages.

P-2.3 Adopt land use regulations that eliminate or minimize new sources of stormwater runoff.

P-2.4 Control the impacts of waterfront development through a prohibition on all new non-water-dependent commercial development.

Responsible Entities

P-2.1 PEP (lead) through contractor

P-2.2 PEP (lead) with contractor assistance, and towns and villages

P-2.3 Towns of East Hampton, Southampton, Shelter Island, Southold, and Brookhaven; and incorporated villages

P-2.4 Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; and NYSDOS

P-3. Use Construction Site Guidelines which Eliminate or Minimize Stormwater Runoff.

Addresses Pathogen Management Objectives 2 and 3.

Construction sites of all types and sizes can be significant sources of pollutants to stormwater runoff because the natural vegetation and land forms which would normally slow and absorb runoff have been removed. The Clean Water Act requires stormwater permits for construction activities on sites involving soil disturbances of five acres or more. However, the threshold will be reduced to one or more acres of disturbance in March 2003. These permits contain a requirement for the permittee to develop a sediment and erosion control plan for the project.

Developing official guidelines for sediment and erosion control plans would ensure that construction sites of all sizes would have access to information about appropriate BMPs for controlling runoff. These guidelines could be incorporated into recommendations for stormwater plans required for General Stormwater permits or they could be required by town planning boards for incorporation into site plans. State Building Codes could also be expanded to include provisions for sediment and erosion control measures.

Steps

P-3.1 **Priority** Require the use of BMPs to control stormwater runoff and sediment erosion at construction sites.

P-3.2 Pursue the expansion of the State Building Code to include provisions for stormwater runoff control practices and erosion and sediment control for all construction activities.

P-3.3 Implement standards for building permits and subdivision approvals that will require new developments to retain and treat all stormwater runoff on the property to the extent practicable.

P-3.4 Continue, through Federal programs (Clean Water Act, section 404) and State programs (the Tidal Wetlands Regulatory Program, Article 25, the Freshwater Wetlands Program, Article 24, and the Protection of Waters Program, Article 15), to regulate all construction projects to ensure that they prevent or minimize impacts to wetlands and other natural resources from stormwater runoff and septic system leakage.

P-3.5 Require sediment and erosion control and stormwater runoff pollution prevention plans for new development greater than five acres, as well as to areas of disturbance that are one acre or more, effective in March 2003.

P-3.6 Review the Suffolk County contractor licensing process for effectiveness and amend regulations to provide for fines and revocation where repeated violations of land use and site plan laws are committed by contractors.

Responsible Entities

P-3.1 Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and incorporated villages

P-3.2 NYSDOS and NYSDEC (co-leads)

P-3.3 Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven and incorporated villages

P-3.4 USACE (Federal lead), NYSDEC (state lead), EPA and NMFS

P-3.5 Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; and incorporated villages

P-3.6 PEP (lead for review) and Suffolk County (lead for making amendments), SCDHS, NYSDEC, EPA

P-4. Demonstrate and Implement Technologies to Remediate Stormwater Runoff.

Addresses Pathogen Management Objectives 2, 3, and 4.

One way to reduce pathogen loadings to the estuary system is to remediate stormwater runoff. A number of projects aimed at minimizing or treating stormwater runoff have been implemented throughout the Peconics. For example, the New York State Department of Transportation (NYSDOT) has committed millions of dollars for mitigation of runoff from State roads and is working with the towns to identify the priority sites for remediation. The Town of Southampton has already developed and implemented a comprehensive program financed through a $2 million bond act that was passed in 1994. The New York State Clean Water/Clean Air Bond Act also provides funding for stormwater remediation in the Peconic Estuary. An example is the remediation of highway stormwater discharge to Hashamomuck Pond in the Town of Southold ($600,000 State and $600,000 local match). Other towns have identified some priority locations and will remediate them as funds are made available. Examples of specific remediation projects include a grass filter strip on Shelter Island ($10,000 in Near Coastal Waters funds), artificial wetlands at several locations in Southold ($10,000 FY 1995 Action Plan Demonstration Project funds), and Open Marsh Water Management in both East Hampton and Southold ($11,000 Near Coastal Waters fund for Northwest and Accobonac Harbors; $236,000 USFWS funds for Long Beach Bay).

In addition to general recommendations regarding remediation, two of the actions below highlight ongoing projects in the Peconics which have been designed to mitigate coliform contamination. The effectiveness of existing and new remediation projects needs to be assessed through water quality monitoring both before and after project implementation. The Peconic Estuary Program is also funding a Regional Stormwater Management Plan.

For related actions, see P-13 and P-14.

Steps

P-4.1 Demonstrate a variety of different technologies to remediate stormwater runoff and determine the effectiveness and appropriateness of the technologies in various settings around the estuary.

P-4.2 Ensure that information on ongoing, successful stormwater remediation projects is shared among the NYSDOT, Suffolk County Department of Public Works, and towns and villages in a timely fashion.

P-4.3 Ensure that the NYSDEC and the SCDHS continue to work cooperatively with East End towns on stormwater remediation projects by providing monitoring support following the implementation of management actions, providing ambient coliform loading data, helping to evaluate sources of coliform bacteria, and assessing localized impacts of runoff, particularly on shellfish beds and bathing beaches.

P-4.4 Implement the Town of East Hampton Ditch Plains Oceanside Drainage Project to restore the water quality of South Lake Montauk.

P-4.5 Conduct a pilot project to construct and operate a composting waste toilet facility at the East Hampton Town Beach on Lake Montauk. Evaluate the effectiveness of such a facility and determine if there are other locations around the estuary where this type of toilet could be installed for public use.

P-4.6 **Priority** Develop a "Regional Stormwater Management Plan" to evaluate and recommend technologies to remediate stormwater runoff in the estuary.

Responsible Entities

P-4.1 PEP (lead)

P-4.2 PEP (lead) through contract with Cornell Cooperative Extension

P-4.3 NYSDEC Shellfish Sanitation Program and SCDHS Office of Ecology (co-leads)

P-4.4 Town of East Hampton (lead) and Cornell Cooperative Extension

P-4.5 Town of East Hampton

P-4.6 PEP (lead) through contractor and Peconic Baykeeper, EPA, NYSDEC, SCDHS

P-5. Enhance Existing Septic System Controls and Implement New Best Management Practices.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Wastewater treatment for most of the residences, businesses, and institutions of the watershed of the Peconics is serviced by on-site disposal systems (OSDS), such as septic tanks or cesspools. In some areas, these systems are decades old and have not been properly maintained. Systems that have not had the solids pumped regularly and whose leaching fields have been compromised by clogging may eventually release inadequately filtered fluids that contain high concentrations of pathogens. Once released to the surface, these fluids can be carried into the estuary via stormwater.

One of the simplest and most effective methods of pinpointing septic system leakage is through the placement of dye in the toilets of the suspected system. The appearance of the dye in nearby surface waters after a period of time will indicate a compromise of the leaching field. However, these tests can only be done with the cooperation of the homeowner, and it is often difficult to obtain permission to run the tests since a positive result may end in a requirement for the homeowner to repair, upgrade, or replace the entire system. Providing a means to obtain funding for repairing and upgrading OSDS might result in fewer failing systems.

Because current inspections by government agencies and voluntary dye-testing may not be effective at identifying and remediating all substandard or malfunctioning OSDS in the Peconic area, it may be necessary to mandate inspections and repair/replacement of OSDS under certain circumstances.

For related actions, see Public Outreach and Education POE-3.3, POE-5.5, POE-5.6, and N-5.

Steps

P-5.1 Implement existing programs that identify failing septic systems and work with property owners to have the systems repaired or replaced. Regular inspection and testing could be done by local agencies, particularly in older communities, to ensure that problems are detected and addressed in a timely manner. For those municipalities with existing inspection regulations, those regulations should be enforced.

P-5.2 **Priority** Work with waterfront residents to conduct voluntary dye tests on their septic systems to determine if there are significant leakage problems.

P-5.3 Develop and implement a requirement for inspection and certification of OSDS at specified intervals or upon transfer of property. If a system does not meet current standards, the homeowners would be required to repair or replace the system.

P-5.4 Investigate the need for and feasibility of establishing an OSDS (septic system) district(s) to provide homeowners access to low-interest loans available through the State Revolving Fund to repair and upgrade malfunctioning OSDS.

P-5.5 Conduct a workshop with appropriate State, Suffolk County, and town officials to review and evaluate existing septic system controls (including system monitoring, required maintenance, and repair and replacement of failing systems) and current BMPs for septic systems.

P-5.6 Implement OSDS BMPs contained in NYSDEC guidance for new developments.

Responsible Entities

P-5.1 Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and SCDHS

P-5.2 Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and SCDHS

P-5.3 PEP (lead); Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and SCDHS

P-5.4 PEP (lead), State Environmental Facilities Corporation, towns, SCDHS

P-5.5 PEP

P-5.6 Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and SCDHS

P-6. Provide Pumpout Facilities and Encourage Their Use.

Addresses Pathogen Management Objectives 1, 3, and 4.

One of the ways to reduce the potential for pathogen loading in marina and mooring areas from human sewage is to minimize boater discharges. Boats on which people stay for extended periods of time represent a particular concern because of the amount of waste generated on these vessels. There is currently legislation that requires that marinas, which dock houseboats/barges, have a functioning pumpout station. This law needs to be rigorously enforced. The use of shoreside restrooms and the use of Type III marine sanitation devices (MSD) on boats (which have holding tanks), combined with pumpout facilities at marinas, would minimize the potential for release of pathogens into the water through untreated wastes and wastes from boats with Types I and II marine sanitation devices.

The Federal Clean Vessel Act (CVA) provides money to the States to develop a plan for siting and constructing pumpout facilities at docks and marinas in an effort to reduce the potential contamination of coastal waters with human sewage from boats. The Act also provides grant money to be administered by the States for subsidizing the construction of these facilities once the need has been identified at specific sites. Currently funded projects are listed in **Table 5-3**. All funds from the CVA have currently been obligated; it is not anticipated that additional funding will be available through this legislation.

For related actions, see Public Outreach and Education POE-3.4 and POE-3.5.

Steps

P-6.1 Continue to provide boaters with incentives to use pumpout stations, such as providing pumpout stations that are easy to use, clean, quick, free (or low-cost), and land-based or mobile.

P-6.2 Conduct a survey of recreational vessels and pumpout stations in the Peconic Estuary, and prepare a plan for the construction, installation, maintenance, and repair of pumpouts and waste reception facilities sufficient to qualify all or parts of the Peconics for designation as a vessel waste no discharge area. (See P-7 for related action.)

P-6.3 Administer Statewide Clean Vessel Act (CVA) grants (and any other similar grants) for the construction, installation, maintenance, and repair of pumpout and waste reception facilities pursuant to the State Clean Vessel Act Plan developed by NYSDOS.

P-6.4 Promote the use of shore-based toilets, holding tanks on boats, and pumpout stations, especially in areas of heavy boat traffic or environmentally sensitive areas. Marinas should encourage their patrons to use shore toilet facilities when berthed at a dock, particularly if they remain overnight.

P-6.5 Ensure strict enforcement of the Suffolk County Article 12 requirement that marinas which facilitate overnight docking of houseboats or housebarges maintain a waste pumpout facility.

Responsible Entities

P-6.1 Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; and private marina owners

P-6.2 NYSDOS (lead), NYSDEC and PEP No-Discharge Area (NDA) Committee, EPA

P-6.3 NYSDEC (administers the plan in New York State for the U.S. Fish and Wildlife Service which is responsible for the CVA) and municipal and private marina owners

P-6.4 NY Sea Grant Extension Service Pumpout Education Program (lead), Association of Marine Industries, local governments, NYSDEC, and NYSDOS

P-6.5 SCDHS

Table 5-3. Clean Vessel Act Grants in the Peconics.

Location	Town	Amount Requested
Sag Harbor Pumpout Boat	Southampton — Sag Harbor	$25,000
Peconic Bays Pumpout Boat	Southampton — all others	$25,000
Shagwong Marina	East Hampton — Three Mile Harbor	$ 6,145
Strong's Marina	Southold — Great Peconic Bay	$ 7,500
Montauk Sportsman's Dock	East Hampton — Lake Montauk	$ 6,214
Game Fishing Marina	East Hampton — Lake Montauk	$ 7,166
Larry's Lighthouse Marina	Riverhead — Meetinghouse Creek	$ 8,111
Marine Park Docks	Village of Sag Harbor	$ 5,250
East Creek Marina	Southold — East Creek	$11,250
Cutchogue Harbor Marina	Southold — Cutchogue Harbor	$13,183
New Suffolk Shipyard	Southold — Cutchogue Harbor	$24,366
Gateway Marina	Southampton — Flanders Bay	$ 4,939
East Hampton Point Marina	East Hampton — Three Mile Harbor	$ 3,675
Coecles Harbor Marina and Boatyard	Shelter Island — Coecles Harbor	$13,856
Albertson Marine	Southold — Budds Pond	$ 4,650
Downtown Riverhead Pumpout Station	Riverhead	$14,930
Star Island Pumpout Facility	East Hampton — Lake Montauk	$25,000
Claudio's Marina	Southold — Greenport Harbor	$ 6,952
Great Peconic Bay Marina	Riverhead — Kings Creek	$12,926

P-7. Establish Vessel Waste No Discharge Areas.

Addresses Pathogen Management Objectives 1, 3, and 4.

Through the Clean Water Act, waterbodies may be designated as "Vessel Waste No Discharge Areas (or Zones)." The discharge of untreated vessel waste is prohibited within the three-mile jurisdiction of Sate coastal waters and navigably connected waters. However, treated waste from approved Marine Sanitation Devices (MSDs) can be discharged in these waters. Within no discharge areas, vessels are prohibited from discharging both treated and untreated waste into surface waters.

Local governments may submit No Discharge Area (NDA) petitions through NYSDEC seeking the Federal NDA designation, which is administered by EPA. The EPA will approve state designation of waterbodies as No Discharge Areas when the petitioner can demonstrate that there is a need for greater protection of the resources and there are sufficient pumpout facilities to service the number of boats using the waterbody. In addition, the petition includes information on enforcement and public education.

In an effort to advance the idea of a NDA in the Peconics, a committee was formed made up of representatives from the Peconic Estuary Program, New York State, Association of Marine Industries, and the Peconic BayKeeper. The group reached an agreement that supports the recommendation of designating the entire estuary as a NDA. The Peconic Baykeeper has met with the five East End Towns and asked for their support in designating the entire estuary a NDA. All five towns are in support and expressed their willingness to act as partners in the application process. Officials from the NYS Department of State with assistance from the BayKeeper are currently preparing the petition on the Municipalities behalf. The draft petition is nearing completion and is expected to be provided to the Towns and reviewing agencies so it can be implemented for the 2001 boating season.

Steps

P-7.1 Develop agreement on Peconic Estuary Program Vessel Waste No Discharge Area.

P-7.2 **Priority** Develop and submit an appropriate application for a vessel waste no discharge area based on recommendations provided by the committee in P-7.1.

P-7.3 **Priority** Implement and enforce a vessel waste no discharge area throughout the estuary.

Responsible Entities

P-7.1 PEP CAC Chair and AMI representative (co-leads); NYSDOS; PEP; Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; AMI; and Peconic Baykeeper

P-7.2 Application development and submission: NYSDEC and NYSDOS (co-leads), in conjunction with Towns; determination of adequacy of pumpout and treatment facilities and approval of NYSDEC designation: EPA (lead); enforcement of no discharge area: local enforcement agencies (lead), USCG, and NYSDEC.

P-7.3 NYSDOS, Peconic Baykeeper (implementation), NYSDEC, U.S. Coast Guard, and Town Bay constables (enforcement)

P-8. Use Administrative and Regulatory Measures to Control Pollution from Boaters and Marinas.

Addresses Pathogen Management Objectives 1, 3, and 4.

There is an existing law in Suffolk County mandating the investigation of reported nuisances at marinas. This law may be broadly interpreted to include problems resulting in pollution of surface waters such as stormwater runoff, malfunctioning septic systems at shoreside restrooms, and improper use of pumpout facilities. Currently, enforcement of this law is in response to complaints. Pollution problems may be addressed under this law through some provision for routine inspection of marinas and shore facilities.

Steps

P-8.1 Investigate the administrative, regulatory, and programmatic elements of the Suffolk County Law to investigate reported nuisances at marinas in order to determine if this law could be applied to evaluate and manage pollution from marinas and other sources.

P-8.2 Examine existing site plan review process and special permit legislation and amend to accommodate close scrutiny of marinas and all waterfront projects to address pathogen sources.

Responsible Entities

P-8.1 SCDHS

P-8.2 SCDHS (lead), with stormwater contractor assistance (see P-12); and Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead

P-9. Promote the Use of Best Management Practices to Control Pathogen Loadings from Marinas, Mooring Areas, and Boatyards.

Addresses Pathogen Management Objectives 1, 3, and 4.

In addition to BMPs for boat waste, the Coastal Nonpoint Source Program Guidance for CZARA section 6217 also lists recommendations for minimizing pollution from marinas and boatyards from runoff and septic system leakage. These BMPs could be codified and required as permit conditions for the construction of new marinas and boatyards or the expansion of existing ones.

Steps

P-9.1 Select and promote the use of BMPs to control pathogen loadings from new and existing marinas, mooring areas, and boatyards in accordance with section 6217 of CZARA.

P-9.2 Include BMPs in accordance with section 6217 of CZARA to permit conditions for new marinas, mooring areas, and boatyards.

Responsible Entities

P-9.1 NYSDOS (lead); Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; and NYSDEC

P-9.2 Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; and NYSDEC; NYSDOS

P-10. Ensure Adequate Disinfection at Sewage Treatment Plants.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Disinfection of effluent from sewage treatment plants is essential to prevent the spread of disease. Disinfection can be accomplished by a variety of methods, all of which have been proven effective under specific conditions. There are concerns about the use of chlorine as a disinfectant because chlorine may not effectively eliminate certain viruses from effluent. In addition, chlorine may have toxic effects on living organisms when it becomes complexed in seawater with organic compounds.

Steps

P-10.1 Ensure that adequate disinfection at sewage treatment plants continues.

P-10.2 Encourage all sewage treatment plants to use ultraviolet disinfection.

Responsible Entities

P-10.1 NYSDEC (lead); and operators of the Town of Riverhead, Shelter Island Heights, BNL, NWIRP, Village of Sag Harbor, and Plum Island Disease Control Center STPs

P-10.2 PEP (lead)

P-11. Monitor Effluent from the Corwin Duck Farm.

Addresses Pathogen Management Objectives 1, 3, and 4.

Meetinghouse Creek in the Town of Riverhead has been identified as being significantly contaminated with coliform bacteria. In the past, duck waste was diluted, filtered, and allowed to discharge into the creek. In an attempt to lower the levels of coliforms in the effluent, a freshwater wetland was constructed on-site to capture and retain pathogens until they die rather than allowing them to move into a body of water along with the runoff. Monitoring is necessary to evaluate the effectiveness of the artificial wetland treatment system.

Steps

P-11.1 Monitor Meetinghouse Creek receiving waters to determine efficacy of the wetland treatment system installed to treat effluent from the Corwin Duck Farm.

Responsible Entities

P-11.1 USDA-Natural Resources Conservation Service (NRCS) (lead) and Suffolk County Soil and Water Conservation District

P-12. Identify Sources and Loadings of Nonpoint Sources of Pathogens.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Knowing the sources of pathogens in the estuary as well as the total loadings of pathogens to various embayments is a crucial first step in designing remedial activities. A reliable, first-order quantification of pathogen sources in the estuary would aid in determining the most cost-effective management and remedial actions that would result in lowered coliform levels and, ultimately, reopened shellfish beds. The PEP has funded a "Regional Stormwater Management" project to establish a comprehensive stormwater strategy. This project, which will begin in the summer of 2000, will include a system-wide stormwater inventory, an integrated characterization effort, and a stormwater management strategy.

Pollutant loadings can be estimated using land use data and land cover information. Land cover information is available from a variety of sources including the NOAA Coastal Change Analysis Program (C–CAP) which derives its data from satellite imagery. These data have been acquired by the NYSDOS and have been ground-truthed with existing aerial photographs for the New York coastal region. A land use analysis for the study area has been conducted by the Suffolk County Department of Planning, and a preliminary stormwater contributing area map has been developed from the stormwater data collecated by the Towns, County and State.

Steps

P-12.1 Identify and assess the major nonpoint source and stormwater inputs and quantify loadings of pathogens to local harbors in the Peconic Estuary System.

P-12.2 Develop a DNA "library" of coliform bacteria isolated from feces of animals, including humans. *See related Public Outreach and Education Action POE-3.1.*

P-12.3 Pilot the use of a DNA library to assess coliform sources in selected embayments. This knowledge can potentially be used to identify loading pathways and, thus, the means by which to remediate those loadings.

P-12.4 Perform land cover analyses for the study area which can be used to determine stormwater runoff loadings. Include tabulation and mapping of existing land cover types and analysis of land cover changes over time.

Responsible Entities

P-12.1 PEP (lead) with contractor assistance; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; villages; NYSDEC; SCDHS; EPA

P-12.2 Cornell Cooperative Extension (lead) in cooperation with PEP

P-12.3 Cornell Cooperative Extension (lead) in cooperation with PEP

P-12.4 PEP through contract with NYSDOS (lead)

P-13. Develop and Implement Nonpoint Source Control Plans for Pathogens.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Comprehensive planning involving multiple levels of government is required to address a pathogen-contaminated waterbody, particularly since contamination is often due to a variety of sources, including stormwater runoff, septic systems (cesspools), vessel wastes and even wildlife and domestic animal wastes.

This action recognizes the need for the plans to be developed for specific waterbodies, as well as the need to secure funding for pathogen management through the Suffolk County Water Quality Coordinating Committee.

Steps

P-13.1 **Priority** Develop nonpoint source control plans for specific embayments for each nonpoint source category associated with potential pathogen contamination (such as stormwater runoff, on-site disposal systems, and marinas/boating) through the "Regional Stormwater Management Plan" and sub-watershed management pilot projects for each town (see Action P-12).

P-13.2 Continue to promote nonpoint source management of pathogens through the Suffolk County Water Quality Coordinating Committee (SCWQCC), and coordinate Committee activities with the PEP. (The SCWQCC is comprised of agencies [including the NYSDEC and SCDHS] which have a stake in improving water quality of the Peconic Estuary System.)

Responsible Entities

P-13.1 PEP (lead), with contractor assistance in concert with state and local governments; SCDHS; NYSDEC; EPA; SCDPW; NYSDOT

P-13.2 SCWQCC, chaired by the Suffolk County Soil and Water Conservation District (lead), and PEP

P-14. Obtain Funding to Address Stormwater Runoff.

Addresses Pathogen Management Objectives 1, 2, 3, and 4.

Some actions in this chapter can be implemented without additional outside funding. For example, the local highway or public works departments in many municipalities already have the appropriate equipment and trained personnel for carrying out many of the BMPs for stormwater runoff remediation. Several towns incorporate funds every year into their highway or public works department budgets specifically for this purpose.

Other actions will require additional funding. State funds are available through the New York Department of Transportation as well as the NYSDEC from the Bond Act. The members of the Peconic Estuary Program have been very successful at applying for and receiving Federal funds under the Clean Water Act. Projects funded since the inception of the PEP in 1993 are contained in **Table 5-4**.

Steps

P-14.1 Include an annual amount in the highway operating budget specifically for the correction of existing road runoff problems. Implementation of this action would support the effort described in Action P-4.

P-14.2 Identify projects in the Peconic Estuary watershed that are fundable under the Transportation Efficiency Act and NYSDOT capital budget that will improve water quality by preventing or remediating road runoff.

P-14.3 **Priority** Identify projects in the Peconic Estuary watershed under the New York Clean Water/ Clean Air Bond Act that will improve water quality by preventing or remediating road runoff.

Responsible Entities

P-14.1 Suffolk County DPW; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; and incorporated villages; PEP

P-14.2 Suffolk County DPW; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; incorporated villages; PEP HRWG; NYSDOT; SCDPW

P-14.3 Suffolk County; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; incorporated villages; and PEP HRWG, NYSDEC

Table 5-4. Peconic Estuary Demonstration/Implementation Projects — Pathogen Mitigation.

Project Title	Federal/State Funding
Near Coastal Waters Grants	
Filter Strip Project/Stormwater Abatement	$ 10,000
Open Marsh Water Management Project	$ 246,385[1]
"Saving the Bay" Poster/Pamphlet Project	$ 5,000
Corwin Duck Farm Constructed Wetlands	$ 68,000
FY94 Action Plan Demonstration Projects	
Composting Waste Public Restroom Facility	$ 18,730
Wetland Restoration Project	$ 36,970[2]
Ultraviolet Disinfection/Shelter Island Heights STP	$ 6,800
FY95 Action Plan Demonstration Projects	
Nonpoint Source Pollution	
Prevention/Coecles Harbor Marina	$ 47,359[3]
Stormwater Quality Management ("Stormtreat")	$ 12,650
Shallow Wetland/Biofiltration	$ 19,500
Ozone Treatment of Stormwater Runoff	$ 18,850
Storm Drain Outfall (Ecoboom)	$ 20,000
Stormwater Education/Outreach	$ 4,000
FY96 Action Plan Demonstration Projects	
Nonpoint Source/Boat Ramps	$17,000
Section 319 Nonpoint Source Grants[4]	
Town of East Hampton Surface Water Pollution Abatement	$ 34,500
Stormwater Mitigation at Goose Creek	$ 15,000
Hashamomuck Point Stormwater Remediation	$ 39,000
Stormwater Vac-Con Sewer Cleaning Machine	$ 180,000
Bay Avenue Drainage Improvements	$ 50,000
East Creek Stormwater Retention/Biofilter	$ 62,000

[1]$11,385 Near Coastal Water grant; project expanded with $235,000 U.S. Fish and Wildlife Service grant to NYSDEC
[2]$9,970 FY94 APDP grant; project expanded with $27,000 U.S. Fish and Wildlife Service grant to NYSDEC
[3]Funded in part with CWA section 319 Nonpoint Source grant ($16,409)
[4]Clean Water Act section 319 grants are through NYSDEC

P-15. Conduct Water Quality Monitoring.

Addresses Pathogen Management Objectives 1, 3, and 4.

In order to accurately assess the levels of pathogen indicators in the system, routine water quality sampling is critical. The NYSDEC Shellfish Sanitation Program is the primary entity that carries out this activity for the purpose of protecting human health from the consumption of shellfish contaminated with pathogens. The Suffolk County Department of Health Services (SCDHS) is the lead entity for the purpose of protecting human health from pathogens at bathing beaches. SCDHS also analyzes water samples for coliforms as part of a larger program to assess overall quality of the waters in the Peconic system. In order to determine the impact of control measures on pathogen indicator concentrations in the water, it is important that these monitoring programs be maintained.

Water quality monitoring is required for assessing the status of all shellfish beds. There are a number of small, shallow embayments in the Peconics that are closed to shellfishing as a result of coliform contamination. The towns are interested in reopening these areas on a conditional or seasonal basis to access the shellfish resources that exist there. More intensive water quality sampling (increased frequency and number of stations) by the State Shellfish Sanitation Program may result in more detailed assessments of the amount, timing, and sources of contamination in these bodies of water. This additional information may result in upgrading the classification of some sections of these embayments to shellfishing for at least part of the year.

In 1998, several New York marine surface water samples were analyzed for *Pfiesteria piscicida*; some of the samples from Peconic Estuary waters contained *Pfiesteria piscicida. Pfiesteria* is a microscopic organism that has a complex life cycle that includes toxin-producing stages. The exact conditions that are necessary to trigger toxin production by *Pfiesteria piscicida* are poorly understood, but it is believed these conditions do not commonly occur in New York coastal waters. The New York State Departments of Environmental Conservation and Health are working with county health departments to complete comprehensive sampling for *Pfiesteria* and developing plans for responding to possible toxic *Pfiesteria piscicida* outbreaks.

Steps

P-15.1 Maintain the water quality sampling programs run by the NYSDEC Shellfish Sanitation Program and the SCDHS Bureau of Marine Resources in order to monitor pathogens in shellfish beds and public beaches and to assess the results of mitigation measures, respectively.

P-15.2 Conduct *Pfiesteria piscicida* sampling effort to characterize embayments with respect to this organism.

Responsible Entities

P-15.1 NYSDEC and SCDHS (co-leads)

P-15.2 NYSDEC and SCDHS (co-leads), NYSDOH, and NYS *Pfiesteria* workgroups

BENEFITS OF MANAGEMENT ACTIONS

Successful implementation of the actions in this chapter will result in environmental benefits, human health benefits, and economic benefits to the estuary system by ensuring cleaner water and continued or increased availability of shellfish lands for harvesting. Although these benefits have not been quantified in monetary terms, their value is potentially quite high. Ensuring open beaches for tourists and clean water for recreational users supports a variety of local businesses, such as restaurants, hotels, and shops. The re-opening of shellfish beds to harvesting would have the benefit of increasing the revenue generated from this fishery. The value of this increased revenue would depend on the abundance per unit area of shellfish (primarily hard clams) in the closed beds and the market price at the time of re-opening. Finally, it is worthwhile to note that actions to reduce pathogen loadings also will often reduce inputs of sediment particles and nutrients into the system.

COSTS OF MANAGEMENT ACTIONS

Estimated costs for each of the pathogen management actions are provided in **Table 5-5**. As shown in the table, for some actions, costs can not be estimated due to the variables involved. Other actions rely on implementation using current levels of effort and funding. Many of the actions have secondary or indirect costs that also are difficult to measure. For these reasons, it is not possible to estimate the total cost of implementing the proposed pathogen management actions.

For example, in order to re-open shellfish beds to reharvesting, the sources of pollution in each separate growing area would have to be identified. Then the cost of remediating each separate source could be estimated. A conservative estimate would involve locating the point at which each stormwater discharge enters an embayment and determining the cost of remediating each of those discharges. Sources of leachate from on-site disposal systems could be determined through dye tests done in conjunction with each individual residence or business. Those septic systems that are shown to contribute substantial quantities of pathogens would need to be replaced or upgraded, and this cost would be added to the total. Suspected vessel discharges could be monitored and enforcement of laws prohibiting discharge of raw sewage could be increased. The increased expense of monitoring and enforcement for any designated vessel waste no discharge area would also have to be added in. If wildfowl are determined to be a significant source, some action might have to be taken regarding these populations, including a public education campaign on not feeding them, and this would require an additional cost.

The cost of implementing all of these actions could run into the millions of dollars and would have to be compared to the increased value of the harvest to be taken out of the estuary as well as the values placed on cleaner water, reduced human health risks, and better recreational opportunities.

The total cost of all new actions for the pathogens management in the chapter is $1,718,750 in one-time costs and $1,530,000 annually. (See “Action Costs” in **Chapter 1** for an explanation of how these costs were determined.)

PATHOGENS ACTIONS SUMMARY TABLE

Table 5-5 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 5-5. Pathogens Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
P-1	**Use Existing or Implement New Stormwater Management Regulations to Control Pathogen Loading and Other Forms of Nonpoint Source Pollution.** ***(Objectives 1, 3, and 4)***				
P-1.1	Continue to implement general stormwater permit programs to control the discharge of stormwater from industrial, construction, and municipal activities.	NYSDEC (lead), EPA (data management system)	Ongoing	Base Program Enhanced Program: NYSDEC – 1.0 FTE/yr	C/O R
P-1.2	Determine if general stormwater permits adequately regulate pollution from activities subject to national stormwater regulations.	PEP (lead for assessment), NYSDEC (permit issuance)	Post-CCMP	NYSDEC – 1.0 FTE PEP – 1.0 FTE	R
P-1.3	Investigate the need to regulate, for general stormwater management, communities with populations less than 100,000 in the Peconic Estuary watershed in order to control coliform discharges.	NYSDEC (lead)	Following EPA issuance of new stormwater regulations	NYSDEC – 1.0 FTE	R
P-2	**Develop Land Use Regulations that Eliminate or Minimize New Sources of Stormwater Runoff.** ***(Objectives 1, 2, 3, and 4)***				
P-2.1 **Priority**	Evaluate existing and develop model land use regulations that eliminate or minimize new sources of stormwater runoff.	PEP (lead) through contractor	Post-CCMP	$50,000	R
P-2.2	Review the East Hampton HPOD legislation and the results of its implementation, adopt similar regulations in other East End towns and villages.	PEP (lead) with contractor assistance, and towns and villages	Post-CCMP	$50,000 PEP – 0.2 FTE Towns – 0.5 FTE each	R
P-2.3	Adopt land use regulations that eliminate or minimize new sources of stormwater runoff.	Towns of East Hampton, Riverhead, Southampton, Shelter Island, Southold, and Brookhaven; and incorporated villages	Post-CCMP	Towns – 0.5 FTE each	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-2.4	Control the impacts of waterfront development through a prohibition on all new non-water-dependent commercial development.	Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; NYSDOS; NYSDEC	Post-CCMP	Towns – 0.5 FTE each	R
P-3	**Use Construction Site Guidelines which Eliminate or Minimize Stormwater Runoff.** ***(Objectives 2 and 3)***				
P-3.1 **Priority**	Require the use of BMPs to control stormwater runoff and sediment erosion at construction sites.	Towns of East Hampton, Riverhead, Southampton, Southold, Shelter Island, and Brookhaven; and incorporated villages	Post-CCMP	Towns – 0.5 FTE each/yr	R
P-3.2	Pursue the expansion of the State Building Code to include provisions for stormwater runoff control practices and erosion and sediment control for all construction activities.	NYSDOS and NYSDEC (co-leads)	Ongoing	NYSDEC – 0.5 FTE NYSDOS – 0.5 FTE	R
P-3.3	Implement standards for building permits and subdivision approvals that will require new developments to retain and treat all stormwater runoff on the property to the extent practicable.	Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; and incorporated villages	Following completion of Action P-3.2 or development of local standards	Towns 0.5 FTE each	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-3.4	Continue, through Federal programs (Clean Water Act, section 404) and State programs (the Tidal Wetlands Regulatory Program, Article 25, the Freshwater Wetlands Program, Article 24, and the Protection of Waters Program, Article 15), to regulate all construction projects to ensure that they prevent or minimize impacts to wetlands and other natural resources from stormwater runoff and septic system leakage.	USACE (Federal lead), EPA, NMFS; NYSDEC (state lead)	Ongoing	Base Programs	C/O
P-3.5	Require sediment and erosion control and stormwater runoff pollution prevention plans for new development greater than five acres, as well as to areas of disturbance that are one acre or more, effective in March 2003.	Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; incorporated villages	Post- CCMP	Base Programs	R
P-3.6	Review the Suffolk County contractor licensing process for effectiveness and amend regulations to provide for fines and revocation where repeated violations of land use and site plan laws are committed by contractors.	PEP (lead for review), Suffolk County (lead for making amendments), SCDHS, EPA, NYSDEC	Post-CCMP	EPA – 0.2 FTE NYSDEC – 0.2 FTE SCDHS – 0.3 FTE PEP – 0.2 FTE	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-4	**Demonstrate and Implement Technologies to Remediate Stormwater Runoff.** ***(Objectives 2, 3, and 4)***				
P-4.1	Demonstrate a variety of different technologies to remediate stormwater runoff and determine the effectiveness and appropriateness of the technologies in various settings around the estuary.	PEP (lead)	Ongoing	(Grass filter strip — $10,000 Near Coastal Waters funds; artificial wetlands and retention rings — $10,000 FY95 Action Plan Demonstration Project funds; OMWM — $11,000 Near Coastal Waters fund for Northwest and Accabonac Harbors; $235,000 USFWS funds to NYSDEC for Long Beach Bay) PEP – 0.1 FTE	C/O
P-4.2	Ensure that information on ongoing, successful stormwater remediation projects is shared among the NYSDOT, SCDPW, and towns and villages in a timely fashion.	PEP (lead) through contract with Cornell Cooperative Extension	Spring 2000	($10,000) PEP – 0.1 FTE	C/O
P-4.3	Ensure that the NYSDEC and the SCDHS continue to work cooperatively with East End towns on stormwater remediation projects by providing monitoring support following the implementation of management actions, providing ambient coliform loading data, helping to evaluate sources of coliform bacteria, and assessing localized impacts of runoff, particularly on shellfish beds and bathing beaches.	NYSDEC Shellfish Sanitation Program, SCDHS Office of Ecology (co-leads)	Ongoing	Base Program	C/O

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-4.4	Implement the Town of East Hampton Ditch Plains Oceanside Drainage Project to restore the water quality of South Lake Montauk.	Town of East Hampton (lead), Cornell Cooperative Extension	2 years once started	($65,000 East Hampton; $175,000 ISTEA)	C/O
P-4.5	Conduct a pilot project to construct and operate a composting waste toilet facility at the East Hampton Town Beach on Lake Montauk. Evaluate the effectiveness of such a facility and determine if there are other locations around the estuary where this type of toilet could be installed for public use.	Town of East Hampton	Construction completed; operation to commence in 1999; evaluation in 2000	($23,270 Town of East Hampton; $18,730 PEP FY94 APDP funds)	C/O
P-4.6 **Priority**	Develop a "Regional Stormwater Management Plan" to evaluate and recommend technologies to remediate stormwater runoff in the estuary.	PEP (lead) through contractor and Peconic Baykeeper, EPA, NYSDEC, SCDHS	Summer 2000	($45,000 PEP FY98; $65,100 Clean Water Act funds) EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE	C/N
P-5	**Enhance Existing Septic System Controls and Implement New Best Management Practices.** ***(Objectives 1, 2, 3, and 4)***				
P-5.1	Implement existing programs that identify failing septic systems and work with property owners to have the systems repaired or replaced. Regular inspection and testing could be done by local agencies, particularly in older communities, to ensure that problems are detected and addressed in a timely manner. For those municipalities with existing inspection regulations, those regulations should be enforced.	Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; SCDHS	Post-CCMP	SCDHS – 1.0 FTE Towns – 0.5 FTE each/yr	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-5.2 **Priority**	Work with waterfront residents to conduct voluntary dye tests on their septic systems to determine if there are significant leakage problems.	Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; SCDHS	Post-CCMP	Relatively inexpensive for test and time spent; may be considerable for homeowners if septic system is found to be malfunctioning SCDHS – 1.0 FTE/yr	R
P-5.3	Develop and implement a requirement for inspection and certification of OSDS at specified intervals or upon transfer of property. If a system does not meet current standards, the homeowners would be required to repair or replace the system.	PEP (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; SCDHS	Post-CCMP	SCDHS – 1.0 FTE Towns – 0.25 FTE each	R
P-5.4	Investigate the need for and feasibility of establishing an OSDS (septic system) district(s) to provide homeowners access to low-interest loans available through the State Revolving fund to repair and upgrade malfunctioning OSDS.	PEP (lead), State Environmental Facilities Corporation, Towns, SCDHS	Post-CCMP	SCDHS – 0.3 FTE PEP – 0.2 FTE Towns – 0.1 FTE each	R
P-5.5	Conduct a workshop with appropriate State, Suffolk County, and town officials to review and evaluate existing septic system controls (including system monitoring, required maintenance, and repair and replacement of failing systems) and current BMPs for septic systems.	PEP	Fall 2000	$10,000 PEP – 0.1 FTE	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-5.6	Implement OSDS BMPs contained in NYSDEC guidance for new developments.	Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; SCDHS	Post-CCMP	SCDHS – 2.0 FTE/yr Towns – 1.0 FTE/yr	R
P-6	**Provide Pumpout Facilities and Encourage Their Use.** ***(Objectives 1, 3, and 4)***				
P-6.1	Continue to provide boaters with incentives to use pumpout stations, such as providing pumpout stations that are easy to use, clean, quick, free (or low-cost), and land-based or mobile.	Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; private marina owners	Ongoing	Base Programs	C/O
P-6.2	Conduct a survey of recreational vessels and pumpout stations in the Peconic Estuary, and prepare a plan for the construction, installation, maintenance, and repair of pumpouts and waste reception facilities sufficient to qualify all or parts of the Peconics for designation as a vessel waste no discharge area (See P-7 for related action.)	NYSDOS (lead), NYSDEC, PEP NDA Committee, EPA	Survey: completed Plan: Spring 2000	EPA – 0.1 FTE NYSDEC – 0.2 FTE PEP – 0.1 FTE DOS – 0.5 FTE	C
P-6.3	Administer Statewide Clean Vessel Act (CVA) grants (and any other similar grants) for the construction, installation, maintenance, and repair of pumpout and waste reception facilities pursuant to the State CVA Plan developed by NYSDOS.	NYSDEC (administers the plan in NY State for the USFWS which is responsible for the CVA), municipal and private marina owners	1993–2004	Base Programs	C/O

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-6.4	Promote the use of shore-based toilets, holding tanks on boats, and pumpout stations, especially in areas of heavy boat traffic or environmentally sensitive areas. Marinas should encourage their patrons to use shore toilet facilities when berthed at a dock, particularly if they remain overnight.	NY Sea Grant Extension Service Pumpout Education Program (lead), AMI, local governments, NYSDEC, NYSDOS	Ongoing	Base Programs	C/O
P-6.5	Ensure strict enforcement of the Suffolk County Article 12 requirement that marinas which facilitate overnight docking of houseboats or house barges maintain a waste pumpout facility.	SCDHS	Ongoing	SCDHS – 1.0 FTE	R
P-7	**Establish Vessel Waste No Discharge Areas.** ***(Objectives 1, 3, and 4)***				
P-7.1	Develop agreement on Peconic Estuary Program Vessel Waste No Discharge Area.	PEP CAC Chair and AMI representative (co-leads); NYSDOS; PEP; Towns of East Hampton, Southampton, Shelter Island, Southold, and Riverhead; AMI; Peconic Baykeeper	Fall 1999	Base Program	C/O

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-7.2 **Priority**	Develop and submit an appropriate application for a vessel waste no discharge area based on recommendations provided by the committee in P-7.1.	Application development and submission: NYSDEC and NYSDOS (co-leads) in conjunction with Towns; determination of adequacy of pumpout and treatment facilities and approval of NYSDEC designation: EPA (lead); enforcement of vessel waste no discharge area: local enforcement agencies (lead), USCG, NYSDEC	Spring 2000	Application and approval: Included in Action P-6.2 (Estimated cost for private boat owners to retrofit: the cost to install Type III devices on vessels currently having Type I or II devices is estimated at $2,000 per vessel. It has been estimated that there are approximately 500 vessels using the Peconics regularly that would require retrofits.)	C/N
P-7.3 **Priority**	Implement and enforce Vessel No Waste Discharge Area throughout the estuary.	NYSDOS & Peconic Baykeeper (implementation); NYSDEC, U.S. Coast Guard, Town Bay constables (enforcement)	Summer 2002	Towns – 0.25 FTE each/yr NYSDEC – 0.5 FTE/yr USCG – 0.25 FTE/yr	R
P-8	**Use Administrative and Regulatory Measures to Control Pollution from Boaters and Marinas.** ***(Objectives 1, 3, and 4)***				
P-8.1	Investigate the administrative, regulatory, and programmatic elements of the Suffolk County Law to investigate reported nuisances at marinas in order to determine if this law could be applied to evaluate and manage pollution from marinas and other sources.	SCDHS	Spring 2000	Cost to be determined	R
P-8.2	Examine existing site plan review process and special permit legislation and amend to accommodate close scrutiny of marinas and all waterfront projects to address pathogen sources.	SCDHS (lead) with stormwater contractor (see Action P-12); Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead	Begin: Spring 2000	SCDHS – 1.0 FTE Towns – 0.2 FTE each	R

Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-9	**Promote the Use of Best Management Practices to Control Pathogen Loadings from Marinas, Mooring Areas, and Boatyards.** ***(Objectives 1, 3 and 4)***				
P-9.1	Select and promote the use of BMPs to control pathogen loadings from new and existing marinas, mooring areas, and boatyards in accordance with section 6217 of CZARA.	NYSDOS (lead); Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; NYSDEC	Ongoing	NYSDEC – 0.1 FTE/yr NYSDOS – 0.1 FTE/yr	C/O
P-9.2	Include BMPs in accordance with section 6217 of CZARA to permit conditions for new marinas, mooring areas, and boatyards.	Towns of East Hampton, Southampton, Southold, Shelter Island, and Riverhead; NYSDEC; DOS	Ongoing	NYSDEC – 0.1 FTE NYSDOS – 0.1 FTE	C/O
P-10	**Ensure Adequate Disinfection at Sewage Treatment Plants.** ***(Objectives 1, 2, 3, and 4)***				
P-10.1	Ensure that adequate disinfection at sewage treatment plants continues.	NYSDEC (lead); operators of the Town of Riverhead, Shelter Island Heights, BNL, NWIRP, Village of Sag Harbor, and Plum Island Disease Control Center STPs	Ongoing	NYSDEC – 0.1 FTE/yr	C/O
P-10.2	Encourage all sewage treatment plants to use ultraviolet disinfection.	PEP (lead)	Ongoing	Included in Action P-10.1	C/O
P-11	**Monitor Effluent from the Corwin Duck Farm.** ***(Objectives 1, 3, and 4)***				
P-11.1	Monitor Meetinghouse Creek receiving waters to determine efficacy of the wetland treatment system installed to treat effluent from the Corwin Duck Farm.	NRCS (lead), Suffolk County Soil and Water Conservation District	Monitoring is ongoing through 1999	Base Programs (Included in $71,579 Near Coastal grant funds; $3,500 from Corwin Duck Farm)	C/O

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-12	**Identify Sources and Loadings of Nonpoint Sources of Pathogens.** ***(Objectives 1, 2, 3, and 4)***				
P-12.1	Identify and assess the major nonpoint source and stormwater inputs and quantify loadings of pathogens to local harbors in the Peconic Estuary System.	PEP (lead) with contractor assistance; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; villages; NYSDEC; SCDHS; EPA	Start Spring 2000 through Summer 2001	EPA – 0.1 FTE NYSDEC – 0.1 FTE SCDHS – 0.1 FTE Towns – 0.1 FTE each	C/O
P-12.2	Develop a DNA "library" of coliform bacteria isolated from feces of animals, including humans. (See POE-3.1)	Cornell Cooperative Extension (lead) in cooperation with PEP	Fall 1996 though Spring 2000	Base Programs ($85,000 grant)	C/O
P-12.3	Pilot the use of a DNA library to assess coliform sources in selected embayments. This knowledge can potentially be used to identify loading pathways and, thus, the means by which to remediate those loadings.	Cornell Cooperative Extension (lead) in cooperation with PEP	Spring 1999 through December 2000	Base Programs ($75,000 grant)	C/O
P-12.4	Perform land cover analyses for the study area which can be used to determine stormwater runoff loadings. Include tabulation and mapping of existing land cover types and analyses of land cover changes over time.	PEP through contract with NYSDOS (lead)	Fall 1999 through December 2000	PEP – 0.1 FTE ($88,019 ($40,500 from PEP APDP; $47,519 from EPA 104(b)(3) funds))	C/O

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-13	**Develop and Implement Nonpoint Source Control Plans for Pathogens.** ***(Objectives 1, 2, 3, and 4)***				
P-13.1 **Priority**	Develop nonpoint source control plans for specific embayments for each nonpoint source category associated with potential pathogen contamination (such as stormwater runoff, on-site disposal systems, and marinas/boating) through the "Regional Stormwater Management Plan" and subwatershed management pilot projects for each town (see Action P-12).	PEP (lead), with contractor assistance in concert with state and local government; SCDHS; NYSDEC; EPA	December 2000 (start)	Base Program EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr Towns – 0.1 FTE each/yr SCDPW – 0.1 FTE/yr NYSDOT – 0.1 FTE/yr	R
P-13.2	Continue to promote nonpoint source management of pathogens through the Suffolk County Water Quality Coordinating Committee (SCWQCC), and coordinate Committee activities with the PEP.	SCWQCC, chaired by the Suffolk County Soil and Water Conservation District (lead), PEP	Ongoing	SCS&WCD – 0.2 FTE/yr	R
P-14	**Obtain Funding to Address Stormwater Runoff.** ***(Objectives 1, 2, 3, and 4)***				
P-14.1	Include an annual amount in the highway operating budget specifically for the correction of existing road runoff problems. Implementation of this action would support the effort described in Action P-4.	Suffolk County DPW; Towns of East Hampton, Southampton, Shelter Island, Southold, Riverhead, and Brookhaven; incorporated villages; PEP	Post-CCMP	PEP – 0.1 FTE/yr Towns – 0.1 FTE each/yr	R

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Table 5-5. Pathogens Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
P-14.2	Identify projects in the Peconic Estuary watershed that are fundable under the Transportation Efficiency Act and NYSDOT capital budget that will improve water quality by preventing or remediating road runoff.	Suffolk County DPW; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven; incorporated villages; PEP HRWG; NYSDOT; SCDPW	Ongoing	PEP – 0.1 FTE/yr Towns – 0.1 FTE each/yr SCDPW – 0.1 FTE/yr NYSDOT – 0.1 FTE/yr	R
P-14.3 **Priority**	Identify projects in the Peconic Estuary watershed under the New York Clean Water/Clean Air Bond Act that will improve water quality by preventing or remediating road runoff.	Suffolk County; Towns of East Hampton, Southampton, Southold, Shelter Island, Riverhead, and Brookhaven, incorporated villages; PEP HRWG; NYSDEC	Annually	NYSDEC – 0.2 FTE/yr Towns – 0.1 FTE each/yr SCDPW – 0.1 FTE/yr	R
P-15	**Conduct Water Quality Monitoring.** ***(Objectives 1, 3, and 4)***				
P-15.1	Maintain the water quality sampling programs run by the NYSDEC Shellfish Sanitation Program and the SCDHS Bureau of Marine Resources in order to monitor pathogens in shellfish beds and public beaches and to assess the results of mitigation measures, respectively.	NYSDEC, SCDHS (co-leads)	Ongoing	Base Programs	C/O
P-15.2	Conduct *Pfiesteria piscicida* sampling effort to characterize embayments with respect to this organism.	NYSDEC, SCDHS (co-leads), NYSDOH, NYS *Pfiesteria* Workgroups	Summer 1998 through Summer 2001	Suffolk County - Base Program. NYSDEC - included in *Pfiesteria* Rapid Response Grant from EPA	C/O

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CHAPTER
SIX

TOXICS MANAGEMENT PLAN

OBJECTIVES

1) Measure the levels of toxics in the environment to discern trends in environmental quality and to determine the effectiveness of management programs.

2) Minimize human health risks due to the consumption of shellfish, finfish, and drinking water.*

3) Protect and improve water and sediment quality to ensure a healthy and diverse marine community.

4) Eliminate where possible, and minimize where practicable, the introduction of toxic substances to the environment, through regulatory and non-regulatory means.

5) Where toxic contamination has occurred, ensure clean-ups occur quickly, and according to the most appropriate and stringent environmental standards.

* The Peconic Estuary Program is not primarily a drinking water protection program. However, many actions in this Plan, if implemented, may result in protection and improvement to groundwater resources.

MEASURABLE GOALS

The PEP's measurable goals with respect to toxics include:

- Improve the quality of the ambient environment (surface waters, groundwaters, sediments, and biota) where there is evidence that human inputs impair or threaten these resources (as measured by surface water, groundwater, sediments, and biota monitoring programs). [See Actions T-2, T-3, T-4, T-5, T-6, T-7, T-8, POE-4]
- Comply with schedules for conducting site characterizations, remedial actions, and post-remedial monitoring at hazardous waste sites; effectively characterize risks and protect human health and the environment at hazardous waste sites; ensure compliance with permit limits for point source discharges (as measured by compliance with schedules at hazardous waste sites; conducting effective characterizations; and point source monitoring). [See Action T-2]
- Decrease overall emissions of reportable toxics from the five East End towns (as measured by the Federal Toxics Release Inventory). [See Action T-7]
- Eliminate holdings of banned, unneeded, and unwanted pesticides and hazardous substances by 2005 (as potentially measured by collections during "Clean Sweep" programs, household hazardous waste collection programs and events, or surveys of farmers/commercial landscapers/homeowners). [See Action T-4]
- Decrease overall agricultural/residential/institutional pesticide applications in the five East End towns (as potentially measured by point-of-sale surveys, surveys of residents, or commercial applicator tallies). [See Actions T-4, POE-4]
- Eliminate to the maximum extent practicable, pesticide applications on turf grass on all publicly held land by 2003 (as potentially measured by municipal resolutions passed [or equivalent]). [See Action T-4]
- Eliminate underground storage tanks exempt from current replacement requirements via incentive programs and public education and outreach (as potentially measured following baseline established of number of underground storage tanks (USTs) and monitoring of the number of underground tanks removed, retired, and replaced). [See Actions T-6, POE-4]
- Decrease the total amount of treated lumber installed in the marine/estuarine environment (as potentially measured by baseline established from shoreline surveys and monitoring of permits issued for bulkheading installations, replacements, and removal). [See Actions T-6, POE-4]
- Reduce the number of two stroke marine engines in use in the estuary (as potentially measured by harbormaster conducted surveys). [See Action POE-4]

INTRODUCTION

Toxic contaminants refer to either man-made or naturally occurring substances that, when found in certain concentrations, can cause adverse ecosystem or human health effects. Within the estuary system, toxic substances can be found in surface waters and groundwater, attached to sediments and soils, and in plants and animals. These substances can directly affect the ability of fish, shellfish, wildlife, and plants to survive or reproduce. Some toxic contaminants can accumulate in the tissues of edible fish and shellfish, making them dangerous to wildlife and unsuitable for unrestricted human consumption. Toxics of concern in the Peconic Estuary System are listed in **Table 6-1.**

Toxic substances can enter the estuary system from either point sources or nonpoint sources. Point source pollution is pollution that comes from discrete, identifiable locations or sources such as a discharge pipe from a sewage treatment plant. Nonpoint source pollution originates from a variety of dispersed and diffuse sources, including pollutants deposited within the watershed and then carried to the estuary through freshwater flows from rivers, runoff, and stormwater, as well as watershed drainage through groundwater underflow.

The Peconic Estuary System generally has low levels of toxic materials in the water, sediment, and organisms, especially when compared to other regional coastal areas. There are, however, impairments that prevent the goals of the Peconic Estuary Management Conference from being fully realized and threats that should be addressed now to prevent impairments from occurring in the future.

OVERALL QUALITY AND USE IMPAIRMENTS

Environmental Criteria and Standards for Toxic Substances

The Federal and State governments generally take a chemical-specific approach to regulating toxic contamination. Under this approach, the concentration of pollutants in the environment (water column, fish tissues, or sediments) is measured and compared to numeric criteria, standards, or effect levels. These criteria are generally developed in such a way so as to be protective of aquatic life, wildlife, and humans. These criteria, standards, and effect levels serve as surrogates for direct measurements of adverse pollution effects and are used as guidelines for pollution control and management programs. An ecosystem or effects-based approach can be utilized as a substitute for the chemical-specific approach or as a check on the chemical-specific approach. Under an effects-based approach, direct field and laboratory studies of the adverse effects of toxic contamination in plants and animals are used to try to determine the level of contamination that results in an observed effect.

Surface Water Quality Criteria

The State, under Federal and State Laws, establishes water quality criteria to protect both aquatic life and wildlife, ensure their propagation and survival, and prevent tainting of species consumed by humans or other wildlife. These criteria also are designed to protect human health from oncogenic (tumor-forming) effects and chronic non-oncogenic effects from the consumption of fish, shellfish, and drinking water.

Groundwater Quality Criteria

Groundwater ultimately enters the estuarine system and contaminants that the groundwater delivers can affect aquatic life, wildlife, and humans. While groundwater is especially important as a source of nutrients to the estuary, it can also be an important source of toxic substances, particularly pesticides that are applied to the landscape. The extent of pesticide contamination of groundwater has been extensively studied on Long Island. Most groundwater quality criteria are based on the protection of human health, and are expressed as Federal Maximum Contaminant Levels (MCLs) or New York State Maximum Contaminant Levels. Federal MCL standards are applicable for treated drinking water sources and are based on a one-year average concentration of more than one sample. Other applicable criteria are Federal Lifetime Health Advisories (HA) and New York State Class GA standards. Class GA standards are for fresh groundwaters whose best usage is as a source of potable water supply. New York State includes general standards of 50 ug/L for unspecified organic contaminants and 5 ug/L for principal organic contaminants.

Sediment Quality Criteria/Dredged Material Guidelines

Toxic contaminants in bottom sediments create the potential for continued environmental impact even where water column levels comply with established criteria. The EPA is in the process of establishing sediment quality criteria for chemicals which cause or have the potential to cause adverse effects to the pelagic (water column dwelling) and benthic (bottom dwelling) organisms and their food chains, including humans. Guidelines already exist for assessing dredged material.

The U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) has specified "Effects Range" values for toxics in sediments to indicate contaminant concentrations at which bottom dwelling organisms may be adversely affected, and as an indicator of overall ecosystem health. While the NOAA Effects Range values are not sediment quality criteria for regulatory purposes, they provide a benchmark for evaluating sediment contaminant measurements.

Finfish, Shellfish, and Game

The State routinely monitors contaminant levels in fish and game and issues advisories on eating sportfish and game because some of these foods contain chemicals at levels that may be harmful to human health. These advisories are updated yearly. At the present time, chemical contaminants are present or believed to be present at elevated levels for a number of species throughout the State and within the Peconics which has led to the consumption advisories shown in **Table 6-2**.

Criteria for Radioactive Materials

The presence of radioactive materials in the environment is of concern in the Peconic Estuary System, primarily due to the presence of Brookhaven National Laboratory (BNL) in the headwaters of the Peconic River. Safe drinking water standards can be used to assess observed radiological measurements in the freshwater portion of the Peconic River, even though the Peconic River is not used as a source of drinking water. Standards for radionuclide concentrations in sediments or fish do not exist. Sediments and fish are normally evaluated in terms of their potential contribution to the radiation dose to the public. New York State has established limits for the effective dose equivalent to an individual from any facility. The NYSDEC has established guidance for evaluating clean-up plans for radioactively contaminated soils and specifies an annual exposure (greater than background

radioactive exposure) goal after the remedial action is complete, while also requiring that the radiation exposures to the public from residual radioactive material in soil after clean-up be "as low as reasonably achievable" (ALARA).

Risk Based Criteria

The EPA and New York State both take a risk-based approach toward the protection of human health from known, probable, and possible carcinogenic substances. In the scientific literature and as a matter of public policy, it is recognized that for some chemicals, the presence of any amount, however small, is associated with some adverse effect, though the risk of this adverse effect may likewise be small. Recognizing that achieving a "zero level" in the environment for some contaminants is not possible at this time, these agencies have established risk based criteria (*i.e.*, levels in the environment associated with a one in one million incremental cancer risk). This type of approach is not used for developing environmental criteria for the protection of aquatic life and wildlife. It is possible that the presence of some chemicals at any concentration may affect aquatic life and wildlife both at the level of the individual as well as populations, and, therefore, complex food webs. Individual criteria also do not, at this time, take into account additive or synergistic toxic effects. The risk associated with individual man-made radionuclides is, however, considered additive, and the allowable risk reflects the additive effect of exposure to multiple man-made radionuclides. For these reasons, the Peconic Estuary Program participants do, therefore, recognize that zero discharge (from point and nonpoint sources) of toxic and manmade radionuclide pollutants, and particularly of bioaccumulative chemicals, is a goal.

SOURCES OF TOXIC CONTAMINANTS WITHIN THE PECONIC ESTUARY SYSTEM

Both point sources and nonpoint sources of pollution contribute toxic contaminants to the estuary system. Because there are a limited number of point source surface water discharges in the Peconic Estuary System, most toxic pollutants found in the area are nonpoint in origin, carried into the bays via groundwater and runoff.

Point Sources of Pollution

Point source discharges in the Peconic Estuary consist of wastewater discharges, certain stormwater discharges, and a limited number of industrial discharges. Point source discharges to surface and ground waters are regulated under the State Pollutant Discharge Elimination System (SPDES) Program administered by the NYSDEC. Permits are written to ensure that the discharge does not cause or contribute to the violation of ambient water quality standards. Under Phase I of the SPDES stormwater program, permits are required to be issued for municipal separate storm sewer systems serving large or medium-sized populations (greater than 250,000 or 100,000 people, respectively), and for stormwater discharges to surface waters associated with industrial activity, including certain types of marinas. At the present time, nine establishments in the Peconic Estuary Program Study Area have been issued SPDES stormwater general permits.

Table 6-1. Toxics of Concern in the Peconic Estuary System.*

Contaminant	Measured Levels and Area of Impact	Potential Sources
Polychlorinated Biphenyls (PCBs)	ER-L[a] exceeded for sediments in Meetinghouse Creek; elevated levels in freshwater fish at BNL (on-site only); Statewide consumption advisories in place for lobster and crab hepatopancreas, snapping turtles, and waterfowl; local consumption advisory in place for striped bass, bluefish, and American eels	Potential sources are outside of the Peconics aside from evidence of historical discharges from BNL
Mirex	Statewide consumption advisory in place for waterfowl	Statewide problem
Chlordane (banned from use in the 1980s)	Statewide consumption advisory in place for waterfowl	Statewide problem
DDT[b] (banned from use in the 1970s)	ER-Ls exceeded for sediments at Upper Sag Harbor Cove, East Creek, and Meetinghouse Creek	Agricultural areas containing residual DDT
Aldicarb (an insecticide which is no longer in use)	Does not exceed State water quality criteria for toxics; widespread groundwater contamination along North Fork; detected in surface waters of East Creek and other North Fork creeks	Agricultural areas containing residual Aldicarb
MTBE (methyl *tert*-Butyl Ether)	Does not exceed State water quality criteria for toxics; detected in surface waters of Sag Harbor Creek near Havens Beach, Peconic River, and other surface waters	Octane booster in gasoline
PAHs	ER-Ls exceeded for sediments in East Creek, mouth of Peconic River, Upper Sag Harbor Cove, and Meetinghouse Creek	Atmospheric deposition from the burning of fossil fuels, road runoff, and boat wet exhaust
Arsenic	ER-Ls exceeded for sediments in six sites (Great Peconic Bay, West Neck Bay, Fish Cove, East Creek, Mouth of the Peconic River, and Meetinghouse Creek)	Pesticides and stormwater runoff; treated lumber
Copper	Elevated levels in Peconic River sediments at BNL	BNL
Lead	ER-Ls exceeded for sediments in four sites (West Neck Bay, East Creek, Upper Sag Harbor Cove, and Meetinghouse Creek)	Primarily historic anthropogenic sources such as lead additives in gasoline
Mercury	ER-Ls exceeded for sediments at two sampling sites (West Neck Bay and Meetinghouse Creek); elevated levels in Peconic River sediments outside BNL	Stormwater and urban runoff; BNL
Silver	ER-Ls exceeded for sediments at two sampling sites (mouth of Peconic River and Meetinghouse Creek); elevated levels in Peconic River sediments outside BNL	Stormwater and urban runoff; BNL

Table continued on next page

Table 6-1. Toxics of Concern in the Peconic Estuary System. (continued)

Contaminant	Measured Levels and Area of Impact	Potential Sources
Radionuclides	Water, sediment, and fish samples taken from Peconic River outside BNL contain measurable levels of radioactive materials; however, observed concentrations are well below State established criteria	BNL[c]

*Toxics of concern and potential sources are based on currently available data and information. Additional toxics of concern may be identified in the future.

[a]Under NOAA's effects range values for toxics in sediments, concentrations below the ER-L (effects range-low) represent conditions in which adverse effects on bottom dwelling organisms would rarely be observed. Concentrations equal to and above the ER-L, but below the effects range-median (ER-M) represent a possible effects range within which effects would frequently be observed.

[b]Concentrations of other organochlorine pesticides did not exceed ER-L concentrations in any of the tested sediments.

[c]Natural occurring radioactivity and fallout from atmospheric nuclear weapon tests also contribute to measurable levels of radioactivity, including areas not affected by releases from BNL.

Permits also are issued on a case-by-case basis if the EPA or the State determines that a stormwater discharge to surface water contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States. No permits of this type have been issued to date in the Peconic Estuary Study Area.

Discharges to ground waters include sanitary wastes from residences and commercial establishments and non-contact cooling waters. There are no permitted discharges of wastewater from industrial activities to groundwater in the Peconic Estuary Study Area (aside from a permit at BNL). Businesses which generate wastewater containing toxic substances dispose of such wastewater by containing the limited volumes on-site, and then removing them by approved hazardous waste handlers/transporters for treatment off-site. This method is often referred to as "hold and haul."

There are eight permitted surface water dischargers in the Peconic Estuary system: Brookhaven National Laboratory (discharge includes sanitary wastewater and cooling waters as well as wastewater from industrial-type activities), Navy Weapons Industrial Reserve Plant (NWIRP) at Calverton, Riverhead Sewage Treatment Plant, Plum Island Animal Disease Center, Riverhead Foundation Aquarium (discharges wastewater from animal display and rehabilitation operations), Bayview Ventures (discharges filter backwash from a potable water treatment plant), Shelter Island Heights Sewage Treatment Plant, and Sag Harbor Sewage Treatment Plant.

Nonpoint Sources of Pollution

There are numerous nonpoint sources of toxic substances in the Peconic Estuary. These nonpoint sources frequently contribute a wide variety of pollutants to the estuary in addition to toxic contaminants, such as pathogens and nutrients. Groundwater underflow and stormwater runoff are the primary pathways by which nonpoint pollution enters the estuary system. Loadings from suburban and urban areas (residential and commercial uses), roads, agricultural land, marinas, boating, and industrial sites contribute pollutants to the estuary system. In addition, some toxics enter the estuary system via atmospheric deposition. Once deposited on land within the estuary, stormwater runoff and groundwater can carry these substances into receiving waters. While each of

these diffuse sources of pollution may seem unimportant, the cumulative effect of the nonpoint source loadings can be significant.

Pesticides, an emerging concern, may be introduced to the Peconic System from suburban and urban sources as well as from agricultural operations. Though no causal link has been identified, low levels of pesticides may be affecting aquatic resources, including eelgrass, sensitive larval stages of commercially and recreational important finfish and shellfish, including lobsters, and other ecologically important species. Even pesticides that are banned or not being applied can cause or contribute to environmental problems if they are not disposed of or improperly stored.

In 1995, Cornell Cooperative Extension of Suffolk County conducted an "Agricultural Clean Sweep" to provide Long Island farmers and agribusiness associates (such as those involved with landscape and turf maintenance) with an opportunity to dispose of, in an environmentally sound manner, a variety of pesticide products that could no longer be used legally or effectively in current operations. The collected unusable/unwanted pesticides became the property of the contracted hazardous waste disposal firm and were properly disposed of in an environmentally sound manner. Participation was voluntary and free of charge. Waste pesticides for collection were pre-registered only after the participants attended a training session which prepared them to safely transport their own pesticides. In this single two-day collection 28,150 pounds of waste pesticides were collected from 76 participants.

At the Suffolk County Pesticide Collection Project conducted on July 10, 1999 in Riverhead and on July 12, 1999 in Huntington, a total of ninety-nine 55-gallon drums of unwanted and unusable pesticide were collected for appropriate disposal. This $75,000 program was funded by Suffolk County in connection with an Environmental Benefit Project associated with an enforcement action by the NYSDEC. Among the pesticides turned in were such outlawed agents as DDT and aldicarb (Temik). Working in cooperation with NYSDEC, two trade groups sponsored the event: the Professional Certified Applicators of Long Island, Inc. and the Nassau/Suffolk Landscape Gardeners Association.

Agricultural Inputs

When rainwater drains agricultural lands where pesticides are in use or were used in the past, the water can carry contaminants into the estuary system. Both DDT and Aldicarb have been found in sediment and water samples in the Peconics, despite the fact that these substances can no longer legally be used. Pesticides are also believed to be a source of arsenic found in the estuary system.

Suburban and Urban Inputs

Stormwater runoff and groundwater can carry many different substances from parking lots, roads and highways, and residential and commercial areas. When contaminants are introduced to these areas, they can be swept into receiving waterbodies with groundwater and stormwater runoff during rainfall events. Suburban and urban areas are believed to contribute a variety of chemicals, including arsenic, copper, lead, mercury, silver, cadmium, zinc, MTBE (methyl *tert*-Butyl Ether), and Polynuclear Aromatic Hydrocarbons (PAHs) to the Peconic Estuary System.

Potential sources of toxic substances include:

- Leaks from industrial facilities due to poor housekeeping practices, insufficient containment and improper storage;
- Improper storage, use, and disposal of household hazardous chemicals, including automotive fluids, solvents, cleaning fluids, and lawn and garden pesticides;
- Operation and maintenance of on-site disposal systems, including organic solvents improperly used as septic system "cleaners" containing halogenated and aromatic hydrocarbons, which are now banned;
- Discharge of pollutants in storm drains, such as waste oils;
- Commercial activities and land uses, including parking lots, gas stations, and other entities not under SPDES permit purview; and,
- Existing underground storage tanks under 1,100 gallons for storage of heating oil, for use on premises, that are not double walled, constructed of non-corrodible materials and equipped with leak detection or overflow prevention systems.

Historically, spills or leaks of contaminants within the Peconic Estuary System have not been a major source of pollution. Records from October 1985 through August 1988 indicate that, of the 25 reported spills or leaks within the study area, approximately 25 percent involved volumes greater than 100 gallons. The predominant type of spill or leak during this review period involved electrical transformers on poles that spilled or leaked coolant oil. Such spills have on occasion contained PCBs. Most of these spills were reported to be one gallon or less in volume.

Major fuel storage sites pose a potential threat, in the event of catastrophic failure. In the Peconics, bulk storage exists at Plum Island, Shelter Island, and at Brookhaven National Laboratory. Spillage in Northville also could conceivably drift around the North Fork into the Peconics. Recommendations regarding the State Oil Spill Areawide Contingency Plan for the Peconic Estuary are discussed in the Habitat and Living Resources Chapter of this Plan (see HLR-15.7).

Pesticide use on residential and commercial properties, publicly owned lands, and golf courses is a concern. The Peconic Estuary Program encourages the management of lawns and landscaped areas in accordance with integrated pest management (IPM) principles (properly applying only those pesticides when needed). As reported in the Consumer Unions 1996 piece *Pest Management at the Crossroads*, "Consumer lawn care products and the formulation applied by lawn care companies tend to be mixtures of fertilizers and herbicides, insecticides and sometimes fungicides. By selling a few common mixtures, the industry keeps costs down, but on the downside, many applications include one or more active ingredients not really needed on a particular lawn or only marginally useful in many areas." Improper storage and disposal of pesticides can also result in impacts to groundwater and surface waters.

Vector control ditches (mosquito ditches) are maintained by the Suffolk County Department of Public Works (SCDPW), which typically applies sprays for larval control of mosquitoes. Problem areas are monitored to determine effective treatments. The primary insecticide used is Bti (bacillus thuringiensis var, israelensis); in some areas methoprene is used. The use of the mosquito larvicides in storm drains and catch basins has been advocated as a mosquito control measure. This could contribute larvicides to surface waters following rainfall events. Recently, the pesticide malathion has been applied in residential areas. Malathion is labeled for use on adult mosquitoes and cannot be applied to water.

Pollutants associated with construction sites (including roads, highways, and bridges) and road, highway and bridge operation, maintenance and runoff systems include pesticides, petrochemicals (oil, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash waters associated with these products and paint chips. Road runoff can contain petroleum products (including the octane booster MTBE), heavy metals (lead, zinc, copper, cadmium, chromium, nickel, and manganese) and cyanide from vehicle and tire wear-and-tear and exhausts.

MTBE is a special concern nationally, in New York, on Long Island, and in the Peconic Estuary study area. Congress required in the Clean Air Act of 1990 that areas of the country with the worst ozone smog problems use reformulated gasoline (RFG). MTBE is the oxygen additive most commonly used by the petroleum industry to satisfy the RFG mandate. Ethanol is the second most commonly used additive. MTBE is very soluble in water, does not "cling" to soil well and has a tendency to migrate much more quickly than other components of gasoline. Most detections of MTBE are below levels of public health concerns and are within the range EPA has set for a taste and odor advisory (at 20 to 40 ppb). Small individual fuel spills and stormwater runoff contribute to low-level detections of MTBE in water supplies. Even though significant air quality gains have been made using RFG, these air benefits can be maintained without using MTBE and without endangering water resources, through the use of safe alternatives like ethanol.

Harbor Protection Overlay Districts

The Town of East Hampton recognizes that those who own property bordering on the Town's harbors (including flag lots, flag strips, and flag access strips) derive many benefits from proximity to these waters and therefore have a special responsibility to help protect them. The Town has established a Harbor Protection Overlay District (HPOD) whereby all lots in this district are subject to special requirements for maintaining or protecting wildlife habitats and surface water quality to protect aquatic life. This includes:

- *Requiring new parking lots and driveways to have "unimproved" surfaces or be constructed of one or more of the following: poured concrete, hot plant asphalt, rapid curing cut-back asphalt or quartz gravel;*
- *Requiring that runoff from new paved roads, parking lots and driveways be managed on-site;*
- *Requiring that fuel tanks be double walled fiberglass if installed below ground or include specified containment provisions if installed elsewhere;*
- *Requiring that swimming pools: be constructed or installed with a system to reduce the use of chlorine, such as an ozonator, ionizer, or ultra violet disinfectant system; have drywells constructed for evacuation of water from the pool; not be drained anywhere but to the dry well; and not be cleaned by means of an acid wash unless the acids used are neutralized prior to discharge from the swimming pool; and,*
- *Allowing the use of wood treated with copper chromated arsenate (CCA), ammoniacal copper quat (ACQ), or creosote in tidal waters only when it can be shown that no reasonable alternatives exist to using these treated woods.*

In March 2000, EPA and the USDA released a legislative framework to encourage immediate congressional action to reduce or eliminate the use of MTBE and promote renewable fuels like ethanol, through amendments to the Clean Air Act. Further, EPA announced the beginning of a regulatory action to eliminate MTBE in gasoline, issuing an advanced notice of proposed rulemaking under section 6 of the Toxic Substances Control Act. This section gives EPA the authority to ban, phase out, limit or control the manufacture of any chemical substance deemed to pose an unreasonable risk to the public or environment. EPA expects to issue a full proposal to ban or phase down MTBE, that will be followed by a time period required by law for analysis and public comment before a final action can be taken.

Golf Courses

The use of pesticides and fertilizers on golf courses is a potential groundwater problem. A SCDHS 1999 study detected pesticides in seven of the 31 golf course wells tested, with two of these wells exceeding the drinking water MCLs. However, in shallow wells that would show impacts from recent pesticide and fertilizer applications, no pesticides were detected and average nitrate concentrations were below state and Federal MCLs. Thus, the recent implementation of Best Management Practices appears to have greatly reduced the risk of pesticide and fertilizer contamination in the golf courses tested.

Marinas and Boating

During the course of normal marina operations, various activities and locations in the marina can generate polluting substances. Such activities include waste disposal, boat fueling, and boat maintenance and cleaning; such locations include storage areas for materials required for these activities and hull maintenance areas. Of special concern are substances that can be toxic to aquatic life, pose a threat to human health, or degrade water quality. Paint sandings and chips, oil, grease, and fuel are examples. Because marinas are located at the water's edge, there is often no buffering of the release of pollutants to waterways. There are 69 marinas in the Peconics.

The principal pollutants in runoff from marina parking areas and hull maintenance areas are suspended solids and organics (predominately oil and grease). Toxic metals from boat hull scraping and sanding are part of, or tend to become associated with, the suspended solids. For example, lead is used as a fuel additive and ballast, and may be released through incomplete fuel combustion and boat bilge discharges. Arsenic is used in paint pigments, pesticides, and wood preservatives. Zinc anodes are used to deter corrosion of metal hulls and engine parts. Copper and tin are used as biocides in anti-foulant paints. Other metals (iron, chrome, etc.) are used in the construction of marinas and boats. Petroleum hydrocarbons (including polynuclear aromatic hydrocarbons, or PAHs) can be elevated in marina waters due to refueling activities and bilge or fuel discharge from nearby boats.

National Toxic Substance Control Efforts

In developing management strategies for toxics, some actions occur at the national level, such as decisions regarding pesticide use and toxic substance bans. For example, among its provisions, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) authorizes EPA to control pesticides that may threaten ground water and surface water. FIFRA provides for registration of pesticides and enforceable label requirements, which may include maximum rates of application, restrictions on use practices, and classification of pesticides as "restricted use" pesticides (which limits use to certified applicators trained to handle toxic chemicals). Under the Toxic Substances Control Act (TSCA) and FIFRA, the sale, use or distribution of certain toxic substances has been banned or reduced.

State Pesticide Program

Under the Pesticide Use Program, NYSDEC regulates the sale and use of restricted and general use pesticides in order to prevent the unsafe or excessive application of pesticides. This program is implemented through certification of pesticide applicators and backed up by examinations to ensure that only knowledgeable, qualified people are permitted to handle and apply these chemicals. A certification is required by commercial applicators if they handle and apply restricted or general use pesticides, and by private applicators (e.g., farmers) if they plan to use a restricted use pesticide. It has been estimated that 50 percent of the commercial pesticide applicators on Long Island may be operating without the required approvals. While pesticides have not been identified as impairing water quality or living resources, the potential for misuse or unintended off-site impacts exists, particularly from uncertified applicators. The NYSDEC is currently working with involved government agencies and other organizations to develop a Long Island Pesticide Management Plan that will further address pesticide use in the Estuary.

It is important that marina operators and patrons take steps to control or minimize the entry of toxic substances into marina waters. For the most part, this can be accomplished with simple preventive measures such as performing boat cleaning and repair activities on protected sites, locating servicing equipment where the risk of spillage is reduced, providing adequate and well-marked disposal facilities, and educating the boating public about the importance of pollution prevention. The benefit of effective pollution prevention to the marina operator can be measured as the relatively low cost of pollution prevention compared to the potentially high cost of environmental cleanup.

A marina is required to obtain a SPDES stormwater discharge permit if vehicle maintenance activities, such as vehicle (boat) rehabilitation, mechanical repairs, painting, fueling, and lubrication or equipment cleaning operations are conducted at the marina. SPDES permits apply only to the point source discharges of stormwater from maintenance areas at the marinas.

Marinas not involved in equipment cleaning or vehicle maintenance activities are not covered under the SPDES stormwater program. Likewise, a marina that has no point source discharges of stormwater is not regulated under the SPDES stormwater program, regardless of its classification and the types of activities conducted. In addition, some marinas are marine service stations which are not regulated under the SPDES stormwater program. These types of marinas are primarily in the business of selling fuel without vehicle maintenance or equipment cleaning operations.

Marine Engine Wet Exhaust

Small boat engines commonly use seawater to both cool and quiet their exhaust. Seawater passes through the heat exchanger, gear oil cooler, and aftercooler (if equipped), and is then injected into the exhaust. When injected, some of the gaseous and solid component of the exhaust transfers into the cooling water. The cooling water then discharges into the receiving water. Small boats are powered by either inboard or outboard engines. Inboard engines are generally diesel fueled while outboard engines typically use gasoline. Inboard and outboard engines can be either two-stroke or four-stroke. The majority of small boat outboard engines are two-stroke gasoline engines. The moving parts of gasoline-powered, two stroke outboard engines are lubricated with oil that is pre-mixed with gasoline. Thus, the oil is continuously burned with gasoline. In four-stroke engines, lubricating oil is circulated and not intentionally introduced into the combustion chamber. The discharge consists of water injected as a cooling stream into the exhaust system of small boat engines. Exhaust constituents generated during the operation of the engines can be transferred to the engine's water cooling streams and discharged as wet exhaust. Inboard engines usually discharge wet exhaust above the water line, outboard engines generally discharge their wet exhaust through the propeller hub.

The main discharge constituents from all engines are oxides of nitrogen, organic compounds (including hydrocarbons [HCs]), carbon monoxide (CO), and particulates. The hydrocarbon constituents are primarily the result of incomplete combustion. Since diesel fuels have a different composition than regular gasoline the distribution of constituents in their exhaust differ between the two engine types. In general, diesel engines produce higher particulate emissions and lower organic emissions than gasoline powered engines.

Some limited studies have been done on the impact of marine engine exhaust on water quality. A 1995 study measured the rate of introduction of volatile organic compounds (VOCs) into water during the operation of gasoline powered two-stroke and four-stroke outboard engines. The VOC compounds found in the water were almost exclusively aromatic hydrocarbons, including pollutants such as benzene, toluene, ethylbenzene, and napthelene. In most cases, other types of hydrocarbons

were not found. No bioaccumulative pollutants are suspected to be present in these discharges. For many toxic constituents, there is a significant reduction in the individual pollutant loadings in two-stroke vs. four-stroke engines. While the reduction varies by pollutant, it typically ranges from 90 percent reduction to over 99 percent reduction.

Treated Lumber in the Marine Environment

As reported in "Assessment of the Risks to Aquatic Life from the Use of Pressure-Treated Wood in Water" (T.J. Sinnott, NYSDEC, June 1999), when wood is used for in-water construction such as pilings, breakwalls, abutments or other submerged or partially submerged structures, the potential exists for toxic preservatives to leach from the wood and harm adjacent aquatic ecosystems. Wood preservatives are chemical pesticides that are applied to wood to protect it from decay brought about by fungi or insect attack. While preservatives can be brushed on, sprayed on, or soaked into wood, the most effective treatment is to force preservative solutions deeply into the wood under high pressure.

Creosote, pentachlorophenol, and inorganic arsenicals are the three most widely used preservative compounds. Creosote is a mix of PAHs that are products of the fractional distillation of coal tar. Pentachlorophenol is a manufactured organochlorine pesticide. Inorganic arsenicals are various blends of metallic salts such as CCA (chromated copper arsenic) or mixtures of metallic salts, arsenic, and organic compounds such as ACA (ammoniacal copper arsenate) or copper naphthenate. All three wood preservatives work because they are toxic to insects and fungi.

Available scientific data for each of the three types of preservatives have been evaluated to attempt to assess the potential risks to aquatic life from the use of pressure treated lumber in water. For all three wood preservatives, the greatest amount of leaching occurs when the treated wood is first put in place. The rate of leaching drops off significantly after a short period of relatively high leaching. In general, any impacts to aquatic life are most likely to occur during the initial period of high leaching. The area where adverse effects occur is likely to be highly localized. The greater the distance from the treated wood, the more dilute the concentration of leached pesticide. For each of the preservative pesticides, fate processes such as volatilization, photolysis, sediment sorption, and microbial degradation work to degrade and reduce the concentration of the pesticide in the water even while it is leaching. For each specific type of wood preservative, recommendations are provided for minimizing the risks to aquatic life.

In recent years, a number of products made out of recycled plastic have come available. These products are designed to replace treated wood for fencing, pilings, and decking. Products made of recycled plastics appear to be safer. They do not function by inherent toxicity, rather they are simply unsuitable substrate for fungi or insects to subsist in or on. Whether or not recycled plastic products have the necessary structural or functional integrity or are economically viable replacements to pressure treated lumber is not assessed for this report.

Nonpoint Sources Addressed in the Coastal Zone Act Reauthorization Amendments of 1990

In the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), Congress recognizes that nonpoint source pollution is a key factor in the continuing degradation of many coastal waters and establishes a new program to address this pollution. In enacting CZARA, Congress calls upon states to develop and implement State Coastal Nonpoint Source Control Programs, which must be approved by both the National Oceanic and Atmospheric Administration (NOAA) and EPA. Congress gives the EPA the responsibility to develop technical guidance for state development of such programs.

Under CZARA, EPA specifies "management measures" for three categories of nonpoint source pollution that may potentially contribute toxics to the Peconic Estuary: agriculture, urban areas, and marinas and recreational boating. "Management Measures" are defined in CZARA section 6217(g)(5) as "economically achievable measures for the control of the addition of pollutants, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives."

Atmospheric Deposition

Acid rain has traditionally been a concern with respect to lowering the pH of freshwater ecosystems due to excessive loadings of acidity. In the context of the Peconic Estuary Program, acid rain is not a primary concern with respect to direct impact on surface water pH, due to the buffering capacity of the marine system. However, there may be a concern with respect to indirect impacts of rainfall acidity on the Peconic Estuary System. Such indirect impacts may be related to the effects of acidity on the Peconic River and on the solubility and transport of contaminants through soil, groundwater, and sediment.

While dry and wet deposition of toxic contaminants present in the atmosphere occurs, no particular toxic pollutants have been identified as being of concern from this source. PAHs, organic compounds derived from pyrogenic (combustion) and petrogenic (petroleum-based) sources, have been detected in sediments within the estuary. The distribution of PAHs suggests loadings are airborne (pyrogenic) PAHs, which are deposited directly on surface waters, as well as in the watershed, and then carried to the estuary through freshwater flows from rivers, runoff, and stormwater, and watershed drainage through groundwater underflow. Nationally, programs are being implemented by the Federal and State governments under the Clean Air Act Amendments to further study and reduce toxic emissions.

Dredged Material Placement

At the present time, no toxic-related restrictions have been imposed on the placement of dredged materials in the Peconics. All dredged material from the Peconics is put to beneficial uses, such as beach nourishment or wetland restoration, or is otherwise placed upland (*i.e.*, above the spring high tide water line).

The EPA and the U.S. Army Corps of Engineers (Corps) have identified the likely need to continue marine placement of dredged material in the Long Island Sound Area. In 1999, the EPA in cooperation with the Corps issued a notice of intent to prepare an environmental impact statement to consider the potential identification of one or more placement sites for Long Island Sound dredged material. EPA and the Corps have decided to consider the use of four existing sites and their identification as dredged material placement sites under Section 102(c) of the Marine Protection, Research and Sanctuaries Act. Other alternatives will also be evaluated, including other open water placement sites and other placement and management options. Identification of a site does not itself result in placement of any particular material, it serves only to make the site a placement option available for consideration in the alternatives analysis for each individual dredging project in the area.

The PEP participants consider it unlikely a placement site will be proposed within the PEP study area. (See also the Habitat and Living Resources Chapter of this Plan.)

Site Specific Concerns

There are a number of sites within the Peconic Estuary that contribute or have the potential to contribute toxic contaminants to the estuary system through point source discharges and/or from stormwater runoff. The sites that are of particular concern are shown in **Figure 6-1** and described briefly below.

Sewage Treatment Plants

The Riverhead, Sag Harbor, and Shelter Island Heights STPs receive and treat wastewater generated by residences and local commercial establishments. Brookhaven National Laboratory and the Plum Island Animal Disease Center have their own sewage treatment plants.

Sewage treatment plant (STP) effluents are subject to disinfection to limit the discharge of pathogens. The most common method of disinfection is chlorination. Chlorinated discharges to surface waters are of concern because, in systems like the Peconics which contain high levels of organic matter, chlorinated compounds can be formed which, although short lived, can be quite toxic to aquatic organisms. The complexity of the reactions of chlorine in the environment increases the difficulty of assessing its impact. Increased attention is being given to addressing the possible need to limit all uses of chlorine as a means of reducing the input of chlorinated compounds into the environment.

Disinfection methods other than chlorination, such as ultraviolet (UV) radiation and ozone, appear to be as effective as chlorine for reducing bacteria and may be more effective in reducing other pathogens. UV disinfection is now used at both the BNL and Plum Island Animal Disease Center STPs. UV has been proposed for use at Riverhead and Sag Harbor and has been tested on a pilot scale at Shelter Island Heights. Effective disinfection by methods other than chlorination can reduce impacts on aquatic life and human health while still being protective of human health from pathogens. These issues are discussed further in the Pathogens Chapter.

North Sea Municipal Landfill Site, North Sea, NY

Remedial actions at this Superfund site have been completed and EPA has determined that no further action (other than air and groundwater monitoring) is necessary. Impacts on surface waters were considered in the selected remedy. Contaminants of concern included volatile organic chemicals (VOCs), PAHs, metals (arsenic and lead) and other organics.

Based on the monitoring that has taken place, the EPA will be requiring the Town of Southampton to conduct additional benthic community and sediment toxicity testing, in accordance with an EPA approved plan. Based upon EPA's review of the monitoring, sampling and analysis results, EPA will evaluate the efficacy of the remedy under the Superfund law. If warranted, the Superfund record of decision will be amended and the remedy revised.

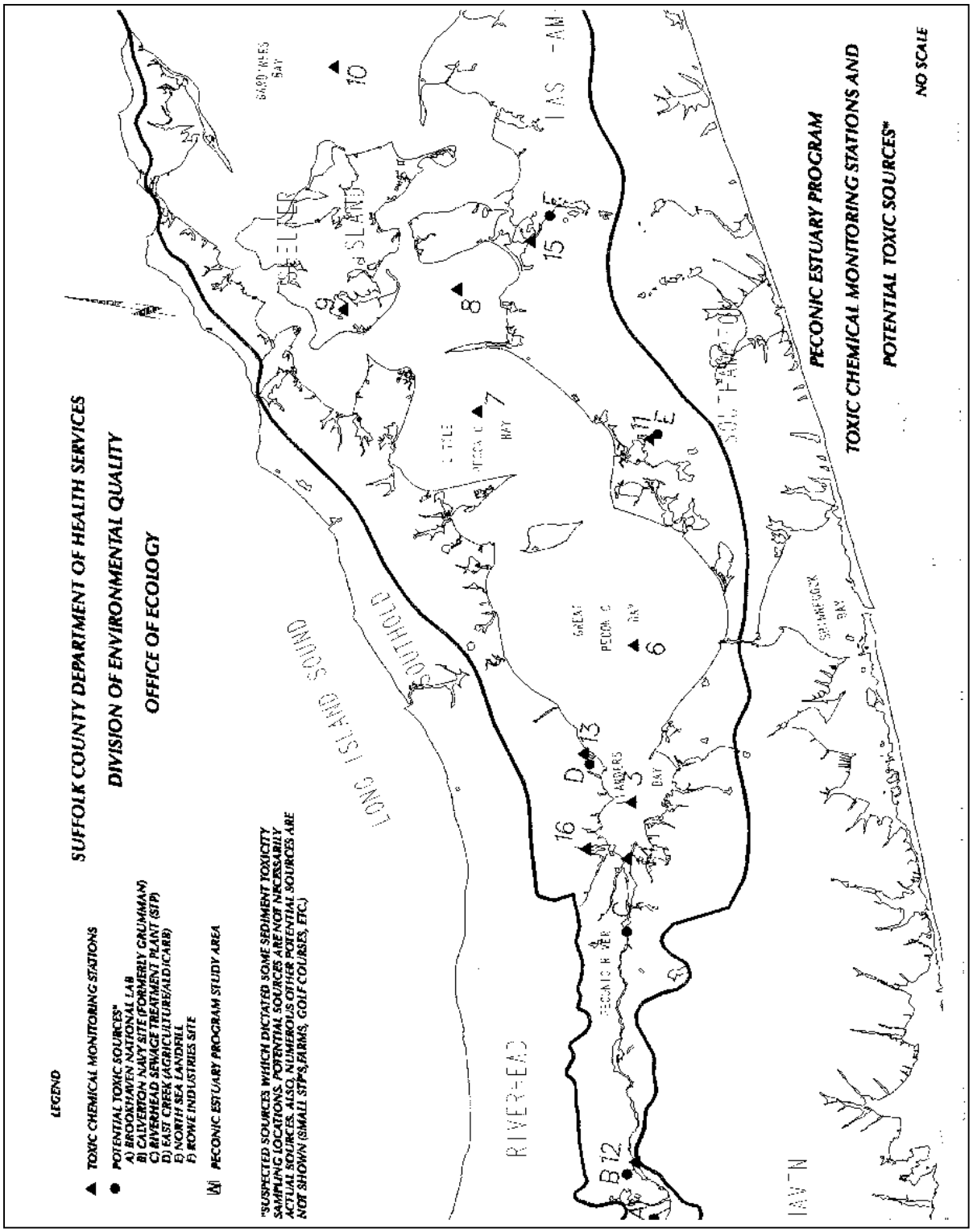

Figure 6-1. Toxic Chemical Monitoring Stations and Potential Toxic Sources.

Rowe Industries Site, Sag Harbor, NY

Remedies selected for this Superfund site include in-situ vapor extraction, soil excavation and disposal, treatment of contaminated groundwater, and long-term monitoring. The toxic contaminants of concern are volatile organic chemicals, tetrachloroethylene (PCE) and trichloroethylene (TCE). The soil that required excavation has been excavated and disposed of off-site. The in-situ vapor extraction system is presently being operated. The groundwater remedy is currently under construction.

The Federal Superfund hazardous substance cleanup program was created by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The Act authorizes the Federal government to respond to spills and other releases (or threatened releases) of hazardous substances, as well as leaking hazardous waste dumps. There are three Federal Superfund Sites on the National Priority List in the study area: the North Sea Municipal Landfill, Rowe Industries, and a portion of the Brookhaven National Laboratory Site. Two other sites in the PEP Study Area have been identified as inactive hazardous waste disposal sites by the NYSDEC -- Mattituck Airbase and the East Hampton Landfill Lagoons. These sites are not known to be impacting the Peconic Estuary and the State is addressing known and potential contamination problems.

Brookhaven National Laboratory (BNL), Upton, NY

Point source discharges at BNL include sanitary wastewater and cooling waters as well as wastewater from industrial-type activities. The BNL SPDES permit requires monitoring of effluents from industrial-type activities prior to discharge into the wastewater collection system. Information collected due to this monitoring requirement will be reviewed and considered when the BNL discharge permit comes up for renewal. EPA completed a Multi-Media Compliance Evaluation Inspection at BNL, beginning May 5, 1997. This comprehensive inspection evaluated BNL's compliance with statutory and regulatory requirements including the effectiveness of its treatment and disposal practices, pollution controls, operations and maintenance procedures, and self-monitoring/reporting records and practices. BNL has, as a result of the inspection, entered into a memorandum of agreement (MOA) to implement a facility-wide environmental management system, and EPA has issued enforcement orders to BNL for the violations found during the inspection.

As described in the MOA, it is both EPA's and U.S. Department of Energy's (DOE) objective that BNL be operated so as to maintain full compliance with applicable environmental requirements and to protect the environment and the health and safety of workers at the facility and the general public. While DOE as a generator of hazardous waste at BNL is subject to various legal requirements, the commitments in the MOA extend beyond such requirements and include a voluntary initiative on the part of DOE. The goal of these voluntary undertakings is to enhance environmental management at BNL through the development and implementation of an Environmental Management System (EMS) that is focused on environmental compliance and pollution prevention.

Specifically, BNL has agreed to develop and implement an expedited process evaluation of all experimental and industrial operations at BNL for the purpose of identifying all waste streams produced at the facility. The evaluation will also include determining the proper regulatory status of each waste stream to ensure the wastes are managed in accordance with applicable local, State and Federal environmental regulations and in such a manner as to pose no threat to the environment. The evaluation establishes a baseline of on-going BNL operations and will also be used to assess future activities. All experimental and industrial-type operations will be inventoried and pollution prevention/waste minimization and assessment/prevention/control opportunities will be identified, tracked and assessed for implementation.

Tritium Contamination

Concerns have been raised about possible tritium contamination from BNL in the Peconic River and adjacent areas with possible impacts to human health and the ecosystem, including possible implications regarding Brown Tide. However, the NYS Department of Health (NYSDOH) has estimated the potential radiation dose to a person to be small, less than one percent of the applicable standard in NYSDOH regulations, and less than 10 percent of the NYSDEC remedial action threshold. Radiation experts from EPA have reviewed the NYSDOH report and concur with the findings. This contamination is separate and distinct from the groundwater tritium plume detected in December 1996 associated with BNL's High Flux Beam Reactor (HFBR). The HFBR groundwater tritium plume is out of the Peconic Estuary Program Study Area. The Peconic Estuary Program will continue to involve radiation experts from the NYSDOH and EPA to assist in data interpretation and evaluation.

Actions under the Superfund Program Affecting the Peconic Estuary Study Area at Brookhaven National Laboratory

BNL has been placed on the Federal Superfund Site National Priority List. Because of the complexity of the site, it has been broken into several "operable units" (OU). OU V contains the portion of the site which influences the Peconic Estuary Study Area. The Superfund status is based on preliminary studies which indicate that contamination at BNL is impacting the Peconic River. A Remedial Investigation (RI) for OU V has been completed to characterize the nature and extent of contamination and identify areas that pose an unacceptable risk to human health and the environment. The conclusions drawn from the RI form the basis for the remedial action alternatives to be conducted. Surface soil, subsurface soil, groundwater, surface water, sediments, and fish tissue samples have been collected and analyzed as part of the remedial investigation process. Samples have been analyzed for a comprehensive list of inorganic, volatile organic, and semi-volatile organic substances, as well as for pesticides, PCBs, radionuclides, ammonia, phenols, and cyanide. The concern with respect to the Peconic Estuary watershed is elevated concentrations of metals in Peconic River sediments and other co-located contaminants including radionuclides. No significant off-site migration of these contaminants above sediment screening levels was found, aside from one depositional area just outside the Laboratory boundary on Suffolk County-owned property.

A baseline risk assessment was prepared to evaluate potential risks from exposure to contaminants in the absence of remediation. The baseline risk assessments conducted for Operable Unit V were reported in the Final Operable Unit V Remedial Investigation Report (May 27, 1998) and the Final Operable Unit V Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report (January 31, 2000), in which the risk assessment also includes all radiologic data included in the Remedial Investigation Report. The results from the combined studies are reflected in the proposed remedy. An ecological risk assessment was also performed to determine if any contaminants posed an unacceptable risk to ecological receptors. Ecological receptors include any plants and animals that could be exposed to contaminants now, or in the future.

In the spring of 2000, the DOE released a plan proposing a remedy for Operable Unit V at BNL. This Proposed Plan provides a description of site concerns and discussion of completed investigations, a summary of risk assessments performed, evaluations of remedial alternatives, and recommendations for the preferred alternative. This area includes BNL's sewage treatment plant and the headwaters of the western branch of the Peconic River.

The proposed remedy included excavating Peconic River sediment containing copper, mercury, and silver at concentrations above cleanup goals. PCBs and DDD are largely co-located with the elevated metals, and will be cleaned up during remediation of the metals. Radionuclides, mainly cesium-137

and low levels of plutonium, are below acceptable levels established by the United States Environmental Protection Agency (15 millirem/year above background), but will also be removed during sediment cleanup where they are co-located with the elevated metals. The sediment will be dewatered and shipped to a licensed off-site disposal facility. The proposed remedy also included a localized removal of soil at the Lab's sewage treatment plant and additional monitoring and characterization of contaminants in groundwater.

Soils in the sand filter beds and adjacent berms at the STP contain elevated levels of mercury, silver, chromium, lead and radionuclides as well. A best management practice, localized removal of soil contamination, is proposed to remove high levels of mercury and cesium-137. This removal of contamination will reduce the potential for leaching and subsequent migration to groundwater and the Peconic River and will reduce potential risks associated with cesium-137 in soils. Soils from the sand filter beds and berms exceeding cleanup goals would be removed through excavation. Excavated portions of the sand beds would be replaced with sand or gravel, and excavated areas on the berms would be backfilled with clean fill, compacted and graded. Excavated materials will be disposed of in a licensed off-site disposal facility.

Low levels of VOCs, primarily trichloroethene (or trichloroethylene, TCE) were detected in groundwater both on and off site. The highest concentration of TCE found on site was 32 parts per billion (ppb), and offsite levels had a maximum of 8.5 ppb (the drinking water standard is 5 ppb). These values are reported in the Remedial Investigation Report. A more recent sampling in 1999 found a maximum TCE concentration on site of 17 ppb and a maximum off-site concentration of 8.2 ppb. Tritium was found with maximum levels about one-tenth of the drinking water standard of 20,000 picoCuries per liter (pCi/l).

To be sure that the health of the residents located downgradient of OU V is protected, homes and businesses in the OU V area were offered public water in 1997. Outpost monitoring wells have been placed along the predicted path of the groundwater and additional monitoring data will be collected. If future monitoring data suggest a need for a groundwater remedy, the OU V remedy will be modified.

During the public comment period on the Proposed Plan, the community raised numerous concerns with the proposal to remove contaminated sediments from the Peconic River. The concerns included wetland restoration considerations; the exact extent of contamination, particularly in the County Park east of BNL; and other technologies. After considering all of the public comments, DOE has made a determination to work with the community to develop additional information regarding the best cleanup approach to the contaminated river sediments. DOE, EPA, and NYSDEC will make a final decision on the cleanup of the contaminated soil at the STP and the groundwater. The decision will be formalized in a document called the Record of Decision (ROD). Attached to the ROD will be a Responsiveness Summary, which will summarize public comments and DOE responses to those comments. Following final remedy selection, these documents will be available for public review. Finally, the public will be kept informed during the remedy implementation phase.

After DOE works with the community to resolve the concerns related to the sediment cleanup, a new Proposed Plan will be issued for public comment on the portion of the OU V remedy related to the Peconic River sediments.

Underground Storage Tanks

Leaks in excess of a thousand gallons from underground storage tanks are known to have occurred in the past in the Peconic Estuary, on Long Island, and nationally. The extent of these sources of pollution is potentially large because the contamination is underground and may go unnoticed for an extended period of time.

New York State law includes provisions for preventing spills of petroleum. These provisions require all facilities with a minimum capacity of 1,100 gallons to be registered, set forth standards for the handling and storage of petroleum, and set forth standards for new and substantially modified underground and aboveground storage facilities. Owners and operators must notify NYSDEC of any spills. Another State program addresses the requirements for the bulk storage of other hazardous substances, including the registration of storage tanks, spill reporting procedures and specifications for the sale and delivery of such substances.

Suffolk County sanitary code requirements (Article 12) are even more stringent than state requirements. The County law went into effect in 1980 and addresses all underground and aboveground tanks storing fuels, solvents, and chemicals, anything that could contaminate groundwater or surface water. New underground tanks are required to have secondary containment and be constructed of non-corrodible materials, and must have leak detection and overflow protection systems. All existing facilities had to be brought up to new construction standards by 1990.

The County law exempted existing tanks from the replacement requirement that were under 1,100 gallons and used for the storage of heating oil for on-premises use. However, new tanks of this type must be made of non-corrodible materials. The Financing chapter of this CCMP includes several recommendations regarding incentives for private homeowners to address this potential threat to groundwater and surface water.

Navy Weapons Industrial Reserve Plant (NWIRP) Site (Calverton, NY)

The NWIRP formerly engaged in the manufacture of aircraft parts and sub-assemblies. The facility has phased out all of its manufacturing process operations and the former operator of the property, the Northrop Grumman Corporation, vacated the property in February 1996. Since that time all property contained within the perimeter fence, with the exception of four parcels of land totaling approximately 350 acres which have been retained by the Navy to continue the installation restoration (IR) program, have been conveyed to the Town of Riverhead. There are no longer any process-type operations that generate hazardous waste conducted on the Navy's 350 acres. Any waste (solid or hazardous) generated will be the result of the continuation of the IR program. An initial assessment was completed by the Navy in 1986 and a site investigation has been completed. The site is currently being handled under the Federal Resource Conservation and Recovery Act (RCRA) corrective action program. Corrective action implementation includes a RCRA Facility Assessment, a RCRA Facility Investigation (RFI), and a Corrective Measures Study (CMS). If determined necessary, the State will issue a permit for carrying out corrective measures selected from the corrective measures alternatives evaluated in the CMS.

The RCRA Facility Assessment has been completed at this site for all identified solid waste management units/areas of concern (SWMUs/AOCs). The RFI has been completed for a majority of the SWMUs/AOCs identified with contamination. The RFI process is still in progress at eight SWMUs/AOCs. Solvents including toluene, 1,1,1 trichloroethane (TCA), and methyl ethyl ketone (MEK or 2 butanone) have been identified by the State as of concern in groundwater. The most recent permit for this facility was issued on April 24, 2000 and will expire on April 30, 2010.

The (Bulova) Watch Case Factory Site (Sag Harbor, NY)

At this site, New York State is requiring continued operation of ongoing soil and groundwater remediation systems to treat VOCs. The VOCs include 1,1,1-trichloroethane (TCA) and trichloroethylene (TCE) which were the solvents used in intermediate cleaning operations during watch manufacturing. A fate and transport model demonstrated that chemicals at the site are not anticipated to impact Sag Harbor Cove. The treatment systems will operate until remediation goals are achieved or it is demonstrated to the State that achieving the goals is not technically practicable.

Plum Island Animal Disease Center

The Plum Island Animal Disease Center surface water discharge to the Peconic Estuary System consists of a wastewater treatment plant, which includes boiler blowdown and diked tank farm stormwater discharges. The wastewater treatment plant effluent is disinfected by ultraviolet light (UV) treatment process. This facility also has a separate general stormwater permit for the other stormwater outfalls that discharge to surface waters. The permit for this facility includes a special condition requiring the development and implementation of a Best Management Practices Plan to prevent or minimize the potential for the release of significant amounts of toxic or hazardous substances through runoff, spillage, leaks, sludge or waste disposal, and stormwater discharges, including but not limited to drainage from raw material storage.

CHARACTERIZATION OF THE RESOURCES OF THE PECONIC ESTUARY WITH RESPECT TO TOXICS

The characterization of the resources of the Peconic Estuary with respect to toxics is based on an analysis of existing and new data on toxics in the estuary's surface water, groundwater, sediments, and living resources, along with information that has been collected on specific areas of concern (such as Superfund sites). To supplement historical data and data collected through other environmental studies (*i.e.*, pesticides in groundwater), the Peconic Estuary Program commissioned a study of toxic chemical distributions in Peconic Estuary sediments for 12 sites that was completed in 1996. In 1998, the EPA conducted a survey of sediments from 34 tidal creeks and embayments. The sediments in this later study were evaluated both for chemical specific contamination and overall toxicity to a marine organism ("toxicity testing"). EPA conducted additional sediment sampling for chemical specific analyses and toxicity testing in 2000. In 1999, EPA collected finfish, shellfish and crustaceans and will be analyzing the edible portions for toxic substances, including radiological contaminants. "A Characterization of the Resources of the Peconic Estuary with Respect to Toxics" (PEP, January 2001) may be consulted for additional information and detail.

Some toxic substances, which enter the estuarine system break down fairly rapidly and cause few, if any, problems. Others tend to be very slow to break down, often accumulating in bottom sediments, where they may eventually be ingested or absorbed by bottom-dwelling organisms. Some toxic substances have a tendency to travel through the food chain and accumulate in the tissues of finfish, shellfish and crustaceans. For these reasons, the emphasis of the recent sampling efforts for toxics in the Peconic Estuary involved investigations of sediments and tissues of aquatic animals.

Surface Water Quality

Monitoring for toxics in the estuarine water column has occurred on a limited basis in the Peconic Estuary System. Detailed new investigations have focused on sediments and fish tissues where toxics tend to accumulate. The available data show no exceedances of State water quality criteria for toxics. Therefore, there are no identified surface water quality impairments due to toxics in the estuarine water column.

Data analysis has, however, indicated widespread contamination of groundwater from Aldicarb (nematocide used on potato plants), particularly along the North Fork. Aldicarb also has been detected in the surface waters of East Creek and other North Fork Creeks. While Aldicarb is no longer in use, its presence in surface waters is likely due to inputs from groundwater. Another emerging concern is MTBE (methyl *tert*-Butyl Ether) which has been showing up in surface water samples, including Sag Harbor Creek near Havens Beach (perhaps related to an active recovery operation nearby), the Peconic River, and other surface waters.

In 1997, New York State and the U.S Geological Survey began a cooperative effort to monitor pesticides in State waters, including one station in the Peconic Estuary watershed on the Peconic River. Samples were analyzed for 47 pesticides, including herbicides, insecticides and their degradation products. The pesticide concentrations measured in this survey probably do not reflect maximum annual concentrations because most of the samples were collected during base flow (low-flow) conditions. While no pesticides with available water quality criteria were identified present in excess of the applicable criteria, the pesticides atrazine and simazine were detected in surface water samples (USGS, 1997).

Some trace metals analysis has been performed on Peconic Estuary waters (see *Distribution of Trace Metals and Dissolved Organic Carbon in a Brown Tide Influenced Estuary: The Peconics*, E. Breuer, May 1997). Although results for the metals sampled for which New York State has adopted and EPA has approved aquatic life based water column criteria (cadmium, copper, lead, nickel, and silver) showed evidence of anthropogenic (man-made) inputs, they did not exceed the established criteria.

Observed radiological measurements in the freshwater portion of the Peconic River have been compared to safe drinking water standards, even though the Peconic River is not used as a source of drinking water. While the tritium concentration in a few samples exceeded the drinking water standard, the annual average concentrations have consistently been less than the drinking water standards.

Sediment Quality

Under the Peconic Estuary Program, sediments from 12 locations were sampled for the presence of 98 naturally occurring and man-made substances (Arthur D. Little, 1996). Five stations were selected to characterize “main bays” water quality. The other seven were chosen because of specific management concerns.

In this study, pollutant concentrations were compared to “Effects Range-Low” (ER-L) and “Effects Range-Median” (ER-M) values developed by NOAA. ER-L values generally correspond to concentrations below which contaminant induced effects are unlikely. Values at or above ER-M levels indicate that contaminant induced effects are likely. None of the samples collected exceeded ER-Ms. Some ER-Ls were exceeded, which indicates the need for actions to reduce sources to prevent problems in the future. Sediments with levels above the ER-L tended to be in sheltered bays

Table 6-2. Summary of New York State Health Advisories for Chemicals in Sportfish and Game Applicable to the Peconic Estuary System.

For additional and related information on these advisories, please consult the complete text of the NYSDOH Chemicals in Sportfish and Game, available from the NYSDOH or on the NYSDOH web site on the Internet at http://www.health.state.ny.us.

Species	Advisory	Potential Toxic(s) of Concern	Applicable Areas
Lobster and Crab	Do not eat hepatopancreas (also known as the tomalley, mustard, or liver)	Cadmium, PCBs, and other contaminants	All marine waters of the State
Marine Striped Bass, Bluefish, and American Eels	Limit consumption to no more than ½ pound per week	PCBs[a]	Peconic Bay, Gardiners Bay, and Block Island Sound
All Freshwater Fish	Limit consumption to no more than ½ pound per week	Multiple contaminants	All fresh waters of the State
Waterfowl: Mergansers	Do not consume	PCBs, mirex, chlordane, and DDT	Statewide
All Other Waterfowl	Skin and remove all fat before cooking; discard stuffing after cooking; limit to two meals per month	PCBs, mirex, chlordane, and DDT	Statewide
Snapping Turtles	Remove fat, liver, and eggs prior to cooking meat or preparing soup; women of childbearing age, infants, and children under 15 should avoid eating snapping turtle meat or soups made with their meat.	PCBs	Statewide

[a]The source of PCBs leading to this advisory is not in the Peconic Estuary system and, therefore, management actions addressing this concern are not included in this CCMP.

and harbors in the vicinity of rivers where fine-grained sediments and decaying organic matter tend to accumulate. ER-Ls for metals were exceeded 18 times (based on 12 stations and 9 metals with available ER-L values). Two metals, arsenic and lead, accounted for 10 of the exceedances of the ER-Ls. The other metals are copper, mercury, silver, cadmium and zinc. Overall, the Peconic Estuary has clear instances of elevated metal concentrations, especially in East Creek and Meetinghouse Creek. There is the potential for occasional adverse biological effects due to the presence of metals in sediments. Pesticide concentrations in sediments were low, except DDT residues, which were present in some locations. This is very likely due to the drainage of agricultural areas containing persistent residues of DDT. DDT was banned from use in the United States in the 1970s.

The total PCB concentrations at Meetinghouse Creek exceeded the ER-L. This measurement, when compared to the other PCB measurements in Peconic Estuary sediments, suggests a potential localized source of PCBs to Meetinghouse Creek.

Endocrine Disruptors

Injury to endocrine function by environmental contaminants is potentially debilitating to a variety of physiological systems. The endocrine system in animals consists of glands that produce hormones that enter the bloodstream to regulate important bodily functions such as growth, development, reproduction, and behavior. Previous studies have found correlations between specific impairments of reproductive activity and elevated tissue concentrations of certain contaminants. These contaminants may mimic or block endocrine system processes, potentially affecting critical bodily functions. The reproductive injuries reported to date include: reduced fertility; impaired hatchability and viability of offspring; impaired reproductive hormone activity; and altered sexual development and behavior. There are also reports of slow growth, atrophy, and lower rates of metabolic behavior. At least 45 chemicals have been identified as potential endocrine disrupting contaminants, including industrial contaminants (such as polychlorinated biphenyls (PCBs) and dioxins), insecticides (such as DDT) and herbicides (such as dichlorophenoxy acetic acid (2,4-D) and atrazine).

At the present time, environmental criteria are not being derived specifically to take into account endocrine disruption impacts. It is possible that these effects may occur when contaminant concentrations are below current criteria and standards.

In 1998, the EPA collected sediments for analysis under the "Peconic Estuary Tributaries Sediment Toxics Survey." Locations were selected to be representative of the typical land uses in the estuary (undeveloped, developed residential, agricultural, mixed-use urban/industrial). A total of 34 sites were selected. The samples consisted of a composite of equal grab samples collected from three locations at each sampling site. Sediments were analyzed for a total of 108 toxic contaminants, including PCBs, PAHs, pesticides, and metals. In addition to the analysis for individual chemical constituents, the sediment was evaluated for overall sediment toxicity using the marine amphipod *Ampelisca abdita*. These toxicity tests lasted l0 days and the endpoint measurement is mortality. Toxicity testing is a valuable gauge because the results provide an assessment of the overall toxicity resulting from exposure to multiple contaminants.

A complete report is not yet available for the chemical-specific results of the EPA Tributaries Sediment Toxics Survey. A majority of the analysis results, which have been subjected to a quality assurance crosscheck, are available, and some preliminary observations can be made. The preliminary results for metals are comparable with the A.D. Little Toxics Survey (1996), and as in that survey, some ER-Ls for metals were exceeded, most noticeably for arsenic, but also for mercury and copper, and perhaps silver. In addition, Meetinghouse Creek sediments exhibited the only ER-L exceedances of zinc, copper, and nickel. No ER-M values for metals have been exceeded at those stations for which data are available. Also similar to the A.D. Little Toxics Survey, levels of the pesticide DDT and its breakdown products (DDD and DDE) in excess of the ER-L were observed in numerous locations. This included one station, Jockey Creek, where the level of DDT exceeded the level of its breakdown products, suggesting an ongoing or

Testing of dredged material for toxic substances is required only under certain conditions (depending on factors including: volume; make up of the material (i.e., percent sand); place of origin; likelihood of contamination; and proposed placement location). Typically, there are betweexn 50 and 100 permit applications approved per year in the Peconics involving dredging and dredged material placement. Generally, dredged material from the Peconic Estuary consists of coarse-grained sandy material, and testing for the presence of toxics has not been required.

continuing source or application of DDT. The individual levels of DDD and DDE in Sawmill Creek exceeded the ER-M for total DDTs. Because of the special nature of the DDT-related results for Jockey Creek and Sawmill Creek, these sites have been referred to the NYSDEC for further investigation. An analysis of the EPA sampling results for PCBs and PAHs has not been completed. A final complete report on chemical-specific results with a rigorous analysis of the data is being prepared by the EPA.

A final report on the sediment toxicity testing results, for the 34 sites tested, is available (Sediment Toxicity Testing in the Peconic Estuary/Watershed Using the Amphipod, *Ampelisca abdita,* EPA Region II, August 1998). The survival rate was relatively high across all stations, from 76 percent to 97 percent. A percent survival result of less than 80 percent can indicate some toxicity, and this result occurred at five stations: Little Bay (76 percent), Paynes Creek (78 percent), West Neck Bay (78 percent), Sag Harbor STP (79 percent), and Northwest Creek (79 percent). Paradoxically, the stations with the highest survival rates included sites which had some of the most frequent incidences of exceedances of ER-Ls for metals. The five stations with the highest *Ampelisca* survival rates were: the Peconic River at Riverhead (97 percent), Downs Creek (96 percent), Reeves Creek (95 percent), Meetinghouse Creek (95 percent) and Peconic River at the STP outfall (94 percent). These results illustrate the importance of investigations involving both chemical-specific analyses and overall toxicity testing in assessing sediment quality. The toxicity testing results will be further assessed in light of the results on the chemical-specific report now under preparation. EPA conducted additional sediment sampling for toxicity analyses in 2000. Results of this sampling will be available in 2001.

Finfish, Shellfish and Crustacean Quality

Based upon the relative paucity of data available on the concentrations of toxics in the living resources of the Peconic Estuary, EPA initiated a "Peconic Estuary Fish, Shellfish and Crustacean Toxics Survey." The objectives of this survey were to:

- Determine whether the toxic compounds identified by the NYSDOH as being important for the issuance of human health advisories for the consumption of aquatic species are relevant in edible tissues of selected fish and shellfish, and tissues and hepatopancreas (tomalley) of selected crustacean species in the Peconic Estuary;
- Assess and compare concentrations of toxics identified by the NYSDOH as being important for the issuance of human health advisories in legal sized finfish, shellfish, and crustaceans in open areas or tributaries, as applicable to a given species, for the four Peconic Bays and selected tributaries;
- Assess and compare the general quality of representative open and closed shellfish areas in creeks of the Peconic Estuary with respect to toxics in hard clams;
- Assess and compare the general quality of representative open shellfish areas in creeks of the Peconic Estuary with respect to toxics in bay scallops; and,
- Evaluate whether radiochemicals associated with Brookhaven National Laboratories are present in blue crabs and fluke above background (reference site) levels.

The species that were collected for analysis included: striped bass (bluefish and weakfish were alternate species), American eel, fluke/summer flounder (bluefish and weakfish were alternative species), hard clams, bay scallops, blue crabs, and lobsters. Samples will be analyzed for a comprehensive suite of toxic chemicals including metals, pesticides, PCBs, dioxins, furans, as well as

radiological isomers of strontium, cesium, and plutonium and gross alpha, beta, and gamma radiation. The complete results of this survey should be available in 2001.

NOAA's Mussel Watch Program includes one sampling site in the Peconic Study area (in Gardiners Bay). While samples from mussels from Gardiners Bay did not show concentrations of chemicals exceeding public health guidelines, concentrations of dieldrin and PAHs were identified as "high" relative to concentrations in other locations, though NOAA reported there is no reason to suppose such concentrations cause harm to marine organisms or to humans.

Dredged Material Quality

At the present time, no restrictions have been placed on the placement of dredged material from the Peconic Estuary due to the presence of toxic substances. All dredged material from the Peconic Estuary presently is put to beneficial use, such as beach nourishment or wetland restoration, or is otherwise placed upland (*i.e.*, above the spring high tide water line).

Groundwater Quality

Significant pesticide contamination of groundwater resources in the Peconic Estuary watershed has been found in connection with at least two recent studies. One, entitled *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (June 1999) relates to an 18-month study conducted by the SCDHS in cooperation with the NYSDEC. The second study is entitled *Pesticides and their Metabolites in Wells of Suffolk County, New York 1998* (June 1999) and was conducted by the USGS in cooperation with the NYSDEC.

Pesticides and their Metabolites in Wells of Suffolk County, New York 1998 (June 1999)

As described in this report, the permeable soils in Suffolk County make the surficial sand-and-gravel aquifer highly susceptible to contamination from activities on the land surface. This highly permeable aquifer is a source of water for domestic and public supply systems in the county and is hydraulically connected to underlying aquifers that are also used for public water supply. Because of this vulnerability and the importance of the surficial sand-and-gravel aquifer and in response to the documented contamination of the surficial aquifer by Aldicarb in the early 1980's, the SCDHS established a groundwater monitoring program for pesticides and other chemicals of concern. The SCDHS has consistently demonstrated the presence of older persistent residues from pesticides like Aldicarb, which are no longer used on Long Island. In a joint study conducted by USGS, NYSDEC and SCDHS, wells (including water supply wells) with known or suspected pesticide residues were sampled. The primary purpose of this study was to supplement the SCDHS monitoring program. Because all of these samples were from raw, untreated water from the surficial aquifer, the results are not representative of chemical characteristics of drinking water.

Pesticides monitored included many of the most commonly used pesticides in the country. The laboratory methods used to analyze the samples collected had lower detection limits for many pesticides than do the methods used by SCDHS. Because this study was intended to complement the SCDHS program, however, many pesticides that are commonly detected by the SCDHS (including Aldicarb and its degredates) were not investigated. Thus, the results do not represent a complete description of all pesticide residues in groundwater in Suffolk County. The report presents data on the concentration and frequency of detection of the 60 pesticide residues monitored and discusses the

concentrations in relation to Federal and State water quality standards. The report also relates the detection of selected herbicide residues to the predominant land use around 50 wells sampled and discusses the concentrations of these residues in relation to one another.

Of the 60 pesticide residues monitored, 25 were detected. Five of these were insecticides or insecticide metabolites (*i.e.*, pesticide breakdown products). At least one pesticide or metabolite was detected in 44 of the 50 samples. Some samples contained as many as 11 different pesticides or pesticide metabolites. Many of the compounds had not been previously monitored. The data collected indicated that some pesticides that are commonly monitored by the SCDHS are present at trace levels, well below the level of detection provided by the laboratory analytical methods used by the SCDHS. The concentrations of only a few compounds detected in the samples collected exceeded applicable State or Federal water quality standards. However, no Federal drinking water standards have been established for many of the pesticides and pesticide metabolites that were detected.

Comparison of the presence of seven frequently detected herbicides or herbicide metabolites with land use around the wells indicates that the occurrence of these pesticides is related to land use, such as weed control associated with agricultural production and at utility substations and utility rights-of-way, and possibly residential uses.

The 25 pesticide residues that were detected are as follows:

> Insecticides: p,p,-DDE; Carbofuran; Dieldrin; Carbaryl; Lindane.
> Herbicides: Atrazine; Simazine; Deethylatrazine; Metolachlor; Metolachlor ESA; Metolachlor OA; Tebuthiuron; Deisopropylatrazine; Metribuzin; Prometon; Alachlor; Alachlor ESA; EPTC; Linuron; Trifluralin; 2,6-Diethylanaline; Alachlor OA; Cyanazine; Hydroxyatrazine; Terbacil.

Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY (June 1999)

As stated in this report, the goal of this study was to obtain water quality information across the full geographic area of both Nassau and Suffolk Counties. The main objective of the sampling program was to identify pesticides and metabolites that leach to groundwater and to help define where these pesticide impacts have occurred. The sampling program was not randomly conducted. In addition to obtaining the geographic coverage needed, specific areas thought to be vulnerable to pesticide impacts were targeted by the testing program. The results of the testing are representative only of the specific locales tested, and should not be considered representative of groundwater quality in all areas. The sampling program was conducted by collecting groundwater samples from monitoring wells, private domestic wells, and public supply wells, and analyzing them for a wide range of pesticide and metabolite compounds. In cases where a public or private well contained water treatment, only the raw water was sampled for this project. A total of 2,306 samples were collected and analyzed for this project, including 1,901 from Suffolk County. Fifty percent of the samples were collected in Suffolk's five eastern towns to determine pesticide impacts to private wells and because the region contains the bulk of Long Island's agricultural acreage.

Pesticides were found in every type of well tested, and were detected at levels exceeding drinking water Maximum Contaminant levels (MCLs) in all well types. All of the community supply wells found to exceed MCLs were either removed from active service or fitted with granular activated carbon filtration for contaminant reduction.

The results indicate that 89 percent of the wells exceeding pesticide related MCLs are located in Suffolk's five eastern towns, that is 15.4 percent of the wells tested in eastern Suffolk exceeded an MCL. Private wells in agricultural areas of Suffolk's five eastern towns are at the highest risk of pesticide contamination, with 50.5 percent (324 of 642 wells tested) containing detections of pesticides. The data show that 30 different pesticides (including metabolites) were detected in (western and eastern) Suffolk wells. Ten pesticides (in Nassau and Suffolk) exceeding drinking water MCLs are now banned from use on Long island due to concerns of potential adverse health effects and ability to leach to groundwater. Banned or discontinued pesticides accounted for 88 percent of the wells that exceeded MCLs. The stability and persistence of pesticide residues in Long Island groundwater is clearly demonstrated by the fact that six of the 10 chemicals found to exceed drinking water MCLs have been banned from sale or use for 10 to 20 years.

Due to the movement of groundwater, and the migration of contaminants with it, private wells located hundreds to thousands of feet downgradient of the points of likely chemical applications, were found impacted by agricultural pesticides. Groundwater impacts resulting from pesticide use at golf courses were examined by testing 31 wells located at 18 Long Island golf courses. One pesticide/pesticide metabolite was found above the MCL in the golf course monitoring, in one well in each county. The monitoring results indicate that turf management practices can effectively control impacts to groundwater at golf courses. The implementation of Best Management Practices can even further reduce the levels of pesticides found in the groundwater.

The SCDHS has done a follow-up study of golf courses with an expanded list of analytes and with new monitoring wells at five more courses in the county, including Shinnecock, National, and Maidstone. Preliminary data suggests that a few low concentrations of pesticides exist. The NYSDEC has been funding the monitoring program for three years at about $100,000 per year.

The pesticide chemicals detected in Suffolk County Wells were:

> alachlor; aldicarb sulfoxide+sulfone; arsenic; atrazine; bis 2-ethylhexyl phthalate; cadmium; carbofuran; 2,4-D; dicamba; 1,2 dichloroethane; 1,2 dichloropropane, 1,3 dichloropropane; dieldrin; dinoseb; ethylene dibromide (EDB); endosulfan sulfate; ethofumesate; MCPP; metalaxyl; methomyl; metolachlor; metribuzin; 4-nitrophenol; oxamyl; prometon; propachlor; simazine; tebuthiuron; tetrachloroterephthalic acid; 1,2,3-trichloropropoane

(Note: In this study chlordane and propoxur were detected in Nassau, but not Suffolk, County wells).

Environmental Impacts in the Peconic Estuary Study Area Associated with Brookhaven National Laboratory (see Figure 6-2)

New York State Department of Health Sampling

Water, sediment and fish samples taken from the Peconic River outside of BNL, as part of the New York State Department of Health monitoring program, contain measurable levels of different radioactive materials. The detected radioactive materials included tritium (H-3), cobalt-60 (Co-60), strontium-90 (Sr-90), cesium-137 (Cs-137), and americium (Am-241). The observed concentrations of these radionuclides are more than can be attributed to fall-out (from above ground atomic weapon tests). This indicates that discharges from BNL have contributed to these observed concentrations. The radiation dose from the observed radionuclide concentrations in fish is small. At less than one millirem per year, the average committed effective dose equivalent from radioactive materials that

Table 6-3. Pesticide Chemicals Detected in Suffolk County Wells in Two Recent Studies.

Pesticide Chemical	***Pesticides and Their Metabolites in Wells of Suffolk County, New York 1998* (June 1999)***	***Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (June 1999)**
Alachlor	X	X
Alachlor ESA	X	
Alachlor OA	X	
aldicarb sulfoxide+sulfone		X
arsenic		X
atrazine	X	X
bis 2-ethylhexyl phthalate		X
cadmium		X
Carbaryl	X	
carbofuran	X	X
Cyanazine	X	
2,4-D		X
p,p,-DDE	X	
Deethylatrazine	X	
Deisopropylatrazine	X	
dicamba		X
1,2 dichloroethane		X
1,2 dichloropropane		X
1,3 dichloropropane		X
dieldrin	X	X
2,6-Diethylanaline	X	
dinoseb		X
ethylene dibromide (EDB)		X
endosulfan sulfate		X
EPTC	X	
ethofumesate		X
Hydroxyatrazine	X	
Lindane	X	
Linuron	X	
MCPP		X
metalaxyl		X
methomyl		X
metolachlor	X	X
Metolachlor ESA	X	
Metolachlor OA	X	
metribuzin	X	X
4-nitrophenol		X
oxamyl		X
prometon	X	X
propachlor		X
simazine	X	X
tebuthiuron		X
Terbacil	X	
Tebuthiuron	X	
tetrachloroterephthalic acid		X
1,2,3-trichloropropoane		X
Trifluralin	X	

*Because this study was intended to complement the SCDHS program, many pesticides that are commonly detected by the SCDHS (including aldicarb and its degredates) were not investigated in this study.

may be attributed to releases from BNL is less than one percent of the established New York State limit of 100 millirems per year. The projected radiation dose from Sr-90 and Cs-137 contamination in the river is less than 10 percent of the New York State guidance value for remedial action, and therefore no remedial action to reduce contamination in the Peconic River is called for. The overall trend of the concentration of Sr-90 and Cs-137 in fish shows a decrease with time.

Brookhaven National Laboratory Sampling

BNL is a DOE laboratory conducting research in physical, biomedical, and environmental sciences, as well as in selected energy technologies. Brookhaven Science Associates, a not-for-profit research management organization, operates BNL under a contract with DOE. In 1980, the BNL site was placed on the NYSDEC list of Inactive Hazardous Waste Disposal Sites. In 1989, it was included on EPA's National Priorities List of Superfund sites. BNL's inclusion on the Superfund and NYSDEC lists was primarily due to the effects of discontinued past operations, which could impact Long Island's sole source aquifer, the Island's sole primary drinking water source.

As reported in the *Proposed Plan for Operable Unit V: Peconic River/Sewage Treatment Plant* (BNL, February 9, 2000) BNL has a total of 29 Areas of Concern. To ensure effective management of them, these areas were grouped into six distinct Operable Units (see **Figure 6-3**). Only Operable Unit V potentially influences the Peconic Study area. Operable Unit V consists of three Areas of Concern: the Sewage Treatment Plant (AOC 4)) (**see Figure 6-4**); Capped and Retired Formerly Leaking Sewer Pipes within the Operable Unit (AOC 21); and the Former Eastern Tritium Plume (AOC 23). The Sewage Treatment Plant AOC includes Peconic River sediment and surface water, the soils in the area of the Sand Filter Beds, Hold-up Ponds, and the Satellite Disposal Area.

An OU V Remedial Investigation was conducted to identify the nature and extent of soil, sediment, groundwater, and surface water contamination. The investigation included geophysical and biological surveys; sampling of soil, groundwater, surface water, and sediments; chemical and radiological analyses; benthic invertebrate toxicity testing; fish bioaccumulation studies; data validation; and preparation of the Remedial Investigation and Risk Assessment Report. Subsequent to the final Remedial Investigation report, BNL conducted a more comprehensive sampling of soils, sediment, and water for plutonium, uranium, and other radionuclides. The results of this study are presented in BNL's *Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report* (January 21, 2000).

State and Federal standards, criteria and guidance values were reviewed to evaluate the nature and extent of contamination in soil, sediment, groundwater and surface water. Screening criteria used to identify contamination were derived from these requirements. These screening criteria are given in the *Operable Unit V Remedial Investigation and Risk Assessment Report.* The principle contaminants that have been released to the STP include metals, solvents, and radionuclides. Elevated levels of metals and PCBs, and low levels of pesticides and radionuclides, were detected in Peconic River sediment. Concentrations were highest in on-site surface sediments and most prominent in the on-site depositional areas located approximately 0.5 mile, 1 mile, and 1.5 miles downstream of the STP. The following is a summary of the range of contaminants found in the Peconic River sediments, STP soils, fish, sludge inside and soils surrounding the retired and capped sewer lines, and groundwater.

Peconic River Sediments: Fourteen inorganic contaminants were detected at concentrations greater than the sediment-screening levels (see **Figure 6-5**). Of these, the metals mercury (maximum 24.5 mg/kg), silver (maximum 171 mg/kg), and copper (maximum 1140 mg/kg) were detected most often, and at the highest concentrations above the screening level. Other analytes detected at concentrations

above the screening level included the PCB Aroclor-1254 (maximum 1.5 mg/kg), DDD (maximum 0.096 mg/kg), DDE (maximum 0.089 mg/kg), alpha-chlordane (maximum 0.073 mg/kg), gamma-chlordane (maximum 0.043 mg/kg), and endosulfan (0.018 mg/kg). Contamination was highest in surface sediments and was most prominent in a depositional area approximately one mile downstream of the STP.

Cesium-137, americium-241, and plutonium 239/240 were found at higher activities in the Peconic River sediments than in the reference sediment samples collected from the Connetquot River, a river with similar characteristics as the Peconic River and outside the influence of the BNL site. The maximum cesium-137 concentration in sediments on site was 21.1 picoCuries per gram (pCi/g). The maximum americium-241 and plutonium-239/240 concentrations were also found on-site at 1.91 pCi/g and 0.158 pCi/g, respectively. Similar to the inorganic contaminants, the low-level radionuclides detected were highest in the surface sediments and were most prominent in a depositional area approximately 1 mile downstream of the STP.

Sewage Treatment Plant Soils: Surface soils and subsurface soils in, or in the vicinity of, the STP (including the sand filter beds and related berms) were found to contain elevated levels of several inorganic constituents including mercury, silver, copper, chromium, lead, zinc, and thallium. The maximum concentrations were 15.1 milligrams per kilogram (mg/kg) for mercury, 112 mg/kg for silver, 80.7 mg/kg for copper, 157 mg/kg for chromium, 95.5 mg/kg for lead, 60.7 mg/kg for zinc, and 1.2 mg/kg for thallium. Elevated levels were concentrated in the top 6 inches and did not extend beyond a depth of 3 feet.

In the soils of the sand filter beds and berms, the most frequently detected radionuclides were naturally occurring uranium-233/234 and uranium-238; all detected activities of both were within the range of background. Plutonium was detected less frequently, and at low activities. The maximum activity of plutonium-239/240 in the berms was 7.31 pCi/g, and in the sand filter beds was 0.399 pCi/g. The radionuclide with the highest levels was cesium-137; its levels were highest in the berms and areas adjacent to the sand filter-beds, with a maximum concentration of 98.8 pCi/g. Americium-241 was highest in the sand filter beds with a maximum concentration of 3.74 pCi/g. Generally, the activities of the radionuclides were highest in the top one foot of soil.

Peconic River Fish: Fish collected from the Peconic River headwaters had bioaccumulated PCBs (the average Aroclor-1254 concentration in fish on site was 1.8 mg/kg). Naturally occurring uranium radionuclides were detected in some of the fish samples, with highest activities in the inedible portions of the fish. The radionuclide cesium-137 was detected most frequently. It was found in higher concentrations in fish collected on-site, and generally in slightly higher concentrations in the flesh and skin than in the bone and viscera. The highest activity of cesium-137 in fish was in a whole-body sample of pickerel taken on site (2.712 pCi/g).

Sludge and Soil (retired and capped sewer line): The Laboratory sampled soils surrounding the areas where leaks were identified along the retired and capped sewer line during the Operable Unit V investigation. The results of the investigation identified only a few areas with low concentrations of inorganic constituents. This indicates that the sewer line leading to the STP is not a likely source of significant contamination to the surrounding soils. The formerly leaking pipes in Operable Unit V were replaced in 1993. As part of a more recent investigation, sludge was collected from the bottom of manholes along the retired and capped sewer line and analyzed for radionuclides. The results identified elevated activities of a few radionuclides. Americium-241 and cesium-137 were found at the highest activities relative to screening levels, and plutonium was detected, generally at low levels.

Groundwater: Current groundwater sampling results indicate that levels of tritium in the groundwater are well below the drinking water standard. The highest concentration of trichloroethene (TCE) found on site during the Remedial Investigation was 32 ppb. Maximum off-site levels were 8.5 ppb, slightly greater than the drinking water standard of 5 ppb. Concentrations of VOCs are decreasing in magnitude. A more recent sampling in 1999 found a maximum TCE concentration on site of 17 ppb and a maximum off-site concentration of 8.2 ppb.

The elevated levels of TCE in groundwater off site were found at depths (200 feet) below the depths at which residential wells are typically screened, and public exposure to TCE in groundwater is unlikely. Homes and businesses in the Operable Unit V area were offered public water in 1997. Seventeen new monitoring wells have been installed as outpost wells on the eastern perimeter of the public water hookup area. Monitoring of contaminants in groundwater will continue.

Both soil and groundwater samples were collected in the area of the Hold-up Ponds during the investigations, and no evidence of leakage was found. No further action is planned and these ponds will remain as part of the operating Sewage Treatment Plant. A groundwater monitoring network will be put in place as part of the Lab's Groundwater Improvement Program (Phase II) to assure continued effectiveness of the Hold-up Ponds.

Extensive sampling and exploratory excavations were conducted at the Satellite Disposal Area and no evidence of contamination was found. In 1985, bromine trifluoride cylinders and two boxes of laboratory chemicals were removed from the Satellite Disposal Area. No additional remediation is planned for this area.

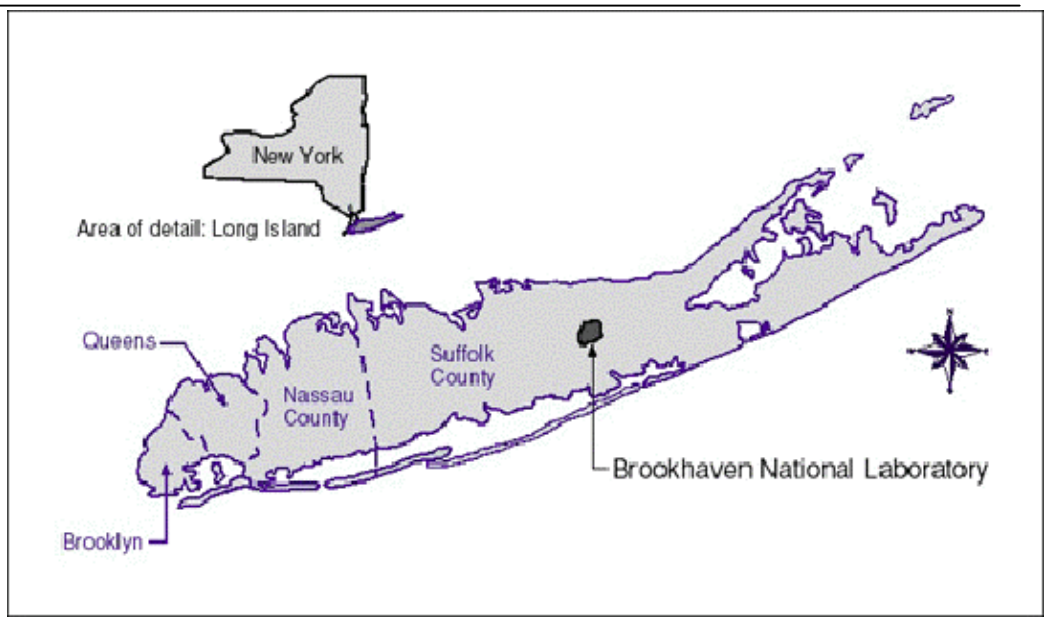

Figure 6-2. Brookhaven National Laboratory's Location with Respect to New York State and Long Island (from *Proposed Plan for Operable Unit V: Peconic River/Sewage Treatment Plant, Brookhaven National Laboratory* (BNL, February 9, 2000)).

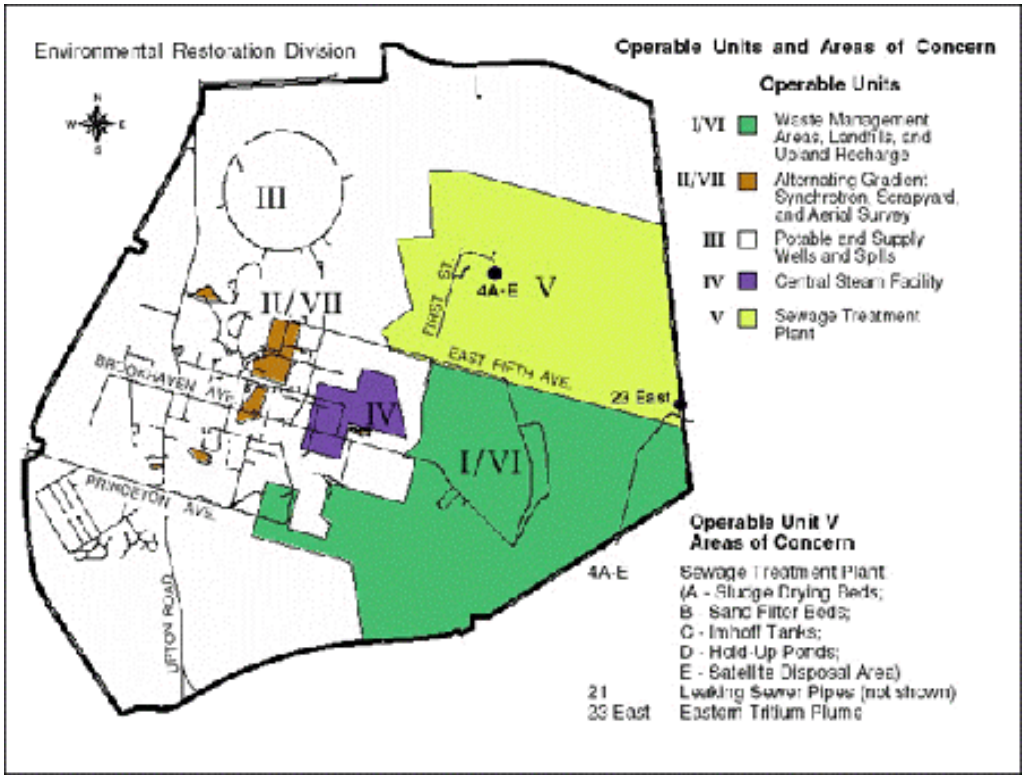

Figure 6-3. Brookhaven National Laboratory's Six Operable Units and OU V Areas of Concern (from *Proposed Plan for Operable Unit V; Peconic River/Sewage Treatment Plant, Brookhaven National Laboratory* (BNL: February 9, 2000)).

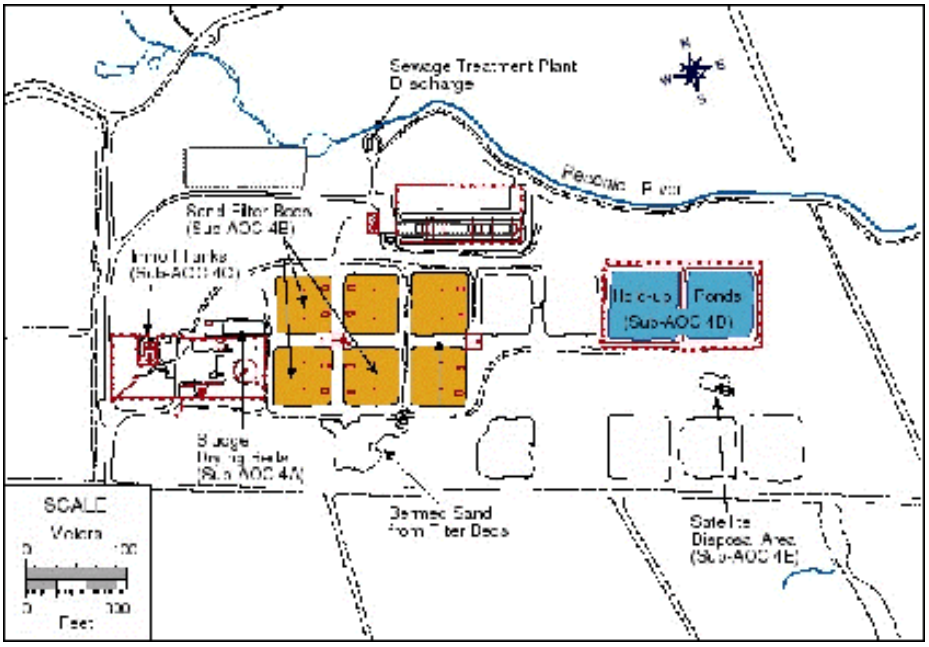

Figure 6-4. BNL's Sewage Treatment Plant (AOC 4) and the Sub-Areas of Concern within the plant (from *Proposed Plan for Operable Unit V: Peconic River/Sewage Treatment Plant, Brookhaven National Laboratory* (BNL: February 9, 2000)).

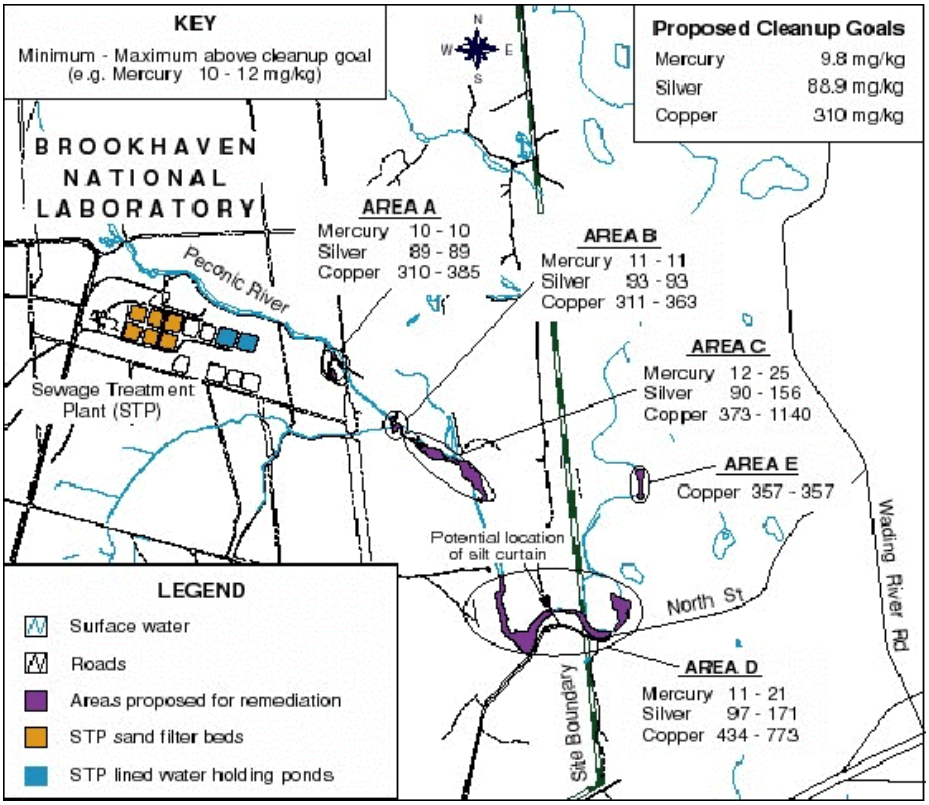

Figure 6-5. Areal Extent of Sediments Contaminated or Potentially Contaminated with Metals above Toxicity-Based Cleanup Goals (from *Proposed Plan for Operable Unit V: Peconic River/Sewage Treatment Plant, Brookhaven National Laboratory* (BNL: February 9, 2000)).

MANAGEMENT ACTIONS

The Toxics Action Plan addresses research and monitoring, specific strategies for sites of concern and nonpoint sources of pollution, and general management strategies for pollution prevention and regulation of toxics within the estuary. The actions encompass a wide scope of management strategies, including:

- Remediation at specific sites or sources;
- Enforcement of existing and new regulatory requirements that control toxics;
- Reduction of the use of toxics;
- Pollution prevention programs;
- Research, monitoring, and data analysis; and,
- Public Education (included in the Public Education and Outreach Management Plan).

In the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions will not require any new or additional resources because they are being undertaken through "base programs" or with funding that has been committed. In other cases, new or additional resources need to be secured by some or all of the responsible entities in order to complete the priority actions.

TOXICS MANAGEMENT ACTIONS

T-1. Review Historical Monitoring Data and Conduct New Monitoring Studies Where Needed to Further Characterize Sources, Loadings, and Impacts of Toxic Contaminants.

T-2. Continue Remedial Efforts and Review of Regulatory Compliance at Sites of Concern in the Peconic Estuary.

T-3. Assess Alternatives to Chlorination for Disinfection at Sewage Treatment Plants.

T-4. Reduce Loadings of Pesticides and Herbicides within the Peconic Estuary.

T-5. Develop Requirements Regarding Proper Storage and Disposal of Toxic Substances and Chemicals Associated with Construction Sites and Road, Highway, and Bridge Operation and Maintenance and Construction Activities.

T-6. Adopt Requirements for Controlling Toxic Loadings in Stormwater Runoff and Activities in Developed Areas.

T-7. Explore Management Strategies that Emphasize the Elimination or Reduction of Toxic Substances.

T-8 Ensure that Dredged Material is Managed and Placed in Such a Way as to Reduce Toxic Impacts Associated with Contaminated Sediments.

T-1 Review Historical Monitoring Data and Conduct New Monitoring Studies Where Needed to Further Characterize Sources, Loadings, and Impacts of Toxic Contaminants.

Addresses Toxics Management Objectives 1 and 5.

Periodic monitoring of the groundwater, surface water, sediments, and organisms of the Peconic Estuary is necessary to identify new or emerging problems and to assess and measure the impact of ongoing programs and CCMP management actions. In particular, additional sampling and analysis of sediments in creeks and peripheral embayments may be warranted as metals such as arsenic, lead, cadmium, and zinc, as well as PAHs have been detected in various surveys, and the potential for pesticide contamination also exists in the estuary. Investigations should focus on agriculturally influenced creeks (including sampling for pesticides), as well as creeks influenced by development and those with significant stormwater runoff inputs. Former agricultural land may also be a continuing source of pesticide inputs.

Past and present marinas and boatyards are potential sources of heavy metal contamination if boat bottom scraping and painting takes place and paint scrapings (which are almost entirely copper) were not collected and disposed of properly. Additional metals of concern in these sites include lead, zinc, mercury and tin. Historic aerial photos could be used to identify sites where boat bottom maintenance activities took place in the past.

Additional related actions are included in the Public Education and Outreach Chapter of this CCMP, including an action addressing fish consumption advisories.

Steps

T-1.1 Include toxics monitoring in the PEP Long-Term Monitoring Plan.

T-1.2 **Priority** Conduct toxicity testing as well as chemical-specific analyses of Peconic Estuary sediments, including open water areas, tidal creeks, and peripheral embayments. Where toxicity is observed, identify the toxic agent(s) of concern.

T-1.3 Continue to collect and evaluate data on concentrations of bioconcentratable chemicals in mussel tissue through NOAA's Mussel Watch Program.

T-1.4 **Priority** Analyze new data collected in EPA's 1999 "Peconic Estuary Fish, Shellfish and Crustacean Toxics Survey." Review data on organic chemical and metal residues in fish and shellfish tissues to determine whether consumption advisories are due to sources and loadings of toxics within the Peconic Estuary System, and the appropriateness of existing NYS consumption advisories.

T-1.5 **Priority** Re-evaluate PEP sediment survey data to identify chemicals present above known effects levels. Identify toxics present at low levels that individually or cumulatively may be affecting aquatic resources.

T-1.6 **Priority** Determine the potential local source of PCBs in Meetinghouse Creek and, once identified, control or otherwise remediate the source.

T-1.7 Monitor progress on research on endocrine disruptors, and encourage pollution prevention programs to reduce loadings or address potential sources of these contaminants.

T-1.8 **Priority** Identify past and present marinas/boatyard sites as potential sources of heavy metal contamination to the estuary; quantify the extent of the problem and possible effects on the estuary.

Responsible Entities

T-1.1 PEP (EPA, NYSDEC and SCDHS), other public and private groups

T-1.2 EPA (lead), PEP

T-1.3 Data collection: NOAA (lead); data evaluation: EPA (lead), PEP, NOAA

T-1.4 EPA (lead for data collection and report preparation); EPA, NYSDEC, NYSDOH for data interpretation

T-1.5 PEP

T-1.6 Investigation: NYSDEC; control/remediation: NYSDEC, responsible parties

T-1.7 EPA (lead), NYSDEC

T-1.8 PEP (through contract)

T-2. Continue Remedial Efforts and Review of Regulatory Compliance at Sites of Concern in the Peconic Estuary.

Addresses Toxics Management Objectives 4 and 5.

There are three Federal Superfund Sites on the National Priorities List in the study area: the North Sea Municipal Landfill (North Sea, NY), Rowe Industries (Sag Harbor, NY), and a portion of the Brookhaven National Laboratory Site (Upton, NY). The (Bulova) Watch Case Factory Site (Sag Harbor, NY) and a portion of the Navy Weapons Industrial Reserve Plant (NWIRP) Site (Calverton, NY) are also under investigation or being remediated or otherwise permitted at the Federal or State level. These sites are contributors or potential contributors of toxic contaminants to the estuary. The following actions address site-specific concerns at Superfund sites, inactive hazardous waste disposal sites, remediation efforts under the Resource Conservation and Recovery Act (RCRA) sites, and the facilities regulated under the State Pollutant Discharge Elimination System (SPDES).

Marinas and boatyards represent areas of particular concern due to their proximity to the water and certain maintenance and repair actives that may occur there.

Steps

T-2.1(A) Continue remedial efforts and evaluate impacts, monitoring, and ensure consistency with local requirements associated with the surface water discharge for the Rowe Industries site.

T-2.1(B) Continue groundwater monitoring at the North Sea Municipal Landfill; implement benthic community and sediment toxicity testing to ensure remediation efforts are achieved.

T-2.1(C) Continue oversight and remedial efforts at the (Bulova) Watch Case Factory site.

T-2.2 Complete inventory of RCRA facilities within the Peconic Estuary System; review compliance history of facilities; ensure all facilities comply with regulatory and permit requirements.

T-2.3 Ensure that upon Environmental Benefits Permitting Strategy (EBPS) review, the effluent limitations and/or monitoring requirements in BNL SPDES Permit (NY-0005835) for Outfall 001 (the sewage treatment plant discharge) will be revised if findings from the industrial-type effluent monitoring program or any other available data indicates that increased protection is needed. Permit elements that will be evaluated, as appropriate, include: pretreatment, BMPs, toxicity testing, and bioaccumulative contaminants.

T-2.4 **Priority** Ensure that BNL adequately implements its Environmental Management System focused on environmental compliance and emphasizing pollution prevention as specified in the EPA/DOE March 1998 MOA.

T-2.5 **Priority** Implement environmental clean-up remedies under Superfund for Operable Unit V at BNL. Ensure that the remedial investigation currently underway adequately addresses human health (chemical and radiological) and ecological impacts, including potential downstream and off-site impacts.

T-2.6 Continue to implement the RCRA corrective action program at the NWIRP. Ensure that the Corrective Measures Study adequately addresses human health and ecological impacts, including potential downstream and off-site impacts.

T-2.7 Conduct seasonal inspections of marinas and boatyards to ensure maintenance and repair activities are being done properly and there is proper disposal of wastes.

Responsible Entities

T-2.1(A) EPA

T-2.1(B) EPA (lead)

T-2.1(C) NYSDEC (lead)

T-2.2 EPA (lead)

T-2.3 NYSDEC (lead), BNL

T-2.4 EPA (lead), USDOE, BNL

T-2.5 EPA (lead), NYSDEC, BNL, USDOE, NYSDOH

T-2.6 EPA (lead), NYSDEC

T-2.7 NYSDEC

T-3. Assess Alternatives to Chlorination for Disinfection at Sewage Treatment Plants.

Addresses Toxics Management Objectives 3 and 4.

Disinfection of effluent from STPs is essential to prevent the spread of disease. Disinfection can be accomplished by a variety of methods, all of which have been proven effective under specific conditions. Chlorine may have toxic effects on living organisms following discharge when it becomes complexed in seawater with organic compounds. Ultraviolet (UV) disinfection has proven to be an effective disinfectant alternative. Presently, the Brookhaven National Laboratory and Plum Island Animal Disease Center STPs use and the Riverhead and Sag Harbor STPs have proposed UV disinfection in planned plant upgrades; use of UV has been piloted on a portion of the Shelter Island Heights STP flow. The STP at the former Naval Weapons Industrial Reserve Plant (NWIRP) in Calverton, New York, continues to use chlorine disinfection. The permit for this facility is expected to be modified significantly as redevelopment plans for this property move forward. This STP may ultimately discharge to groundwater (outside of the Peconic Estuary watershed) in place of the current surface water discharge to the Peconic River System.

Steps

T-3.1 Install UV disinfection at the Riverhead and Sag Harbor STPs. Evaluate alternatives to chlorine disinfection at the Shelter Island Heights STP and the NWIRP STP if the effluents are of sufficient quality for alternatives to be effective and protective of human health. *See related action P-10 in the Pathogens Management Plan.*

Responsible Entities

T-3.1 Treatment plant operators at Riverhead, Sag Harbor, Shelter Island Heights, and the former NWIRP; NYSDEC

T-4. Reduce Loadings of Pesticides and Herbicides within the Peconic Estuary.

Addresses Toxics Management Objectives 2, 3, and 4.

Significant pesticide contamination of groundwater resources in the Peconic Estuary watershed has been documented in at least two recent studies. This includes some pesticides that were found in raw untreated groundwater at levels exceeding drinking water Maximum Contaminant Levels. However, at the present time, there are no known environmental impairments due to pesticides in the Peconic Estuary. There is also the potential for pesticide use to increase and change, particularly with shifts to intensive agriculture systems (*e.g.*, vineyards, turf grass, ornamentals) and increased residential development. Some pesticides may enter surface waters directly with stormwater runoff. Efforts to manage stormwater primarily due to concerns of pathogens contamination may also result in the prevention of direct loadings of pesticides (and other toxic substances) to surface waters (see Pathogens Management Chapter of this Report). It may be particularly important to ensure commercial applicators of pesticides are properly certified, and to eliminate or reduce pesticide use on or in the vicinity of wetlands. A "Clean Sweep" program was successful in collecting and properly disposing of a large quantity of agricultural and turf/landscape maintenance pesticides that were unusable and unwanted.

The public has clearly indicated its preference for farmland preservation in the watershed. Creating additional pesticide program requirements may be in conflict with that goal, though there will continue to be opportunities for applying best management practices. In addition, market incentives should be explored as a possible driving force for producing agricultural products using the specified pesticide management measure or for producing natural/organic agricultural products, particularly for local sale. Standards could be specified, labeling developed, and promotional materials prepared to advertise the availability of products which are produced using Integrated Pest Management techniques or which are pesticide-free.

Cornell Cooperative Extension will continue work on the Peconic Estuary Pesticide Reduction Initiative funded under a EPA Pollution Prevention Grant, demonstrating on a pilot scale the use of "scouting" by trained personnel to determine the timing of pesticide applications for insects, diseases and weeds, and provide training to assist farm managers in acquiring their own "scouting" expertise.

State agencies have proposed the development/establishment of enforceable State-wide program requirements to manage pesticide use under the State Coastal Nonpoint Source Management Plan under the Coastal Zone Act Reauthorization Amendments (CZARA). However, the extent to which there is compliance with the pesticide use management measure for agricultural areas under CZARA is unknown. State agencies have also proposed the development of a Long Island Pesticide Management Plan.

Pesticide use on public lands can effectively be eliminated or significantly reduced, through initiatives such as the Federal government's Presidential Memorandum that addresses "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds" and Suffolk County's restrictions on pesticide use at county-owned golf courses. "Environmental Principles for Golf Courses in the United States" is a program developed by golf and environmental organizations, and includes objectives regarding reductions in pesticide use.

Financial incentives for voluntary compliance by private growers with the pesticide management measure and for Integrated Pest Management (IPM) strategies may be available through the 1995 Federal Farm Bill's Environmental Quality Incentives Program (EQIP). The Suffolk County Office of the United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS) should apply for funding from the NYS NRCS Office for a 5-year comprehensive pesticide management program initially in the Towns of Riverhead and Southold as a priority and in the other towns in future years.

Additional related actions are included in the Public Education and Outreach Chapter of this CCMP, including actions addressing pesticide use near wetlands, dealing with certified commercial applicators, reducing residential pesticide use, and golf courses.

Steps

T-4.1 **Priority** Continue to pursue development/establishment of the Long Island Pesticide Management Plan and enforceable Statewide agricultural pesticide program requirements under CZARA, which reduce the potential for contamination of surface water and ground water due to the application of pesticides. In the meantime, seek commitments on a voluntary basis from landowners to comply with this management measure.

T-4.2 **Priority** Plan, advertise, and carry out a "Clean Sweep" program to collect and properly dispose of banned or unneeded agricultural and turf/landscaping pesticides.

T-4.3 Ensure that commercial pesticide applicators and applicators of restricted use pesticides are properly certified. *See related Public Outreach and Education Action POE-4.1.*

T-4.4 Enforce the provisions of the State's Freshwater Protection Law to reduce or eliminate loadings of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. *See related Public Outreach and Education Action POE-4.2.*

T-4.5 Develop and implement integrated pest management (IPM) programs that manage pests with minimal impact on human health and the environment.

T-4.6 **Priority** Develop and implement a comprehensive agricultural pesticide management proposal for funding by the USDA.

T-4.7 Investigate opportunities for expansion of organic agricultural operations in the Peconic watershed, as well as marketing and labeling to encourage local sale.

T-4.8 Implement IPM programs on public lands, such as Suffolk County's IPM/pesticide-free golf course initiative. Ensure that all Federal facilities and operations in the PEP Study Area comply with the Presidential Memorandum of April 26, 1996 that addresses "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds."

T-4.9 Restrict or ban pesticides whose residues are frequently detected at levels of environmental or public health concern in groundwater or the estuary.

Responsible Entities

T-4.1 NYSDEC, NYSDOS (co-leads), NYS Department of Agriculture and Markets, NYSDOH, and other public and private groups

T-4.2 Suffolk County Soil and Water Conservation District (lead), with NRCS, EPA, PEP, Towns and the agricultural community

T-4.3 NYSDEC (lead)

T-4.4 NYSDEC (lead)

T-4.5 State (lead); County, Town and Village governments and agencies, homes, businesses and farms

T-4.6 USDA-NRCS and SCSWCD (leads)

T-4.7 PEP (lead)

T-4.8 Federal, County governments; other governmental entities

T-4.9 NYSDEC

T-5. Develop Requirements Regarding Proper Storage and Disposal of Toxic Substances and Chemicals Associated with Construction Sites and Road, Highway, and Bridge Operation and Maintenance and Construction Activities.

Addresses Toxics Management Objectives 3 and 4.

While there are existing State requirements regarding pesticide use and handling and solid and hazardous waste disposal on State funded projects, there are no comprehensive regulatory requirements specifically for construction site chemical use for projects at the County or local level. Aside from State pesticide management, spill management, and solid and hazardous waste disposal requirements, there are no comprehensive regulatory requirements regarding chemical controls at road, highway, and bridge construction sites and operation and maintenance activities at the county, town, and village level.

Steps

T-5.1 Continue to pursue development/establishment of enforceable State-wide program requirements which manage the application, generation, and migration of toxic substances, and ensure the proper storage and disposal of toxic materials at all construction sites.

T-5.2 Adopt requirements consistent with State program requirements at the County, town, and village level regarding chemical controls at construction sites, including road, highway, and bridge construction sites. Until these are adopted, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.

T-5.3 Adopt requirements consistent with State program requirements at the County, town, and village level regarding chemical controls for road, highway, and bridge operation and maintenance activities. In the meantime, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.

Responsible Entities

T-5.1 NYSDEC, NYSDOS (co-leads), local governments, contractors

T-5.2 NYSDEC, NYSDOS, County, town, and village governments, contractors

T-5.3 NYSDEC, NYSDOS, County, town, and village governments, contractors

T-6. Adopt Requirements for Controlling Toxic Loadings from Stormwater Runoff and Activities in Developed Areas.

Addresses Toxics Management Objectives 3 and 4.

There are many toxic pollutants potentially associated with activities in developed areas, such as road, highway, and bridge runoff systems; stormwater runoff and activities from government-owned and operated sites; stormwater and runoff from marinas and activities associated with boating; materials for roads, driveways and parking lot surfaces and management of runoff from these surfaces; fuel storage tanks; swimming pools; solvents used inappropriately in on-site septic systems; and treated lumber. MTBE is a substance of particular concern due to its potential to contaminate both groundwater and surface waters.

Roads, highways, and bridges under State jurisdiction comply with the CZARA nonpoint source management measure to develop and implement runoff management systems to: reduce runoff pollutant concentrations and volumes; identify priority and watershed pollutant reduction opportunities (*e.g*., improvements to existing urban runoff control structures); and establish schedules for implementing appropriate controls. At the present time, however, there are no regulatory requirements regarding controls for road, highway, and bridge runoff systems under county or local jurisdiction. Additional work is needed to ensure that there is widespread implementation with this management measure.

The Town of East Hampton, recognizing that those who own property bordering on the Town's Harbors (including flag lots, flag strips, and flag access strips) derive many benefits from proximity to these waters and have a special responsibility to help protect them, has established a Harbor Protection Overlay District (HPOD). All lots in this district are subject to special requirements for maintaining or protecting wildlife habitats, and surface water quality to protect aquatic life. The following topics are addressed in this law: parking lots and driveways; runoff management; underground storage tanks; swimming pool disinfection systems, cleaning and evacuation systems; and the use of treated lumber. Some of these requirements may also be applicable in areas beyond the HPOD.

Additional related actions are included in the Public Education and Outreach Chapter of this CCMP, including actions addressing septic system “cleaners” and the use of treated lumber in the marine environment.

Steps

T-6.1 Adopt requirements consistent with State program requirements at the County, town, and village level regarding runoff management systems for roads, highways, and bridges. Until adopted, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.

T-6.2 Complete Environmental Management Reviews (EMRs) and Pollution Prevention Opportunity Assessments (PPOAs) at Federal Installations.

T-6.3 Pursue development of enforceable Statewide program requirements to address stormwater runoff at marinas. Seek commitments on a voluntary basis from marina owners to comply with this management measure.

T-6.4 Adopt harbor protection overlay-type districts addressing: materials for roads, driveways and parking lot surfaces and management of runoff from these surfaces; fuel storage tanks; swimming pools; treated woods; and other activities as appropriate. *See related action P-2.2 in the Pathogens Management Plan.*

T-6.5 Conduct regular inspections of retail stores to enforce the County ban on the sale of illegal on-site disposal system (cesspool) products.

T-6.6 **Priority** Develop model guidelines for the placement of treated lumber in the marine environment and identify non-toxic structures, consistent with PEP's overall policy of no net increase of shoreline hardening structures. These guidelines should also address disposal of treated lumber following demolition.

T-6.7 **Priority** Support Legislative framework and EPA regulatory action to reduce/eliminate the use of MTBE in gasoline.

T-6.8 Determine the adequacy of voluntary programs addressing the replacement of on-premises home heating oil tanks. Determine if regulatory replacement programs should be instituted watershed-wide or in certain areas.

Responsible Entities

T-6.1 County, town, and village governments (co-leads), contractors, NYSDOS, NYSDEC

T-6.2 EPA (lead with contractor assistance) and other Federal departments and agencies

T-6.3 NYSDEC, NYSDOS (co-leads), marina owners

T-6.4 Local governments (lead), Towns of Riverhead, Southold, Southampton, Shelter Island, and villages

T-6.5 SCDHS

T-6.6 PEP

T-6.7 PEP

T-6.8 PEP

T-7. Explore Management Strategies that Emphasize the Elimination or Reduction of Toxic Substances.

Addresses Toxics Management Objectives 3 and 4.

Existing State regulatory programs are in place to adequately address industrial/commercial hazardous wastes. Additional opportunities may exist to further reduce the potential for toxic pollutants to enter the environment through pollution prevention initiatives involving reduction/reuse/recycling efforts. For example, areas immediately adjacent to surface waters, serviced by sewer districts, storm sewer collection systems, or businesses which create or use toxic substances (*e.g*., dry cleaners, automotive service stations) can be targeted as priority candidates for pollution prevention initiatives.

Town "Stop Throwing Out Pollutants" collection and disposal programs are an effective means of keeping toxics from being stored or disposed of improperly. Programs vary among the towns, some operate all the time, some are limited to particular designated days.

Mosquito control is an important human-health issue. Management approaches that do not rely on the use of pesticides should be pursued to the extent possible. When deemed necessary, pesticide selection should be limited to the extent practicable and minimizing adverse impacts on the environment should be considered in their selection.

Additional related actions are included in the Public Education and Outreach Chapter of this CCMP, including actions addressing: pollution from boating, wet exhausts from marine engines, upgrading old heating oil underground oil storage tanks, and general pollution prevention programs.

Actions

T-7.1 Develop and implement pollution prevention programs targeting establishments and industries, which generate or use toxic materials, such as marinas and boatyards.

T-7.2 Continue Town "Stop Throwing Out Pollutants" programs.

T-7.3 Reduce the use of insecticides used for mosquito control to the maximum extent practicable that still adequately protect human health and consider adverse impacts on the environment in insecticide selection. Encourage good housekeeping methods of control, such as eliminating/reducing standing water that functions as breeding sites.

Responsible Entities

T-7.1 PEP (lead)

T-7.2 Towns

T-7.3 Suffolk County Department of Public Works Division of Vector Control (lead), NYSDEC, NYSDOH

T-8. Ensure that Dredged Material is Managed and Placed in Such a Way as to Reduce Toxic Impacts Associated with Contaminated Sediments.

Addresses Toxics Management Objectives 3 and 4.

Dredging and dredged material placement operations require State and Federal permits. Between 50 and 100 permits are approved annually in the Peconic Estuary. Generally, dredged material from the estuary consists of coarse-grained sandy material that can be used beneficially or otherwise placed upland. A beneficial use determination (BUD) must be obtained from the NYSDEC to place or beneficially use dredged material in an upland setting. Before a BUD can be granted, the dredged material must be physically and chemically characterized. Testing of the dredged material for toxic substances may be required depending on factors including: volume; make-up of the material (*i.e.*, percent sand); place of origin; and likelihood of contamination (*i.e.*, proximity of present or historical sources of contamination). Testing for the presence of toxics has typically not been required in the Peconics, but if required should include both chemical specific and overall toxicity considerations, particularly sediments from tidal creeks where elevated levels of toxics in sediments have been observed (*i.e.*, Meetinghouse Creek).

In addition to addressing dredging and dredged material management, there is also a need to continue to implement regulatory and voluntary programs that will reduce toxics that may accumulate on sediments to ensure that in the future dredged material is suitable for beneficial uses or placement without restrictions with respect to toxic contaminants. There is also a need to continue to implement regulatory and voluntary programs that reduce sedimentation so that dredging and dredged material placement operations are needed less frequently in the future. These actions and programs are contained elsewhere in this Plan.

The EPA and the Corps have identified the likely need to continue marine placement of dredged material in the Long Island Sound Area. In 1999, the EPA in cooperation with U.S. Army Corps of Engineers issued a notice of intent to prepare an environmental impact statement to consider the potential identification of one or more placement sites for Long Island Sound dredged material. The PEP participants consider it unlikely a placement site will be proposed within the PEP study area, but should remain involved in this process.

Actions

T-8.1 Ensure that all applications for dredging and dredged material placement are critically evaluated with respect to their potential to cause adverse toxic effects to the Peconics ecosystem, and particularly to pelagic and benthic organisms and their food chains, including humans.

T-8.2 Ensure that all permits for dredging and dredged material placement activities are protective of the Peconic ecosystem and particularly pelagic and benthic organisms and their food chains, including humans, from toxic effects.

T-8.3 Participate in the EPA/Corps efforts to identify potential placement sites for Long Island Sound dredged material.

Responsible Entities

T-8.1 NYSDEC, US Army Corps of Engineers (co-leads), EPA, NYSDOS, USFWS, NMFS

T-8.2 NYSDEC, US Army Corps of Engineers (co-leads), EPA, NYSDOS, USFWS, NMFS

T-8.3 NYSDEC (lead), PEP

BENEFITS OF MANAGEMENT ACTIONS

The Toxics Management Actions focus on reducing the levels of toxic contaminants within the estuary system through remediation, source reduction, and pollution prevention and education programs. The benefit of these actions is an environment free from toxic substances in toxic amounts, which supports a healthy and diverse marine and terrestrial community. Specific benefits include:

- Reducing acute (short-term) and chronic (long-term) effects on aquatic life and wildlife or their progeny;
- Limiting the public's exposure to toxics through consumption of seafood and wildlife;
- Ensuring that dredged material is available for beneficial uses;
- Minimizing costs associated with environmental cleanup and remediation; and,
- Restoring contaminated areas to productive uses.

COSTS OF MANAGEMENT ACTIONS

Because the Peconic Estuary is generally of high quality with respect to toxics, many management actions call for a continuation or expansion of ongoing efforts, resulting in no new program costs. Other actions are tied to different action plans, and therefore the benefit and cost information is included elsewhere in this document (*i.e.*, roadway stormwater runoff management). The actions calling for new programs tend to emphasize preventing or reducing the introduction of pollutants to the ambient environment. This approach is a more cost effective means of achieving or maintaining compliance with environmental standards, as compared to remedial and restoration programs which are generally expensive and time-consuming, particularly for persistent or bioaccumulative substances.

The total cost of all new actions proposed for the toxics management in this chapter is $1,845,000 in one-time costs and $1,977,500 annually. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

TOXICS ACTIONS SUMMARY TABLE

Table 6-4 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides a expanded explanation of base programs and action costs.

Table 6-4. Toxics Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
T-1	**Review Historical Monitoring Data and Conduct New Monitoring Studies Where Needed to Further Characterize Sources, Loadings, and Impacts of Toxic Contaminants.** ***(Objectives 1 and 5)***				
T-1.1	Include toxics monitoring in the PEP Long-Term Monitoring Plan.	PEP (EPA, NYSDEC and SCDHS), other public and private groups	Post-CCMP	See environmental monitoring plan (Action M-2.1)	C/N C-R/O-N
T-1.2	Conduct toxicity testing as well as chemical-specific analyses of Peconic Estuary sediments, including open water areas, tidal creeks, and peripheral embayments. Where toxicity is observed, identify the toxic agent(s) of concern.	EPA (lead), PEP	Summer 1998: sampling completed; winter 2000: final report Summer 2000; sampling completed; fall 2001: final report Annually thereafter.	New annual sample collection, analysis, interpretation: EPA: 1 FTE/yr SCDHS: 0.1 FTE/yr $25,000/yr for analyses	C/O R-N for funding for new analyses
T-1.3	Continue to collect and evaluate data on concentrations of bioconcentratable chemicals in mussel tissues through NOAA's Mussel Watch Program.	Data collection: NOAA (lead); data evaluation: EPA (lead), PEP, NOAA	Ongoing; annually	Base Program (NOAA)	C/O
T-1.4	Analyze new data collected in EPA's 1999 "Peconic Estuary Fish, Shellfish and Crustacean Toxics Survey." Review data on organic chemical and metal residues in fish and shellfish tissues to determine whether consumption advisories are due to sources and loadings of toxics within the Peconic Estuary system, and the appropriateness of existing NYS consumption advisories.	EPA (lead for data collection and report preparation), EPA, NYSDEC, NYSDOH for data interpretation	Summer 1999 (sample collection) Spring 2001: final report	Data analysis: EPA: 0.1 FTE NYSDEC: 0.1 FTE NYSDOH: 0.1 FTE Data report preparation: EPA: 0.2 FTE	C/O

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-1.5 **Priority**	Reevaluate PEP sediment survey data to identify chemicals present above known effect levels. Identify toxics present at low levels that individually or cumulatively may be affecting aquatic resources.	PEP	Post-CCMP	$10,000 (estimate)	R
T-1.6 **Priority**	Determine the potential local source of PCBs in Meetinghouse Creek and, once identified, control or otherwise remediate the source.	Investigation: NYSDEC; control/remediation: NYSDEC, responsible parties	Post-CCMP	$10,000- $20,000 (preliminary estimate for identification) NYSDEC: 0.1 FTE Remediation: to be determined	R
T-1.7	Monitor progress on research on endocrine disrupters, and encourage pollution prevention programs to reduce loadings or address potential sources of these contaminants.	EPA (lead), NYSDEC	Post-CCMP	EPA: 0.1 FTE/yr NYSDEC: 0.1 FTE/yr	R/N
T-1.8 **Priority**	Identify past and present marina/boatyard sites as potential sources of heavy metal contamination to the estuary; quantify the extent of the problem and possible effects on the estuary.	PEP (through contract)	Post CCMP	$20,000 (estimate)	R/N
T-2	**Continue Remedial Efforts and Review of Regulatory Compliance at Sites of Concern in the Peconic Estuary.** ***(Objectives 4 and 5)***				
T-2.1 (A)	Continue remedial efforts and evaluate impacts, monitor, and ensure consistency with local requirements associated with the surface water discharge for the Rowe Industries site.	EPA	Ongoing	Base Program	C/O

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-2.1 (B)	Continue groundwater monitoring at the North Sea Municipal Landfill; implement benthic community and sediment toxicity testing to ensure remediation efforts are achieved.	EPA	Ongoing	Base Program	C/O
T-2.1 (C)	Continue oversight and remedial efforts at the (Bulova) Watch Case Factory Site.	NYSDEC	Ongoing	Base Program	C/O
T-2.2	Complete inventory of RCRA facilities within the Peconic Estuary system; review compliance history of facilities; ensure all facilities comply with regulatory and permit requirements.	EPA (lead)	Pilot inventory/inspections ongoing. Fall 2001: Final report	Base Program	C/O
T-2.3	Ensure that upon Environmental Benefits Permitting Strategy (EBPS) review, the effluent limitations and/or monitoring requirements in BNL SPDES Permit (NY-0005835) for Outfall 001 (the sewage treatment plan discharge) will be revised if findings from the industrial-type effluent monitoring program or any other available data indicate that increased protection is needed. Permit elements that will be evaluated, as appropriate, include: pretreatment, BMPs, toxicity testing, and bioaccumulative contaminants.	NYSDEC (lead), BNL	Ongoing	Base Program	C/O

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-2.4 **Priority**	Ensure that BNL adequately implements its Environmental Management System focused on environmental compliance and emphasizing pollution prevention as specified in the EPA/DOE March 1998 MOA.	EPA (lead), USDOE, BNL	Ongoing	Base Program	C/O
T-2.5 **Priority**	Implement environmental cleanup remedies under Superfund for Operable Unit V at BNL. Ensure that the selected remedy adequately addresses human health (chemical and radiological) and ecological impacts, including potential downstream and off-site impacts.	EPA (lead), NYSDEC, BNL, USDOE, NYSDOH	Ongoing	Base Program	C/O
T-2.6	Continue to implement the RCRA corrective action program until completed at the NWIRP. Ensure that the Corrective Measures Study adequately addresses human health and ecological impacts, including potential downstream and off-site impacts.	EPA (lead), NYSDEC	Ongoing	Base Program	C/O
T-2.7	Conduct seasonal inspections of marinas and boatyards to ensure maintenance and repair activities are being done properly and there is proper disposal of wastes.	NYSDEC	Post-CCMP and Annually as Needed	NYSDEC: 1 FTE/yr	R

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-3	**Assess Alternatives to Chlorination for Disinfection at Sewage Treatment Plants. *(Objectives 3 and 4)***				
T-3.1	Install UV disinfection at the Riverhead and Sag Harbor STPs. Evaluate alternatives to chlorine disinfection at the Shelter Island Heights STP and the NWIRP STP if the effluents are of sufficient quality for alternatives to be effective and protective of human health. *See related Action P-10 in the Pathogens Management Plan.*	Treatment plant operators at Riverhead, Sag Harbor, Shelter Island Heights, and the former NWIRP; NYSDEC	Ongoing	Base Program (costs for UV disinfection at Riverhead and Sag Harbor included in NYS Bond Act Proposals. Cost for full scale UV at Shelter Island Heights not yet determined.) NYSDEC: 0.5 FTE	R
T-4	**Reduce Loadings of Pesticides and Herbicides within the Peconic Estuary. *(Objectives 2, 3 and 4).***				
T-4.1 **Priority**	Continue to pursue development/establishment of the Long Island Pesticide Management Plan and enforceable Statewide agricultural pesticide program requirements under CZARA, which reduce the potential for contamination of surface water and ground water due to the application of pesticides. In the meantime, seek commitments on a voluntary basis from landowners to comply with this management measure.	NYSDEC, NYSDOS (co-leads), NYS Department of Agriculture and Markets, NYSDOH, and other public and private groups	Post-CCMP	Estimates: NYSDEC: 2 FTE NYSDOS: TBD NYSDOH: TBD NYS Ag & Markets: TBD	R
T-4.2 **Priority**	Plan, advertise, and carry out a "Clean Sweep" program to collect and properly dispose of banned or unneeded agricultural and turf/landscaping pesticides.	Suffolk County Soil and Water Conservation District (lead), NRCS, EPA, PEP, Towns and the agricultural community	Post-CCMP	$150,000 (estimate)	R

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-4.3	Ensure that commercial pesticide applicators, and applicators of restricted use pesticides, are properly certified. *See related Public Outreach and Education Action POE-4.1.*	NYSDEC (lead)	Ongoing Post-CCMP	Base Program for existing program NYSDEC: 1 FTE/yr for program enhancement	C/O R/N
T-4.4	Enforce the provisions of the State's Freshwater Protection Law to reduce or eliminate loadings of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. *See related Public Outreach and Education Action POE-4.2.*	NYSDEC (lead)	Ongoing Post-CCMP	Base Program for existing program NYSDEC: 1 FTE/yr for program enhancement	C/O R/N
T-4.5	Develop and implement integrated pest management (IPM) programs that manage pests with minimal impact on human health and the environment.	State (lead); County, town and Village governments and agencies, homes, businesses and farms	Post CCMP	NYSDEC: 2 FTE/yr	R/N
T-4.6 **Priority**	Develop and implement a comprehensive agricultural pesticide management proposal for funding by the USDA.	USDA-NRCS and SCSWCD (leads)	FFY2001	Base Program for proposal development 5 FTE/yr and $1M/yr for implementation	R/N
T-4.7	Investigate opportunities for expansion of organic agricultural operations in the Peconic watershed, as well as marketing and labeling to encourage local sale.	PEP (lead)	Post CCMP	PEP: 0.5 FTE/yr (estimate)	R/N

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-4.8	Implement IPM programs on public lands, such as Suffolk County's IPM/pesticide-free golf course initiative. Ensure that all Federal facilities and operations in the PEP Study Area comply with the Presidential Memorandum of April 26, 1996 that addresses "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds."	Federal, County governments; other governmental entities	Post-CCMP	Base Program for existing efforts To be determined for new initiatives	C/O R/N
T-4.9	Restrict or ban pesticides whose residues are frequently detected at levels of environmental or public health concern in groundwater or the estuary.	NYSDEC	Post CCMP	Base Program	C/O
T-5	**Develop Requirements Regarding Proper Storage and Disposal of Toxic Substances and Chemicals associated with Construction Sites and Road, Highway, and Bridge Operation and Maintenance and Construction Activities.** ***(Objectives 3 and 4)***				
T-5.1	Continue to pursue development/establishment of enforceable Statewide program requirements which manage the application, generation and migration of toxic substances, and ensure the proper storage and disposal of toxic materials at all construction sites.	NYSDEC, NYSDOS (co-leads), local governments, contractors	Ongoing	Base Program	C/O

Table continued on next page

Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-5.2	Adopt requirements at the county, town, and village level regarding chemical controls at construction sites, including road, highway, and bridge construction sites. Until these are adopted, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.	County, town, and village governments, contractors, NYSDOS, NYSDEC	Post-CCMP	Towns: 1 FTE/town County: 1 FTE PEP: 1 FTE (Resources also address Action T-5.3 and T-6.1)	R
T-5.3	Adopt requirements consistent with State program requirements at the county, town, and village level regarding chemical controls for road, highway, and bridge operation and maintenance activities. In the meantime, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.	County, town, and village governments, contractors, NYSDEC, NYSDOS	Post-CCMP	See Action T-5.2	R
T-6	**Adopt Requirements for Controlling Toxic Loadings in Stormwater Runoff and Activities in Developed Areas. *(Objectives 3 and 4)***				
T-6.1	Adopt requirements consistent with State program requirements at the County, town, and village level regarding runoff management systems for roads, highways, and bridges. Until these are adopted, seek commitments on a voluntary basis from highway department personnel and contractors to comply with this management measure.	County, town, and village governments (co-leads), contractors, NYSDOS, NYSDEC	Post-CCMP	See Action T-5.2	R

Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-6.2	Complete Environmental Management Reviews (EMRs) and Pollution Prevention Opportunity Assessments (PPOAs) at Federal installations.	EPA (lead with contractor assistance) and other Federal departments and agencies	Summer 1999: Inventory/ coordination with Federal agencies Fall 2001: Final Report	EPA: 0.1 FTE	C/O
T-6.3	Pursue development of enforceable Statewide program requirements to address stormwater runoff at marinas. Seek commitments on a voluntary basis from marina owners to comply with this management measure.	NYSDEC, NYSDOS (co-leads), marina owners	Post-CCMP	NYSDEC: 1 FTE	R
T-6.4	Adopt harbor protection overlay-type districts addressing: materials for roads, driveways and parking lot surfaces and management of runoff from these surfaces; fuel storage tanks; swimming pools; treated woods and other activities as appropriate. *See related action P-2.2 in the Pathogens Management Plan.*	Local governments (lead), Towns of Riverhead, Southold, Southampton, and Shelter Island, villages	Post-CCMP	Towns: 1 FTE/town	R
T-6.5	Conduct regular inspections of retail stores to enforce the county ban on the sale of illegal on-site disposal system (cesspool) products.	SCDHS	Post-CCMP	SCDHS: 1 FTE/yr	R

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-6.6 **Priority**	Develop model guidelines for the placement of treated lumber in the marine environment and identify non-toxic structures, consistent with PEP's overall policy of no net increase of shoreline hardening structures. These guidelines should also address disposal of treated lumber following demolition.	PEP	Post-CCMP	$100,000 (estimate) NYSDEC: 1 FTE	R
T-6.7 **Priority**	Support Legislative framework and EPA regulatory action to reduce/eliminate the use of MTBE in gasoline.	PEP	Post-CCMP	Base Program	C/N
T-6.8	Determine the adequacy of voluntary programs addressing the replacement of on-premises home heating oil tanks. Determine if regulatory replacement programs should be instituted watershed-wide or in certain areas.	PEP	Post-CCMP	$50,000 PEP: 1 FTE	R
T-7	**Explore Management Strategies that Emphasize the Elimination or Reduction of Toxic Substances.** ***(Objectives 3 and 4)***				
T-7.1	Develop and implement pollution prevention programs targeting establishments and industries which generate or use toxic materials, such as marinas and boatyards.	PEP (lead)	Post-CCMP	$100,000 (estimate) PEP: 1 FTE	R
T-7.2	Continue Town "Stop Throwing Out Pollutants" programs.	Towns		Base Programs	C/O

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Table 6-4. Toxics Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
T-7.3	Reduce the use of insecticides used for mosquito control to the maximum extent practicable that still adequately protects human health and consider adverse impacts on the environment in insecticide selection. Encourage good housekeeping methods of control, such as eliminating/reducing standing water that functions as breeding sites.	Suffolk County Department of Public Works Division of Vector Control (lead), NYSDEC, NYSDOH	Post-CCMP	Base Program	R
T-8	**Ensure that Dredged Material is Managed and Placed in Such a Way as to Reduce Toxic Impacts Associated with Contaminated Sediments. *(Objectives 3 and 4)***				
T-8.1	Ensure that all applications for dredging and dredged material placement are critically evaluated with respect to their potential to cause adverse toxic effects to the Peconics ecosystem, and particularly to pelagic and benthic organisms and their food chains, including humans.	NYSDEC, USACE (co-leads), EPA, NYSDOS, USFWS, NMFS	Ongoing	Base program Enhanced program: NYSDEC: 1 FTE/yr (Resources also address Actions T-8.2 and T-8.3)	C/O R
T-8.2	Ensure that all permits for dredging and dredged material placement activities are protective of the Peconic ecosystem and particularly pelagic and benthic organisms and their food chains, including humans, from toxic effects.	NYSDEC, USACE (co-leads), EPA, NYSDOS, USFWS, NMFS	Ongoing	Base program Enhanced program: see Action T-8.1	C/O R
T-8.3	Participate in the EPA/Corps efforts to identify potential placement sites for Long Island Sound dredged material.	NYSDEC (lead), PEP	Post-CCMP	Base Program Enhanced program: see Action T-8.1	C/O R

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CHAPTER
SEVEN

CRITICAL LANDS PROTECTION STRATEGY

OBJECTIVES

1) Compile a Geographic Information System (GIS) database of lands already identified for protection in the Peconic Estuary watershed by various levels of government.

2) Apply the PEP criteria developed to achieve water quality and habitat protection goals for the Peconic Estuary to land available for development in the Peconic Estuary watershed.

3) Determine the degree to which Community Preservation Fund (CPF) plans address PEP watershed management needs.

4) Identify additional parcels, not on CPF protection lists, appropriate for estuarine and watershed protection, satisfying the PEP land prioritization criteria.

5) Estimate funding needed for land protection, quantify benefits (where feasible), and evaluate funding sources available for that protection.

6) Involve a broad cross section of stakeholders in the process.

7) Accelerate land protection in the Peconic Estuary.

8) Coordinate protection recommendations, to the extent possible, with the protection recommendations of the Pine Barrens and special groundwater protection area initiatives.

9) Integrate and coordinate the PEP Critical Lands Protection process with Smart Growth and Sustainable Development tools, initiatives, and ordinance modifications, etc. to assist communities in assigning development to appropriate areas.

10) Develop a strategy for the management of underwater lands which preserves and enhances the region's critical natural resources.

MEASURABLE GOALS

The PEP's measurable goals with respect to critical lands protection include:

- Develop a systematic, watershed-wide evaluation and identification of lands in need of protection with respect to estuarine management concerns and evaluate the funding available for that protection.

- Integrate and coordinate the PEP Critical Lands Protection process with related land use initiatives and ordinance modifications affecting the Peconic Estuary.

INTRODUCTION

This chapter represents the Peconic Estuary Program's strategy for developing a Critical Lands Protection Plan, a recommendation that arose from the public comments of the September 1999 draft Comprehensive Conservation and Management Plan (CCMP). The Critical Lands Protection Plan (CLPP) will ultimately evaluate the land available in the Peconic Estuary Study Area and identify priorities for protection with respect to estuarine management concerns. It is the intent of the Critical Lands Protection Plan to prioritize the available land "through the lens" of habitat and water quality protection. In the reality of acquiring/preserving land, other factors including drinking water, public access, and upland habitats and species, among others come in to play. The Critical Lands Protection Plan is not designed to be the sole reference for land protection in the Peconic region. However, it will be a useful tool for State and local agencies that make land acquisition decisions in part on estuarine considerations.

Rationale for Land Protection-

Ever-increasing development is consuming open space and natural habitat, and stressing watersheds and natural communities. At the current rate of development, nearly two-thirds of our remaining open space and farmland will be lost forever and developed within the next ten years. As is documented in other parts of this CCMP, the pressures development can place on the estuary include:

- loss of natural habitat;
- increased amounts of fertilizers and pesticides from lawns;
- petroleum spills and leaks from underground oil storage tanks;
- septic system inputs; and,
- road runoff.

The loss of natural habitat to development fragments natural communities leading to their eventual decline. Contaminants migrate into ground and surface waters, leading to the decline and death of aquatic communities, including shellfish and finfish. Increased development also brings increased traffic, congestion, and air pollution.

It is not prudent or economically feasible to acquire or protect all of the remaining land available for development in the estuary. Although drawbacks to land protection exist, there is ample justification that land acquisition has significant environmental and public benefits.

Environmental Benefits of Land Protection include:

- preservation of concentrated or unique species or natural communities;
- control of total nitrogen loads;
- protection of watersheds and surface water quality; and,
- protection of groundwater recharge areas.

Public Benefits of Land Protection include:

- aesthetic values that contribute to our quality of life including economic benefits from tourism and resort homes;
- limiting development costs related to traffic congestion and infrastructure investments (water mains, septic and sewer systems, schools and fire departments, electric and telephone lines);
- protection from erosion and flooding-related damages, and other physical hazards;
- drinking water protection;
- increasing public access and recreational opportunities;
- economic compensation to landowners who sell their property for open space and enhanced economic values to the nearby property owners and the community; and,
- protection of productive finfish and shellfish habitats for recreational and commercial purposes.

Drawbacks to Land Protection include:

- reduces the tax base available to a municipality;
- reduces the supply of land available for additional housing and businesses; and,
- possible increase in property values, thereby increasing housing costs and property taxes, which could "squeeze out" low income residents.

Public Willingness to Preserve Land

The public has a strong attachment to the environmental and amenity resources of the Peconic Estuary System, even if they do not use the resources directly. In response to an inquiry of willingness to support undeveloped land preservation and estimating the monetary value that the survey responses implied, the public would spend at least $14.0 thousand per acre for undeveloped land, using a 25-year time horizon and a seven percent discount rate in 1995 dollars. The $14.0 thousand per acre underestimates the actual value the public would be willing to pay because the survey solely focused on the values for protecting "undeveloped lands"; it did not incorporate the value to the public with respect to drinking water protection, critical habitat/species concerns, and estuarine protection. The survey was carried out in August 1995, polling 968 year-round and seasonal residents of the East End of Long Island.

The intrinsic values of many natural resources are difficult, if not impossible, to measure. Attempts have been made to measure elements of value, however. For example, the economic value of eelgrass, intertidal salt marsh, and sand/mud bottoms was estimated, based on the value of the fish, shellfish, and bird species that these ecosystems help "produce" (EAI, 1999). The results suggest an asset value per acre of approximately $12.4 thousand for eelgrass, $4.3 thousand for salt marsh, and $786 for mud flats, using a 25-year time horizon and a seven percent discount rate in 1995 dollars.

Numerous other benefits of open space were determined and quantified including the public's willingness to pay for additional travel to access cleaner waters resulting from open space. A

recreational survey found that swimming was the most popular water-based activity within the Peconic Estuary and accounted for 42 percent of all the water-based recreation trips that year. Using travel cost model estimates, the public was found to be willing to pay $8.59 per swimming trip above and beyond the amount they actually spend to engage in the activity. (Note: The PEP is not recommending the public's willingness to pay be translated into any new or increased fees at public recreation areas.)

Swimming use was found to be dependent on the public's perception of the water quality. A benefit-cost analysis was used to simulate hypothetical, uniform improvements in water quality. A ten percent uniform improvement in water quality in each bay would increase the estimated number of annual swimming trips by 151 thousand and would add a yearly benefit of $1.3 million. This is an increase of about 11 percent in use and in benefits. Most of the benefits ($754 thousand) are due to hypothetical improvements in water clarity (as measured by Secchi depth). If the ten percent hypothetical water quality improvement were maintained for 25 years, this improvement would have a present value of $15.1 million, using a seven percent discount rate and 1995 dollars. This number represents the change in asset value for swimming due to the quality improvement, all else remaining the same. Thus, if the cost of preserving land and other policies to improve water quality did not exceed $15.1 million over the same period, it is a good investment of scarce resources.

Open space has a significant, positive effect on nearby property values. A property value analysis was conducted for the Town of Southold by applying the hedonic method to a database comprised of GIS parcel coverage data and real estate sales data from 1996. A parcel of land adjacent (or within 25 ft.) to open space was found to have, on average, a 12.83 percent higher per-acre value than a similar parcel located elsewhere. To illustrate the impacts of open space to property values, it can then be estimated that a hypothetical contribution of a parcel of approximately ten acres of open space would increase adjoining property values by $410,907. For this illustration, if the ten acres of undeveloped property could be protected for less than $410,907, the benefits would be greater than the costs. Note that even if the property to be protected costs more than $410, 907, the benefits may still exceed the costs. This is because not all the benefits of open space are captured in the hedonic analysis (*i.e.*, general amenity benefits enjoyed by all local residents, regardless of the location of their homes) and, since the study, real estate values have drastically increased in all towns, some more dramatically than others.

Population and Land Use in the Peconic Watershed

The population of eastern Suffolk County continues to grow. While the five eastern towns of Suffolk County comprise eight percent of Suffolk County's total population, the year-round population has steadily grown since 1960 (SCPD, 1997). From 1960 to 1995 the population in eastern Suffolk increased by 67 percent. Tourism and the presence of summer homes increase the population during the summer months. It is estimated that the population in the five eastern towns nearly triples during peak seasonal times, expanding from the 1990 year-round figure of 106,593 up to 289,000 during peak seasonal times (an increase of 171 percent).

The population growth continues to stress the natural resources of this region. While the population in eastern Suffolk increased by 67 percent from 1960 to 1995, the number of year-round households increased 118 percent. Thus, the growth of housing has outpaced population growth (SCPD, 1997).

Forty percent of the acreage in the Peconic Estuary watershed was subject to development in 1995 (SCPD, 1997). If open space programs were not implemented and all 40 percent were developed at

low density residential land uses, the current total nitrogen loads to the western estuary, South Fork, and Shelter Island would more than double, as compared with existing conditions (SCDHS, 1999) assuming that typical lawn care practices continue and there is no change in septic system technology. Given the region's growing population and the significant increase in the rate of development in the last five years, the need for protecting open space and undeveloped land is further underscored.

The ownership pattern of underwater lands in the open bays has to a major extent been the result of past oyster ground management activities (SCPD, 1997). The Suffolk County Planning Department inventoried over 121,000 acres of underwater lands in the Peconic/Gardiners Bay system, contiguous bays and tidal creeks, and the bottom of the Peconic River above the head of the tide (SCPD, 1997). The majority of the area (54 percent) is owned by New York State while Suffolk County has control over roughly 25 percent of the underwater lands. About seven percent of the bottom (8,659 acres) is controlled by the towns or Town Trustees. Villages own only 27 acres and more than 11,000 acres are privately held.

The title and exact locations of many underwater land parcels have become clouded. The titles to underwater parcels that are held jointly by Suffolk County and private interests and to parcels that have unknown owners need to be clarified. In some instances, reference points on adjacent uplands that were used a century ago to locate underwater land parcels are no longer in existence. Boundary disputes are likely to arise in the future as well. Unless addressed and resolved, these issues will hamper development of management plans for the marine portion of the Peconic Estuary.

Recreational Use and Value of the Watershed

The Peconic watershed is used by our residents, second homeowners, and visitors for a vast amount of recreational activities. A PEP-funded recreational survey estimated that in 1995:

- 127,762 people took some 3.3 million swimming, boating, fishing, or shellfishing outings; and
- 156,184 people engaged in about 5.2 million beach use, bird watching, wildlife viewing, or hunting trips.

Swimming and beach use were the most popular activities, followed by bird and wildlife viewing, boating, and fishing (EAI, 1999). Shellfishing and hunting had the fewest estimated number of trips. Activities such as hiking/walking and bicycling were not included in the estimates of recreational activity.

Outdoor recreation is enormously valuable to the Peconic Estuary users. The unpaid benefit individuals receive, on average, from a recreational trip (e.g., consumer surplus) was estimated using a travel cost model (EAI, 1999). The estimated values per recreational trip ranged from $49.83 for viewing birds and wildlife to $8.59 for swimming (in 1995 dollars). Fishing and boating values per trip fall within that range at $40.25 and $19.23, respectively.

The total annual benefit from each recreational activity can be estimated by multiplying the average consumer surplus for an activity by the estimated total number of trips to engage in that activity over the year. Viewing birds and wildlife was the most valued of the activities studied on a total annual benefit basis ($27.3 million). Of the water-based activities, recreational fishing was the most highly valued ($23.7 million). Boating and swimming had annual values of $18.0 million and $12.1 million, respectively.

Estimated asset values for recreational activities in the Peconic Estuary System range from $318 million for bird watching and wildlife viewing to $141 million for swimming. The estimated asset value is $276 million for recreational fishing and $210 million for boating. These figures were estimated using a seven percent discount rate, a time horizon of 25 years, and 1995 dollars. It was assumed that the estimated value rates remain the same over the 25-year period.

Great Peconic Bay was the most popular waterbody in the Peconic Estuary System for recreational activity, accounting for 28 percent of the recreational trips in the Peconic Estuary System, while Flander's Bay is the least frequently used with eight percent. Great Peconic Bay is the most popular location for swimming (30 percent), fishing (29 percent), and boating (25 percent). Gardiners Bay is the most popular location for shellfishing, accounting for 33 percent of all the shellfishing trips in the Peconic Estuary System.

Overall, the residents and visitors of eastern Long Island enjoy a plethora of access points and activities from edges of roads, marinas, and public beaches. Even though the survey revealed that some parts of the estuary are more frequented than others, all bay areas are cherished by the residents in the Peconic system.

Non-Recreational Use and Value of the Watershed

Resource-related businesses play an important role in the Peconic Estuary watershed. Specific uses include commercial fishing, aquaculture, agriculture, fish processing, marinas, ship building and repair, bait and tackle shops, hotels, ferries, petroleum product transfer stations, and educational facilities. The estuary also receives sewage treatment plant effluents as well.

A conservatively low estimate of 1,149 establishments (24 percent of those in the Peconic watershed) were estuarine dependant in 1993 (EAI, 1996). A quarter of the establishments were marine-related (marinas, boating, commercial fishing) while the rest of the establishments included in the study were tourism-related (hotels, motels, restaurants, retail, etc.). More than 7,300 people are employed in these businesses (twenty percent of the employment in the region), with a combined annual income of more than $127 million.

Tourism in the region is based on the water quality of the Peconic Estuary and agriculture. Farmland is an important component of the "sense of place" felt by many of the residents on the East End, who enjoy the rural quality of the area and shopping at numerous local farm stands. A survey of 968 residents, second homeowners and tourists in 1995 revealed that the public's overall priority for land protection was protecting farmland. The survey responses imply that the public would be willing to spend $74.5 thousand per acre of farmland protection, using a 25-year time horizon and a seven percent discount rate in 1995 dollars (EAI, 1999).

Criteria for Land Protection Priorities

The dual goals of water quality and habitat protection in the PEP drive the choice of criteria for land acquisition priorities in the Peconic Estuary.

Proposed criteria for determining priorities for protection include:

- PEP Critical Natural Resource Areas (CNRAs). These areas contain multiple regional attributes of ecological significance as described in **Chapter 4** of this Plan.
- New York State Natural Heritage Program element occurrences. The NYS Natural Heritage Program has identified locations of particular ecological significance, including areas containing rare, threatened, and endangered species.
- United States Fish and Wildlife Service (USFWS) 1994 National Wetlands Inventory. The USFWS 1994 National Wetlands Inventory catalogued the freshwater and tidal wetlands in the area.
- Source control of nitrogen, bacteria, and toxics. The PEP recognizes that protection of parcels within a 1000-foot boundary from freshwater streams and bay coastlines, and parcels in the groundwater contributing area to nitrogen-stressed subwatersheds, may help manage the inputs of nitrogen, pathogens, and toxics into the estuary.

Using GIS and available information about the watershed, the CLPP Work Group has developed the following coverages (assemblages of spatial information):

1. PEP Watershed Boundary;
2. Suffolk County Tax Map Base;
3. PEP Land Available for Development (minus agricultural land available for development);
4. PEP Critical Natural Resource Area boundaries;*
5. New York State Natural Heritage Elements;*
6. U.S. Fish and Wildlife Service National Wetland Inventory — 1994;*
7. PEP Groundwater Water Contributing Areas to Nitrogen Stressed Subwatersheds;*
8. 1000 foot boundary from freshwater stream and bay coastlines;*
9. Community Preservation Fund Project Plan parcels from the five East End towns;
10. Protected lands (includes Federal, State, County, town, village parks, and privately owned conservation lands); and,
11. Suffolk County Greenways proposed acquisition parcels.

* If land is available for development, these criteria are factors that contribute to its "criticality."

The acquisition or purchase of development rights on farmland was not chosen as a criterion for the PEP Critical Lands Protection Plan. The CLPP Work Group recognizes that protection of farmland is the highest priority of locally adopted Community Preservation Fund plans. There are, however, options, tools, and techniques that can be incorporated into acquisition efforts to decrease the nitrogen and biologically harmful chemicals that reach the Peconic Estuary from farmland. The PEP Agricultural Nitrogen Management Work Group is addressing these issues.

Means of Achieving Land Protection

There are many funds and programs available for land protection in the Peconic watershed. While several are noted in CCMP **Chapter 9** (CCMP Financing), there are programs within them specific to land acquisition as well as other funding sources that warrant mention here.

New York State Land Acquisition Programs

New York State Open Space Conservation Plan: Released in 1998 by the New York State's Department of Environmental Conservation and the Office of State Parks, Recreation, and Historic Preservation, this is the current State-wide plan for open space acquisition and protection. The plan identifies sites that are priorities for protection and preservation of farmland, historic and archaeological resources, water quality, natural and scenic environments, and open space/recreational opportunities. This plan is being updated with the assistance of regional advisory committees, with public hearings scheduled on a draft updated plan in the winter of 2001.

New York's Clean Water State Revolving Fund (CWSRF): This fund provides low-interest rate loans to municipalities to carry out projects that reduce or prevent water pollution. As the loans are repaid, money is available to be used again for new loans. The CWSRF program, in existence since 1990, has made over $4.3 billion in loans. The CWSRF program funds projects involving construction of wastewater facilities that reduce or prevent point-source water pollution. Projects that reduce nonpoint source pollution are also eligible for CWSRF financing. Such projects include restoration of riparian vegetation, wetlands and other waterbodies; land purchase or conservation easements for water quality protection such as for wellheads or watersheds; and certain EPA designated estuary projects, such as aquatic habitat restoration and protection.

New York State Environmental Protection Fund (EPF): This fund provides approximately $30 million per year for open space preservation. It is funded primarily through real estate transfer taxes. Decisions regarding the use of these funds are made according to the New York State Open Space Conservation Plan.

New York State Clean Water/Clean Air Bond Act: This Bond Act provides $150 million for State Open Space conservation projects undertaken by either the NYS Department of Environmental Conservation or Office of Parks, Recreation, and Historic Preservation and farmland preservation projects administered by the Department of Agriculture and Markets. An additional $50 million is dedicated to municipal parks and historic preservation projects administered through Office of Parks, Recreation, and Historic Preservation; this also includes funds for land acquisition.

Suffolk County Land Acquisition Programs

Farmland Preservation: This program, the first of its kind in the United States, was created in 1977 for the purpose of acquiring development rights to working farms. The easement acquired eliminates all development rights other than those necessary for agricultural production, and establishes oversight and approval of new farm structures with the County Farmland Committee. Since the inception of the program, approximately $40 million in general obligation bonds have been spent by Suffolk County to preserve 7,000 acres of farmland.

Open Space: This program was created in 1986 and funded through general obligation bonds initially at $60 million. Subsequent appropriations have raised expenditures to $84 million. Approximately 5,000 acres have been acquired by the County to date. It is designed to acquire lands under

development pressure that cannot be clustered, rezoned, or partially developed. Lands acquired are managed generally as passive open space.

Drinking Water Protection: This program is funded with one-quarter cent of the sales tax, which has been generating approximately $35 million annually depending on the economy. The County has acquired 12,000 acres, mostly in the Pine Barrens. Since the inception of the program in 1987, over $220 million has been spent on acquisitions. The program was set to expire in 2001, but has been reauthorized (see "Sales tax extension program" below). The program has three components:

12.5.A requires that acquisitions must relate directly to drinking water supply anywhere in Suffolk County, generally in one of the Special Groundwater Protection Areas (SGPAs). There are seven designated SGPAs within the deep aquifer recharge areas of Suffolk County. The bulk of the money continues to pay for debt service on acquisitions made in the 1989-91 time frame.

12.5.D is a revenue sharing component based on population and is set aside by each town. The towns can elect to spend all or a portion on landfill costs, but Brookhaven and the five eastern towns are still requesting their yearly shares be spent on land acquisition.

12.5.E is the residuary or leftover, which voters in 1996 mandated be spent totally for land acquisition. It is divided into two segments: one-third goes to the four western towns and Shelter Island on a population basis and can be spent to acquire any properties which are authorized by the County Legislature; two-thirds goes to the other, or so-called Pine Barrens towns, on an undifferentiated basis to be spent on Drinking Water-related parcels.

Sales tax extension program: This program, authorized by referendum in 1999, extends the 1/4% sales tax starting in 2001 and ending in 2013. The program will be funded annually depending on the economy and sales tax revenues. It is divided into the following five separate and dedicated accounts:

- **Sewer rate relief** (projected total $300 million over life of program);
- **Tax relief** (projected total $270 million over life of program);
- **Farmland** for the continued purchase of development rights (projected total $62 million over life of program);
- **Drinking Water and Open Space** for land acquisitions, including the Peconic Estuary and the South Shore Estuary Reserve (projected total $114 million over life of program); and,
- **Water Quality** to fund wetland cleanups and rehabilitation, stormwater runoff cleanups, demonstration projects, and other environmental improvements (projected total $95 million over life of program).

Community Greenways: Authorized by referendum in 1998, this program is funded at $62 million over the life of the program. In 1999, the County Legislature authorized the Open Space component ($20 million) principally for drinking water protection parcels, stream tributaries, greenbelt, and habitat enhancement, which comprises about 1,000 acres scattered throughout Suffolk County. Parcels have been targeted for acquisition and negotiations are proceeding. Individual authorizations are also proceeding for lands to be used for Active Recreation ($20 million available), where the County buys the land and a town, village or community group is required to design, build, and

maintain the recreation improvements. Golf courses are specifically excluded. In early 2000, the Legislature authorized the Farmland component ($20 million), for the purchase of development rights to active farms anywhere in the County, provided another level of government commits to 30 percent of the cost of acquisition. This program should be able to preserve another 2,000 acres of farms. Two million dollars are set aside for the construction of a natural history interpretive center.

Land Preservation Partnership: This funding program from general obligation bonds calls for the acquisition of land for various purposes, not including active recreation, in partnership with a town or village primarily. All associated costs are split 50-50, and the land can be divided or held in common ownership as the partners choose. Development rights and conservation easements can also be acquired under this program, funded thus far at approximately $9 million in County dollars.

Review of tax lien properties for environmental value: The Suffolk County Planning Department reviews all tax lien parcels for environmental evaluation after the redemption period has expired to determine if the County should retain these parcels for open space/park/municipal purposes or sell them at auction. This procedure was first initiated by Suffolk County nearly 15 years ago. In 1999 alone, Suffolk County transferred over 350 acres to its Department of Parks, Recreation and Conservation.

Town Community Preservation Fund Project Plans

In November 1998, the voters of the five East End Towns approved a referendum that added a two percent tax to real estate transfers in their communities. Revenues generated by the tax go into a Community Preservation Fund in the Town in which the transaction occurred for the purpose of protection and acquisition of open space and historic properties. In each of the Town's Community Preservation Fund Project Plans, parcels have been identified for protection through fee simple acquisition or other means such as conservation easements.

When the program was conceived, it was estimated the transfer tax would generate approximately $10 million annually until the year 2010 when the program either expires or is renewed. After the first several months of tax receipts, it appears that $10 million is an underestimate of the potential amount generated by this program. For instance, the total revenue generated by all five towns in the year 2000 exceeded $35 million. This total reflects a robust real estate market. Fluctuations in the economy may affect future Community Preservation Fund revenues.

Agencies and Organizations that Protect Land

It may appear from the above noted funding sources that more than enough dollars exist to achieve any set of protection objectives. However, land values are high and escalating, and competing demands on these funds are so great that efforts to prioritize are necessary.

The agencies, communities, and organizations that call upon and expend these funding sources are numerous, staffed with professionals, and actively involved in protecting land in the Peconic Estuary. Land acquisition/protection is occurring now in the absence of a plan that is solely focused on regional estuarine and land management concerns.
In fact, almost any reduction in density of certain areas of the watershed will have a positive effect on the natural community. But with limited funds available, it is incumbent on the community of the Peconic Estuary to seek out the best means by which collective resources can be spent for the greatest benefit to the watershed. The CLPP is intended to provide this guidance.

All of the organizations acting on behalf of land acquisition are either represented on the CLPP Work Group or will be contacted in the stakeholder input process. They include the following:

- United States Fish & Wildlife Service;
- New York State Department of Environmental Conservation;
- Suffolk County Department of Planning;
- The Nature Conservancy;
- Group for the South Fork;
- North Fork Environmental Council;
- Peconic Land Trust;
- Southold Town;
- Riverhead Town;
- Southampton Town;
- East Hampton Town;
- Shelter Island Town;
- Brookhaven Town;
- Village of Dering Harbor;
- Village of Greenport;
- Village of North Haven; and,
- Village of Sag Harbor

Types of Protection Tools Available

In addition to the many sources of funds available to protect land in the Peconic Estuary, there are also many tools available to the organizations and agencies who complete the transactions that protect the land. These include many creative approaches, some of which are described below:

- *Fee Simple Acquisition* — Outright purchase of full title to land at fair market value;
- *Purchase of Development Rights* — Landowner sells all or part of a property's development rights to a municipality or non-profit conservation organization, while still retaining ownership and the right to certain land uses such as farming;
- *Transfer of Development Rights* — Landowner sells all or part of a property's development rights and transfers those development rights to another parcel of land within the same Groundwater Management Zone or sells the development rights to other landowners whose property can support increased density in the same Groundwater Management Zone;

- *Conservation Easements* — Conservation easements are restrictions landowners voluntarily place on their property that legally bind the actions of present and future owners. Easements are used to preserve wildlife habitat, open space, agricultural land, or the historic features of a building while allowing the landowners to continue owning and using the property. Easements can provide tax advantages and/or tax abatement provided that easement is long term or perpetual;
- *Bargain Sale* — Sale/conveyance of title to land or development rights to a charitable organization at less than fair market value;
- *Outright Land Donation* — Donation by a landowner of all or partial interest in a property;
- *Option* — An option signed between a property owner and a conservation organization that provides temporary protection for a parcel while allowing the organization to secure funding for the parcel's acquisition;
- *Right of First Refusal* — A right of first refusal granted to a conservation organization or agency that allows the agency to be notified when a parcel of land is being considered for purchase by another party;
- *Like-kind Land Exchange* — A tax-free transaction whereby a public agency or a non-profit conservation organization exchanges like-kind developable land with property identified for protection;
- *Tax-exempt Installment Sale* — A long-term contract to sell property or associated development rights negotiated between the landowner and municipality and/or non-profit organization, providing significant tax relief;
- *Management Agreements* — An agreement between a property owner and another agency, such as a non-profit conservation organization, on how the property will be managed. For example, a management agreement on a parcel of farmland could state that buffer areas of native vegetation be maintained at the border of active farmland for the purpose of reducing nitrogen runoff to an adjacent water-body;
- *Limited Development/Reduced Density* — Property that is subdivided at a reduced density to better protect open space. Limited development plans can provide tax advantages, reduced infrastructure building costs, and enhanced marketability; and,
- *Clustering* — Land subdivision/proposed development that is clustered on a portion of property to protect open space.

MANAGEMENT ACTIONS

The management actions make use of available information, resources, and public opinions to help decision-makers choose protection priorities that have the greatest benefit for the most critical areas of the watershed.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments, or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base

programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

CRITICAL LANDS PROTECTION PLAN MANAGEMENT ACTIONS

CLPP-1 Develop a PEP "Critical Lands" Map and List Based on Applying the PEP Criteria.

CLPP-2 Continue to Refine the CNRA Boundaries with Results of the Work from the PEP Natural Resources Subcommittee.

CLPP-3 Estimate Funds Needed for Land Protection, to Quantify Benefits (Where Feasible) and Evaluate Funding Sources Available for that Protection.

CLPP-4 Prepare the PEP Critical Lands Protection Plan Report.

CLPP-5 Accelerate Land Protection in the Peconic Estuary.

CLPP-6 Identify a Process for Using Smart Growth Tools, Sustainable Development Initiatives, and Ordinance Modifications, etc. to Assist Communities in Assigning Development to Appropriate Areas.

CLPP-7 Develop a Strategy for the Management of Underwater Lands Which Conserves and Enhances the Region's Critical Natural Resources.

CLPP-1. Develop a PEP "Critical Lands" Map and List Based on Applying the PEP Criteria.

Addresses Critical Lands Protection Plan Objectives 1, 2, 3, 4, and 6.

The identification of all parcels meeting the criteria for protection with respect to estuarine land management concerns can be facilitated by using GIS (for criteria, see pages 7-8). Following the production of a draft map illustrating these parcels, the CLPP Work Group will meet with each town within the Peconic Estuary Study Area to discuss the draft map and list of parcels. Meetings with town and village elected officials, planning and natural resource staff, and additional stakeholders will be an opportunity for the merits of each parcel to be considered individually.

Input from each town will be incorporated into the final list and map of recommended protection priorities for the CLPP.

The town-by-town meetings will be held in 2001.

Steps

CLPP-1.1 **Priority** Identify parcels currently recommended for acquisition in the Peconic Estuary by various levels of government. (i.e., CPF lists).

CLPP-1.2 **Priority** Finalize GIS data coverages that allow selection of parcels within the watershed.

CLPP-1.3 **Priority** Develop a draft map of parcels (for discussion) selected for protection with respect to estuarine management concerns.

CLPP-1.4 **Priority** Hold town-by-town meetings with town officials to discuss individual parcels.

CLPP-1.5 **Priority** Incorporate suggestions from the towns and develop a final map illustrating parcels recommended for protection with respect to estuarine management concerns.

CLPP-1.6 **Priority** Incorporate suggestions from the towns and develop a final list of parcels recommended for protection with respect to estuarine management concerns.

Responsible Entities

CLPP-1.1 Suffolk County Planning Department (SCPD) (lead) and five East End towns

CLPP-1.2 SCPD (lead), CLPP Work Group, and Suffolk County Department of Health Services (SCDHS), PEP Program office

CLPP-1.3 SCPD (lead), PEP Program Office, and CLPP Work Group

CLPP-1.4 The Nature Conservancy (TNC), PEP Program Office (co-leads), SCPD, CLPP Work Group, five East End towns, and villages

CLPP-1.5 SCPD (lead), TNC, PEP Program Office, and CLPP Work Group

CLPP-1.6 TNC (lead), SCPD, PEP Program Office, and CLPP Work Group

CLPP-2. Continue to Refine the CNRA Boundaries with Results of the Work from the PEP Natural Resources Subcommittee.

Addresses Critical Lands Protection Plan Objective 2.

Steps

CLPP-2.1 **Priority** Continue to refine the CNRA boundaries with results of the work from the PEP Natural Resources Subcommittee.

Responsible Entities

CLPP2.1 NYSDEC, PEP Natural Resources Subcommittee (co-leads), CLPP Work Group, and SCPD, and PEP Program Office

CLPP-3. Estimate Funds Needed for Land Protection to Quantify Benefits (Where Feasible) and Evaluate Funding Sources Available for that Protection.

Addresses Critical Lands Protection Plan Objective 5.

Once the parcel list is generated, there is comparable sales data available to estimate the costs of purchasing, in whole or in part, the parcels. It is then necessary to determine the gap, if any, between the cost of protection and the funds available to achieve it. This analysis must be set in the context of how these funds might be spent on other competing acquisition priorities, such as farmland and non-PEP open space lands. Thus based on prior patterns of acquisition funding, the PEP will assume that the future revenue stream will be similar for purposes of developing finance plans and cost estimates. Finally there are methods available to evaluate the benefits of land protection to the community and the neighborhoods in which it occurs.

Steps

CLPP-3.1 **Priority** Determine the costs of acquisition efforts if particular parcels were purchased. Determine the additional cost if all parcels were purchased.

CLPP-3.2 **Priority** Assess the funding gap between needed protection and available funding sources.

CLPP-3.3 **Priority** Analyze and estimate the economic benefits of land acquisition to the community as a whole and to the neighborhood in which protected land is located.

Responsible Entities

CLPP-3.1 TNC, Suffolk County, and towns (co-leads)

CLPP-3.2 TNC, Suffolk County, and towns (co-leads)

CLPP-3.3 PEP Program Office (lead) Consultant EIA, Inc., Group for the South Fork (GSF), and TNC

CLPP-4. Prepare the PEP Critical Lands Protection Plan Report.

Addresses Critical Lands Protection Plan Objectives 1, 2, 3, 4, 5, and 6.

The Critical Lands Protection Plan will be the culmination of evaluating the land available for development in the Peconic Estuary Study Area. The Plan will document the PEP's priorities for protection "through the lens" of habitat and estuarine water quality protection. Estimates of the funds needed for this protection and possible funding sources will be identified.

Steps

CLPP-4.1 Prepare the PEP Critical Lands Protection Plan report.
Priority

Responsible Entities

CLPP-4.1 TNC (lead), PEP Program Office, SCPD, SCDHS, NYSDEC, USFWS, and EPA

CLPP-5. Accelerate Land Protection in the Peconic Estuary.

Addresses Critical Lands Protection Plan Objective 7.

With abundant available funds for land acquisition and a robust real estate market, it may be essential for the public sector to hire more people to work on acquiring land for preservation. This work is time intensive and manpower dependent. The shortage of qualified staff can delay or stall the pace of land acquisition.

To assist in purchasing land while it is still undeveloped and before realized sources of public funding become available, the New York State Environmental Facilities Corporation ("EFC") can offer below market rate financing, including zero percent short-term loans and 50 percent subsidized long-term loans for implementing National Estuary Program CCMPs, such as the Peconic Estuary.

Another means of increasing the rate at which land is protected is provided by "public benefit" or "current use" property taxation methods. In such programs, property tax relief is given on land containing one or more "sensitive areas," such as public access, extra surface water buffer, habitat restoration area, or scenic or conservation easements. The incentive functions by establishing a "current use taxation" property tax assessment that is lower than the "highest and best use" assessment level that usually applies. The reduction in taxable value ranges from 50 percent to 90 percent for the portion of the property in "current use." Penalties for withdrawal from the program are necessary to limit conversions after receiving tax relief. This concept could also be employed in valuing property for New York estate tax purposes.

Finally, income tax credits offer a much greater dollar amount compared to income tax deductions, and thus a greater incentive to give. This is a very effective and high-leverage land protection tool. A tax credit program in North Carolina revealed that for every $1 of tax credit given, $8 worth of land was protected. This type of program is especially useful in higher tax states like New York where the benefits of tax credits are more valuable and where land prices are high and rapidly escalating.

Steps

CLPP-5.1 Increase staff at the town and County level to meet the need for more and faster land acquisitions.

CLPP-5.2 Secure zero percent short-term financing through the NYS EFC for land protection measures.

CLPP-5.3 Develop a "Public Benefit" or "Current Use" ranking system for assessment of property taxes.

CLPP-5.4 Create a State income tax credit program for qualified charitable gifts of land for conservation purposes.

Responsible Entities

CLPP-5.1 Five East End towns and Suffolk County (co-leads)

CLPP-5.2 TNC, all towns, and Suffolk County (co-leads)

CLPP-5.3 TNC, GSF, and all town tax assessors (co-leads)

CLPP-5.4 TNC, GSF, and State Legislature (co-leads)

CLPP-6. Identify a Process for Using Smart Growth Tools, Sustainable Development Initiatives, and Ordinance Modifications, etc. to Assist Communities in Assigning Development to Appropriate Areas.

Addresses Critical Lands Protection Plan Objectives 8 and 9.

Smart Growth activities can benefit homeowners and developers as well as farmers and conservationists by encouraging compact development in areas already developed and leaving open space and farmland alone. Smart Growth and "neo-traditional villages" keep residential and commercial development "clustered" in one area, thus reducing the pressure to develop into surrounding open space and farmland ("sprawl"). Keeping future development "clustered" also makes it easier to affect future nitrogen and pesticide reduction strategies, on the assumption that economies of scale prevail if houses are closer together.

The Suffolk County Planning Commission has just released the report entitled "Smart Communities Through Smart Growth: Applying Smart Growth Principles to Suffolk County Towns and Villages" (Suffolk County Planning Commission, 2000). This document should be integrated with the recommendations of the CLPP. The Suffolk County Planning Commission is in the process of integrating the principles of Smart Growth into its Zoning and Subdivision Guidebook.

Government-sponsored incentive programs currently available include the State Quality Communities program and the Federal Livable Communities program. There are also several private foundations offering grants to create and implement Smart Growth policies.

Steps

CLPP-6.1 Review local ordinances to allow incorporation of Smart Growth initiatives.

CLPP-6.2 Implement Smart Growth initiatives.

Responsible Entities

CLPP-6.1 Towns (lead), and SCPD

CLPP-6.2 Towns (lead), and SCPD

CLPP-7. Develop a Strategy for the Management of Underwater Lands Which Conserves and Enhances the Region's Critical Natural Resources.

Addresses Critical Lands Protection Plan Objective 10.

Steps

CLPP-7.1 Develop a strategy for the management of underwater lands which conserves and enhances the region's critical natural resources.

Responsible Entities

CLPP-7.1 Suffolk County and PEP Program Office (co-leads), NYSDEC, and PEP Natural Resources Subcommittee

BENEFITS OF MANAGEMENT ACTIONS

The most significant benefits of the management actions are not easily quantified. If the actions are successfully implemented, the benefits are manifested in such terms as quality of life, a thriving recreational fishery, clean water in which to recreate, and a healthy and diverse ecosystem. Economic analyses can and will quantify some of these benefits, such as enhanced property values and successful commercial fisheries harvests. But the most significant benefit is the protection of an irreplaceable asset that will only become more expensive to obtain and may not even be obtainable if action is not taken to protect it now.

COSTS OF MANAGEMENT ACTIONS

The total cost of implementing the acquisition recommendations remains to be determined. It is in fact a management action to assess this cost and evaluate whether funds exist to meet it or whether a gap exists that needs to be filled. There are additional costs associated with the following (to be funded by in-kind matches):

- stakeholder input meetings;
- GIS analysis, map production, and distribution; and,
- economic analyses.

The total cost of all actions proposed for critical lands protection is $292,500 in new one time costs; this estimate does not include cost estimates for land protection (including acquisition). (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

CRITICAL LANDS PROTECTION ACTIONS SUMMARY TABLE

Table 7-1 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 7- 1. Critical Lands Protection Strategy Actions.

Action		Responsible Entity	Timeframe	Cost	Status
CLPP-1	**Develop a PEP "Critical Lands" Map and List Based on Applying the PEP Criteria. (*Objectives 1, 2, 3, 4,, and 6*)**				
CLPP-1.1 **Priority**	Identify parcels currently recommended for acquisition in the Peconic Estuary by various levels of government. (i.e., CPF lists)	SCPD (lead) and five East End towns	2001	SCPD: Base Program	C/N
CLPP-1.2 **Priority**	Finalize GIS data coverages that allow selection of parcels within the watershed.	SCPD (lead), CLPP Work Group, SCDHS, PEP Program Office	2001	SCPD – 0.1 FTE	C/N
CLPP-1.3 **Priority**	Develop a draft map of parcels (for discussion) selected for protection with respect to estuarine management concerns.	SCPD (lead), PEP Program Office, CLPP Work Group	2001	Included in Step 1.2	C/N
CLPP-1.4 **Priority**	Hold town-by-town meetings with town officials to discuss individual parcels.	TNC, PEP Program Office (co-leads), SCPD, CLPP Work Group, five East End towns, villages	2001	EPA – 0.05 FTE NYSDEC – 0.05 FTE SCDHS – 0.05 FTE Towns – 0.05 FTE each SCPD – 0.05 FTE TNC – 0.05 FTE	C/N
CLPP 1.5 **Priority**	Incorporate suggestions from the towns and develop a final map illustrating parcels recommended for protection with respect to estuarine management concerns.	SCPD (lead), TNC, PEP Program Office, CLPP Work Group	2001	SCPD – 0.1 FTE TNC – 0.05 FTE	C/N
CLPP 1.6 **Priority**	Incorporate suggestions from the towns and develop a final list of parcels recommended for protection with respect to estuarine management concerns.	TNC (lead), SCPD, PEP Program Office, CLPP Work Group	2001	Included in Step 1.5	C/N

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Table 7-1. Critical Lands Protection Strategy Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
CLPP-2	**Continue to Refine the CNRA Boundaries with Results of the Work from the PEP Natural Resources Subcommittee.** ***(Objective 2)***				
CLPP-2.1 **Priority**	Continue to refine the CNRA boundaries with results of the work from the PEP Natural Resources Subcommittee.	NYSDEC and PEP Natural Resources Subcommittee (co-leads), CLPP Work Group, SCPD, PEP Program Office	2000-2001	Base Program	C/O
CLPP-3	**Estimate Funds Needed for Land Protection, Benefits (Where Feasible) and Evaluate Funding Sources Available for that Protection.** ***(Objective 5)***				
CLPP-3.1 **Priority**	Determine the costs of acquisition efforts if particular parcels were purchased. Determine the additional cost if all parcels were purchased.	TNC, Suffolk County, towns (co-leads)	2001	Base Program	C/N
CLPP-3.2 **Priority**	Assess the funding gap between needed protection and available funding sources.	TNC, Suffolk County, towns (co-leads)	2001	Base Program	C/N
CLPP-3.3 **Priority**	Analyze and estimate the economic benefits of land acquisition to the community as a whole and to the neighborhood in which protected land is located.	PEP Program Office (lead) Consultant EIA, Inc., GSF, TNC	2001	$30,000 NEP Grant	C/N
CLPP-4	**Prepare the PEP Critical Lands Protection Plan Report.** ***(Objectives 1, 2, 3, 4, 5, and 6)***				
CLPP-4.1 **Priority**	Prepare the PEP Critical Lands Protection Plan report.	TNC (lead), PEP Program Office, SCPD, SCDHS, NYSDEC, USFWS, EPA	2001	Base Program	C/N

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Table 7-1. Critical Lands Protection Strategy Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
CLPP-5	**Accelerate Land Protection in the Peconic Estuary.** ***(Objective 7)***				
CLPP-5.1	Increase staff at the town and County level to meet the need for more and faster land acquisitions.	Five East End towns, Suffolk County (co-leads)	2001	To be Determined.	R
CLPP-5.2	Secure zero percent short-term financing through the NYS EFC for land protection measures.	TNC, all towns, Suffolk County (co-leads)	2001	Base Program	R
CLPP-5.3	Develop a “Public Benefit" or "Current Use" ranking system for assessment of property taxes.	TNC, GSF, all town tax assessors (co-leads)	2001	To be determined	R
CLPP-5.4	Create a State income tax credit program for qualified charitable gifts of land for conservation purposes.	TNC, GSF, State Legislature (co-leads)	2000-2001	Base Program	R
CLPP-6	**Identify a Process for Using Smart Growth Tools, Sustainable Development Initiatives, and Ordinance Modifications, etc. to Assist Communities in Assigning Development to Appropriate Areas.** ***(Objectives 8 and 9)***				
CLPP-6.1	Review local ordinances to allow incorporation of Smart Growth initiatives.	Towns (lead), SCPD	2000-2001	To be determined	R
CLPP-6.2	Implement Smart Growth initiatives.	Towns (lead), SCPD	2000-2001	To be determined	R
CLPP-7	**Develop a Strategy for the Management of Underwater Lands Which Conserves and Enhances the Region’s Natural Resources.** ***(Objective 10)***				
CLPP-7.1	Develop a strategy for the management of underwater lands which conserves and enhances the region’s natural resources.	Suffolk County and PEP Program Office (co-leads), NYSDEC, PEP Natural Resources Sub-Committee	2001	To be determined	R

CHAPTER
EIGHT

PUBLIC EDUCATION AND OUTREACH MANAGEMENT PLAN

OBJECTIVES

1) Improve the understanding of human interactions with, and impacts on, the estuary.

2) Promote action-oriented stewardship of the system's resources.

3) Increase awareness of the Peconic Estuary as a regional and national resource.

4) Increase communication and cooperation among the estuary's many and diverse stakeholder groups.

5) Engender support for the PEP CCMP and its recommended management actions.

MEASURABLE GOALS

The PEP's measurable goals with respect to Education and Outreach are:

- Annually, embark on one new, substantial public education effort addressing each of the following areas:
  - Conducting Brown Tide education and outreach;
  - Reducing residential fertilizer use in the Peconic watershed;
  - Improving, protecting or enhancing habitats and living resources;
  - Reducing pathogen loadings to the estuary; and,
  - Reducing the use and loadings of toxics substances to the estuary.

  (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Actions POE-3, POE-4, POE-5, POE-6, POE-7]
- Annually, conduct one major watershed effort involving students in estuary management (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Action POE-7]
- Annually, conduct one major watershed-wide event to educate those who live, work, or recreate in the Peconics (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Actions POE-7, POE-8]
- Annually, support the establishment of one new local embayment or tidal creek association (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee). [See Action POE-7]

INTRODUCTION

The Peconic Estuary System is an integral part of the Long Island economy and ecology. In order to sustain this valuable resource, we must achieve a balance between the needs of the estuary's resources and the sometimes conflicting demands of the region's populace. Key to establishing this balance is an educated citizenry that is willing to support, promote, and actively participate in measures to protect the estuary system at home, at work, and while recreating, and collectively act as wise stewards of a shared public resource. Achieving this requires an intensive education, outreach, and participation effort that is aimed at key audiences/stakeholders as well as the public in general.

Effective public participation in the PEP Management Conference through the Citizen's Advisory Committee (CAC) continues to develop the broad-based public support needed to ensure that estuary program actions are successfully carried out in the implementation phase. The ultimate goal of public participation in the Peconic Estuary Management Conference is to establish the public consensus that ensures long-term support and implementation of the CCMP. The public participation strategy supplements and complements Management Conference activities and advances the CAC's lead role of providing for public input to estuary program decision-making.

Citizen's Advisory Committee

The CAC is one of the many committees that make up the PEP Management Conference. The CAC was initially established to act as the conduit for public involvement in the Program; provide communication between the Management Conference and the public; and promote awareness and understanding of PEP issues, goals, and recommendations through a public outreach and education strategy. The PEP CAC also acts as both an advocate on the recommendations in the CCMP and an education entity for government officials in cooperation with other public policy and interest groups.

Early in the PEP planning process, the many and diverse stakeholders of the bays were identified and invited to become members of the CAC. The following focus groups were established to concentrate on specific estuarine issues: Commercial Fishermen; Recreational Fishermen; Marine Industry; Recreation (including all forms of recreation on the bays and in the watershed); Educators; Civic Groups; Macro-economic Group (including tourism related businesses, real estate, etc.); Agriculture (farming, wineries, etc.); and Environmentalists. Ongoing input proves invaluable in developing and implementing an effective outreach/education strategy as well as an effective CCMP. The members' differing, and at times competing, interests have helped to create a colorful, imaginative, and varied outreach strategy as well as thrusting the CAC into yet another important role in the Program — that of a consensus building entity.

Public Education and Outreach Strategy

In the Peconic Estuary System, nonpoint source pollution is a major issue of concern. Nonpoint source pollution is primarily generated by users of the estuary, from many ordinary, every day activities. Thus the citizens, collectively, contribute both to the problems and threats to the estuary system and to the solutions to these problems. Each and every one of us living, working and recreating on the East End impacts the Peconic Estuary System through everyday actions — in both positive and negative ways. Few, if any, individual actions made as a part of our day-to-day living are likely to significantly affect the overall water quality, living resources, or habitats of the Peconic Estuary. Consider, however, what happens if each of these impacts are multiplied by the thousands and thousands of residents, workers, and visitors in the watershed. It is not long before the

cumulative impact does affect the estuary. Because of this, the Peconics could die the "death of a thousand cuts" or be cherished, nurtured, and healed by thousands of environmentally thoughtful actions. Thus a creative, innovative, and effective public outreach and education strategy is all-important in motivating and making a lasting positive impression on our East End citizenry and stakeholders and thus a lasting positive impact on our most important natural and economic resource — the heart of our region — the Peconic Estuary System.

Because of the extensive work carried out during the Brown Tide Comprehensive Assessment and Management Program (BTCAMP), the PEP Management Conference had a solid foundation on which to build a well organized, active, and successful public education program. The Public Opinion Poll commissioned in 1994 by the PEP CAC set a benchmark on the public's perception of the bays at the commencement of the PEP. In this poll, conducted by the Center for Community Research, 91 questions were asked in a random telephone survey. The results showed that 78 percent of the individuals polled realized the connection of the bays to our local economy and that there was a high level of willingness to pay taxes and take action for the good of the bays, especially among the users of the bay system.

"In the end, we will conserve only what we love,
Love only what we know,
And know only what we are taught."
Baba Dioum

In addition to defining stakeholder and estuary users' knowledge about and levels of commitment toward the estuary system, the poll identified the sources people use to get information on the bays. It showed that the primary sources of bay information were from personal observation, local newspapers, and environmental groups. It also revealed that television, radio, the business community, and children's education were low on the list of bay information sources. In fact, only one half of one percent of those polled felt that bay information was disseminated through children's education.

The PEP CAC has utilized this information to create its outreach and education program. The program started by saturating the already well read local newspapers with press releases and ads, and bringing estuarine information into the areas of television, radio, schools, and the business community, where before there had been little or no information. The overall strategy has targeted both the general public and specific stakeholders with information and projects to foster stewardship for estuary resources. Specific program efforts are highlighted below. This strategy was successful during the Plan development phase, and will continue to be used for Plan implementation. We have every reason to believe that the current strategy, identified herein, along with the Action Plan contained in this chapter, will be successful in effectively reaching the public as the Plan is implemented.

The Bay Show is a monthly, hour-long news magazine format television show that showcases the projects and recommendations of the Peconic Estuary Program. The show features a call-in segment with a guest panel of experts, allowing for interaction with the viewing audience. The Bay Show is aired on local access television that has a wide East End, thus Peconic watershed, viewing audience. A few of the many Bay Show topics include: "Scallops and the Brown Tide"; "Toxics in the Peconics: from Superfund to the Kitchen Sink"; "Marine Recreation on the Peconics: Video Boater's Guide and No-Discharge Zone"; "Rare and Endangered Species in the Peconics: Critical Areas Mapping, Marine Mammals, Sea Turtles, and Terrestrial Species"; "Economic Assessment of the Bays"; "Land Use and Zoning"; and a "Comprehensive Look at the PEP CCMP and its Recommended Actions".

The Adopt-A-Sign project has involved the East End business community in "Saving the Bays in Many Ways" as hundreds of businesses now display the PEP CAC watercolor poster in an 11" x 14" lucite frame/brochure rack with matching brochures. The brochure provides information on basic estuary issues of concern and stresses how the public can be part of the solution in stopping water pollution. This project has been very popular with the public and participating businesses. The PEP CAC looks forward to continuing to work on future outreach projects in cooperation with the business community.

The "East Enders Speak Out" campaign is a series of 60-second radio public service announcements (PSAs) about the bays, using edited taped conversations from East Enders representing different stakeholder groups, such as commercial and recreational fishing, business and real estate, agriculture, students, families, and local government officials. Billy Joel, the famous East End singer/composer, did a radio commercial on the importance of the PEP Program. Other radio PSA campaigns will utilize the CCMP's recommended actions, as well as the experiences of our younger stewards of the bays — the participants in the Annual Peconic Bays Children's Conference.

> *"The largest hurdle in controlling water pollution is lack of understanding. The general public... must understand and acknowledge the connection between individual activities and land use practices to water quality... With understanding through education, individual and collective efforts to change behavior and to become good stewards of our water resources can happen and can make a difference..." Coastal Waters in Jeopardy: Reversing the Decline, an oversight report of the Congressional Committee on Merchant Marine and Fisheries, published by Congress in 1989.*

The Annual Peconic Bays Children's Conference is an inspiring, multi-dimensional educational effort that brings 2nd through 12th grade students and teachers from the five East End Towns together. This three-month multi-generational marine learning experience culminates at the Long Island University - Southampton Campus in an educational, problem-solving event known as the Peconic Bays Children's Conference. Each year the Conference reaches a thousand East End students and, through these students, their families, neighbors, and community.

The major topics of the Peconic Bays Children's Conferences are: 1) Estuarine Ecosystems and Marine Life in the Peconics (the wonders of the bays); 2) Point and Nonpoint Source Pollution (the problems of the bays); and 3) Bay Stewardship in the Home, at School and in the Community (the solutions to the bays). The component parts of the Peconic Bays Children's Conference include: 1) Pre-Conference: teachers' orientation meeting; teachers' workshop; curriculum guides and creative teaching aids; Project Solve — "bay audits" at home and at school; teachers' website development workshop; coordinator/volunteer interaction with the students in the form of Chat Room meetings, website development, and action plan demonstration projects; student creation of Action Plan Demonstration Projects (APDPs) with companion outreach/education materials developed by the student participants; exhibits; art; and performances; 2) Conference & Concert: Student performances; student art; student exhibits with round-robin discussions; student brainstorming among the Conference participants and on our international internet chat room; inspirational, educational games and workshops; and a Billy B! Ways of the Bays concert. 3) Post Conference: Continuation of APDPs and distribution of student outreach materials; continuation of the Project Solve auditing program.

The PEP Youth Advisory Committee (PEP YAC) was created at the first Children's Conference. Although only 6-12th grade students were originally involved, now all participating Conference students, from Grades 2-12, are members. Meetings had initially been held via a hookup with local access television. The Save the Peconic Bays website will now have "bulletin board" capabilities for more instantaneous communication among students in all five East End Towns. Among other

projects, PEP YAC members have created bay scallop sanctuaries at local marinas; planted beach grass filter strips at stormwater runoff sites; created a mesocosm for scientific experimentation; mapped and stenciled storm drains; tracked endangered species via the internet; created and monitored plover and tern nesting sites; and created wetland kayak tours for the general public.

Some of the actions proposed in this chapter call for the continuation of ongoing, successful outreach programs, such as The Bay Show, The Annual Peconic Bays Children's Conference, and PEP YAC, as well as continued outreach media campaigns in radio, print, and television. Other actions call for new hands-on stewardship projects, such as:

- *The creation and promotion of a Peconic Yards and Neighborhoods Program, focusing on the creation of water conserving landscapes and attractive home vegetative buffer zones and filter strips;*
- *Expanded citizen Action Plan Demonstration Projects for all ages;*
- *Small business auditing and pollution prevention programs;*
- *Expanded boating safety and vessel waste No Discharge Area education;*
- *Yearly updates to the Ultimate Guide to the Peconics; and,*
- *Annual State-of-the-Bays Conference.*

Other Projects within the PEP CAC Outreach and Education Program include: a speakers' bureau that goes out to the public with a slide show, traveling wall display, and Bay Show video clips; The *Ultimate Guide to the Peconics*, including vessel waste No Discharge Area education, information on Public Access to the Bays, and education on safe and ecologically sound usage of the bays and watershed; Consensus Building Workshops; "State-of-the Bays" Conferences; PEP CCMP public meetings; PEP CCMP Issues Conferences; a follow-up Public Perception Poll; continued newspaper and radio advertising; and lots of press releases, press conferences and media interviews.

The CAC public outreach program also set aside funding for citizen Action Plan Demonstration Projects, in addition to the previously mentioned student APDP projects. A few of the citizen APDPs funded and completed thus far include monitoring projects and scallop reseeding projects. The PEP CAC is looking to expand citizen APDP-type programs in the future.

In addition to the efforts of the CAC public outreach and education program, there are many valuable adjunct outreach and education projects in the Peconic Estuary System, sponsored by groups such as Save the Peconic Bays, the Cornell Marine Learning Center, Group for the South Fork, The Nature Conservancy, and the Peconic Baykeeper Program.

Public Participation for Soliciting Input on the Draft CCMP

On September 2, 1999 the Peconic Estuary Program Policy Committee met and agreed to release the draft CCMP for public comment. The Policy Committee meeting was followed by a press conference alongside the Peconic River in downtown Riverhead. Copies of the Draft CCMP, public summary, and dates for 12 public meetings were made available that day, though the public comment period did not formally begin until September 16, 1999. The public comment period ended 60 days later on November 16, 1999. In all, 12 public meetings were held, one in the afternoon and one in the evening in an accessible location in each of the six towns in the watershed: Southampton (October 4, 1999), Brookhaven (October 12, 1999), East Hampton (October 18, 1999), Riverhead (October 27, 1999), Southold (October 28, 1999) and Shelter Island (October 29, 1999). Each public meeting consisted of a presentation on each of the chapters of the draft CCMP followed by a period for questions and comments by members of the public. The public was also encouraged to submit written comments.

A live televised "call in" meeting was held on the evening of October 21, 1999 on a local cable channel available in the 5 East End towns. Large newspaper advertisements were purchased in local papers announcing the meetings and the availability of the draft CCMP document. Poster size reproductions of the advertisement were also posted in public and private places in the estuary to bring attention to the meetings and the availability of the draft CCMP document. Two 30-second radio spots were also created; they ran for a 6-week period informing the public of the availability of the draft CCMP. The full text of the draft CCMP and the Public Summary document was also available on the Internet. Press releases accompanied all these efforts.

Perhaps the largest public exposure of the draft CCMP was through the availability of an attractively designed public summary document prepared as an 18 page newspaper supplement that was inserted in six local weekly papers, with a combined circulation of over 65,000 watershed wide. Most households in the watershed subscribe to one or more of these weekly newspapers. There was also coverage, including information on public meeting dates, in the major regional newspaper, *Long Island Newsday*. Additional copies of the newspaper supplement were made available in town halls and in other public and private locations.

A subsequent 30-day public comment commenced on August 10, 2000, and ended on September 9, 2000. Public meetings were held in the afternoon and evening in Riverhead on August 21, 2000. Three sections of the CCMP not made fully available for public comment earlier were released. These were the Base Program Analysis, the Environmental Monitoring Plan, and the Federal Consistency Report. The Peconic Estuary Program issued a press release and coverage was included in various local newspapers.

A document summarizing and responding to all public comments has been prepared and is available from the PEP Program Office.

Public Participation Strategy during Implementation of the CCMP

The Public Participation Strategy during implementation of the CCMP stresses the need to continue to bring together the stakeholders in the watershed, participate in decision-making affecting the estuary, encourage participation in programs to protect, enhance, and restore the estuary and its watershed, and conduct education and outreach efforts on priority topics. A hallmark of the Peconic Estuary Program has been and will continue to be the preparation and use of innovative and high quality participation, education and outreach methods, including printed materials, television and radio spots, and conferences. The elements of the Public Participation Strategy itself are embodied in the actions in this chapter, as well as through the representation of the Citizens Advisory Committee chair on the Management Committee.

MANAGEMENT ACTIONS

Upon approval of the CCMP, the PEP transitions from the characterization and planning phase into plan implementation. The management actions in this chapter reflect the need for a continued PEP CAC outreach and education and participation program during CCMP implementation to ensure continuity of outreach, education, and participation efforts. The CAC also proposes continued funding for the public outreach and education program, including a paid public participation coordinator to implement the strategy and coordinate the post-CCMP CAC activities. This chapter also brings together recommendations for both new and continuing public education and outreach

activities that support the other management actions found in this CCMP, including pathogens, nutrients, toxics, and habitat and living resources.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

PUBLIC EDUCATION AND OUTREACH ACTIONS TO IMPLEMENT THE PUBLIC PARTICIPATION STRATEGY

POE-1. Increase Awareness of the Peconic Estuary as a Regional and National Resource and Improve the Understanding of the Social and Economic Value of the Estuary.

POE-2. Increase Communication and Cooperation Among the Estuary's Many and Diverse Stakeholder Groups.

POE-3. Develop and Implement New Programs and Continue and Expand Existing Programs for Estuary Stakeholders about Controlling the Introduction of Pathogens into the Estuary System.

POE-4. Develop and Implement New Programs for Estuary Stakeholders about Controlling the Introduction of Nutrients into the Estuary System.

POE-5. Develop New and Continue or Expand Existing Education and Outreach Efforts Related to Toxics in the Estuarine System.

POE-6. Develop and Implement Public Education Programs for the Protection of Habitat and Living Resources in the Estuary and the Sustainable Use of Estuary Resources.

POE-7. Promote Action-Oriented Stewardship of the System's Resources.

POE-8. Engender Support for the PEP CCMP and its Recommended Management Actions.

POE-1. Increase Awareness of the Peconic Estuary as a Regional and National Resource and Improve the Understanding of the Social and Economic Value of the Estuary.

Addresses Public Education and Outreach Objective 3.

According to the Public Perception Poll taken in 1994, children's education, television, and radio were poorly rated as sources of bay information. The PEP CAC strategy took that into consideration in creating the successful Annual Peconic Bays Children's Conference, the television news magazine format local cable show, The Bay Show, and numerous radio campaigns. These have proven to be invaluable outreach tools and their use should be continued.

Many agencies and organizations have effective environmental education programs, such as the Suffolk County Department of Health Services. These programs should continue, and to the extent possible, be revised to address estuary related topics and be consistent with this CCMP.

The *Ultimate Guide to the Peconics* is another effective outreach tool. The guide contains information on a wide array of topics and reaches a broad audience of stakeholders in the Peconics. This Guide should be updated and reprinted annually, and should be expanded to include information for Peconic Estuary watershed residents on topics such as environmentally safe household products and practices.

Other methods for increasing awareness about the Peconic Estuary include establishing an Information Resource Center and conducting and using the results of public perception polls to guide education and outreach efforts.

Steps

POE-1.1 Continue existing effective environmental programs such as the Suffolk County Department of Health Services Public Environmental Education Programs.

POE-1.2 Continue/expand PEP CAC's successful outreach programs — The Bay Show and the Annual Peconic Bays Children's Conference — and continue/expand outreach media campaigns in radio, print, and television.

POE-1.3 Establish and promote an Information Resource Center appropriate for all ages to service the community with accurate information. This would include a library of PEP and other estuarine materials, as well as a website. Secure donated space for the resource center.

POE-1.4 Conduct follow-up public perception polls every three years to guide refinements to the education/outreach strategy.

POE-1.5 Continue to update, print, and distribute the *Ultimate Guide to the Peconics*, addressing a wide range of watershed activities and issues, including topics such as boating safety and vessel waste no discharge area education.

Responsible Entities

POE-1.1 Suffolk County Department of Health Services; other education/outreach entities (Peconic BayKeeper, The Nature Conservancy, Group for the South Fork, Cornell Cooperative Extension of Suffolk County, Save the Peconic Bays, New York Sea Grant)

POE-1.2 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-1.3 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-1.4 PEP Public Participation and Outreach Program (lead)

POE-1.5 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-2. Increase Communication and Cooperation Among the Estuary's Many and Diverse Stakeholder Groups.

Addresses Public Education and Outreach Objective 4.

Consensus building workshops and sessions can be important in bringing together diverse stakeholders and developing outcomes that are acceptable to all parties. These sessions can help to create mutual understanding for differing points of view. They are often led by professional facilitators with experience in the field of environmental consensus building. The Consensus Building/Negotiation Workshop the PEP CAC held in 1996 proved invaluable in the Vessel Waste No Discharge Area process. Such workshops should be held as needed to assist in CCMP implementation.

Steps

POE-2.1 Sponsor Consensus-Building Workshops, when needed, in the CCMP implementation phase.

Responsible Entities

POE-2.1 PEP Public Participation and Outreach Program (lead)

POE-3 Develop and Implement New Programs and Continue and Expand Existing Programs for Estuary Stakeholders about Controlling the Introduction of Pathogens into the Estuary System.

Addresses Public Education and Outreach Objective 1.

Pathogens are viruses, bacteria, algae, and protozoans that cause diseases in humans, plants, and other animals. Pathogens can enter the water in untreated or partially treated human sewage and possibly in wild and domestic animal waste. Pathogens increase health risks associated with the consumption of contaminated shellfish and water contact.

Domestic animal waste, fecal material from waterfowl, septic tank wastes, and boater waste are a few of the sources of pathogens that can be eliminated or reduced through simple actions or changes in behavior.

It is believed that domestic animal waste contributes at least a portion of the coliform bacteria to the estuary system. Owners who allow their pets to defecate in areas that are subject to strong stormwater flows (*e.g.*, streets) may be contributing unnecessarily to the overall loading. Proper disposal of pet waste will prevent this source of pathogens from entering the Peconic Estuary via runoff.

Fecal material from wildlife also can be a significant source of pathogens to the estuary. Waterfowl, in particular, aggregate on and near the water and in large numbers, can cause water quality problems in small, poorly flushed embayments. In many areas such as parks, local citizens like to feed birds. Feeding increases the number of birds and the amount of waste material they produce and, thus, the levels of coliform bacteria, which are then released directly or carried via stormwater into the estuary. Food scraps may also attract gulls and crows, which are predators of endangered colonial nesting birds, such as terns and plovers.

Malfunctioning septic systems can introduce untreated or partially treated human wastes into groundwater or nearby surface waters. One of the simplest and most effective methods of pinpointing septic system problems is through the placement of dye in the toilets of the suspected system. The appearance of the dye in nearby surface waters indicates a compromise of the leaching field. These tests can only be done with the cooperation of the homeowner, however, and it is often difficult to obtain permission to run the tests since a positive result may end in a requirement for the homeowner to repair, upgrade, or replace the system. In addition, these tests are only typically effective at pinpointing improper hookups or leaks from systems located near waterbodies.

One of the ways to reduce the potential for pollution in marinas and mooring areas from the discharge of treated human sewage from vessels is to minimize the waste produced on boats in these areas. The use of shoreside facilities by boaters would help achieve this end. In addition, Type III marine sanitation devices (MSD), which are holding tanks, combined with the use of pumpout facilities at marinas, would also minimize the potential for release of pathogens into the water. A successful plan to reduce the potential of pathogen contamination from vessel waste must involve education of the boating public about the need for and availability of pumpout stations for Type III MSDs as well as the appropriate use and disposal of wastes from portable toilets. Studies done in other areas have shown an increase in the use of pumpouts following aggressive education programs on the topic.

Steps

POE-3.1 Develop and implement a comprehensive education/media program for owners of domestic animals about the need to properly dispose of pet waste. (*See related Pathogens Action P-12.)*

POE-3.2 Develop and implement a comprehensive education/media program to educate residents and visitors not to feed wildlife, particularly waterfowl.

POE-3.3 Develop and implement a program whereby waterfront residents can volunteer to have dye tests done on their septic systems to determine if the system is working properly. *(See related Pathogens Action P-5.)*

POE-3.4 Develop and distribute materials to promote the use of shore-based toilets, holding tanks on boats, and pumpout stations, especially in areas of heavy boat traffic or in environmentally sensitive areas. *(See related Pathogens Action P-6.)*

POE-3.5 Continue the public awareness campaign about the availability of vessel waste pumpout facilities through distribution of information prepared by New York Sea Grant and the New York State Department of State. *(See related Pathogens Action P-6.)*

Responsible Entities

POE-3.1 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-3.2 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-3.3 PEP Public Participation and Outreach Program (lead) in concert with homeowners

POE-3.4 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities (NY Sea Grant Extension Service pumpout education program, Association of Marine Industries, local governments, NYSDEC, NYSDOS, and marina owners

POE-3.5 New York Sea Grant Extension Service (lead) and PEP Public Participation and Outreach Program in concert with other education/outreach entities

POE-4 Develop and Implement New Programs for Estuary Stakeholders about Controlling the Introduction of Nutrients into the Estuary System.

Addresses Public Education and Outreach Objective 1.

The general public can play an important role in reducing nutrient loads to the estuary. Excessive nutrients can contribute to problems such as harmful algal blooms and reduced dissolved oxygen and decreased water transparency that may follow. These conditions can adversely affect eelgrass, finfish, and shellfish. Excessive nitrogen may also affect eelgrass directly. Some sources of nitrogen are difficult to control, such as atmospheric deposition and nitrogen associated with historic loadings currently in bottom sediments. Other sources are expensive to manage and may have only site specific impacts, such as loads from sewage treatment plants. Residential fertilizer use, is however, readily manageable. Most, if not all, residential applications of fertilizers can be eliminated entirely. Eliminated or reduced fertilizer applications can also reduce water requirements for lawns and increase the interval between lawn cuttings.

Steps

POE-4.1 **Priority** Develop and implement a comprehensive education/media program to reduce residential fertilizer use in the watershed.

Responsible Entities

POE-4.1 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-5 Develop New, and Continue or Expand Existing Education and Outreach Efforts Related to Toxics in the Estuarine System.

Addresses Public Education and Outreach Objective 1.

Toxic contaminants include man-made and naturally occurring substances that can cause adverse ecosystem or human health effects in certain concentrations. Some toxics in the estuary can accumulate in the tissue of fish and shellfish, making them dangerous to wildlife and unsuitable for unrestricted human consumption.

The Peconic Estuary System generally has low levels of toxic materials in the water, sediment, and organisms. However, there are impairments which should be addressed, and residents and visitors to the estuary should be made aware of any potential threats. An adequate program is in place to develop and update finfish, shellfish, and wildlife consumption advisories. However, consumers of seafood and wildlife within the Peconics may not be aware of the advisories. The Peconic Estuary Program should expand dissemination of consumption advisory information, and to the extent possible, accommodate Spanish and Greek speaking populations, among others. Further, any materials developed specifically for the Peconics should fully and adequately address the issue of low level radionuclide contamination and associated risks.

Estuary users can help to minimize the introduction of toxic substances to the estuary system by controlling pesticide and herbicide use, preventing pollution from marinas and boating activities, and properly using and disposing of household hazardous wastes. Decisions by consumers and residents regarding marine engines, toxics associated with shoreline hardening structures such as bulkheads and docks, and underground storage tanks can also affect loadings of toxics to the estuary.

Pesticides and Herbicides

While pesticides have not been identified as impairing water quality or living resources, the potential for misuse or unintended off-site impacts exists, particularly from uncertified applicators and due to improper residential applications by homeowners. Agricultural uses of pesticides are discussed in the Toxics Chapter of this Plan. The PEP strongly encourages residents desiring to manage pests to do so in accordance with integrated pest management (IPM) practices. Many common lawn care products and formulations applied by homeowners and lawn care companies tend to be mixtures of fertilizers and herbicides, insecticides and sometimes fungicides. Applications, therefore, likely include one or more ingredients not really needed on a particular lawn or only marginally useful in many areas. Any unnecessary application of a pesticide increases the threat of groundwater contamination and potentially, contamination of the bays.

In and around freshwater wetlands, provisions of the State's Freshwater Wetlands Law prohibit the use of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. However, many residents may be unaware of this law.

For golf courses, "Environmental Principles for Golf Courses in the United States," developed by golf and environmental organizations, describes sound objectives for golf course planning and siting, design, construction, maintenance, and facility operations, including reduction of pesticides.

Marinas and Boating Activities

The best method of preventing pollution from marinas and boating activities is to educate the public about the causes and effects of pollution and methods to prevent it. Education outreach programs currently underway can be continued and expanded to address solid waste disposal, liquid material disposal, petroleum control, and boat cleaning. Much of this information can be included in the *Ultimate Guide to the Peconics*. (See Action POE-1.)

Household Septic Systems and Household Hazardous Wastes

Many activities around the home can lead to the introduction of toxic substances to the estuary. For example, organic solvents used as septic system "cleaners" may hinder effective septic system operation by destroying useful bacteria that aid in the degradation of waste, resulting in disrupted treatment activity and the discharge of contaminants. In addition, since the organic chemicals in the solvents are highly mobile in soils and are toxic (some are suspected carcinogens), they can easily contaminate ground water and surface waters and threaten public health. State and County laws restrict/prohibit the sale and distribution of illegal disposal system products in Nassau and Suffolk counties. This includes deodorizers and drain cleaners, as well as cesspool additives. However, sewage system "cleaners" may still be used by unsuspecting residents.

There are many other potentially toxic pollutants associated with everyday activities within a developed watershed. Some of the major sources include household hazardous wastes, garden and lawn care activities, turf grass management, on-site disposal systems, dumping of wastes into storm drains and commercial activities. It is important that estuary residents understand the potential threats of toxics on the ecosystem and take measures to use and dispose of toxics properly. The Peconic Estuary Program will also identify environmentally safe (or less toxic) products and practices.

Three other sources of toxic substances to the environment (discussed in greater detail in the toxics chapter) are marine engines, treated lumber and underground storage tanks. The public can play a role in eliminating or reducing the impacts or threats from these sources through alternatives.

Steps

POE-5.1 **Priority** Develop and carry out an education campaign to eliminate or reduce domestic pesticide use in the watershed. Educate home and business owners about the importance of dealing only with certified commercial applicators of pesticides. *(See related Toxics Action T-4.3.)*

POE-5.2 Increase awareness of the provisions of the State's Freshwater Wetlands Law to reduce or eliminate loadings of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. *(See related Toxics Action T-4.4.)*

POE-5.3 Endorsement, adoption, and implementation of "Environmental Principles for Golf Courses in the United States" by all golf courses in the Peconic Estuary Study Area. As necessary, provide additional detail to the principles to reflect local conditions and concerns.

POE-5.4 Continue/expand dissemination of fish and wildlife consumption advisory information. Expand program to target non-English speaking consumers in the Peconics.

POE-5.5 Continue/expand education outreach programs to specifically address potential boating pollution issues, including: solid waste disposal, liquid material disposal, petroleum control, and boat cleaning.

POE-5.6 Continue/expand ongoing education and outreach efforts to prevent the use of organic solvents as septic system cleaners.

POE-5.7 Continue/expand existing education and outreach activities for pollution prevention; develop/consolidate materials for distribution within the watershed, relying on existing materials and information to the extent possible.

POE-5.8 Develop and carry out a program to encourage rapid conversion to four stroke or in-board dry exhaust marine engines to reduce hydrocarbon loadings to the estuary.

POE-5.9 Develop and carry out a program to encourage alternatives to treated lumber for shoreline hardening structures, particularly maintenance of or restoration to natural shoreline features.

POE-5.10 Develop and carry out a program to encourage voluntary replacement of underground oil storage tanks that are exempt from current county replacement requirements.

Responsible Entities

POE-5.1 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities, NYSDEC, home and business owners

POE-5.2 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-5.3 Golf course owners, operators, and superintendents (lead), PEP Program Office, PEP Public Participation and Outreach Program in concert with other education/outreach entities, U.S. Golf Assoc., Long Island Golf Course Superintendents Assoc.

POE-5.4 NYSDEC (lead), NYSDOH, PEP Public Participation and Outreach Program with other public and private education groups and trade/industry groups

POE-5.5 PEP Public Participation and Outreach Program with other public and private education groups and trade/industry groups, Association of Marine Industries

POE-5.6 PEP Public Participation and Outreach Program in concert with education/trade groups

POE-5.7 PEP Public Participation and Outreach Program in concert with education groups and local governments

POE-5.8 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-5.9 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-5.10 PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities

POE-6 Develop and Implement Public Education Programs for the Protection of Habitat and Living Resources in the Estuary and the Sustainable Use of Estuary Resources.

Addresses Public Education and Outreach Objective 1.

Additional outreach is needed regarding the protection of habitats and living resources, including actions that members of the public can take or avoid in order to protect rare and endangered species and important habitat areas, such as bird nesting sites. Existing information and materials can be combined into a larger education packet. Information provided could include reasons for not walking on dunes and wetlands, encouragement to "pack-in-pack-out" garbage and trash, not feeding wildlife (including waterfowl), which can attract gulls and crows, which are predators of colonial nesting birds, and discouragement from the use of disposable plastic at the shore.

Additional actions recommended for the protection of habitat and living resources include education and outreach to minimize boat encounters with sea turtles and marine mammals and the importance of proper fish waste disposal. Other actions are targeted at commercial and recreational fishermen and focus on both habitat protection and the sustainable use of marine resources. The need for each of these actions is discussed briefly below.

As the number of boats and other commercial and recreational activities in the Peconic Estuary increases, encounters and collisions with sea turtles and marine mammals will continue to occur. Many boaters are not aware of the presence of these animals in the estuary nor of the fact that it can be dangerous both to the animals and to the boaters themselves should they collide. Information on where these animals are generally found, what they look like, and the procedure to follow if a collision occurs could greatly reduce the chances that these animals will be injured or killed in these encounters. It is also important to educate the public on actions that should be taken should these animals be encountered on beaches or in the water. Existing materials from Riverhead Foundation for Marine Research and Preservation should be incorporated into educational and outreach activities.

The waste generated by fishermen from cleaning fish is often discarded back into the water in the mistaken belief that because it is biodegradable it will not harm the estuary system. In fact, this material attracts scavengers, both aquatic and terrestrial, and adds to the organic matter already decaying in the sheltered embayments.

Shellfish harvesters typically concentrate their efforts in the unvegetated mudflats. In some cases, however, harvesters may work their way right up to the edge of the vegetated zone where salt marsh peat forms. Digging for shellfish at this edge destabilizes the vegetation and renders these areas vulnerable to erosion. This may contribute, over time, to the loss of vegetated wetlands.

Overfishing of finfish stocks that are highly desirable has been a concern for decades. Both commercial and recreational fishermen contribute to this problem. Fishery management plans and fishery regulations have been designed for sustainable use of these stocks by humans. In order to ensure that people understand the threats to finfish and the need to comply with regulations, education materials should be developed which specifically address this issue. Existing educational material should be used as much as possible and both written materials and signage should be used, focusing on areas where fisherman congregate, including marinas, bait and tackle shops, and fishing piers.

Implementation of steps under other actions in this chapter, particularly those addressing toxics and nutrients will also protect and enhance the habitats and living resources of the Peconic Estuary.

Steps

POE-6.1 Develop and implement a public education program about: 1) terns, plovers, diamondback terrapins, and other plants and animals that depend on tidal wetlands, beaches, and dunes; 2) the processes necessary for creating and maintaining these habitats; and 3) what people can do to participate in these conservation actions.

POE-6.2 Develop education and outreach materials aimed at minimizing encounters between boats and sea turtles and marine mammals. Educate the public on actions that should be taken should encounters or collisions occur.

POE-6.3 Educate boaters and fishermen regarding the importance of proper fish-cleaning waste disposal practices. Develop public education materials for distribution at marinas, bait and tackle shops and other related businesses detailing these BMPs. *(See related Habitat Action HLR-12.*)

POE-6.4 Develop and carry out a public education program to discourage the harvesting of shellfish at the edge of vegetated salt marshes, to protect this important habitat. *(See related Habitat Action HLR-4.)*

POE-6.5 Develop and carry out a public education program about the value of commercial and recreational fishing regulations and the importance of compliance with these regulations. *(See related Habitat Action HLR-12*.)

Responsible Entities

POE-6.1 PEP Public Participation and Outreach Program (lead) in concert with education groups

POE-6.2 PEP Public Participation and Outreach Program (lead) in concert with education groups including the Riverhead Foundation, NYSDEC

POE-6.3 PEP Public Participation and Outreach Program, AMI, Fishing related businesses

POE-6.4 PEP Public Participation and Outreach Program, NYSDEC, the five East End Towns, commercial and recreational shell fishermen

POE-6.5 PEP Public Participation and Outreach Program, NYSDEC, AMI, Fishing related businesses

POE-7 Promote Action-Oriented Stewardship of the System's Resources.

Addresses Public Education and Outreach Objective 2.

Hands-on activities and personal involvement in estuary activities are excellent ways to build stewardship and encourage collaboration among businesses, industries, local and regional governments, individuals, and groups on estuary projects. Hands-on workshops and training sessions can be used to provide information and materials for projects at the household or community level. In some cases, a small amount of seed money may be all that is needed to spark interest in a local effort aimed at preserving, enhancing, or restoring a local waterbody. Funding may be used for activities such as citizen monitoring and "Adopt a Creek" programs.

Students and youths can be some of the most conscientious stewards of the environment. The PEP Youth Advisory Committee has been used successfully to involve these groups in estuary protection efforts. Local small businesses also can play an important role in the education and outreach efforts and serve as examples of good environmental stewards through participation in small business partnership programs. A potential priority area for these partnerships may be in areas serviced by sewer districts (Riverhead and Sag Harbor) and storm sewer collection systems, which may result in the discharges of contaminants to surface waters.

Steps

POE-7.1 Promote and support the establishment of local watershed associations, focusing around local waterbodies, embayments and especially tidal creeks. Encourage community efforts to understand, protect, and restore these waters.

POE-7.2 Develop and carry out a "Peconics Yards and Neighborhoods" project in which watershed neighborhood groups would be trained in xeriscaping and the utilization of native plants in creating water conserving landscapes. This would also include training in creating attractive home-vegetated buffer zones and filter strips as a way to further mitigate stormwater runoff.

POE-7.3 Establish a Mini Grant Program to provide funding to local citizens groups to encourage the establishment of and participation in local protection and restoration efforts. Identify an agency/organization to administer the program.

POE-7.4 Establish a small business partnership program. Encourage businesses to undertake environmental management reviews and pollution prevention opportunity assessments. Establish criteria to qualify as a "Business for the Bay" and encourage patronage of these businesses.

POE-7.5 Continue/expand the PEP Youth Advisory Committee.

POE-7.6 Encourage the establishment of citizen's monitoring programs.

Responsible Entities

POE-7.1 PEP Public Participation and Outreach Program (lead), PEP Program Office, Peconic BayKeeper

POE-7.2 PEP Public Participation and Outreach Program (lead) in concert with education groups and local civic associations, PEP Program Office

POE-7.3 PEP Public Participation and Outreach Program (lead) in concert with education groups and local civic associations

POE-7.4 PEP Public Participation and Outreach Program in concert with education groups and local business associations

POE-7.5 PEP Program Office, PEP Public Participation and Outreach Program (lead)

POE-7.6 PEP Program Office, Peconic Baykeeper, Accabonac Protection Committee, other local groups

POE-8 Engender Support for the PEP CCMP and its Recommended Management Actions.

Addresses Public Education and Outreach Objective 5.

Without support from the community, implementation of the recommended actions in the CCMP will not be possible. For this reason, stakeholder input has been crucial to formulating actions in this Management Plan. Continued efforts will be needed to reach new audiences and ensure that public support for implementing the CCMP remains strong.

Distributing information on CCMP projects and proposed actions, as well as eliciting feedback from the community are good ways of creating stakeholder interest and spurring dialogue about implementation issues. An annual "State-of-the-Bays" Conference would be a good conduit for reporting progress on CCMP implementation and focusing the public's attention on the estuary. An annual evaluation by citizens of the progress of public agencies and private organizations in implementing the CCMP can also help to keep attention focused on implementation issues. A dedicated public education and outreach coordinator can work with citizens and the private sector to ensure the public is involved in carrying out the CCMP.

Steps

POE-8.1 Convene an annual "State-of-the-Bays" Conference focusing on PEP CCMP recommended actions and issues.

POE-8.2 Develop and annually complete a citizen based "report card" to highlight successes and identify weaknesses, and provide an overall citizen perspective of implementation of the CCMP.

POE-8.3 **Priority** Provide funding for an education and outreach coordinator to work with citizens and the private sector in carrying out the CCMP.

Responsible Entities

POE-8.1 PEP Public Participation and Outreach Program (lead); PEP Program Office

POE-8.2 PEP CAC

POE-8.3 PEP Program Office (lead); PEP Public Participation and Outreach Program; PEP CAC

BENEFITS OF MANAGEMENT ACTIONS

The benefits of funding an effective education and outreach program for residents and visitors to the Peconics are as difficult to quantify as they are important. Can we measure the individual benefit of one less bulkheaded piece of waterfront property, one less pound of fertilizer or pesticide applied to a lawn, or dog waste that has been scooped up and prevented from washing in to a tidal creek? Individually, we probably cannot discern differences. Cumulatively, however, if we are successful in educating the citizens of the watershed about the role they can play in preserving, protecting and restoring the bays, in time and in concert with the implementation of other actions in this CCMP, we can expect to see improvements in water quality, habitats, and living resources.

COST OF MANAGEMENT ACTIONS

It is often said that "an ounce of prevention is worth a pound of cure" and surely this is true with respect to limiting the release of pollutants to the environment and limiting disturbances to habitats and living resources. In fact, many perturbations can be avoided or eliminated through simple practices and actions brought about through education and awareness on the part of individuals, be they homeowners, visitors, business owners, workers, or recreational boaters. The cost of restoration is often prohibitive or not technically feasible. It is, therefore, important to invest in activities that prevent problems from occurring.

The total cost of all new actions proposed in the Public Education and Outreach Chapter is $190,000 for one-time costs and $1,003,500 annually. One-time costs include activities such as developing and preparing education and outreach materials. Annual costs typically include costs associated with planning and carrying out a structured, focused and coordinated education and outreach plan, and activities such as an annual "State of the Bays" conference, children's conferences, and actions with citizens groups, private businesses, etc. For many actions, inclusion of educational materials in a single document such as the *Ultimate Guide to the Peconics* allows for significant cost savings. Actions that can be incorporated in the *Guide*, which is described in action POE-1.4, include POE-5.7, POE-6.2, POE-6.3, and POE-6.5. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

PUBLIC EDUCATION AND OUTREACH MANAGEMENT PLAN ACTIONS SUMMARY TABLE

Table 8-1 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed as dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 8-1. Public Education and Outreach Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
POE-1	**Increase Awareness of the Peconic Estuary as a Regional and National Resource and Improve the Understanding of the Social and Economic Value of the Estuary.** ***(Objective 3)***				
POE-1.1	Continue existing effective environmental education programs, such as the SCDHS Public Environmental Education Program.	SCDHS, other education/outreach entities.	Post-CCMP	Base Programs of various governmental and non-governmental entities	C/O
POE-1.2	Continue/expand PEP CAC's successful outreach programs — The Bay Show and the Annual Peconic Bays Children's Conference — and continue/expand outreach media campaigns in radio, print and television.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	The Bay Show, $70,000/year; The Annual Children's Conference, $20,000/year; general radio/print campaigns, $20,000/year. Total = $110,000/year	R
POE-1.3	Establish and promote an Information Resource Center appropriate for all ages to service the community with accurate information. This would include a library of PEP and other estuarine materials, as well as a website. Secure donated space for the resource center.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$15,000/year (provided space is donated)	R
POE-1.4	Conduct follow-up public perception polls every three years to guide refinements to the education/outreach strategy.	PEP Public Participation and Outreach Program (lead).	Post-CCMP	$10,000 every three years, starting in 2001	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-1.5	Continue to update, print, and distribute the *Ultimate Guide to the Peconics*, addressing a wide range of watershed activities and issues, including topics such as boating safety and vessel waste no discharge area education.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$35,000/year	R
POE-2	**Increase Communication and Cooperation among the Estuary's Many and Diverse Stakeholder Groups. *(Objective 4)***				
POE-2.1	Sponsor Consensus-Building Workshops, when needed, in the CCMP implementation phase.	PEP Public Participation and Outreach Program (lead).	Post-CCMP	$10,000 per workshop (Estimate 1 workshop/yr)	R
POE-3	**Develop and Implement New Programs and Continue and Expand Existing Programs for the Estuary Stakeholders about Controlling the Introduction of Pathogens into the Peconic Estuary Program. *(Objective 1)***				
POE-3.1	Develop and implement a comprehensive education/media program for owners of domestic animals about the need to properly dispose of pet waste. (See related Pathogens Action P-12.2.)	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$10,000	R
POE-3.2	Develop and implement a comprehensive education/media program to educate residents and visitors not to feed wildlife, particularly waterfowl.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$10,000	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-3.3	Develop and implement a program whereby waterfront residents can volunteer to have dye tests done on their septic systems to determine if the system is working properly. (See related Pathogens Action P-5.)	PEP Public Participation and Outreach Program (lead) in concert with homeowners.	Post-CCMP.	Relatively inexpensive for test and time spent; may be considerable for homeowners if there are improper hookups or particularly if the septic system is found to be malfunctioning. PEP: 1 FTE/yr	R
POE-3.4	Develop and distribute materials to promote the use of shore-based toilets, holding tanks on boats, and pumpout stations, especially in areas of heavy boat traffic or in environmentally sensitive areas. (See related Pathogens Action P-6.)	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities (NY Sea Grant Extension Service pumpout education program, Association of Marine Industries, local governments, NYSDEC, NYSDOS,) and marina owners.	Post-CCMP	$25,000	R
POE-3.5	Continue the public awareness campaign about the availability of vessel waste pumpout facilities through distribution of information prepared by New York Sea Grant and the New York State Department of State. (See related Pathogens Action P-6.)	New York Sea Grant Extension Service (lead) and PEP Public Participation and Outreach Program in concert with other education/outreach entities.	Ongoing	Base program	C/O

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-4	**Develop and Implement New Programs for Estuary Stakeholders about Controlling the Introduction of Nutrients into the Estuary System. *(Objective 1)***				
POE-4.1 **Priority**	Develop and implement a comprehensive education/media program to reduce residential fertilizer use in the watershed.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$250,000/yr	R
POE-5	**Develop New and Continue or Expand Existing Education and Outreach Efforts Related to Toxics in the Estuarine System. *(Objective 1)***				
POE-5.1 **Priority**	Develop and carry out an education campaign to eliminate or reduce domestic pesticide use in the watershed. Educate home and business owners about the importance of dealing only with certified commercial applicators of pesticides. (See related Toxics Action T-4.3.)	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities (lead), NYSDEC, home and business owners.	Post-CCMP	$15,000 annually	R
POE-5.2	Increase awareness of the provisions of the State's Freshwater Wetlands Law to reduce or eliminate loadings of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. (See related Toxics Action T-4.4.)	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$15,000 annually	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-5.3	Endorsement, adoption, and implementation of "Environmental Principles for Golf Courses in the United States" by all golf courses in the Peconic Estuary Study Area. As necessary, provide additional detail to the principles to reflect local conditions and concerns.	Golf course owners, operators, and superintendents (lead), PEP Program Office, PEP Public Participation and Outreach Program in concert with other education/outreach entities, U.S. Golf Assoc., Long Island Golf Course Superintendents Assoc.	Post-CCMP	PEP: 1 FTE/yr	R
POE-5.4	Continue/expand dissemination of fish and wildlife consumption advisory information. Expand program to target non-English speaking consumers in the Peconics.	NYSDEC (lead), NYSDOH, PEP Public Participation and Outreach Program with other public and private education groups and trade/industry groups.	Ongoing for State program. Post-CCMP for expanded outreach program.	Base program for State program, $10,000/year for expanded outreach.	C/O for State program. R for expanded program.
POE-5.5	Continue/expand education outreach programs to specifically address potential boating pollution issues, including: solid waste disposal, liquid material disposal, petroleum control, and boat cleaning.	PEP Public Participation and Outreach Program (lead) with other public and private education groups and trade/industry groups, Association of Marine Industries.	Post-CCMP	$15,000 annually	R
POE-5.6	Continue/expand ongoing education and outreach efforts to prevent the use of organic solvents as septic system cleaners.	PEP Public Participation and Outreach Program (lead) in concert with education/trade groups.	Post-CCMP	$25,000	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-5.7	Continue and expand existing education and outreach activities for pollution prevention; develop/consolidate materials for distribution within the watershed, relying on existing materials and information to the extent possible.	PEP Public Participation and Outreach Program (lead) in concert with education groups and local governments.	Post-CCMP	$20,000	R
POE-5.8	Develop and carry out a program to encourage rapid conversion to four stroke or in-board dry exhaust marine engines to reduce hydrocarbon loadings to the estuary.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$15,000	R
POE-5.9	Develop and carry out a program to encourage alternatives to treated lumber for shoreline hardening structures, particularly maintenance of or restoration to natural shoreline features.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$15,000	R
POE-5.10	Develop and carry out a program to encourage voluntary replacement of underground oil storage tanks that are exempt from current county replacement requirements.	PEP Public Participation and Outreach Program (lead) in concert with other education/outreach entities.	Post-CCMP	$15,000	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-6	**Develop and Implement Public Education Programs for the Protection of Habitat and Living Resources in the Estuary and the Sustainable Use of Estuary Resources.** ***(Objective 1)***				
POE-6.1	Develop and implement a public education program about: 1) terns, plovers, diamondback terrapins, and other plants and animals that depend on tidal wetlands, beaches, and dunes; 2) the processes necessary for creating and maintaining these habitats; and 3) what people can do to participate in these conservation actions.	PEP Public Participation and Outreach Program (lead) in concert with education groups.	Post-CCMP	$10,000 (information can be incorporated in the *Ultimate Guide to the Peconics*)	R
POE-6.2	Develop education and outreach materials aimed at minimizing encounters between boats and sea turtles and marine mammals. Educate the public on actions that should be taken should encounters or collisions occur.	PEP Public Participation and Outreach Program (lead) in concert with education groups including the Riverhead Foundation; NYSDEC.	Post-CCMP	$10,000 (information can be incorporated in the *Ultimate Guide to the Peconics*)	R
POE-6.3	Educate boaters and fishermen regarding the importance of proper fish-cleaning waste disposal practices. Develop public education materials for distribution at marinas, bait and tackle shops and other related businesses detailing these BMPs. (See related Habitat Action HLR-12.)	PEP Public Participation and Outreach Program (lead); AMI; Fishing related businesses.	Post-CCMP	$10,000 (information can be incorporated in the *Ultimate Guide to the Peconics*)	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-6.4	Develop and carry out a public education program to discourage the harvesting of shellfish at the edge of vegetated salt marshes, to protect this important habitat. (See related Habitat Action HLR-4.)	PEP Public Participation and Outreach Program (lead); NYSDEC; the five East End Towns; commercial and recreational shell fishermen.	Post-CCMP	$ 15,000	R
POE-6.5	Develop and carry out a public education program about the value of commercial and recreational fishing regulations and the importance of compliance with these regulations. (See related Habitat Action HLR-12.)	PEP Public Participation and Outreach Program (lead), NYSDEC, AMI, Fishing related businesses.	Post-CCMP	$10,000 (information to be incorporated in the *Ultimate Guide to the Peconics*)	R
POE-7	**Promote Action-Oriented Stewardship of the System's Resources. *(Objective 2)***				
POE-7.1	Promote and support the establishment of local watershed associations, focusing around local waterbodies, embayments and especially tidal creeks. Encourage community efforts to understand, protect, and restore these waters.	PEP Public Participation and Outreach Program (lead), PEP Program Office, Peconic BayKeeper	Post-CCMP	$10,000/yr	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-7.2	Develop and carry out a "Peconics Yards and Neighborhoods" project in which watershed neighborhood groups would be trained in xeriscaping and the utilization of native plants in creating water-conserving landscapes. This would also include training in creating attractive home-vegetated buffer zones and filter strips as a way to further mitigate stormwater runoff.	PEP Public Participation and Outreach Program (lead) in concert with education groups and local civic associations.	Post-CCMP	$75,000/yr	R
POE-7.3	Establish a Mini Grant Program to provide funding to local citizens groups to encourage the establishment of and participation in local protection and restoration efforts. Identify an agency/organization to administer the program.	PEP Public Participation and Outreach Program (lead) in concert with education groups and local civic associations.	Post-CCMP	$50,000/yr	R
POE-7.4	Establish a small business partnership program. Encourage businesses to undertake environmental management reviews and pollution prevention opportunity assessments. Establish criteria to qualify as a "Business for the Bay" and encourage patronage of these businesses.	PEP Public Participation and Outreach Program in concert with education groups and local business associations.	Post-CCMP	$50,000/yr	R

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Table 8-1. Public Education and Outreach Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
POE-7.5	Continue/expand the PEP Youth Advisory Committee.	PEP Public Participation and Outreach Program (lead).	Post-CCMP	(Costs for a continued PEP YAC program are incorporated in both the Annual Peconic Bays Children's Conference budget as well as the proposed Mini Grant Program)	R
POE-7.6	Encourage the establishment of citizen's monitoring programs.	PEP Program Office, Peconic Baykeeper, Accabonac Protection Committee, other local groups	Post-CCMP	$10,000/yr	R
POE-8	**Engender Support for the PEP CCMP and its Recommended Management Actions.** ***(Objective 5)***				
POE-8.1	Convene an annual "State-of-the-Bays" Conference focusing on PEP CCMP recommended actions and issues.	PEP Public Participation and Outreach Program (lead); PEP Program Office.	Post-CCMP	$30,000/yr	R
POE-8.2	Develop and annually complete a citizen based "report card" to highlight successes and identify weaknesses, and provide an overall citizen perspective of implementation of the CCMP.	PEP CAC.	Annually, Post-CCMP	Base Program	C/N
POE-8.3 **Priority**	Provide funding for an education and outreach coordinator to work with citizens and the private sector in carrying out the CCMP.	PEP Program Office (lead), PEP Public Participation and Outreach Program; PEP CAC.	Post CCMP	$150,000/yr for public participation and outreach staff salaries	R

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CHAPTER
NINE

CCMP FINANCING

OBJECTIVES

1) At a minimum, continue to fund Federal, State, County, and local programs at current levels.

2) Aggressively seek additional public and private funds.

3) Utilize innovative financial sources and incentives to fully implement the CCMP.

MEASURABLE GOALS

The PEP's measurable goals with respect to financing are:

- Effectively use existing funding and secure new or additional governmental funding for CCMP implementation from the following sources:
    - Federal Government, particularly the U.S. Department of Agriculture;
    - State Government, particularly the Clean Water/Clean Air Bond Act and State Revolving Loan Fund;
    - County Government, particularly the Suffolk County ¼% Sales Tax Program;
    - Town Governments; and,
    - Village Governments.

    (as measured by the Peconic Estuary Program Office). [See Actions F-2, F-3]
- Secure new or additional private sector funding for CCMP implementation, from the following sources:
    - Businesses; and,
    - Not for profit organizations.

    (as measured by the Peconic Estuary Program Office). [See Actions F-4, F-7]

INTRODUCTION

This Management Plan contains both committed and recommended actions for the protection and restoration of the Peconic Estuary System. These actions and this Plan have been created as part of the characterization and planning phases of the PEP. Funding for the planning process has been provided by the National Estuary Program under Section 320 of the Clean Water Act. Upon CCMP approval, the PEP will begin implementation of the Management Plan and its actions. Funding for the continued operation of the PEP and for the implementation of each action in the Plan will need to be secured. The estimated cost of plan implementation is shown in **Table 9-1**. Commitments, previous funding allocations, and available funding to implement the PEP CCMP are shown in **Table 9-2**.

It is anticipated that a wide variety of funding sources will need to be secured to ensure full implementation of the CCMP. Securing this funding is a responsibility of the Peconic Estuary Program. Without a comprehensive strategy for funding the implementation of all aspects of the plan, the PEP runs the risk of not fully achieving its goal of becoming a guide to managing water quality, living resources, and habitats of the Peconic Estuary. The ability of the PEP to achieve its goals and objectives, and the pace at which progress is made, will clearly be a function of the availability of funding. The PEP will continue to use, where possible, cutting edge resource valuation techniques to guide decision-making and implement this Plan.

MANAGEMENT STRATEGY

The PEP supports implementation through a combination of existing resources and additional funds, including donations for project implementation and program enhancement. Early work on the financing strategy has identified four major categories of funding that are known to be available or that will be pursued: NEP Dedicated Funds, the NY State Clean Water/Clean Air Bond Act, Base Program Funding/Services, and Additional Funding Sources. Each of these categories is discussed below.

NEP Dedicated Funds

Although the EPA provided funds under the Clean Water Act for the development of the CCMP, Congress has not dedicated any long-term funding to the implementation of CCMPs. EPA's intent is generally to provide post-CCMP funding to each National Estuary Program, contingent upon sufficient annual funding and adequate progress in implementing actions described in annual workplans. In Federal fiscal years 1998-2001, it is estimated that the PEP will receive $300,000 per year in National Estuary Program funds, subject to availability of funds in EPA appropriations. An annual workplan required to receive these funds will be developed by the Management Conference (or its successor) and submitted to EPA for approval. These funds are designated for demonstration of CCMP actions and require a 50 percent non-Federal match. Priorities for the use of these funds include support of the PEP program office (or its successor), State and County staff support, and education/outreach actions. Beyond the first four years of post-CCMP status, continued National Estuary Program funding is dependent on the results of an EPA conducted Implementation Review. The purpose of the Implementation Review is to perform a comprehensive review of the PEP's progress in implementing its CCMP.

Table 9-1. Cost Estimates for Implementing Recommended[1] Actions in the Peconic Estuary Program Comprehensive Conservation and Management Plan.

Management Plan Element	New One-time Costs[1, 2]	New Annual Costs[1, 2]	Notes
Brown Tide	$ 3,250,000	-	Includes cost estimate for a one time $2.8M research plan
Nutrients	$ 767,500	$ 1,372,500	Does not include costs for implementing agricultural BMPs
Habitats and Living Resources	$ 9,088,750	$ 1,881,250	Includes cost estimate for a one-time $3M research plan
Pathogens	$ 1,718,750	$ 1,530,000	Does not include cost estimates for remedial stormwater projects
Toxics	$ 1,845,000	$ 1,977,500	
Critical Lands Protection Plan	$ 292,500	-	Does not include costs estimates for land protection (including acquisition)
Public Education/Outreach	$ 190,000	$ 1,003,500	
Financing	$ 1,162,500	$ 600,000	
Post-CCMP Management	$ 1,525,000	$ 1,060,000	Includes costs for one time and annual environmental monitoring programs
Sub-Total	$19,840,000	$ 9,424,750/year	
Habitat Restoration Plan	$59,156,560	-	Preliminary estimate in PEP (draft) Habitat Restoration Plan (July 15, 2000)
Agricultural BMPs	To be determined	To be determined	CAC Estimate: $100 million ($10 million per year for 10 years)
Stormwater Remediation	To be determined	To be determined	CAC Estimate: $50 million
Land Protection	To be determined	To be determined	CAC Estimate: $100 million
Total	$78,996,560	$ 9,424,750/year	Does not include costs for agricultural BMPs, stormwater remediation, or land protection

[1] These estimates do not include costs for actions already funded or underway or for which governmental or non-governmental commitments have been secured.
[2] Personnel costs are estimated at $75,000 per year per position.

Table 9-2. Commitments, Previous Funding Allocations, and Available Funding to Implement the PEP CCMP.

	Past and One Time Allocations Note: Funding may be available Town, County, State or nationwide		**Potential Annual Income** (2001 and beyond)	
Suffolk County 1/4% Sales Tax Program (2000-2013)			Estimate (for PEP efforts)	$2.5M /year
Suffolk County Open Space Initiatives	Community Greenways Preservation Partnerships	$ 62 M $ 16.6 M	Open Space Farmland Development Rights	$1 M/year $1.5M/year
Community Preservation Funds	Original Estimate: Note: Estimate may be exceeded as $45M generated 4/99-12/00	$110 M		
Suffolk County Capital Program	Brown Tide Research (1995- present) PEP Program Support (1995 - present)	$ 1.1 M $ 700,000	Brown Tide Research PEP Program Support	$ 150,000/year $ 100,000/year
NYS Clean Air/Clean Water Bond Act	Allocation for Peconic Estuary and South Shore Estuary Awards to date 1997-1999: (SSER: $4,299,600) Peconic 2000 Allocation for SSER/PEP 2001 and beyond	$ 30 M $ 9,647,150 $ 2 M $ 14,053,250		
Clean Water Act/EPA; Suffolk County Match; and NYSDEC Match	- National Estuary Program - Stormwater Demonstrations - Action Plan Demonstration Projects - Other Total EPA funding (1993 - 2000) Suffolk County Match (estimate; actual amount is greater) NYSDEC Match (estimate)	$ 4,511,644 $ 702,629 $ 285,000 $ 680,800 $ 6,180,073 $ 1,600,000 $ 150,000	National Estuary Program target: $310,000/year Suffolk County Match (Program Office & Marine Monitoring): $310,000/year Note: Increased appropriations are now authorized for the National Estuary Program in 2001 and beyond	

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Table 9-2. Commitments, Previous Funding Allocations, and Available Funding to Implement the PEP CCMP. (continued)

Governmental/ Organizational Commitments (Expressed as Full Time Equivalents or FTEs at $75,000 per FTE/year) Note: Includes resources for new actions in the CCMP and does not include "base program" resources	EPA: 1.80 FTE = $ 135,000 NYSDEC: 2.95 FTE = $ 221,250 SCDHS: 1.65 FTE = $ 123,750 PEP: 0.70 FTE = $ 52,500 Towns: 2.25 FTE = $ 168,750 Other Entities: 4.15 FTE = $ 311,250 Total 13.5 FTE = $ 1,012,500	EPA: 1.80 FTE/year = $135,000/year NYSDEC: 2.00 FTE/year = $ 90,000/year SCDHS: 1.25 FTE/year = $ 93,750/year PEP: 0.90 FTE/year = $ 67,500/year Towns: 0.50 FTE/year = $ 37,500/year Other Entities: 0.60 FTE/year = $ 45,000/year Total: 6.25 FTE/year = $468,750 /year
Estuaries and Clean Waters Act of 2000	Portion of $275M available nationwide	
NOAA Coastal Ocean Program	Brown Tide Research (1997-2003) $ 3M	
Other potential funding sources:	- Federal Land and Water Conservation Fund - USDA EQIP & WHIP (Environmental Quality Incentives Program and Wildlife Habitat Incentives Program) - Clean Water Act Section 319 (nonpoint source management) - NYS Environmental Protection Fund - Other funding under the NYS Clean Air/Clean Water Bond Act categories (i.e., open space) - State Revolving Fund (loans)	

New York State Clean Water/Clean Air Bond Act

In November 1996, New Yorkers proclaimed their commitment to a clean environment by approving the $1.75 billion Clean Water/Clean Air Bond Act.

Five types of projects may qualify for funding under the Bond Act:

- **Clean Water**- $790 million;
- **Safe Drinking Water**- $355 million;
- **Solid Waste**- $175 million;
- **Municipal Environment Restoration** (Brownfields)- $200 million; and
- **Air Quality**- $230 million.

With passage of the 1996 Clean Water/Clean Air Bond Act, tremendous opportunities are available to restore, preserve, and protect the State's valuable environmental resources. Section 56-0303 of Title 3 of the Bond Act provides $495 million to municipalities and soil and water conservation districts for water quality improvement projects. This includes $30 million for water quality improvement projects identified by the Comprehensive Conservation and Management Plans of the Peconic Estuary and the South Shore Estuary Reserve. No decision has been made at this time regarding the allocation of the $30 million between the two areas. Guidance from New York State has limited eligibility for Peconic Estuary projects to:

- Water quality improvement projects which address elimination of raw sewage, failing individual septic systems, and advanced wastewater treatment (beyond secondary);
- Nonpoint source pollution abatement and control projects; and,
- Aquatic habitat restoration.

$295 million is available statewide for other clean water projects that are applicable in the Peconic Estuary, including open space acquisition and programs to help small businesses protect the environment. Eligible applicants for Bond Act funds are municipalities and soil and water conservation districts. In the case of aquatic habitat restoration projects, the term municipality includes the State itself.

In determining eligibility and evaluating applications, the State has noted that due consideration will be given to:

- The suitability and feasibility of the project in relation to the goals of the respective management program, plan, or project;
- The priority of the project in relationship to other projects proposed under the same program or plan. Highest priority shall be given to projects that provide the greatest reduction in pollutants or most significant habitat improvement and are identified as priorities in the respective management program, plan, or project;
- The availability of matching funds on the part of the applicant, where applicable; and,
- The urgency of the need for Bond Act funds based on availability of other funding sources.

State assistance payments from the Bond Act will vary, depending on the type of project. For example, State assistance payments will fund: 1) up to 85 percent of the cost of the project for wastewater treatment improvement projects; 2) 50 percent of the cost of aquatic habitat projects; 3) 50 percent of the cost of pollution prevention projects; and 4) 50 percent of the cost for nonagricultural nonpoint source abatement projects. For agricultural nonpoint source abatement projects, up to 75 percent of the project costs may be granted with no landowner or operator contribution, or up to 90 percent with such a contribution. Project costs incurred after November 5, 1996 are eligible for consideration.

While the Bond Act funding for the Peconic Estuary is substantial, it is not likely to be sufficient to meet all needs, and there are limitations on the use of funds (*i.e.*, private individuals or organizations cannot receive Bond Act funds; research activities are ineligible). Therefore, while it will provide much needed funding for many important projects, additional funding will still need to be identified and secured.

Base Program Funding

It is anticipated that a great many of the actions in this Plan can be implemented through the efforts and resources of existing programs. The costs for these actions are described in this Management Plan as "base program." This term is used to refer to actions that can be funded within the existing programmatic support of the implementing entity. In many cases, these actions are ongoing elements of existing agency workplans; in other cases the actions can be accomplished by refocusing agency activities without identifying additional funding. The PEP has not estimated costs for individual base program actions since these actions are accomplished within existing programs and workplans. This CCMP includes numerous commitments on behalf of EPA, NYSDEC, SCDHS, other Federal, State and County agencies, local governments, and other implementing entities to continue the implementation of ongoing programs. These commitments assume that base programs continue to be funded, at a minimum, at current levels.

Additional Funding Sources

Actions that do not fit within the scope of ongoing programs and existing agency efforts will require additional funding or resources. The Peconic Estuary Program will establish a Finance Work Group to develop a financing strategy and seek funding to carry out these recommended actions during the implementation process. In particular, special efforts may be needed to obtain funding for education, outreach, and participation efforts, as relatively little government agency funding seems to be available for those sorts of actions.

Because of the significant role local governments bear in implementing many of the actions in this Plan, local governments will play a key role in identifying and securing additional funding sources. In all cases, the PEP will continue to consider the ability of local governments to pay for projects prior to their implementation. In addition, the PEP and participating agencies will:

- Ensure that local governments are actively involved in the Management Conference and are aware of CCMP actions that may impact them;
- Actively work with local governments to ensure their understanding and gain their support for the environmental benefits of proposed projects;
- Continue to develop cost estimates for project implementation and refine and update cost estimates as necessary;

- Actively work with local governments to identify funding sources; and,
- Foster the development of low-cost approaches to address environmental problems and implement such approaches whenever possible (for example, encouraging non-structural, low tech, and low maintenance means to reduce runoff and pollutant inputs).

Action Costs

Information in the cost column of the management action tables in the back of each chapter represents the Peconic Estuary Program's best estimate of the costs associated with each action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where practicable, the Peconic Estuary Program has made estimates of the costs of base programs, either in terms of dollars or work years. Where this Plan recommends or commits to new, expanded, or enhanced efforts beyond those tasks that may be described as base programs, the Peconic Estuary Program has attempted to quantify the necessary resources to carry out the new, expanded, or enhanced work.

Resources were expressed as a dollar amount, typically for projects suitable for contracting out, or as "work years" or full time equivalent" employees (or "FTEs") for work that is most likely to be carried out by governmental staff. Some activities require both contracting dollars and FTEs. Resource needs expressed as FTEs are usually estimated to the nearest one-tenth of a work year (*i.e.*, approximately one month or 20 work days). For some of the smaller tasks that are likely to be undertaken with other separate but related tasks, the FTE estimates may be combined, and this is indicated in the table. For estimating the overall cost of implementing this Plan, the Program will use an estimate of $75,000 per FTE per year, which includes salary, fringe benefits, and indirect costs. The actual cost of a full time worker may be more or less than this amount and will likely vary by agency, complexity of task, and point in time at which work is initiated.

Carrying out some tasks requires an annual and ongoing investment of resources. Other tasks have been expressed as one-time investments. This distinction is made for each action in the Plan, and is also reflected in the total cost of implementing the Plan.

For programmatic resource allocation analysis, a significant effort has been made to quantify time commitments for actions involving PEP sponsoring agencies (EPA, NYSDEC, or SCDHS). For such actions, a commitment has been indicated and resource needs have been estimated. Carrying out these actions forms the core workplan for the PEP coordinators from the sponsoring agencies and the PEP office staff.

In many cases, the Peconic Estuary Program was unable to quantify resources (either in dollar amount or in work years) associated with these base programs. This is because elements related to recommendations and actions are frequently inextricably linked to regional management initiatives targeted at areas larger than the PEP watershed, making segregation of PEP resources exceedingly difficult or impossible (*e.g.*, coastal zone management programs for all of Long Island; endangered species management, etc.). Also, recommendations and actions are often intertwined in larger and/or related programs, making their individual cost isolation impractical (*e.g.*, staff working on wetland mapping and trends analysis also work on numerous other natural resource efforts, such as permitting and enforcement as well). Finally, parties responsible for implementing actions use diverse and often incompatible methods of accounting and cost/time analysis, making efforts to discretize costs difficult and ultimately, inherently inaccurate, and thus, unhelpful.

Not all resource needs have been estimated at this point in time, and the costs of some activities will be subject to further refinement in the future. Many costs have not been estimated for the private sector, because the planning processes have not developed actions specific enough to do so (*e.g.*, septic tank management recommendations, since recommended pump-out intervals have not yet been specified and upgrade incentive programs have not been fully agreed upon). The PEP will attempt to estimate these costs in the future as needed and will attempt to identify funding for compliance assistance where possible.

MANAGEMENT ACTIONS

The remainder of this chapter presents proposed actions for securing funding sources for CCMP implementation. These actions address each of the four major categories of funding discussed above: NEP Dedicated Funds, the NY State Clean Water/Clean Air Bond Act, Base Program Funding/Services, and Additional Funding Sources.

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

CCMP FINANCING MANAGEMENT ACTIONS

F-1. Establish a Finance Work Group to Formulate/Refine Financing Options.

F-2. Effectively use NEP Funding, the NYS Bond Act Funding, the Suffolk County ¼% Sales Tax Program, and Base Programs to Implement the CCMP.

F-3. Explore Options for Federal, State, and County Funding.

F-4. Encourage Non-Profit Organizations to Administer Funding for Estuary Protection Efforts.

F-5. Fund Actions under the State Revolving Loan Fund.

F-6. Use Municipal Bonds for Project Financing.

F-7. Identify and Obtain Sources of Private Sector Funding.

F-8. Utilize Funds from Fines and Settlements.

F-9. Utilize Tax Abatements and Other Tax Incentives to Encourage Conservation Projects and Environmental Improvements.

F-10. Establish Municipal Improvement Districts to Pay for Qualified Projects.

F-11. Identify Sources of Funding for Land Preservation and Acquisition.

F-12. Encourage Citizen Initiated Environmental Legislation.

F-13 Investigate the Feasibility of Establishing Selective Sales Fees to Fund Environmental Management Programs.

F-1 Establish a Finance Work Group to Formulate/Refine Financing Options.

Addresses Financing Objectives 1, 2 and 3.

A financing work group should be formed to assist in the further refinement of financing options to implement the CCMP.

Steps

F-1.1 Establish a finance workgroup to formulate/refine financing options
Priority

Responsible Entities

F-1.1 PEP (lead)

F-2 Effectively Use NEP Funding, the NYS Bond Act, the Suffolk County ¼% Sales Tax Program, and Base Programs to Implement the CCMP.

Addresses Financing Objective 1.

NEP Dedicated Funds, the NY State Clean Water/Clean Air Bond Act, and Base Program Funding/Services are major funding sources that have already been identified. Additional funding sources that may be used for CCMP action implementation are described on the pages that follow. The information regarding these and other possible sources will be refined by the Finance Work Group during CCMP implementation.

The sales tax revenues from the Suffolk County ¼% Sales Tax Program, approximately $260 million over 13 years (beginning December 1, 2000), will be used for three distinct categories: open space acquisition ($100 million), farmland easements ($60 million), and water quality improvement projects ($100 million). A portion of the funding for water quality improvement projects will be available for use in the Peconic Estuary for projects including nonpoint source abatement and control, pollution prevention initiatives, and aquatic habitat restoration projects recommended by the PEP.

Steps

F-2.1 Provide post-CCMP funding to implement eligible CCMP actions; strive to obtain additional funding based on the results of EPA conducted Implementation Reviews.

F-2.2 Ensure that funding reserved for the PEP in the New York State Clean Air/Clean Water Bond Act is used effectively for the highest priority eligible projects.

F-2.3 **Priority** Effectively use funding for PEP recommended projects from the Suffolk County ¼% Sales Tax Program.

F-2.4 Utilize existing base program funding from Federal, State, County, and local government programs to implement actions as appropriate; ensure that funding for these agencies remains, at a minimum, at current levels.

Responsible Entities

F-2.1 EPA (lead), PEP

F-2.2 NYSDEC (lead), PEP

F-2.3 Suffolk County (lead), PEP

F-2.4 EPA, NYSDEC, SCDHS, other Federal, State, and county agencies, and local governments (co-leads)

F-3 Explore Options for Federal, State, and County Funding.

Addresses Financing Objective 2.

A number of Federal statutes and programs provide grants or matching funds for projects related to conservation planning and management, including the Clean Water Act, Coastal Zone Management Act, Clean Vessel Act, Intermodal Surface Transportation Efficiency Act, and others under EPA, NOAA, USFWS, and NYSDOT.

There are numerous provisions in the Federal Clean Water Act that can provide funding for CCMP actions, such as the Nonpoint Source (NPS) Management Program under Section 319 and the Water Quality Management Planning (WQMP) Program under Section 604(b). Opportunities exist when the State carries out these and other Federally funded programs, and through other State programs, including those under the Environmental Protection Fund. There are also provisions which have established and capitalized the State Revolving Fund program, funds from which can be used to carry out CCMPs. Candidate funding sources exist in other Federal and State statutes and agencies.

Two USDA programs, the Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP) are sources of funding and technical assistance for farmers, ranchers, and landowners. EQIP was established to provide a single voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. Nationally, it provides technical, financial, and educational assistance, half of it targeted to livestock-related natural resource concerns and the other half to more general conservation priorities. EQIP is available primarily in priority areas where there are significant natural resource concerns and objectives. Assistance includes: cost sharing at up to 75 percent of costs of certain conservation practices; incentive payments to up to 100 percent for three years; and a maximum payment of $10,000 per person per year and $50,000 over the length of the contract. $3.495 million was available in New York State in 1997; $3.63 million in 1998. The FY99 budget included a 50 percent increase ($100 million nationwide) for EQIP. The majority of these funds have been allocated to upstate projects. Future allocations should include significant allocations to priority projects in the Peconic Watershed.

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat on private lands. It provides both technical assistance and cost sharing to help establish and improve fish and wildlife habitat. Participants work with USDA's Natural Resources Conservation Service to prepare a wildlife habitat development plan in consultation with the local conservation district. The plan describes the landowner's goals for improving wildlife habitat, includes a list of practices and schedule for installing them, and details the steps necessary to maintain the habitat for the life of the agreement.

Suffolk County is the leading agricultural county in New York State, based upon the value of products produced. Much of this agriculture is concentrated on the East End. Even though the Peconic Estuary supports the largest number and greatest concentration of rare and endangered species in the State, and aside from the fact that East Enders rely exclusively on groundwater for drinking water, to date, neither EQIP nor WHIP funds have been awarded to the Suffolk County Soil and Water Conservation District.

Steps

F-3.1 Support the Clean Water Act reauthorization, including grants to States for continued capitalization of State Revolving Loan Funds.

F-3.2 Advocate 100 percent funding of Clean Water Act Sections 319 and 604(b) by the Federal government and 100 percent funding of the New York Nonpoint Source Management Program through the State Environmental Protection Fund.

F-3.3 Fund CCMP Actions under non-CWA statutes, such as the Coastal Zone Management Act, Clean Vessel Act, Intermodal Surface Transportation Efficiency Act, and others.

F-3.4 Provide funding under the USDA's Environmental Quality Incentives Program and Wildlife Habitat Incentives Program (EQIP/WHIP) for the Suffolk County Soil and Water Conservation District for priority projects consistent with the goals of the PEP.

F-3.5 Actively seek government agency funding for program enhancements and projects mentioned in the CCMP. Develop a list of government funding sources that matches CCMP recommendations with mission/authorities of various government agencies.

Responsible Entities

F-3.1 NYSDEC (lead), PEP CAC

F-3.2 NYSDEC, NYSDOS (co-leads)

F-3.3 NOAA, USFWS, NYSDOT (leads) with input from PEP

F-3.4 USDA Natural Resources Conservation Service (lead); Suffolk County Soil and Water Conservation District in cooperation with PEP

F-3.5 PEP (lead)

F-4 Encourage Non-Profit Organizations to Administer Funding for Estuary Protection Efforts.

Addresses Financing Objective 2.

Funding for proposed CCMP actions need not always be provided by government agencies. There are individuals and corporations interested in making contributions to implement estuary protection, preservation, and restoration efforts. Non-profit organizations under section 501(c)(3) of the Internal Revenue Code are ideally suited to receive such contributions and disburse funds for the purposes of furthering their mission as well as the PEP's mission. One such fund that can be established and administered by non-profit entities is an "Environmental Improvement Fund." Private citizens as well as private industry can receive monies from the Environmental Improvement Fund to install improved environmental systems and other environmental improvements that require large capital funding.

The PEP will encourage non-profit organizations to fund appropriate CCMP actions. To accomplish this, the PEP will:

- Identify CCMP actions that may be appropriate for funding by non-profit organizations. (Examples include research studies, environmental monitoring, and educational programs);
- Identify existing non-profit organizations with missions that overlap with the PEP's;
- Seek expressions of interest from non-profit organizations to work in partnership with the PEP to identify those actions they can implement; and,
- Work with interested non-profit organizations to develop a coordinated strategy to further mutual goals, including: soliciting private sector funds; funding appropriate CCMP actions; and, including non-profit organization activities in CCMP updates.

Steps

F-4.1 Identify actions suited for funding by non-profit organizations. Identify existing non-profit organizations with missions that overlap PEP's and seek expressions of support from them. Work with interested organizations to further mutual goals and solicit private sector funding.

F-4.2 Investigate opportunities for establishing an Environmental Improvement Fund to provide funding for private citizens and industry for funding environmental improvements.

Responsible Entities

F-4.1 PEP (lead)

F-4.2 PEP (lead)

F-5 Fund Actions under the State Revolving Loan Fund.

Addresses Financing Objective 2.

The Federal Clean Water Act's State Revolving Loan Fund (SRF) provision was established to provide low interest loans to localities for water pollution control projects. A SRF has been established by the State within EPA guidelines. The New York State SRF was capitalized initially by a combination of Federal grants and State matching funds with the intent of recycling money back into the SRF as the loans were repaid, making the fund self sufficient over time. Since 1990, New York State has received over $1.6 billion in Federal capitalization grants and provided over $314 million in State matching funds. The State has executed over 590 loans totaling over $4.2 billion to over 250 communities throughout the State.

Funding decisions are made based on the State's intended use plan (IUP) and priority project list. The SRF was primarily established to provide financing for conventional sewage treatment projects. However, the Clean Water Act and EPA guidance specifically allow the use of the SRF for nonpoint source projects consistent with the State's Nonpoint Source Management Program, such as structural and vegetative stormwater management controls; sediment and erosion control practices; and certain waterbody and wetland restoration techniques. The Clean Water Act and EPA guidance also specifically allow the use of the SRF for activities in an approved CCMP that are listed on the State's IUP, such as land acquisition, habitat enhancement, monitoring and enforcement, education, and training.

The SRF is an important funding source for nonpoint source management and CCMP actions, particularly for capital improvements that have a substantial useful life and for which a strong case can be made that funding is available to repay the debt over time. Examples of CCMP projects for which long term borrowing may be appropriate include activities such as:

- Building sewage treatment facilities;
- Improving or upgrading on-site septic systems;
- Building stormwater management systems;
- Installing nonpoint source pollution controls or equipment; and,
- Building boat pumpout facilities for vessel waste.

The SRF may also be an important mechanism for land acquisition for preserving environmentally sensitive areas and open space. Land acquisition for *drinking water source protection* is currently eligible under the State SRF. Land acquisition can be through purchase (fee simple) or easement. For eligibility, the land to be acquired must be identified in a plan or report that includes a technical basis for the land acquisition; parcels must be excluded from future sale considerations; and the municipality must agree to protect the land from incompatible uses. Costs related to land acquisition that is eligible for SRF financing may include: cost of purchase (based on fair market value) or easement; property appraisal; survey; site assessment; and title search and other legal fees. Utilizing financing available under the SRF may similarly be important for land acquisition in the Peconic Estuary for preserving environmentally sensitive areas and open space.

The New York State SRF does not presently provide financing to private entities (individuals, businesses, or organizations). This precludes the SRF from directly financing certain environmental improvement or protection measures that may be important to the success of the CCMP. The establishment of special districts (as described elsewhere in this chapter) can provide a vehicle for financing certain specified environmental improvement or protection measures. Constitutional, statutory, or regulatory changes are necessary at the State level to provide funding to private entities. Providing SRF funding to private entities could enhance implementation of some CCMP actions.

Most entities may be under the misconception that grants are always a better deal than SRF loans. Most State and local government officials are more familiar with grants, and consequently, many misconceptions exist. In fact, a loan may often be a better deal than a grant for the following reasons:

- Most grant programs require significant cost shares (as much as 50 percent or more). A State Revolving Fund Loan can cover 100 percent of project costs with no cash up front;
- SRF loans provide significant cost savings over the life of a loan. For example, a zero percent SRF loan will cost approximately 50 percent less than the same project financed by a commercial loan at 7.5 percent. Additionally, a zero percent SRF loan is equivalent to receiving a 50 percent grant (where the other 50 percent (match) is financed at market rate); and,
- Financing a project with an SRF loan means fewer Federal requirements than any other Federal grant. The SRF program is experienced in helping applicants through the loan application process and providing extensive technical assistance.

Steps

F-5.1 This CCMP includes both specific and general management actions aimed at preserving, protecting and restoring water quality, living resources, and habitats to ensure their eligibility for SRF financing. Ensure that CCMP projects are included on the State's priority list and intended use plan. Identify priority nonpoint source projects and ensure that they are included on the State's priority list and intended use plan.

F-5.2 Educate municipalities and other potential recipients on the possible benefits of SRF loans.

F-5.3 Make necessary constitutional, statutory, or regulatory changes necessary at the State level to provide SRF funding to private entities

F-5.4 Provide zero percent loans under the SRF for land acquisition consistent with this Plan.

Responsible Entities

F-5.1 NYSDEC (lead), NYS Environmental Facilities Corporation (EFC), PEP, Towns and Villages

F-5.2 PEP, NYS Environmental Facilities Corporation (co-leads)

F-5.3 NYS Legislature, NYSDEC, EFC

F-5.4 EFC, NYSDEC

F-6 Use Municipal Bonds for Project Financing.

Addresses Financing Objective 2.

If the SRF cannot be accessed, CCMP implementors may look to traditional municipal finance markets to fund capital projects. The substantial advantage of municipal bonds is that there is a lower effective interest rate than if the funds were borrowed directly by corporations or individuals to finance environmental projects. The capital requirements must meet the minimum threshold size for cost effective underwriting. The minimum recommended size for a bond issue is typically no less than one million dollars. While technically feasible to issue bonds with a smaller total issue size, the cost of issuing may be prohibitive.

Consolidating capital requirements is a general approach that integrates the financing needs of numerous localities to achieve economies of scale during the financing process. Approaches for consolidating municipal debt include:

- Creating special multi-jurisdictional districts;
- Using State bond banks/State financial agencies; and,
- Pooling bonds from multiple localities in a joint issue.

The fundamental advantage of these methods is that they allow individual municipalities more efficient access to capital. Consolidating debt is a logical approach to implementing CCMP actions where several municipalities must take similar actions to address a particular problem.

Steps

F-6.1 Consider traditional municipal finance markets to fund capital projects where appropriate.

Responsible Entities:

F-6.1 Towns, villages (leads), with input from PEP

F-7 Identify and Obtain Sources of Private Sector Funding.

Addresses Financing Objective 2.

Some of the capital required to implement CCMP initiatives may be obtained either directly or indirectly from private sources. This approach is particularly effective in funding initiatives that are below the minimum threshold size for a viable municipal debt offering as well as for those projects for which funds are not available through traditional financing mechanisms. Using private capital has a number of advantages: it does not encumber the tax base of local and regional governments or constrain future borrowing; it links some of the contributors to estuary or watershed pollution with the costs of mitigating impacts; and it has the potential to create commercial opportunities for the private sector.

Developer Financing: Developer financing consists of securing funds to finance either mitigation or environmental protection activities from land developers. It is generally secured around impact fees, capacity credits, and negotiated extractions.

Impact fees are an assessment on real estate development activities to fund additional infrastructure capacity. Intended to compensate for additional demands placed on existing services by new development, they are most applicable to capital improvements directly related to needs such as traditional sewage treatment and stormwater management. Typically a fee (usually on the order of a few thousand dollars for each residential unit) is charged to the developer; the sum of the accumulated impact fees provide a capital fund which may be used to finance any number of projects, although they are most commonly used to expand municipal infrastructure, such as sewage treatment facilities and stormwater management measures.

Capacity credits are essentially prepaid impact fees. They permit developers to protect the viability of a future development project by "reserving" an increment of capacity in a new or expanded facility. Although voluntary, developers often choose to pay them in order to ensure their ability to undertake development in the future.

Negotiated extractions, a type of impact fee, are assessments established on a case-by-case basis. They are most appropriate for large development projects, particularly commercial or industrial ventures. Negotiated extractions are considerably more complex to administer than impact fees, but they ultimately provide more flexibility.

Privatization: Privatization refers to the use of private firms to build and operate facilities, such as sewage treatment plants, or to provide services such as environmental inspections. Capital for financing the necessary investment is provided by the private firm, which then operates the project as a commercial venture. Privatization may be an effective approach for small-scale capital projects that can be tied to a revenue stream for a private operator. An example would be procuring vehicles and equipment for septic system maintenance. In this instance, a private operator provides the necessary capital items, the revenue streams to finance the investment are provided by commercial and residential owners of septic systems, and incentives in the form of requirements to maintain septic systems facilitate private investment by ensuring a need for the services.

Industry-Sponsored Initiatives: Private capital may be available in the form of voluntary, industry-sponsored initiatives. Increasingly, private firms are voluntarily financing environmental projects.

This approach depends on the availability of one or more firms that are able and willing to make the necessary investment in meaningful projects. Potential revenues or benefits from this approach may not be predictable or consistent.

Opportunities for firms to publicize their achievements can encourage voluntary donations of capital. For example, donated equipment or facilities could identify the provider, special plaques or citations could commemorate a donation, and local officials could participate in dedication ceremonies. Candidate firms include those who have a stake in potential regulation or who are otherwise interested in environmental protection. While it is important to ensure that projects are consistent with CCMP or watershed goals, industry-sponsored initiatives can be particularly attractive for small scale projects where the capital requirements are below the threshold for cost effective municipal debt financing.

Leasing: Leasing can be used to obtain capital equipment, facilities, or property, or in overcoming a funding shortfall. Examples include leasing oil spill containment equipment or vehicles and equipment used for nonpoint source abatement or wetlands restoration. Mechanisms for leasing arrangements are generally available through standard local government procurement. While leasing does not circumvent the need for revenues to cover the carrying cost of the leased item, it does potentially allow a capital item to be procured in a more timely fashion. Assessments of the financial reasonableness of the lease include comparisons of the annual lease fee with the equivalent annual cost of buying equipment and should be based on estimates of useful life, residual value, and the cost of capital.

Steps

F-7.1 Collect and use developer fees from firms undertaking land development to finance mitigation and environmental protection activities.

F-7.2 Identify and promote opportunities for private firms to build and operate facilities and to provide services.

F-7.3 Identify and promote opportunities for voluntary, industry-sponsored initiatives.

F-7.4 Utilize leasing arrangements, where appropriate, for small-scale capital purchases or equipment or in overcoming a funding shortfall.

Responsible Entities

F-7.1 Towns, villages (leads)

F-7.2 PEP (lead), town and local governments, PEP, private entities

F-7.3 PEP (lead), PEP CAC, private entities, industry groups and trade associations, PEP, local governments

F-7.4 Towns, villages

F-8 Utilize Funds from Fines and Settlements.

Addresses Financing Objective 3.

Occasionally, sufficient funds become available through fines, negotiated settlements, or jury awards to fund significant capital improvement programs. Although these are essentially unpredictable sources, it can be useful to establish a process for securing, using, and perhaps sustaining these funds when appropriate occasions arise. For example, an existing entity such as an environmental trust can be designated as the recipient for various punitive or restitution payments flowing to the State or local governments. Some Federal statutes, such as the Oil Pollution Act and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), provide that penalties for damages to natural resources be shared with State or local trustees to implement restoration activities.

Where such opportunities present themselves, the results can be particularly attractive. Major cases may produce substantial revenue, and public acceptability is high based on the "polluter pays" principle. Projects funded through these means offer a vehicle to turn penalties and fines to positive purposes. Disadvantages of this source of funding are its uncertainty and vulnerability to competition for other uses.

The PEP should identify an appropriate legal entity with established administrative procedures for using funds, including clearly defined objectives, project eligibility and selection criteria, and fund recipient eligibility. A list of priority projects or funding needs to which proceeds can immediately be applied should be maintained. The need for establishing legislation to establish an endowment, including an assessment of the specific legal procedures in the State for distributing funds from penalties or litigation, should be further investigated.

Steps

F-8.1 Establish a program to utilize funds from fines, negotiated settlements, or jury awards for CCMP actions, should they become available.

Responsible Entities

F-8.1 EPA, NYSDEC and local governments (leads), PEP

F-9 Utilize Tax Abatements and Other Tax Incentives to Encourage Conservation Projects and Environmental Improvements.

Addresses Financing Objective 3.

A variety of tax incentives can be used to encourage property owners to undertake improvement projects that benefit the environment, including real property tax abatements, income tax deductions, and real property tax reductions.

Real Property Tax Abatements: Real property tax abatements could be effectively used to support qualified environmental projects, such as replacement of underground gasoline and home heating oil tanks, septic system upgrades, commercial/residential stormwater abatement projects, certain environmental improvements at marinas, restoration of wetland buffers, re-establishment of native vegetation, and the removal of hardened shoreline structures. The Real Property Tax Law (RPTL) will need to be amended to enable towns to grant these real property tax abatements.

The real property tax law requires that all real property in the State be taxed unless exempt from State law. While the State law lists numerous exemptions to promote certain public policy objectives, the environmental protection and improvement measures mentioned above are not listed. The Municipal Home Rule Law prohibits towns from superseding a "State statute relating to...creation or alteration of areas of taxation." Therefore, specific State legislation is necessary to enable towns to give tax relief to those who undertake qualified environmental projects.

Specifically, Section 487-a of the RPTL should be amended to include the conservation methods mentioned above, or a new section could be added specifically listing these exemptions from taxation of improvements which aid in environmental protection. Towns willing to implement this tax abatement would need to do so pursuant to a locally adopted plan outlining the condition needing remediation, the extent of the problem, the incentive to the recipient, and the impact on the tax base. Towns can establish programs to be limited and targeted to specific needs, with sunset provisions and other limits so as not to create unpredictable and unforeseen administrative complications and unnecessary negative fiscal impacts to the tax base.

Environmental Improvement Income Tax Deduction: Revisions to the New York Tax Law can encourage certain qualified environmental protection measures by providing for interest deductions for these measures and permitting lending institutions to be exempted from earned income for loans for these projects. Tax credits (similar to those currently provided for solar and wind energy systems) could encourage replacement of underground gasoline and home heating oil tanks, upgrading of septic systems, commercial/residential stormwater abatement projects, certain environmental improvements at marinas, restoration of wetland buffers, reestablishment of native vegetation, and the removal of hardened shoreline structures. Further, interest income earned by lending institutions is factored in to compute net income and thus is taxable in New York State. Lending institutions that receive interest income from municipalities are exempt from State tax, which provides for lower municipal interest rates. This action envisions banks developing environmental improvement loan portfolios with exemptions similar to those afforded municipalities whose interest payments are exempt from State taxation. This would enable businesses and residents to make environmental improvements to their property at less than prevailing market interest rates.

Homeowner Associations: Homeowner associations typically control the open lands created by reserved areas resulting from a subdivision. Regulations for the reserved area are typically written by the developer for the association; most regulations are without regard for the resource that constitutes the reserved area, be it farmland, woodlands, wetlands or dunes. Homeowner association land should be afforded an additional real property tax reduction if the reserved area conforms to a management plan for the reserved area. For example, agricultural reserves that are not farmed in accordance with a management plan would be taxed at a higher rate than those that are.

Steps

F-9.1 Amend the Real Property Tax Law (RPTL) to enable towns to grant real property tax abatements for qualified environmental protection measures.

F-9.2 Amend the New York State Tax Law to provide for deductions for certain qualified environmental protection measures and to exempt lending institutions from taxes on earned income for loans for these projects.

F-9.3 Identify the necessary mechanisms and feasibility providing for real property tax reductions for homeowner associations whose lands are managed in accordance with a management plan (*i.e.*, amendments to the Real Property Tax Law).

Responsible Entities

F-9.1 State Legislature (lead), Towns, PEP (for coordination)

F-9.2 State Legislature (lead), Towns, PEP (for coordination)

F-9.3 Local governments, PEP (lead)

F-10 Establish Municipal Improvement Districts to Pay for Qualified Projects.

Addresses Financing Objective 3.

Municipalities can establish improvement districts (such as sewer, drainage, water, water quality treatment, water supply, harbor improvement, and others) and provide improvements or services wholly at the expense of the district. Such districts and the properties within the districts would receive the benefit of municipal finance rates, favorable terms to pay for certain improvements, and municipal requests for proposals to undertake certain improvements. Qualified improvements could include: replacement of underground gasoline and home heating oil tanks, septic system upgrades, commercial/residential stormwater abatement projects, certain environmental improvements at marinas, restoration of wetland buffers, reestablishment of native vegetation, and the removal of hardened shoreline structures. Town-wide septic system and fuel oil tank districts might be desirable, but State law may need to be amended to allow such districts. Instead of creating new districts, it may also be possible to amend existing districts to achieve the same ends. While the existing legislation for Wastewater Disposal Districts makes reference to "on-site wastewater disposal systems," it is unclear if this provision pertains to private septic systems or simply to collection districts for the purpose of transporting sewage to treatment plants. This section could be amended or clarified to provide for private on-site septic system improvements.

Steps

F-10.1 Establish appropriate improvement districts (or amend existing districts) to encourage the adoption of certain qualified environmental improvements.

F-10.2 Amend the State Town Law to allow the establishment of town wide septic systems and fuel oil tank districts to encourage environmental improvements. Also, the existing legislation for Wastewater Disposal Districts should be amended or clarified to provide for private on-site septic system improvements.

Responsible Entities

F-10.1 Towns, PEP

F-10.2 State Legislature (lead), Towns, PEP

F-11 Identify Sources of Funding for Land Preservation and Acquisition.

Addresses Financing Objective 3.

Open space preservation through conservation planning, land acquisition, or the use of easements can be used to protect important habitats of rare or endangered species and can have social, environmental, and economic benefits. Open space planning involves identifying and saving what is most important or most valued in a community or region while still accommodating desirable or sustainable growth. The environmental benefits of open space preservation are discussed in other chapters of this CCMP.

Community Preservation Fund: The Community Preservation Fund establishes a two percent real estate transfer tax to support farmland and open space conservation in the five East End towns. It is estimated that this tax will raise $110 million over 10 years. Elements of the program include:

- Exemption of up to $250,000 on improved property (to ameliorate concerns regarding affordable housing);
- A sunset provision in which the tax would expire in the year 2010;
- Creation of an advisory committee to identify lands to be preserved and oversee implementation;
- An agricultural land exemption;
- The tax is subject to mandatory referendum before any East End town can levy the tax;
- The buyer pays the tax;
- Money raised in a town stays in the town in which the tax is levied; and,
- The tax applies only in the East End towns and nowhere else in New York State.

New York State Open Space Conservation Plan: Statewide, significant funding is available through the New York State Clean Water/Clean Air Bond Act specifically for open space preservation under the Clean Water provisions of the Act ($150 million). The New York State Environmental Protection Fund (EPF), which is funded primarily through real estate transfer taxes, also has funded open space preservation (approximately $30 million per year). Decisions regarding use of these funds are made according to the New York State Open Space Conservation Plan. The NYSDEC has established regional advisory committees to solicit recommendations regarding open space resource priorities. This Open Space Conservation Plan proposes strategies for conserving various types of areas. Acquisition is only one of many suggested approaches to conservation of open spaces. The plan also recommends voluntary landowner initiatives and establishment of partnerships between public agencies and private organizations for achieving the objectives of the plan.

County and Town Open Space Initiatives: Suffolk County and each of the East End towns have set aside significant funding for open space and farmland preservation. Preservation may take the form of outright acquisition or the purchase of development rights. Suffolk County programs include the ¼% Sales Tax Drinking Water Program (raising approximately $20 million per year for use county-wide through 2013 via ¼% sales tax); Open Space Program ($1 million per year through annual appropriations); Farmland Purchasing of Development Rights (PDRs) ($1.5 million per year through

annual appropriations); Community Greenways Fund ($62 million in bonds for the acquisition of farmland development rights, open space, and parklands for active recreational use); and Preservation Partnerships. Funding available through town governments are as follows: East Hampton: $5 million; Riverhead: $2 million; Shelter Island: $0.6 million; Southampton: $5 million; and Southold $4 million. Additional match from Suffolk County may be available through Suffolk County Preservation Partnerships. This funding is for open space and farmland preservation countywide and town-wide and not necessarily limited to land in the PEP Study area. County and town open space and farmland preservation and acquisition programs should consider open space priorities identified by the PEP.

Private Land Trusts: Land trusts are private, tax-exempt, non-profit organizations whose primary purpose is to conserve important open land, usually by acquiring it in fee or by conservation easement and ensuring that it is effectively managed for conservation purposes. A land trust may have its own specific objectives or strategies, such as conserving ecologically sensitive lands. Land trusts can also help others acquire land. To obtain an easement or acquire fee title to a parcel of land, a considerable amount of negotiation must take place and land trusts are often in the best position to do this. Land trusts have skills and experience and may already have established good working relationships with key landowners. Land trusts can explain the benefits of donating an easement and are knowledgeable about tax laws. The two primary land trusts in the Peconics are The Nature Conservancy and the Peconic Land Trust.

Conservation Easements and Purchase of Development Rights: Conservation easements encompass development rights along with other types of easements. This approach is based on the concept that it is not necessary to transfer ownership of the property, but only to restrict certain uses. Under a conservation easement, the right to develop a site in accordance with its highest zoned use is given up, in whole or in part, in return for certain financial and tax benefits. This separation of rights from the property is legally binding, is recorded along with the title and deed records, and is conveyed along with ownership of the land. Conservation easements are intended to be tradable, and thus enjoy much more flexibility to define specific rights and conditions. This makes it easier to tailor easements to the distinctive needs of property owners, who define the restrictions they wish to observe. The principle is similar to owning land in a development subject to legally binding covenants against subdividing property. Although easements can be structured for a given period of time, easements generally must give up development rights permanently in order to qualify for tax advantages. This is primarily because it is difficult to value fixed period easements, such as a 10-year moratorium on developing a property.

Easement donors can take advantage of three different tax benefits. First, the value of the easement (defined as the difference in value between the land with and without development rights) can be deducted from the donor's income for Federal and State income tax purposes. Second, property values are assessed on the consequent lower value of the land, thus reducing the owner's property taxes. Finally, the land is subject to lower estate taxes when the land passes on to the donor's heirs, an advantage particularly relevant when farmland is at issue. These tax advantages can be significant in higher growth areas where development pressures create a high value for development rights and render purchase of such rights too expensive to undertake. In lower growth areas, on the other hand, the value of development rights may be low enough that the property owner would prefer to be paid for the rights because the tax advantages are so small, and the costs might be low enough that the agency or organization could more easily afford a purchase.

One of the greatest challenges in this approach is gaining the serious consideration of donors. In addition, it is essential to identify lands that are likely to provide the most environmental value. This

is particularly crucial in purchasing development rights, which are not tradable and whose purchase price is not likely to be recovered. Because donations create a monitoring responsibility, it is also important to focus resources on critical areas.

Conservation Improvement Districts: In a conservation improvement district, willing landowners/neighbors finance the purchase of critical open space or environmentally sensitive land through their respective local property tax bills. The landowner is a willing seller, and neighboring property owners apply to the town to acquire the land pursuant to the provisions of the Conservation Improvement District. The town acquires the land using funding raised through a special assessment applied to the tax bills of the petitioning landowners. The landowners preserve the open space and their tax bills rise incrementally. This type of program facilitates the direct participation of concerned citizens in environmental conservation.

Agricultural Assessment Districts: The New York State Legislature allows the establishment of Agricultural Assessment Districts to help farmers keep land in agricultural production by reducing property taxes. In Agricultural Assessment Districts, farmers agree to keep land in agricultural production for eight years in exchange for reduction in property taxes. A similar program could be established to apply more generally to open space and environmentally sensitive lands. Taxes on these lands would be deferred and not forgiven so that the property owners must pay all back taxes if the land is developed in the future or prorated if there is partial development, thereby encouraging conservation. This process could, for example, reduce taxes by 30 percent or more and be limited to only those parcels identified by the town board as warranting this incentive. In an effort to limit the impact on town revenues/receipts, the town could further limit the percent reduction based on the importance of the parcel, the gross amount of reductions by any town board in any one year, and other factors.

Steps

F-11.1 Provide regular input to the NYSDEC Region 1 Open Space Advisory Committee regarding important open space preservation and acquisition parcels. Incorporate priority areas in the State Open Space Conservation Plan.

F-11.2 Provide regular input to County and town committees regarding important open space and farmland preservation. Coordinate County and town efforts with the State Open Space Conservation Plan.

F-11.3 **Priority** Implement the Community Preservation Fund and coordinate this program with other open space conservation programs.

F-11.4 Private land trusts should continue to acquire and preserve important open space and environmentally sensitive land.

F-11.5 Use conservation easements and the purchase of development rights to preserve open space and protect environmentally sensitive areas.

F-11.6 Amend the State Town Law to allow the establishment of Conservation Improvement Districts. Encourage open space and environmentally sensitive land acquisition through such districts.

F-11.7 Amend the State Town Law to allow the establishment of Open Space Conservation Assessment Districts. Encourage the preservation of open space and environmentally sensitive lands through such districts.

Responsible Entities

F-11.1 PEP (lead), Regional Open Space Advisory Committee, NYSDEC

F-11.2 PEP (lead), Suffolk County Department of Planning, Towns

F-11.3 Towns

F-11.4 The Nature Conservancy, Peconic Land Trust (co-leads), PEP

F-11.5 Local governments, private land trusts (co-leads), willing landowners, PEP

F-11.6 State Legislature (lead), Towns, private landowners, PEP

F-11.7 State Legislature (lead), Towns, private landowners, PEP

F-12 Encourage Citizen Initiated Environmental Legislation.

Addresses Financing Objective 3.

The State's Town Law presently allows citizens to place a number of issues on the ballot without Town Board approval, *i.e.*, to initiate legislation. The Town Law is vague with respect to measures regarding certain environmental improvements. The Town Law does provide that town boards may, upon a board motion or upon a petition, submit at special or biennial elections a proposition to dredge, bulkhead, dock, or otherwise improve navigable or other waterways within the town. Whether or not such improvements could include septic tank improvements, fuel tank replacement, or wetland buffer restoration, and the like, is unclear. The Town Law should be clarified or an additional section added.

Steps

F-12.1 Amend the State Town Law to enable citizens to put environmental protection measures (such as septic tank improvements, fuel tank replacement, or wetland buffer restoration) to a public vote which will result in funding to be allocated to pay for these measures.

Responsible Entities

F-12.1 State Legislature (lead), Towns, citizens, PEP

F-13 Investigate the Feasibility of Establishing Selective Sales Fees to Fund Environmental Management Programs.

Addresses Financing Objective 3.

In the absence of securing sufficient funds for CCMP implementation, the feasibility of establishing selective fees to fund environmental management programs should be investigated.

At least four states (Wisconsin, Iowa, Minnesota, and Oregon) currently assess a surcharge on fertilizer/pesticide sales or charge producers/distributors directly. These agricultural chemical fees are imposed on fertilizers, pesticides, agricultural additives and minerals, and some herbicides, as a sales distribution fee.

Such fees, if employed in the Peconics, could generate significant revenues because of the relatively large volume of fertilizers and pesticides used. For pesticides, there could be a graduated rate structure, which varies according to the toxicity of the ingredients. Fees could be collected to cover both commercial agriculture and residential garden uses. Revenues could be used to fund related education/outreach programs to discourage unnecessary/inappropriate fertilizer/pesticide use, agricultural best management practices, or surface or groundwater remediation projects.

Steps

F-13.1 **Priority** Investigate the feasibility of establishing selective sales fees (on products such as fertilizers and pesticides) to fund environmental management programs.

Responsible Entities

F-13.1 New York State Legislature, PEP, NYSDEC

COSTS OF MANAGEMENT ACTIONS

The total cost of all new actions proposed in the Financing Chapter is $1,162,500 for one-time costs and $600,000 annually. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

CCMP FINANCING MANAGEMENT PLAN ACTIONS SUMMARY TABLE

Table 9-3 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed as dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both **Chapter 1** and **Chapter 9** provides an expanded explanation of base programs and action costs.

Table 9-3. CCMP Financing Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
F-1	**Establish a Finance Work Group to Formulate/Refine Financing Options. *(Objectives 1, 2 and 3.)***				
F-1.1 **Priority**	Establish a Finance Work Group to Formulate/Refine Financing Options.	PEP (lead).	Post-CCMP	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr	R
F-2	**Effectively Use NEP Funding, the NYS Bond Act, the Suffolk County ¼% Sales Tax Program, and Base Programs to Implement the CCMP. *(Objective 1)***				
F-2.1	Provide post-CCMP funding to implement eligible CCMP actions, strive to obtain additional funding based on the results of EPA conducted Implementation Reviews.	EPA (lead), PEP.	Federal fiscal years 1998 - 2001	($300,000 per year annual target)	C/O
F-2.2	Ensure that funding reserved for the PEP in the New York State Clean Air/Clean Water Bond Act is used effectively for the highest priority eligible projects.	NYSDEC (lead), PEP.	Annually during 1998-2005	($30,000,000 [less funds allocated to the South Shore Estuary Reserve Program], additional funds may also be available)	C/O
F-2.3 **Priority**	Effectively use funding for PEP recommended projects from the Suffolk County ¼ % Sales Tax Program.	Suffolk County (lead), PEP	Beginning December 1, 2000	(Estimated funding available may be $2.5 M/yr for water quality improvement projects alone)	C/N
F-2.4	Utilize existing base program funding from Federal, State, County, and local government programs to implement actions as appropriate; ensure that funding for these agencies remains, at a minimum, at current levels.	EPA, NYSDEC, SCDHS, other Federal, State, and county agencies, and local governments (co-leads).	Ongoing	Existing agency program staff and resources, as applicable	C/O

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-3	**Explore Options for Federal, State, and County Funding.** ***(Objective 2)***				
F-3.1	Support the Clean Water Act reauthorization, including grants to States for continued capitalization of State Revolving Loan Funds.	NYSDEC (lead), PEP CAC.	Annually	Base Program	C/O
F-3.2	Advocate 100 percent funding of Clean Water Act Sections 319 and 604(b) by the Federal Government and 100 percent funding of the New York State Nonpoint Source Management Programs through the State Environmental Protection Fund.	NYSDEC, NYSDOS (co-leads).	Annually	Base Program	C/O
F-3.3	Fund CCMP Actions under non-CWA statutes, such as the Coastal Zone Management Act, Clean Vessel Act, Intermodal Surface Transportation Efficiency Act, and others.	NOAA, FWS, NYSDOT (leads) with input from PEP.	Annually	Base Program PEP – 0.1 FTE/yr	R
F-3.4	Provide funding under the USDA's Environmental Quality Incentives Program and Wildlife Habitat Incentives Program (EQIP/WHIP) for the Suffolk County Soil and Water Conservation District for priority projects consistent with the goals of the PEP.	USDA Natural Resources Conservation Service (lead), Suffolk County Soil and Water Conservation District in cooperation with PEP.	Annually	PEP – 0.1 FTE/yr USDA-NRCS – 0.1 FTE/yr SCS&WCD – 0.1 FTE/yr	R

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-3.5	Actively seek government agency funding for program enhancements and projects mentioned in the CCMP. Develop a list of government funding sources that matches CCMP recommendations with mission/authorities of various government agencies.	PEP (lead).	Post-CCMP	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr	C/N
F-4	**Encourage Non-profit Organizations to Administer Funding for Estuary Protection Efforts.** ***(Objective 2)***				
F-4.1	Identify actions suited for funding by non-profit organizations. Identify existing non-profit organizations with missions that overlap PEP's and seek expressions of support from them. Work with interested organizations to further mutual goals and solicit private sector funding.	PEP (lead).	Post-CCMP	PEP – 0.1 FTE/yr	C/N
F-4.2	Investigate opportunities for establishing an Environmental Improvement Fund to provide funding for private citizens and industry for funding environmental improvements.	PEP (lead).	Post-CCMP	PEP – 0.1 FTE/yr	R

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Table 9-3. CCMP Financing Management Actions. (continued)

	Action	Responsible Entity	Timeframe	Cost	Status
F-5	**Fund Actions under the State Revolving Loan Fund.** ***(Objective 2)***				
F-5.1	This CCMP includes both specific and general management actions aimed at preserving, protecting and restoring water quality, living resources, and habitats to ensure their eligibility for SRF financing. Ensure that CCMP projects are included on the State's priority list and intended use plan. Identify priority nonpoint source projects and ensure that they are included on the State's priority list and intended use plan.	NYSDEC (lead), NYS Environmental Facilities Corporation (EFC), PEP, Towns and Villages.	Upon approval of the CCMP for CCMP actions, immediately for nonpoint source management actions	NYSDEC – 0.1 FTE/yr PEP – 0.1 FTE/yr	C/N
F-5.2	Educate municipalities and other potential recipients on the possible benefits of SRF loans.	EPA, NYS Environmental Facilities Corporation (leads), NYSDEC.	Post-CCMP	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr EFC – 0.1 FTE/yr	C/N
F-5.3	Make necessary constitutional, statutory, or regulatory changes necessary at the State level to provide SRF funding to private entities.	NYS Legislature, NYSDEC, EFC.	Post-CCMP	Base Program	R
F-5.4	Provide zero percent loans under the SRF for land acquisition consistent with this Plan.	EFC, NYSDEC	Post-CCMP	Base Program	R
F-6	**Use Municipal Bonds for Project Financing.** ***(Objective 2)***				
F-6.1	Consider traditional municipal finance markets to fund capital projects where appropriate.	Towns, villages, with input from PEP.	Upon approval of the CCMP	Base Program	R

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-7	**Identify and Obtain Sources of Private Sector Funding.** ***(Objective 2)***				
F-7.1	Collect and use developer fees from firms undertaking land development to finance mitigation and environmental protection activities.	Towns, villages (leads).	Upon approval of the CCMP	Towns – 0.1 FTE each/yr	R
F-7.2	Identify and promote opportunities for private firms to build and operate facilities and to provide services.	PEP (lead), Town and local governments, private entities.	Post-CCMP	PEP – 0.1 FTE/yr	R
F-7.3	Identify and promote opportunities for voluntary, industry-sponsored initiatives.	PEP (lead), PEP CAC, private entities, industry groups and trade associations, PEP, local governments.	Post-CCMP	PEP – 0.1 FTE/yr	R
F-7.4	Utilize leasing arrangements, where appropriate, for small-scale capital purchases or equipment or in overcoming a funding shortfall.	Towns, villages.	Post-CCMP	Base Program	R
F-8	**Utilize Funds from Fines and Settlements.** ***(Objective 3)***				
F-8.1	Establish a program to utilize funds from fines, negotiated settlements, or jury awards for CCMP actions, should they become available.	EPA, NYSDEC, local governments (leads), PEP.	Post-CCMP	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr	R
F-9	**Utilize Tax Abatements and Other Tax Incentives to Encourage Conservation Projects and Environmental Improvements.** ***(Objective 3)***				
F-9.1	Amend the Real Property Tax Law (RPTL) to enable towns to grant real property tax abatements for qualified environmental protection measures.	State Legislature (lead), Towns, PEP (for coordination).	Post-CCMP	PEP – 0.5 FTE Towns – 0.5 FTE each	R

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-9.2	Amend the New York State Tax Law to provide for deductions for certain qualified environmental protection measures and to exempt lending institutions from taxes on earned income for loans for these projects.	State Legislature (lead), Towns, PEP (for coordination).	Post-CCMP	PEP – 0.5 FTE Towns – 0.5 FTE each	R
F-9.3	Identify the necessary mechanisms and feasibility providing for real property tax reductions for homeowner associations whose lands are managed in accordance with a management plan (*i.e.*, amendments to the Real Property Tax Law).	Local governments, PEP (lead).	Post-CCMP	PEP – 0.5 FTE Towns – 0.5 FTE each	R
F-10	**Establish Municipal Improvement Districts to Pay for Qualified Projects.** ***(Objective 3)***				
F-10.1	Establish appropriate improvement districts (or amend existing districts) to encourage the adoption of certain qualified environmental improvements.	Towns (lead), PEP.	Post-CCMP	Towns – 1 FTE each PEP – 1.0 FTE	R
F-10.2	Amend the State Town Law to allow the establishment of town wide septic systems and fuel oil tank districts to encourage environmental improvements. Also, the existing legislation for Wastewater Disposal Districts should be amended or clarified to provide for private on-site septic system improvements.	State Legislature (lead), Towns, PEP.	Post-CCMP	PEP – 0.5 FTE/yr	R

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-11	**Identify Sources of Funding for Land Preservation and Acquisition.** ***(Objective 3)***				
F-11.1	Provide regular input to the NYSDEC Region 1 Open Space Advisory Committee regarding important open space preservation and acquisition parcels. Incorporate priority areas in the State Open Space Conservation Plan.	PEP (lead), Regional Open Space Advisory Committee, NYSDEC.	Post-CCMP	Utilize Base Program; funding available under the Bond Act (initially $150 million) and the Environmental Protection Fund (approximately $30 million per year) PEP – 0.1 FTE/yr	C/N
F-11.2	Provide regular input to County and town committees regarding important open space and farmland preservation. Coordinate County and town efforts with the State Open Space Conservation Plan.	PEP (lead), Suffolk County Department of Planning, Towns.	Upon Approval of the CCMP	Base Program (A portion of the funds available at the county level and a portion of the $16.6 million available at the town level) PEP – 0.1 FTE/yr	C/N
F-11.3 **Priority**	Implement the Community Preservation Fund and coordinate this program with other open space conservation programs.	Towns.	1999 - 2010	Base program (Community Preservation Fund expected to raise $110 million in the five East End towns) PEP – 0.2 FTE/yr	C/O
F-11.4	Private land trusts should continue to acquire and preserve important open space and environmentally sensitive land.	The Nature Conservancy and Peconic Land Trust (leads), PEP.	Post-CCMP	Base program (for identifying priorities), to be determined for acquisition	R
F-11.5	Use conservation easements and the purchase of development rights to preserve open space and protect environmentally sensitive areas.	Local governments (lead), private land trusts, willing landowners, PEP.	Post-CCMP	PEP – 0.2 FTE/yr Towns – 1/FTE/town/yr	R

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Table 9-3. CCMP Financing Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
F-11.6	Amend the State Town Law to allow the establishment of Conservation Improvement Districts. Encourage open space and environmentally sensitive land acquisition through such districts.	State Legislature (leads), Towns, private landowners, PEP.	Post-CCMP	PEP – 0.2 FTE/yr	R
F-11.7	Amend the State Town Law to allow the establishment of Open Space Conservation Assessment Districts. Encourage the preservation of open space and environmentally sensitive lands through such districts.	State Legislature (leads), Towns, private landowners, PEP.	Post-CCMP	PEP – 0.2 FTE/yr	R
F-12	**Encourage Citizen Initiated Environmental Legislation. (Objective 3)**				
F-12.1	Amend the State Town Law to enable citizens to put environmental protection measures (such as septic tank improvements, fuel tank replacement, or wetland buffer restoration) to a public vote which will result in funding to be allocated to pay for these measures.	State Legislature (lead), Towns, citizens, PEP.	Post-CCMP	PEP – 0.2 FTE/yr	R
F-13	**Investigate the Feasibility of Establishing Selective Sales Fees to Fund Environmental Management Programs. (Objective 3)**				
F-13.1 **Priority**	Investigate the feasibility of establishing selective sales fees to fund environmental management programs.	State Legislature (lead), PEP, NYSDEC	Post-CCMP	Base Program PEP – 0.5 FTE	R

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CHAPTER
TEN

POST-CCMP MANAGEMENT

OBJECTIVES

1) Create a stable and effective management structure for CCMP implementation.

2) Ensure widespread public agency participation/representation and use existing authorities to the maximum extent possible.

3) Develop and implement an integrated long-term monitoring plan for water quality and habitats/living resources issues with a coordinated data management strategy.

4) Track the progress of CCMP implementation (commitments, outcomes, and environmental effects), providing routine reporting and allowing for refining of management approaches.

MEASURABLE GOALS

The Peconic Estuary Program's measurable goals with respect to post-CCMP management and implementation are:

- Implement the Peconic Estuary Program Environmental Monitoring Plan. [See Action M-2]
- Produce status reports. [See Action M-3]
- Update municipal officials. [See Action M-4]
- Develop sub-watershed implementation plans (as measured by the number of sub-watershed plans initiated). [See Action M-5]

INTRODUCTION

> *The ultimate success of any National Estuary Program management conference can be measured by implementation of its Comprehensive Conservation and Management Plan (CCMP). Plan implementation requires a clear understanding among all participating entities concerning their responsibilities for actions recommended in the CCMP (Battelle et al., 1995).*

The Peconic Estuary Program has recognized the need for establishing a long-term framework for Peconic Estuary management, as shown by the PEP goals and objectives at the beginning of this chapter. In light of the significance placed upon post-CCMP management and monitoring by Congress, the EPA, and the PEP Management Conference, the PEP Management Conference directed that a separate section of this Management Plan specifically deal with the issue of long-term management. Accordingly, this chapter of the CCMP includes not only a discussion on the critical issue of long-term institutional and organizational framework, but also a summary of other important parameters such as long-term monitoring, mechanisms for measuring progress, and data management.

INSTITUTIONAL FRAMEWORK

The PEP has selected a long-term institutional framework for post-CCMP management, which is to continue the existing management structure. Various alternatives were proposed in the Draft CCMP. These alternatives served as a starting point for the public as well as agencies and resource managers in the decision-making process. During the public comment period for the draft Management Plan, the PEP Management Conference sought input from interested parties regarding a final long-term institutional framework for post-CCMP management.

The three alternative frameworks proposed in the draft CCMP were:

1. Continuation of Existing Management Conference Structure *(Policy Committee; Management Committee; Citizens,Technical, and Local Government Advisory Committees; Natural Resources Subcommittee; and Program Office);*
2. Formation of a Regional Advisory Commission *(formal, non-regulatory commission of East End town and village representatives);* and,
3. Formation of the Pine Barrens Maritime Reserve Commission *(Modification of the Pine Barrens Maritime Reserve Act as a mechanism to involve State, County, and local governments in a regional implementation process).*

For the foreseeable future, the Management Conference will continue the existing Management Conference structure (see Appendix B). The PEP Program Office at the SCDHS Office of Ecology will continue to be a critical coordinating, management, and administrative body.

Continuation of Existing Management Conference Structure

At the core of the existing PEP Management Conference structure are the Management Committee and Program Office. (**See Figure 10-1**) The Program Office is located in the SCDHS Office of Ecology. The Management Committee consists of voting representatives from EPA, the NYSDEC, Suffolk County, local government, chairs of Citizens and Technical Advisory Committees, and

several other advisory members. (See Appendix B for a full discussion of the Management Conference Structure.)

The existing Management Conference structure remains intact. The Local Government Committee, Technical Advisory Committee, and Citizens Advisory Committee will continue to be integral to the long-term management process. The Citizens Advisory Committee will continue to maintain a vigorous public education and outreach program. The Technical Advisory Committee and the Natural Resources Subcommittee will provide technical guidance regarding long-term monitoring and assessment projects, technical implementation projects, and CCMP assessment and goal attainment. Local governments will be crucial to the implementation process itself with regard to issues such as land use, zoning, and implementation of nonpoint source control programs.

Both the Management Committee and Local Government Committee currently report to the Policy Committee. Under the Post-CCMP structure, both will continue to report to the Policy Committee, which will review and approve progress reports on implementation and sanction major new policy initiatives.

The Program Office will continue its management, coordination, and administration functions, as they are applicable to post-CCMP management, and as resources allow. Several responsibilities and functions outlined in the PEP *Management Conference Agreement* (June 1993) which will still be applicable to the post-CCMP period are noted as follows:

Management Responsibilities

- Communicate regularly with all PEP participants about activities and issues to ensure consensus and that all views are fairly represented in work products;
- Coordinate activities among Federal, State, County, and local agencies as well as the public sector to obtain program objectives;
- Manage the preparation of annual workplans and reports, in cooperation with all PEP participants;
- Coordinate conference activities in identifying and seeking alternative sources of funding for activities associated with the estuary system; and,
- Implement the CCMP.

Technical Responsibilities

- Oversee and assist in coordinating the planning, development, and implementation of all phases of the PEP; and
- Identify, participate in, and ensure the transfer of scientific/engineering information to PEP participants.

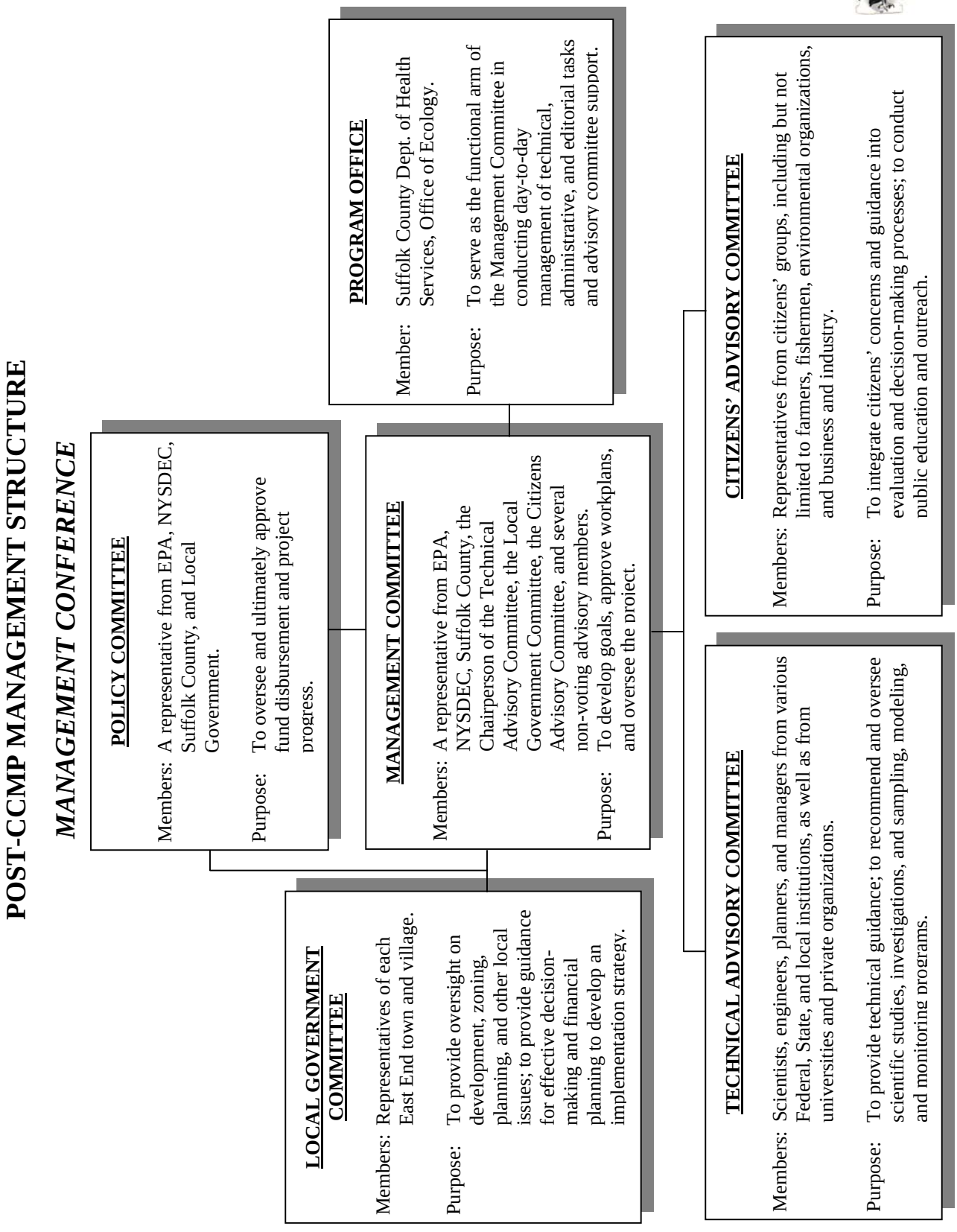

Figure 10-1. Peconic Estuary Program Post-CCMP Management Structure.

Program Administration

- Manage development of Requests for Proposals;
- Oversee the administration and performance of contracts and grants;
- Facilitate the convening of conferences and meetings;
- Prepare routine PEP status reports and program information. The Program Office and Suffolk County maintain the PEP worldwide web site and the Program Office library that contains a collection of program documents, reports, and maps; and,
- Prepare and distribute a periodic newsletter on the Peconic Estuary Program.

Administrative Support

- Routinely attend meetings of major committees;
- Ensure the transfer of all PEP materials (*e.g.*, work products, reports, meeting minutes, etc.) to the appropriate persons and locations; and,
- Receive and respond to requests for technical information and assistance regarding the PEP from the public, elected officials, EPA Headquarters, and others.

Benefits of Continuing the Existing Management Conference Structure

- The structure relies on a pre-existing framework that has been successful in integrating concerns and building consensus in an often complex and contentious process;
- The structure effectively involves numerous stakeholders closely in the management process;
- The Program Office, which benefits from decades of institutional environmental management continuity in eastern Suffolk County, is at the heart of the administration and management process;
- The NYSDEC (which administers State Bond Act funding) and EPA (which provides post-CCMP funding) will have active roles; and,
- The structure would not involve any new or major institutional expenditures and therefore would be relatively low cost (provided that all Committee representatives will continue to participate actively in committee activities without compensation and that staff from the SCDHS Office of Ecology can continue to dedicate a portion of their time to program coordination, as well as long-term monitoring and data management).

Drawbacks of Continuing the Existing Management Conference Structure

The following drawbacks of continuing the existing management conference structure were identified in the draft CCMP and will need to be considered and addressed in the implementation phase:

- The Management Conference structure is centered around the Management Committee that does not itself implement many of the recommended actions in the draft CCMP. This drawback may be overcome by close and active coordination with advisory committees and workgroups. Additional committees, such as a Habitat Restoration Work Group and the proposed Financing Work Group, can be integrated and can report directly to the Management Committee, or, in some cases, other committees, such as the Local Government Committee, as needed;
- The structure has no ability to raise revenues. This can be overcome by a coupling with a non-profit arm with fund-raising ability; and,
- The Management Conference structure does not have any direct regulatory or enforcement authority. Several Management Conference members have, on numerous occasions, expressed the opinion that a lack of direct regulatory or enforcement authority is highly desirable and is in the spirit of the consensus-building approach of the PEP Management Conference. Also, agencies that sit on the Management Conference do, of course, have regulatory authorities.

LONG-TERM MONITORING

Monitoring during CCMP implementation is needed to gather information on the changing state of the estuary system. This information can be used to prioritize activities and measure the success of management actions. Specific details regarding PEP post-CCMP monitoring efforts are included in the various main chapters of this draft management plan and the monitoring plan presented in Appendix I. The overall strategy for long-term monitoring is summarized below. Monitoring plan elements are summarized in **Table 10-1**.

A diagram of some of the major long-term monitoring topics for the PEP is shown in **Figure 10-2**. It is critical to emphasize that the PEP is a *management* program rather than primarily a research effort. Therefore, all monitoring efforts directly undertaken, coordinated, or overseen by the PEP must be primarily management-oriented. For example, the PEP would probably not perform a long-term zooplankton study merely to determine shifts in regional species composition abundance, but to ultimately enable evaluation of possible linkages to causal factors. PEP projects must be more determinate in terms of hypotheses and probable management utility. An appropriate research project would be to perform synoptic zooplankton and nutrient monitoring to determine whether changes in nutrient loading are adversely affecting that trophic level, in terms of abundance or species composition. More than just an academic or semantic issue, the clear definition of project objectives and management utility will have profound impacts on project types.

This is not to discount PEP involvement in long-term research projects. The PEP, as part of the CCMP, will continue to identify long-term research efforts necessary to characterize and understand basic processes and parameters. The PEP will also seek to procure sources of funding to support such research. In the case of Brown Tide, the PEP will actively participate in the Brown Tide Steering Committee.

Several of the PEP monitoring program topics in **Figure 10-2** will be performed as part of pre-existing programs (point source discharge data through SPDES permits; groundwater monitoring programs through the SCDHS, the Suffolk County Water Authority, NYSDEC, and other entities; coliform/shellfish sanitation program through NYSDEC, surface water monitoring program through SCDHS; etc.). Also, the NYSDEC will continue its finfish trawl surveys, and landings data for finfish and scallops will provide some indication of fisheries resources. Finally, Brown Tide research will be addressed through the Brown Tide Steering Committee, in which the PEP will continue to participate actively. Several possible funding sources are outlined in the Brown Tide chapter.

Even though the pre-existing long-term efforts will be ongoing, substantial effort will be required to compile, analyze, and use some of the data. The Management Committee will continue to identify entities that will commit resources to such data analysis and use. For example, the coliform and finfish trawl data is routinely collected, but requires substantial resources to compile and report for the PEP. Similarly, groundwater programs collect substantial data at the County and State levels, but compilation and use of data represents a formidable challenge.

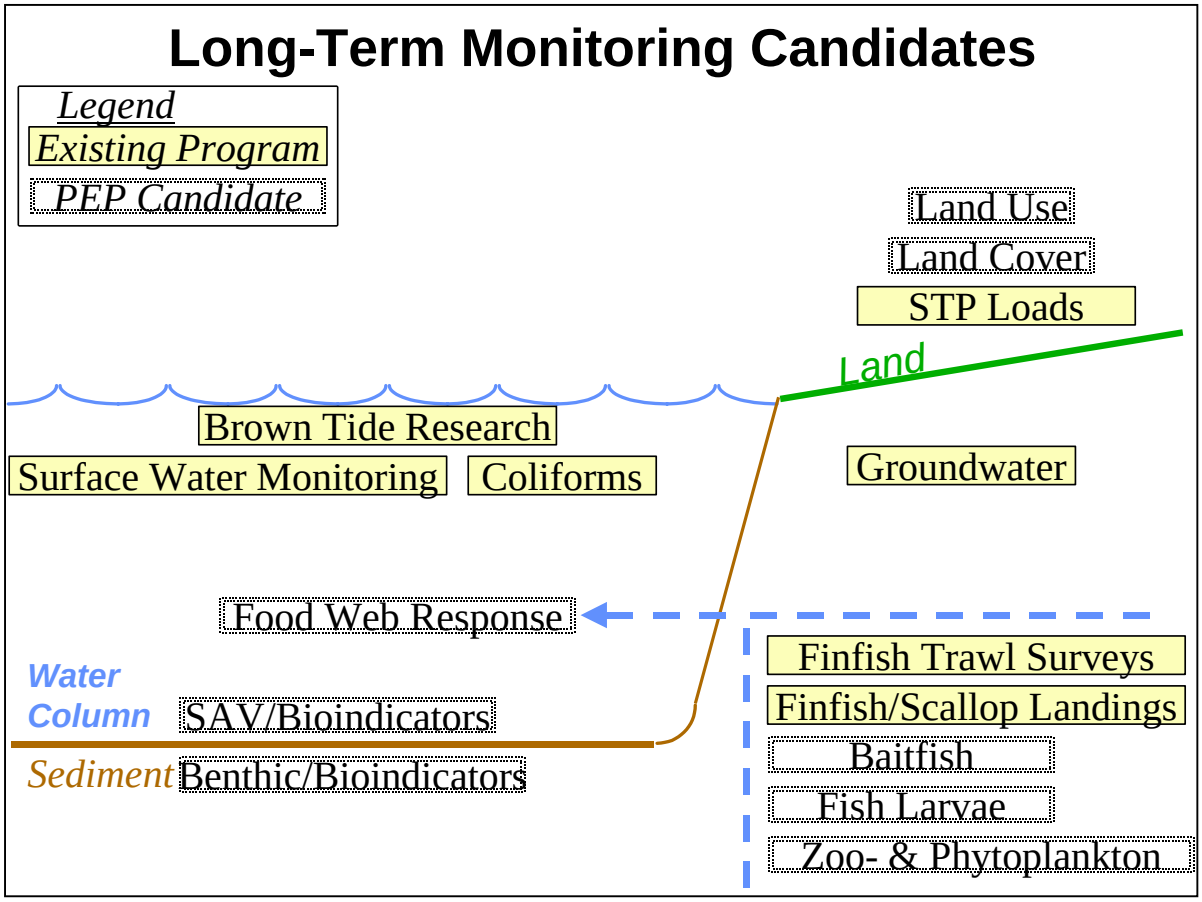

Figure 10-2. Long-Term Monitoring Topics.

Table 10-1. Environmental Monitoring Plan.

Monitoring Program	Base Programs		New Costs	
	One-Time	Annual	One-Time	Annual
Aquaculture and Transplanting Activities		X	$710,000	$5,000
Bay Scallops (recruitment success and survival dynamics)			$200,000 (over three years)	
Biota (Fish, Shellfish, Crustacean) Monitoring for Toxics	X			
Brown Tide Research Initiative		X		
Brown Tide Steering Committee		X		
Coastal 2000		X		
Dredging			$37,500	$7,500
Endangered Species Program		X		
Federal Toxics Release Inventory		X		
Hazardous Waste Site Monitoring		X		
National Pollutant Discharge Elimination System (NPDES) Program		X		
NMFS Commercial Landings Program		X		
Vessel Waste No Discharge Areas				$5,000
NOAA Mussel Watch Program		X		
NYS Pesticide Reporting Law		X		
NYS Pollutant Discharge Elimination System (SPDES) Program		X		
NYS Shellfish Land Certification Program		X		
NYSDEC Juvenile Finfish Survey		X		$645,000
NYSDEC Wetlands Inventory	X		$500,000	$50,000
Osprey, Terns and Waterfowl				TBD
Pesticide Use Monitoring		X		$25,000
Restoration Monitoring			$35,000	$15,000
SCDHS Alexandrium Monitoring	X			$35,000
SCDHS Bathing Beaches and Swimming Pools Program		X		
SCDHS Groundwater Monitoring (for nitrogen and pesticides)		X		
SCDHS North Creeks Study		X		
SCDHS Pfiesteria Monitoring	X			$25,000
SCDHS Routine Point Source Monitoring		X		
SCDHS Surface Water Quality Monitoring		X		
SCPD Land Use Monitoring		X		
Sediment Monitoring				25,000
Shoreline Hardening Monitoring	X			35,000
Submerged Aquatic Vegetation Long Term Monitoring	X			$30,000
Suffolk County Groundwater Model	X			
Surface Water Monitoring for Toxics	X			
Two Stroke Marine Engine Inventory				$10,000
Underground Storage Tank Inventory			$50,000	$10,000
USFWS National Wetlands Inventory	X			
Total			**$1,332,500**	**$922,500**

Even more difficult is procuring resources and funding sources for programs which are not pre-existing. For example, there is currently no mechanism to perform routine, ongoing land use and land cover monitoring. Also, there are no long-term monitoring commitments related to baitfish, fish larvae, zooplankton and phytoplankton, submerged aquatic vegetation, and benthic communities. The PEP must procure commitments for carrying out and funding priority monitoring projects. This will involve a joint and cooperative effort between the Management Committee and Technical Advisory Committee.

The Management Committee will continue to evaluate costs and benefits of possible monitoring program options. Part of this analysis will include a weighing of the costs of given programs against the *likelihood* of success and the *value* of success. For example, it is possible that a prohibitively expensive program may not be possible, even though resulting data could be extremely valuable. Conversely, a project which cannot guarantee a high probability of intended results (*e.g.*, a usable bio-indicator) could still be desirable, if the possibility of success is reasonable when weighed against modest project costs and a potentially high project utility.

The selection of monitoring parameters and programs must include commitments from entities to conduct the programs and dedication of sufficient resources to enable the efforts. The final monitoring plan contained in Appendix I conforms to *National Estuary Program Guidance, Comprehensive Conservation and Management Plans, Content and Approval Requirements* (EPA 1992). This guidance document emphasizes the need for clearly defined monitoring plans not only to measure the effectiveness of CCMP actions, but also to provide information necessary to redirect and refocus the CCMP. As required by EPA, the monitoring plan defines program objectives and performance criteria, describes testable hypotheses, and specifies monitoring variables and plan details.

Monitoring Priorities

EPA funding for establishing a long-term monitoring program is limited. Currently, the following priorities for use of PEP post-CCMP monitoring monies (NEP-funded) are as follows:

Water Quality
Continuation of the water quality monitoring program for purposes of establishing a long-term program, with linkages not only to Brown Tide and nitrogen and DO management, but also to the tidal creeks study, the submerged aquatic vegetation monitoring program, and, possibly, other programs. This also includes integrating groundwater quality data and input rates, particularly for key subwatersheds.

Sediment
Benthic mapping is needed to direct further long-term monitoring of sediment communities and other environmental issues.

Submerged Aquatic Vegetation
A long-term submerged aquatic vegetation program is needed to capitalize upon prior efforts and to establish trends in eelgrass and macroalgae abundance and distribution. Ideally, submerged aquatic vegetation will be linked with water quality as a bioindicator. Eelgrass restoration will be considered based on the results of the PEP habitat criteria study.

Other Projects

A small amount of funding will remain for additional living resources/habitat monitoring efforts. This could include establishing a long-term benthic monitoring study, possibly in conjunction with the tidal creeks study. Hopefully, prior efforts could be continued to evaluate water quality and sediment communities to support development of a meaningful bioindicator, although larger studies may be necessary to accomplish this. Another project option includes evaluating trends of baitfish abundance and distribution.

Additional Natural Resources Research and Monitoring Needs

The natural resources committee has identified several projects, which would require several hundreds of thousands of dollars in funding, to conduct important long-term monitoring and living resources projects. These projects include system-wide studies of benthic communities, baitfish, fish larvae, zooplankton, and phytoplankton. A formal project list and justification will be prepared by the Management Committee for further evaluation and consideration and additional funding sources will be sought. Candidates for funding may include the New York State Environmental Protection Fund and possibly the Suffolk County Capital Program ($50,000 proposed for zooplankton and phytoplankton characterization, which would assist not only in Brown Tide research, but also in PEP long-term monitoring).

Land Use Monitoring

The continuing collection and analysis of land use data is, of course, a paramount long-term monitoring priority. It will be critical in linking land use trends with pollution loading, water quality, and habitat and living resources. It will also be an important tool in tracking the progress of CCMP implementation.

The Suffolk County Planning Department will be crucial to any long-term land use monitoring efforts. The Planning Department has a verified Geographic Information System (GIS) database for existing land uses at tax map scale for the Towns of Riverhead, Southold, Shelter Island, Southampton, East Hampton, and the Peconic River corridor in the Town of Brookhaven. The Planning Department also has a verified GIS database for existing zoning in this same region. Both of these databases should be updated on an annual basis to reflect conditions as of March 1 (tax status day). The update and maintenance of the GIS databases will require coordination of activities among the Planning Department, Suffolk County Real Property Tax Service Agency (SCRPTSA), town tax assessors and town planners. Suggested agency roles are as follows:

- Town tax assessors could provide a list to SCRPTSA of those parcels for which there has been a change in tax assessment code as of March 1. These lists could then be provided by SCRPTSA to the Planning Department for review, conversion into land use classification codes, and incorporation into the GIS land use database. The Planning Department would then make this updated land use database available to the towns for their use. This would include data in map format. Alternatively, the Planning Department could receive Real Property Transfer Reports (RP-5217) for review to monitor land use changes; and
- Town Planners could provide a list of any modifications to town zoning codes and maps to the Planning Department, which in turn would correct the GIS zoning database and provide the information to the towns for their use (includes map format).

If one or more of these procedures is implemented, annual updates of GIS products (i.e., databases, tabulations, trends, and maps at tax map scale) for existing land use and zoning, can be made

available for the PEP study area and towns as a whole. The databases would be maintained by the Planning Department to assure consistency in methodology application for the region.

Living Resources Monitoring Coordinator

The Management Conference recommends coordinating long-term monitoring program needs for field/living resources concerns by hiring at least one full-time staff person dedicated solely to conducting and, to some degree, coordinating these programs. This person would serve as an "environmental analyst," "biologist," or "marine conservation planner" and would oversee routine, limited submerged aquatic vegetation surveys, baitfish surveys, and/or other monitoring efforts. The person would also oversee the efforts of the agencies charged with collecting data and to keep track of those agencies' commitments to compile and report on their databases. Candidate agencies for providing or housing a staff person would be the NYSDEC, Cornell Cooperative Extension, The Nature Conservancy, or the SCDHS.

Until such a position is filled, the Management Conference will continue to conduct these monitoring efforts using voluntary contribution of multiple agency resources. An interim option is to contract out long-term monitoring tasks. A possible disadvantage of this approach would be a lack of institutional continuity and precarious annual funding sources.

In regard to these issues, the Management Committee will focus on sustainable, long-term databases which can be used to monitor the effects of CCMP implementation, rather than substantial short-term expenditures of funds to obtain limited characterizations which would not likely be useful in long-term monitoring, even though they could be of immediate scientific interest.

Living Resources Research Plan

The PEP, through the present Marine Conservation Planner, has prepared a Framework for Developing a Living Resources Research and Monitoring Plan. This Framework, which has been peer reviewed, will be revised based on peer review comments and integrated with other monitoring efforts (*e.g.*, sediment nutrient flux and toxicity) to update the existing plan, and to identify priority research areas and topics.

MEASURING PROGRESS OF CCMP IMPLEMENTATION

The PEP Management Committee evaluated various mechanisms for measuring progress of CCMP implementation, including technical/scientific measurements (*e.g.*, "bay quality indices"), performance standards, and other, more citizen-oriented mechanisms such as "government report cards." Reports summarizing the progress of various implementation mechanisms will be prepared by the PEP.

Dual Approach: Reports on Outputs and Outcomes

Reporting the status of CCMP implementation, and redirecting effort as needed, is crucial to successful implementation of the Plan. There are two types of measures of CCMP implementation:

- **Outputs** — reviews to determine whether CCMP commitments have been met; and
- **Outcomes —** reviews of progress using appropriate environmental indicators to determine whether the Peconic Estuary is responding as expected to pollution controls, and whether unanticipated environmental problems are emerging.

The CCMP provides a framework for tracking both outputs and outcomes. For outputs, each action in the CCMP identifies what is to be done, by when, and by whom. The PEP will review these commitments and recommend mid-course corrections as needed. For outcomes, the Environmental Monitoring Plan includes recommendations to periodically measure and report on a number of environmental indicators of the success of CCMP implementation. These indicators will tell us whether our goals and objectives are being met. The most important indicators are those, which involve measuring the ambient environment to assess whether beneficial uses are being restored, and whether the ecosystem is healthier and more productive as a result of actions taken. Other indicators involve measuring continuing loading of pollutants to the ambient environment.

Technical Measures

A variety of technical criteria or indices can be developed to assist in evaluating the outcomes of CCMP implementation and effectiveness of CCMP activities. Many of these criteria, including non-regulatory guidelines, are described in other chapters of this Management Plan, such as nitrogen guidelines and DO standards.

In developing indices, the Management Committee will emphasize integration of water quality and living resources, to the extent possible. Examples include water quality habitat criteria for submerged aquatic vegetation, and possibly use submerged aquatic vegetation as a bio-indicator of water quality and habitat quality. Also, benthic communities used as integrators of watershed stresses may be valuable bioindicators. These are, of course, subject to the findings of ongoing scientific studies being conducted by the PEP.

Coordination of scoping and design of a technical report, and its elements, will be performed by the PEP Management Conference. At a minimum, this report will include parameters such as groundwater quality changes, surface water nutrient trends, dissolved oxygen violations, and alterations in land use and land cover patterns.

Non-Technical Measures

Non-technical measures also can be used as tools for assessing CCMP implementation. Reports summarizing the progress of various implementation mechanisms will also be prepared as a mechanism for tracking progress. Implementation funding levels and appropriations will be included. New regulatory initiatives and enforcement of pre-existing initiatives also will be important.

Mechanisms such as preparing environmental "report cards" and government action "check lists," as outlined in *Measuring Progress of Estuary Programs, A Manual*, (EPA 1994) has been recommended. That manual also outlines a bay quality index, an aggregate index of various parameters to attempt to monitor long-term changes in bay quality. The report also emphasizes the importance of surveys and public education in the progress measurement process.

CCMP Reporting

Every three years, the PEP will prepare a report on the status and effectiveness of CCMP implementation, focusing on outputs, as required by EPA National Estuary Program Guidance. The report will include commitments for redirection of efforts as needed. One and one-half years after the first CCMP Implementation Report, and every three years after that, the PEP will also prepare a full account of the status and effectiveness of CCMP implementation, measured by the environmental outcomes being tracked through implementation of the PEP Environmental Monitoring Plan.

DATA MANAGEMENT

The December 1993 *Peconic Estuary Program Data Management Strategy* designated the SCDHS Office of Ecology as the repository of water quality data and most GIS data. The Program Office also became the prime repository for natural resource data on a provisional basis. Since that time, the USFWS has worked on several mapping efforts and has provided GIS coverages to the Program Office for storage and distribution. Suffolk County will continue its role as a water quality data repository and data management agency; a permanent long-term habitat and living resources data repository will need to be identified. The *Data Management Strategy* and related policies and practices will be periodically reviewed and updated, as needed.

POST CCMP MANAGEMENT ACTIONS

Within the CCMP, some steps within the actions have been identified as priorities, as indicated under the step number. The PEP will seek to implement priority actions in the near term. Priorities may be either new or ongoing, commitments or recommendations. Completing some priority actions does not require any new or additional resources, because they are being undertaken through "base programs" or with funding that has been committed. In other cases, in order to complete the priority actions, new or additional resources need to be secured by some or all of the responsible entities.

POST-CCMP MANAGEMENT ACTIONS

M-1. Implement a Long-Term Management Structure.

M-2. Conduct Monitoring and Coordinate Research.

M-3. Produce Progress Reports and Manage Data.

M-4. Update Municipal Officials.

M-5. Develop Sub-Watershed Implementation Plans.

M-6. Ensure Consistence with National and State Historic Preservation Laws and the Endangered Species Act when Implementing the CCMP.

M-1. Implement Long-Term Management Structure.

Addresses Post-CCMP Objectives 1 and 2.

Steps

M-1.1 **Priority** Continue the current management conference structure. Review the effectiveness of this structure during Implementation Reviews, or as needed, and make changes as appropriate.

M-1.2 **Priority** Continue to use SCDHS Office of Ecology as the PEP Program Office, to provide program administration, coordination, management, and technical support services.

Responsible Entities

M-1.1 PEP Management Conference (lead)

M-1.2 PEP (lead), SCDHS

M-2. Conduct Monitoring and Coordinate Research.

Addresses Post-CCMP Objective 3.

Steps

M-2.1 **Priority** Implement the PEP Environmental Monitoring Plan and integrate/coordinate monitoring with research.

M-2.2. **Priority** Appoint a Living Resources Monitoring and Research Coordinator to develop and oversee the long-term habitat and living resources monitoring plan.

M-2.3. **Priority** Continue to fund the NYSDEC coordinator, particularly to coordinate management of habitat and living resources issues in the post-CCMP period.

Responsible Entities

M-2.1 PEP Management Conference (lead)

M-2.2 PEP Management Conference

M-2.3 NYSDEC, EPA

M-3. Produce Progress Reports and Manage Data.

Addresses Post-CCMP Objective 4.

Steps

M-3.1 **Priority** Produce Implementation Reports on outputs (attainment of CCMP commitments and recommendations), and reports on outcomes (environmental conditions and indicators).

M-3.2 Update the PEP Data Management Strategy to establish SCDHS as the continuing long-term data repository for water quality-related information. A permanent habitat and living resources data repository will need to be identified.

Responsible Entities

M-3.1 EPA, NYSDEC, SCDHS, PEP Management Conference

M-3.2 PEP Management Conference (lead)

M-4. Update Municipal Officials.

Addresses Post-CCMP Objective 3.

Steps

M-4.1 **Priority** Update municipal officials on the Peconic Estuary Program. Provide educational opportunities for these officials on the CCMP and technical issues.

Responsible Entities

M-4.1 PEP (lead)

M-5. Develop Sub-Watershed Implementation Plans.

Addresses Post-CCMP Objective 2.

Steps

M-5.1 **Priority** Develop sub-watershed implementation plans integrating actions from all CCMP chapters for one waterbody, embayment, or geographic area in each town, per year.

Responsible Entities

M-5.1 PEP (lead) with local officials, businesses, non-governmental organizations, and citizens

M-6. Ensure Consistency with National and State Historic Preservation Laws and the Endangered Species Act when Implementing the CCMP.

Addresses Post-CCMP Objective 2.

While this Comprehensive Conservation and Management Plan in and of itself will not have any effect on historic or prehistoric resources, there is the potential that individual actions of this plan that are subsequently implemented might. In compliance with Section 106 of the National Historic Preservation Act, if any Federal undertaking performed as part of the CCMP has the potential to have an effect on prehistoric or historic resources as a result of ground-disturbing activities, EPA will evaluate the need for the performance of an initial Stage IA cultural resources survey (CRS) and any necessary additional stages of survey, prior to project implementation, to identify areas sensitive for the discovery of prehistoric or historic resources. Coordination of any further cultural resources investigations will be carried out by the appropriate Federal agency. To the extent that such actions are State undertakings, NYSDEC will be the lead for consulting with the State Historic Preservation Officer.

Informal consultation pursuant to Section 7 of the Endangered Species Act has been initiated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. While EPA believes that the CCMP will not have a negative effect on Federally-listed or proposed threatened or endangered species or their habitats, it is possible that some components of the CCMP may have to be modified based on input from these agencies. Any actions contemplated for the protection or enhancement of habitat for a Federally-listed species should be implemented with the consent of the Fish and Wildlife Service and the National Marine Fisheries Service.

Steps

M-6.1 Ensure consistency with National and State historic preservation laws and the Endangered Species Act when implementing the CCMP

Responsible Entities

M-6.1 EPA, NYSDEC, PEP

COSTS OF MANAGEMENT ACTIONS

The total cost of all new actions proposed in the Post CCMP chapter is $1,525,000 in one-time costs and $1,060,000 annually. The majority of these one-time and annual costs are for implementing the PEP Environmental Monitoring Plan. (See "Action Costs" in **Chapter 1** for an explanation of how these costs were determined.)

POST-CCMP MANAGEMENT ACTIONS SUMMARY TABLE

Table 10-2 provides the following summary information about each of the actions presented in this chapter.

Status

An action's status is designated in the table by either an "R" for "Recommendation" or a "C" for "Commitment." Actions that are commitments are being implemented because resources or funding and organizational support is available to carry them out. Actions that are "recommendations" require new or additional resources by some or all of the responsible entities. "O" refers to ongoing activities; "N" indicates new actions.

Timeframe

This category refers to the general timeframe for action implementation. Some actions are ongoing or nearing completion; implementation of other actions is not anticipated until some time in the future.

Cost

Information in the cost column represents the PEP's best estimate of the costs associated with action implementation. "Base Program" means that no new or additional funds will be needed outside of the responsible entity's operating budget to implement the action. Where additional funding is needed, resources to implement an action may be expressed in dollar amounts or work years or both. One full time equivalent employee or "FTE" is estimated as costing $75,000 per year, which includes salary, fringe benefits and indirect costs. The "Action Costs" description in both the Overview and Finance Chapters provides a expanded explanation of base programs and action costs.

Table 10-2. Post-CCMP Management Actions.

Action		Responsible Entity	Timeframe	Cost	Status
M-1	**Implement a Long-Term Management Structure.** ***(Objectives 1 and 2)***				
M-1.1 **Priority**	Continue the current management conference structure. Review the effectiveness of this structure during Implementation Reviews or as needed, and make changes as appropriate.	PEP Management Conference (lead).	Post-CCMP	EPA – 02 FTE/yr NYSDEC – 0.2 FTE/yr SCDHS – 0.2 FTE/yr	C
M-1.2 **Priority**	Continue to use SCDHS Office of Ecology as the PEP Program Office, to provide program administration, coordination, management, and technical support services.	PEP (lead), SCDHS.	Ongoing	$75,000/yr, in EPA NEP Post-CCMP funds.	C/O
M-2	**Conduct Monitoring and Coordinate Research.** ***(Objective 3)***				
M-2.1 **Priority**	Implement the PEP Environmental Monitoring Plan and integrate/coordinate monitoring with research	PEP Management Conference (lead).	Post-CCMP	Some monitoring is ongoing; costs need to be specified for some new initiatives. PEP – 0.1 FTE/yr Costs for Environmental Monitoring Plan: Annual costs: $ 910,000 One-time costs: $1,512,000	C/O; R/N

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Table 10-2. Post-CCMP Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
M-2.2 **Priority**	Appoint a Living Resources Monitoring and Research Coordinator to develop and oversee the long-term habitat and living resources monitoring plan.	PEP Management Conference.	Post-CCMP	$50,000 annually for coordinator.	R
M-2.3 **Priority**	Continue to fund the NYSDEC coordinator, particularly to coordinate management of habitat and living resources issues in the post-CCMP period.	NYSDEC, EPA.	Ongoing	$75,000 per year, in EPA NEP post-CCMP funds.	C/O
M-3	**Produce Progress Reports and Manage Data.** ***(Objective 4)***				
M-3.1 **Priority**	Produce Implementation Reports on outputs (attainment of CCMP commitments and recommendations), and reports on outcomes (environmental conditions and indicators).	EPA, NYSDEC, SCDHS, PEP Management Conference.	CCMP Implementation Reports: June 2001 and every three years thereafter Environmental Outcomes Reports: Dec 2002 and every three years thereafter	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr	C/O
M-3.2	Update the PEP Data Management Strategy to establish SCDHS as the continuing long-term data repository for water quality-related information. A permanent habitat and living resources data repository will need to be identified.	PEP Management Conference (lead).	Post-CCMP for data management strategy update.	Base Programs for data management strategy update. Costs to be determined for long-term habitat and living resources data management. PEP – 0.1 FTE/yr	C

Table continued on next page

Table 10-2. Post-CCMP Management Actions. (continued)

Action		Responsible Entity	Timeframe	Cost	Status
M-4	**Update Municipal Officials.** ***(Objective 3)***				
M-4.1 **Priority**	Update municipal officials on the Peconic Estuary Program. Provide educational opportunities for these officials on the CCMP and technical issues.	PEP (lead).	Post-CCMP and annually thereafter.	EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr	C/N
M-5	**Develop Sub-Watershed Implementation Plans.** ***(Objective 2)***				
M-5.1	Develop sub-watershed implementation plans integrating actions from all CCMP chapters for one waterbody, embayment, or geographic area in each town, per year.	PEP (lead) with local officials, businesses, non-governmental organizations, and citizens.	Post-CCMP	Estimate: $100,000/yr to initiate new projects. Technical support: EPA – 0.1 FTE/yr NYSDEC – 0.1 FTE/yr SCDHS – 0.1 FTE/yr	C/N
M-6	**Ensure Consistency with National and State Historic Preservation Laws and the Endangered Species Act when Implementing the CCMP.** ***(Objective 2)***				
M-6.1	Ensure consistency with National and State historic preservation laws and the Endangered Species Act when implementing the CCMP.	EPA, NYSDEC, PEP	Post-CCMP	Base Program, as needed	C/N

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APPENDIX A

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CHAPTER 10: POST CCMP MANAGEMENT

(No references.)

APPENDIX B

Management
Conference Structure

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MANAGEMENT CONFERENCE STRUCTURE

The structure of the Peconic Estuary Program Management Conference is presented in **Figure 10-1**. This structure is initially developed during the nomination process by representatives of EPA Region II, New York State, and Suffolk County, in cooperation with local government officials and members of the BTCAMP Citizens Advisory Committee. The Management Conference consists of Policy and Management Committees, and three advisory committees: the Citizens Advisory Committee, Technical Advisory Committee (TAC), and Local Government Committee (LGC). These committees provide the framework in which the Management Conference will meet the goals of this program. They represent a forum for open discussion, cooperation, and compromise that results in consensus. While these committees function as separate entities, they are not meant to be exclusive. Thus, all committee meetings are open to the public. In addition, communication between committees exists in the form of members that serve on more than one committee and Federal, State, and county representatives who will be attending all Management Conference meetings. The roles and responsibilities of each of the committees, as well as charges to them, are summarized below.

POLICY COMMITTEE

The Policy Committee consists of representatives from EPA, NYSDEC, Suffolk County, and local government. Currently, the representatives are the EPA Director of the Division of Environmental Planning and Protection, Regional Director of the New York State Department of Environmental Conservation, the Suffolk County Executive, an agreed upon representative of local government who at the time of the preparation of this document was the Supervisor of the Town of Southold. The Policy Committee approves the workplan and budgets, approves Action Plans and the Comprehensive Conservation and Management Plan, and resolves policy issues, including those identified by the Management Committee.

MANAGEMENT COMMITTEE

The roles and responsibilities of the Management Committee are to recommend the workplans, budgets, Action Plans, and the Comprehensive Conservation and Management Plan to the Policy Committee. On behalf of the Policy Committee, the Management Committee manages the Peconic Estuary Program, ensuring the commitments and deadlines are met. The Management Committee also coordinates the effective involvement of the advisory committees.

Committees within the Peconic Estuary Program strive for consensus. However, if a Management Committee vote needs to be taken, representatives from EPA, NYSDEC, Suffolk County (currently represented the Office of the Suffolk County Executive), the Local Government Committee (currently represented by the Southold Town Supervisor), and the chairs of the Citizens and Technical Advisory committees will be eligible to vote.

Including both voting and non-voting members, the Management Committee representation currently consists of representatives of EPA Region II (Environmental Planning & Protection Division), the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service (USFWS), NYSDEC Division of Marine Resources, New York State Department of State (NYSDOS) (Division of Coastal Resources and Waterfront Revitalization), New York State Department of Transportation

(NYSDOT), the Town of Southold (representing local government), a representative of the New York State Legislature, and the chairs of the Citizens and Technical Advisory Committees.

LOCAL GOVERNMENT COMMITTEE

The Local Government Committee (LGC) consists of representatives from the five East End Towns surrounding the Peconic Bay (Southhold, Riverhead, Southampton, East Hampton, Shelter Island), the Town of Broookhaven, which is not directly on the shores of the marine system but is located within its watershed and includes portions of the Peconic River, the eight villages surrounding Peconic Bay (Quogue, Dering Harbor, Sag Harbor, North Haven, Southampton, Westhampton Beach, Greenport, East Hampton), and the Trustees of Freeholder Commonalities (East Hampton, Southold, Southampton).

The charges to the LGC, in addition to providing input into the Conference Agreement, the annual workplan, and CCMP, are to develop and oversee the implementation of the local government outreach component of the workplan. The Local Government committee is crucial because local governments have ultimate responsibility over land use, zoning, and other local issues.

TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee consists of representatives from universities, the Federal government (EPA, USFWS, USFDA), New York State (NYSDEC, NYSDOS, NYSDOT), Suffolk County (Office of the County Executive, SCDHS, Suffolk County Planning Department, Soil and Water Conservation District), local government planning and environmental agencies, and other entities dealing in technical issues. New members with specific expertise are asked to join the TAC as pertinent issues arise. In addition to providing input into the Conference Agreement and the annual workplans, the TAC meets the needs of the Management Conference including recommending the addition of the members as appropriate. The TAC also develops the research agenda that supports the CCMP in the form of both a comprehensive agenda unconstrained by availability of funds and a priority ranking of potential projects. In addition, the TAC assists in the development of public outreach/education components of the PEP.

CITIZENS ADVISORY COMMITTEE

The Citizens Advisory Committee (CAC) consists of members of the public that have an interest in preserving and protecting Peconic Bay. The CAC, as an autonomous group, initially divided into ten focus groups, into which each member of the committee fits based on their interests. These focus groups are commercial fishers, marina and related industries, recreational fishermen, environmental/ecology, recreation, agriculture, macroeconomics, education, commerce/business, and civic organizations and members at large. Additional individuals may join the CAC by requesting placement in the appropriate focus group.

In addition to providing input into the Conference Agreement and the annual workplans, the CAC develops and oversees implementation for the public involvement and education component of the workplans. The CAC also develops a Citizens Action Plan for inclusion in the overall Action Plan and the CCMP.

PROGRAM OFFICE

The Program Office roles and responsibilities are outlined as follows:

Management Responsibilities

- Communicates regularly with all PEP participants about activities and issues to ensure consensus and that all views are fairly represented in work products;
- Coordinates activities among Federal, State, county, and local agencies as well as the public sector to obtain program objectives;
- Participates in inter-agency work groups;
- Manages the preparation of annual workplans, the CCMP, and budgets, in cooperation with all PEP participants; and
- Coordinates conference activities in identifying and seeking alternative sources of funding for activities associated with Peconic Bay.

Technical Responsibilities

- Manages the planning, development, and implementation of all phases of the PEP using knowledge of marine and estuarine environmental systems related to scientific/engineering operations, and programmatic issues;
- Coordinates the compilation of findings of other estuary programs and transmits them to the PEP Management Conference; and
- Identifies, participates in, and ensures the transfer of scientific/engineering information to Program participants.

Program Administration

- Provides administrative support to the Management Conference;
- Manages development of Requests for Proposals for tasks identified in the annual workplan among all involved agencies and advisory committees;
- Oversees the administration and performance of contract and grant activities to ensure quality products are produced on time and within budget;
- Facilitates the convening of conferences and meetings for local and State officials and legislators to brief them on CCMP development and PEP progress in coordination with other Conference participants; and
- Prepares PEP status reports, as needed, and coordinates review with all PEP participants.

Administrative Support Responsibilities

- Attends meetings of major committees (not limited to the technical, local, citizens, management and policy committees);
- Manages preparation of all PEP work products, including data summaries, annual reports, technical reports, CAC products, and modeling activities, for content and accuracy before publication;

- Ensures the transfer all PEP materials (*e.g*., work products, annual reports, meeting minutes, etc.) to the appropriate persons and locations (*e.g*., Management Conference participants, the public, local libraries, etc.); and
- Receives and responds to requests for technical information and assistance regarding the PEP from the public, elected officials, EPA Headquarters, and others.

APPENDIX C

Management
Conference Membership

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Policy Committee

Kathleen Callahan, Chair
Director, Division of Environmental Planning and Protection
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290 Broadway — 24th Floor
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SUNY @ Stony Brook
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(* Non-voting member)

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Chief of Estuaries and Oceans Section
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USFWS New York Field Office
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Cortland, NY 13045

*Assemblyman Fred Thiele
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Bridgehampton, NY 11932

Citizens Advisory Committee

Kevin McDonald, Chair
Group for the South Fork

Bruce Anderson
Suffolk Environmental Consulting

Jennifer Andreoli
Landmarks

Ed Bausman

Anne Baird

League of Women Voters of the Hamptons

Betty Brown
North Fork Environmental Council

Alexander Budd

Jim Cain
Riverhead Conservation Advisory Board

Joe Colao

Floyd Carrington
Shinnecock Marlin & Tuna Club

Rameshwar Das

Sandra Dumais
Marine Education Center, CCE

Clete Galasso
Larry's Lighthouse Marina

Alex Gregor

Charles F. Guilloz
Southampton Business Alliance

Bill Gunther
Brookhaven National Laboratory

Billy Hajek
Accabonac Protection Committee

Emerson Hasbrouck
Cornell Cooperative Extension

Harvey Hellering

Andrew Jones

Eve Kaplan
North Fork Environmental Council

John Kelly, M.D.

Robert Kent
New York Sea Grant

Mark Ketcham

Alan & Donna Kuchas

Jean Lane
Steve Latson

Southold Town Baymens Assoc.

Stuart R. Lowrie, Ph.D.
The Nature Conservancy

Mrs. Lorry Mangan

Jeanne Marriner
Save the Peconic Bays

Gayle Marriner-Smith
Eco-Vision

Robert McAlevy
Red Cedar Point Association

Lynn Mendelman, Ph.D.
Mendelman Associates

Richard Mendelman
Seacoast Enterprises Associates, Inc.

Carol Morrison
Concerned Citizens of Montauk

Patricia Mundus

Peter Needham
Association of Marine Industries

Mal Nevel
Shelter Island Baymens Assoc.

Johanna Northam
Suffolk County League of Women Voters

Desiree & Louis Passantino

Georgette Preston

Michael Reichel

Mike Rewinski

Frederick Arthur Ross

Ken Rubino
East End Waterways Tours

Diana Schwenk

Bill Smith
Fish Unlimited

Tim Sullivan

Marianne Tillman

Earl Voorhees

Audrey Watson
Pres., Mattituck Chamber of Commerce

Peter Wenczel
Southold Town Baymen's Assoc.

Victor Zupa

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Town of Southampton

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Town of Shelter Island

Jean W. Cochran, Supervisor
Town of Southold

John LaValle, Supervisor
Town of Brookhaven

Robert Kozakiewicz, Supervisor
Town of Riverhead

David E. Kapell, Mayor
Village of Greenport

Timothy Hogue, Mayor
Village of Dering Harbor

Paul F. Rickenbach, Jr., Mayor
Village of East Hampton

Robert Ratcliffe, Mayor
Village of North Haven

Thelma Georgeson, Mayor
Village of Quogue

William Young, Jr., Mayor
Village of Sag Harbor

Douglas Murtha, Co-Chairperson
Village of Southampton

Robert Strebel, Mayor
Village of Westhampton Beach

James Drew, Councilman
Town of Southampton

Fredrick Stelle, Trustee
Town of North Haven

Chris Kent, Councilman
Town of Riverhead

Sharon Kast
Town of Shelter Island

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Town of East Hampton

Chris Smith, Chair (2000-2001)
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Suffolk County Planning Department

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Tom Halavik
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Bight

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Town of Brookhaven
Robert Kent
New York Sea Grant

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Association of Marine Industries
Executive Secretary

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Town of Southampton

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LI Regional Planning Board

Heather Lanza
The Nature Conservancy

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NYSDEC Bureau of Shellfisheries

Tony Leung
NYSDEC Division of Water

Daniel Lewis
NYSDEC Bureau of Shellfisheries

Carl Lind
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SCDPW Waterways

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New York Sea Grant

Kevin McAllister
Peconic BayKeeper

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Suffolk County Soil & Water
Conservation District

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Vito Minei
Suffolk County Department of
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Aslam Mirza
NYSDEC Division of Water

Jerrold H. Mulnick
Food & Drug Administration

Bronius Nemickas
U.S. Geological Survey

Nancy Niedowski
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U.S. Fish and Wildlife Service

Laurence Penny
Town of East Hampton Natural
Resources

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Laura Smith
Town of Southampton

Laura Star

NYSDEC Division of Water
Ken Testa
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LIU - Southampton University

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New York Seafood Council

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Suffolk County Planning Department

Alice Weber
NYSDEC Finfish & Crustaceans

Judith Weis, Ph.D.
Professor of Zoology
Rutgers University

Marguerite Wolffsohn
Town of East Hampton

* The Technical Advisory Committee list also includes key members of the Habitat Restoration Work Group, Critical Lands Protection Plan Work Group, and the Nitrogen Management Work Groups.

APPENDIX D

Demonstration and Implementation Projects

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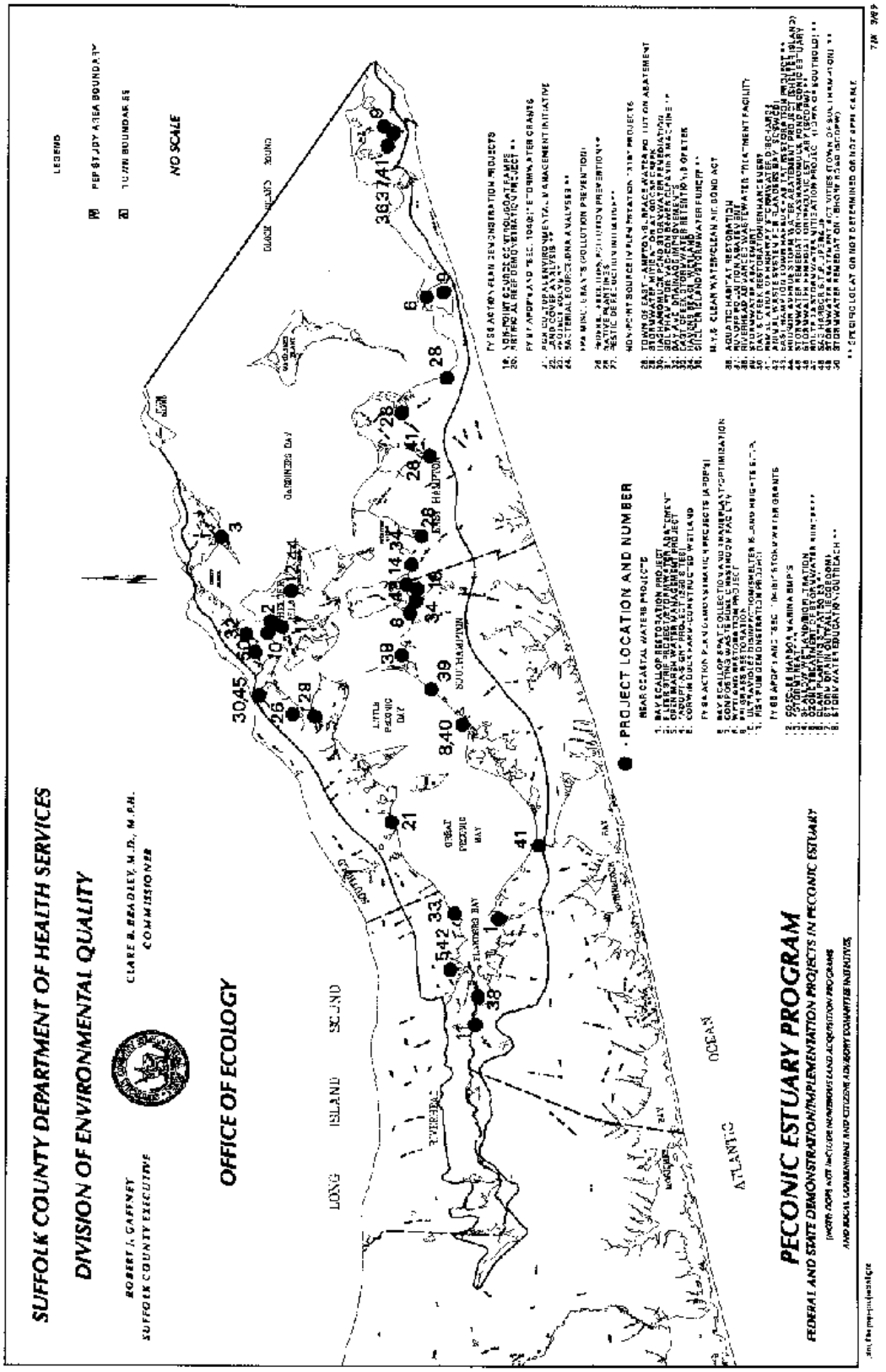
PECONIC ESTUARY PROGRAM

FEDERALLY AND STATE-FUNDED

DEMONSTRATION AND IMPLEMENTATION

PROJECTS

PEP Program Office
(631) 852-2077


SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
DIVISION OF ENVIRONMENTAL QUALITY
OFFICE OF ECOLOGY
ROBERT J. GAFFNEY
SUFFOLK COUNTY EXECUTIVE
CLARE B. BRADLEY, M.D., M.P.H.
COMMISSIONER
LEGEND
PEP STUDY AREA BOUNDARY
TOWN BOUNDARIES
NO SCALE
LONG ISLAND SOUND
ATLANTIC OCEAN
GARDINERS BAY
GREAT PECONIC BAY
FLANDERS BAY
SOUTHAMPTON
EASTHAMPTON
RIVERHEAD
PROJECT LOCATION AND NUMBER
NEAR COASTAL WATERS PROJECTS
PECONIC ESTUARY PROGRAM
FEDERAL AND STATE DEMONSTRATION/IMPLEMENTATION PROJECTS IN PECONIC ESTUARY

PECONIC ESTUARY PROGRAM (PEP)
RELATED DEMONSTRATION AND IMPLEMENTATION PROJECTS

The following is a brief description of demonstration and implementation projects for the Peconic Estuary which have been funded since the inception of the PEP. To date, funding commitments to 92 projects have totaled over $13.5 million. In most cases, local match results in significantly greater project resources. A funding list and a map of the project locations are attached. A separate listing of State assisted projects that benefit the Peconic Estuary is included as Table 1; the New York State Clean Water/Clean Air Bond Act and Environmental Protection Fund projects are included on both lists. Not all projects in Table 1 are included on the map.

A) NEAR COASTAL WATERS GRANTS

The PEP was the only Tier IV National Estuary Program (NEP) to qualify for this funding, due to outstanding performance and high-quality proposed projects. All projects are underway or completed.

1) Bay Scallop Restoration Project (Cornell Coop. Ext.)

The objective of this project was to continue to enhance and restore populations of bay scallops in the Peconic Estuary by purchasing and planting seed scallops. Over 100,000 seed scallops were planted in the estuary over several weeks. This project was conducted in Flanders Bay; a draft report indicates that the spring, 1994 seeding was successful. The project was significantly expanded, using a National Marine Fisheries Service grant.

Aside from the immediate benefits of increasing local scallop populations, this project also provided information on the overwintering survival of various size scallop seed, and the survival rate of hatchery raised vs. natural set scallops. This information allowed the development of optimal planting strategies for the future.

2) Filter Strip Project/Stormwater Abatement (Cornell Coop. Ext. & Natural Resources Conservation Service)

Ideally, this project will lower coliform levels enough so that the creek can remain opened to shellfishing at least on a seasonal basis. Marine waters of Long Island are plagued with numerous points of stormwater runoff. This runoff causes declines in marine water quality, deterioration of benthic habitats, and closure of shellfish grounds due to coliform bacteria.

Presently communities are restricted in their ability to mitigate this impact. This is largely due to the cost of installation of the traditionally used leaching rings which cost about $50,000 to install per project.

This project has constructed a grassed filter strip at the headwaters of Gardiners Creek in Shelter Island where State Road 114 contributes stormwater runoff. This project utilized manual labor to install the filter strip so that stormwater runoff would be distributed to a larger infiltration area that would prevent it from point sourcing via a natural swale to the creek. Data documenting the effectiveness of the filter strip system is being collected. If this simple technology is proven effective, it may be implemented at additional selected sites within the estuary.

3) Open Marsh Water Management (Cornell Cooperative Extension)

By filling, and occasionally diverting, mosquito control ditches, this approach will restore wetlands and allow these habitats to act as a more efficient filter of both nutrients and coliform bacteria. Through this project, a portion of the approximately 300 acres of State-owned tidal wetlands at Long Beach Bay in Orient will be restored by using Open Marsh Water Management (OMWM).

Under OMWM, most ditches in the tidal marshes would be plugged, restoring the water table to pre-ditching levels. As a result, conditions in the marsh will favor desirable, native vegetation. Marsh pools and ponds would no longer be drained, improving habitat for waterfowl and other wildlife. In addition, recent studies suggest that OMWM can reduce the export of wildlife-source coliform bacteria from the marsh. This could help improve water quality in the area, where certain shellfish beds have been recently closed as a result of fecal coliform contamination. Additional benefits may include a reduction in coliform inputs to adjacent shellfishing areas.

The original PEP project proposal has been significantly expanded, as NYSDEC has been awarded $235,000 from the U.S. Fish & Wildlife Service for the project. This funding has also been contracted to Cornell Cooperative Extension.

4) Adopt-a-Sign Program (PEP Citizens Advisory Committee)

This project consists of posting signs to alert people to the fact that they are in the Peconic Estuary watershed. The signs include posters in plexi-glass, with an educational brochure integrated into the design. They have been distributed at over 250 locations.

5) Corwin Duck Farm — Constructed Wetland Treatment System (Natural Resources Conservation Service and Suffolk County Soil and Water Conservation District)

On the Corwin Duck Farm, a wetland was constructed to decrease the amount of nitrogen and possibly pathogens entering the bay from Meetinghouse Creek. Historic duck farm pollution to Meetinghouse Creek has resulted in local and regional adverse impacts. This treatment system is expected to significantly improve the quality of duck farm wastewater and may serve as a model for other animal waste treatment systems. Construction for the program has been completed, and the wetland is operating.

B) FEDERAL FY94 ACTION PLAN DEMONSTRATION PROJECTS

Again, the PEP was the only Tier IV NEP to receive this funding due to the progress of the program. Projects have been selected, and contracts have been issued. These projects are underway or completed.

6) Bay Scallop Spat Collection and Transplant/Optimization (East Hampton)

This project is designed to accelerate scallop reproduction at Napeague Harbor in East Hampton. This project will demonstrate and assess certain criteria for the establishment of a Bay Scallop (*Argopecten irradians*) spat collection field adjacent to historically productive eelgrass (*Zostera marina*) beds in Napeague Harbor. This field will be located in such a way as to entrap scallop spat entrained in a tidal flow which would ordinarily be swept out of the harbor to areas less desirable for survival. The spat collection system will be assessed for optimal deployment timing and position in the tidal stream and water column.

A technologically enhanced spat collector design, to replace the common onion bag, will be used to improve mechanical harvesting. Animals will be retrieved from the collectors for artificial rearing and subsequently reintroduced to prime natural nursery sites when their increased size justifies a greater change of survival. The project attempts to demonstrate the effectiveness of collection, rearing, and reintroduction of otherwise lost juvenile scallops as a management approach to the problem of reestablishment of viable reproductive populations following catastrophic events.

7) Composting Waste Public Restroom (East Hampton)

This project will mitigate potential nutrient and pathogen pollution from a public restroom at South Lake Montauk Bathing Beach. The Town of East Hampton proposed to construct a composting waste restroom facility for the South Lake Montauk Bathing Beach. The proposal is to design, construct, maintain, and monitor a public beach comfort station utilizing a compostable waste reduction system. The facility will replace the existing comfort station and will be designed to comply with the Americans with Disabilities Act, the New York State Building Code, the Suffolk County Department of Health Services Standards, Town planning and design standards, and all other applicable regulations.

8) Wetland Restoration Initiative (Southampton Town and Cornell Cooperative Extension)

This project will restore critical habitat and pollution buffer areas at a site in Southampton. Wetland restoration is a newly-emerging field that promises to recapture significant wetland area that has been lost to dredge and fill activities or other destructive activities. In order to successfully restore a wetland, there must be a basic understanding of the physical and biological processes that control the formation and stability of that wetland system. Successful projects require site assessment data collection before construction, preparation of a practicable restoration plan, active management during construction, and intensive monitoring after completion of restorative activities. This project will demonstrate ways in which human-induced impacts can be mitigated. Also, the restoration project provides the perfect framework for educating students and concerned citizens alike in general wetlands ecology and demonstrating the feasibility of such a project in other areas of the estuary system. This proposal is being augmented with a U.S. Fish & Wildlife Service grant to conduct the efforts at Paynes' Creek.

9) Eelgrass Restoration (East Hampton Town and Cornell Cooperative Extension)

This project will restore critical habitat at a site in East Hampton. The project will carry out an intensive eelgrass planting program as well as an eelgrass bed survey in East Hampton. Bottomland in East Hampton harbors will be surveyed to determine suitability for planting, then an actual planting program will be carried out whereby eelgrass shoots will be planted on the bottom. The planting technique, density, and suitability of donor plants will be based on the results of a pilot-scale demonstration eelgrass program presently taking place in East Hampton. Additionally, eelgrass seeds will be collected in order to establish an eelgrass seed bank and for use in planting additional bottomland in this project. This project is being carried out and coordinated by the Marine Program of Cornell Cooperative Extension and the East Hampton Natural Resources Department, and is being conducted in conjunction with the PEP Eelgrass Habitat Criteria Study (EEA, Inc.).

10) Ultraviolet Disinfection Pilot Project (Shelter Island and Cornell Cooperative Extension)

This project has demonstrated the elimination of potentially harmful chlorine disinfection at the Shelter Island Heights sewage treatment plant. There are presently ten sewage treatment plants located in the watershed of the Peconic Estuary, four of which discharge directly to surface waters. While sources of nitrogen from these sewage treatment plants have had much discussion recently, control of coliform bacteria (and the pathogenic organisms they indicate) is another important aspect of these sewage treatment plants. While chlorination provides for disinfection to protect public health, there is a potential negative environmental impact from chlorine and chlorinated compounds entering marine surface waters.

An alternate method of disinfection of sewage treatment plant effluent is through the use of ultraviolet (UV) light. UV light adds nothing to the water column and is effective as a germicide because of photochemical damage to RNA and DNA within the cells of an organism. Disinfection of sewage treatment plant effluent by UV has the potential to not only protect public health, but to also improve water quality and habitat in the Peconic Estuary by eliminating the harmful environmental side effects of chlorination.

11) Fish Run Demonstration Project (NYSDEC)

This project tested feasibility of restoring alewife runs over dammed areas of the Peconic River. Alewives and rainbow smelt are an important food source for many commercially and recreationally important species. The Peconic River, the site of this demonstration project, has been identified as a stream which historically provided runs for these fish. A pilot project for restoration has been implemented. Re-establishment of this run would provide prey items in freshwater and marine environments, as well as added recreational and possible commercial opportunities. While the initial pilot was unsuccessful, NYSDEC hopes to re-test the project.

C) FEDERAL FY95 DEMONSTRATION/IMPLEMENTATION PROJECTS (ACTION PLAN DEMONSTRATION PROJECTS AND CLEAN WATER ACT, SECTIONS 104(b)(3) AND 319 FUNDING)

While other Tier IV NEP's qualified for $65,000 in funding, the PEP received almost $150,000 when EPA and NYSDEC identified additional funding sources. The additional funding was, again, due to outstanding program performance and high-quality proposals. The projects have been selected, and contracts have been issued.

12) "Stormtreat" Stormwater Quality Management (Contractor)

The "Storm-Treat" technology will be tested at a site to be selected within the Peconic Estuary. This technology, which captures and treats pollution (*e.g.*, sediments, nutrients, bacteria) in the first flush of rainfall through several physical and chemical processes, involves installation of a sedimentation chamber with an overflow into a created wetland.

13) Shallow Wetland/Biofiltration (Cashin Associates)

A shallow wetlands system is being constructed and planted at Havens Beach at Sag Harbor. The system, which will consist of a sediment sump and emergent wetlands area, will act as a "biofilter," creating wetlands habitat while preventing sediments, nutrients, and bacteria from entering the bay.

14) Ozone Treatment of Stormwater Runoff (Cornell Cooperative Extension)

The use of ozone treatment technology to disinfect stormwater runoff will be tested. The project will include site selection, engineering, installation, and testing.

15) Storm Drain Outfall (Eco-Boom Marine Control)

Eco-Boom has installed its "boom" containment device to trap pollution which discharges from a storm drain at Gardiners Creek, Shelter Island. A durable, fine-mesh netting will be suspended from a boom at the water surface and anchored to the bay bottom. The boom will prevent suspended solids, bacteria, and debris from being washed out of the containment area. Preliminary test results show excellent performance in reducing coliform levels.

16) Stormwater Education/Outreach (Cornell Cooperative Extension)

Cornell Cooperative Extension will perform outreach sessions for local governments, conveying the utility of stormwater management efforts tested under 104(b)(3) and other PEP demonstration initiatives.

17) Coecles Harbor Marina — Best Management Practices (New York Sea Grant/Coecles Harbor Marina

A series of best management practices will be implemented at Coecles Harbor Marina. These include stormwater runoff mitigation and implementation of various procedures, including dustless sanding and improvements in waste oil and washdown water processing. Sea Grant will implement the educational and demonstration aspects of the project.

18) Clam Planting Strategies (Cornell Cooperative Extension)

Cornell Cooperative Extension will perform an analysis of machine-planted hard clams vs. hand-planted clams. The project will result in a resource restoration benefit in terms of clam stocks and will provide invaluable information for future seeding efforts.

D) FEDERAL FY96 ACTION PLAN DEMONSTRATION PROJECTS

$75,000 in Federal fiscal year 1996 funds have been provided to the PEP. The funding is being used to conduct the following demonstration projects.

19) Nonpoint Source Pollution Control at Boat Ramps (Cashin Associates)

Nonpoint source best management practices are being demonstrated at two public boat ramp sites in the Sag Harbor Cove area (Amherst Road and John Street), mitigating direct stormwater runoff at those sites. This highly visible project will result in water quality benefits, public education and outreach, and model site plans which will be developed and disseminated to Towns.

20) Artificial Reef Demonstration Project (Cornell Cooperative Extension)

Artificial reefs, using removable "reefballs," have been proposed for two sites to be determined in the Peconic Estuary. The reefballs are intended primarily to create additional habitat, while also providing recreational opportunities (diving, fishing, etc.).

E) FY97 ACTION PLAN DEMONSTRATION PROJECT AND "SEC. 104(B)" GRANTS ($207,519)

21) Agricultural Environmental Management (A.E.M.) Initiative (Suffolk County Soil & Water Conservation District)

Using the A.E.M. approach, a comprehensive inventory and analysis is being conducted for all farms within the watershed to assess the impact and potential impact the farms may have on the Peconic Bay Estuary and shallow aquifer. Plans will be developed for high priority farms and best management practices implemented based upon future funding. A total of 13 farms within the watershed will implement high priority best management practices. $163,920 in Environmental Protection Fund monies have been awarded to the Suffolk County Soil and Water Conservation District to augment the existing PEP grant of $30,000 for this project.

22) Land Cover Analysis (NYS Department of State)

Land cover analysis using state-of-the-art remote sensing and satellite interpretation techniques, coupled with field verification of land cover types, will be analyzed for critical areas of the PEP watershed. This information will be used in refining stormwater modelling efforts and in developing land cover trends analyses based on historic satellite imagery. These status and trends analyses will also be useful for several habitat and living resources initiatives.

23) Project SOLVE (Save the Peconic Bays, Inc.)

The goal of Project SOLVE (Promoting Sustainability-Ownership-Leadership Values in Environmental Education) is to build the capacity of regional schools (elementary through high school) to deliver environmental education that fosters sustained student critical thinking, decision-making, and hands-on problem solving around real-life issues in student homes/schools. The project uses the PEP Children's Conference format and student home/school environmental audits over a two-year period as catalysts for community learning and community change. Objectives of Project SOLVE are using the 1998/1999 PEP Children's Conferences and preconference activities to: 1) partner with EPA staff and other local agency officials in teaching educators applied environmental audit techniques; 2) support teaching of these skills in the classroom; 3) assist teachers/students during an audit research phase, and the change-oriented decision making, planning, and action period; 4) empower networking via a Save the Peconic Bays-hosted Internet chat group; and 5) structure the conferences to teach/model teamwork and regional collaboration. Year 1 targets audit projects in student homes/schools. Year 2 fosters more advanced analysis and local/regional problem solving. Media outreach will promote intergenerational public dialogue over key issues raised by student data.

24) Bacterial Source/DNA Analyses (Cornell Cooperative Extension)

As a means to identify coliform sources, a DNA library, specific to eastern Long Island, will be developed based on *Escherichia coli* isolated from the scat of animals (including human fecal material). The DNA library will consist of "genetic fingerprints" determined by contour-clamped homogenous electric field (CHEF) pulsed field gel electrophoresis (PFGE) for each strain of *E. coli* isolated. Once the DNA library has been established, it will be used to catalogue and identify sources of fecal pollution. Key among these will be the identification of coliform source(s) in water samples from closed shellfish areas in order to determine the most appropriate mitigation strategy to permit the reopening of these areas. The new *E. coli* DNA library for species from Long Island will be compared to the

E. coli DNA library that has been established from animals located in Virginia. Comparisons will be made for differences and similarities of like species based on geographical origin. Once the source of contamination is known, then the information can be used by managers to more effectively develop nonpoint source pollution mitigation strategies that are tailored to the specific causative animal or animals, including humans.

F) MISCELLANEOUS GRANTS (POLLUTION PREVENTION) ($57,500)

25) Federal Facilities/Pollution Prevention (EPA)

EPA has received funding to develop an inventory of Federal facilities and environmental practices (excluding Brookhaven National Laboratory). This information will be used to assess impacts and to develop management strategies and best management practices.

26) Peconic Estuary Native Plantings Initiative (Cornell Cooperative Extension)

With the funding provided, native plantings were established at two public spaces (Southampton and Southold Town Halls) in the watershed in areas highly visible to year-round and seasonal residents, business owners, municipal officials, students, and visitors. These plantings were established as living workshops where both adults and youth can learn about the diversity of native plants and their beauty, hardiness, and suitability for landscaping purposes. These plantings will also serve as reference sites where watering, maintenance, and pesticide and fertilizer inputs vs. traditional landscaping practices will be measured. Information on the plants and where to buy them would be available at each location. The public will be encouraged/challenged to establish native plantings at their homes, businesses, and in public spaces. The number and areal extent of such plantings at homes/businesses/public spaces will be counted through surveys and other appropriate means (such as having interested participants register their native plantings) and estimates of reduced water, maintenance, and fertilizer inputs will be measured directly or estimated based on the reference sites and surveys.

27) Peconic Estuary Pesticide Reduction Initiative (Cornell Cooperative Extension)

Training workshops are being conducted to directly assist farm managers in acquiring "scouting" expertise to identify pests, determine if threshold populations of pests are present, and make appropriate decisions/recommendations of when to apply pesticides. When no other control strategies are available, growers will consider environmental characteristics such as persistence, toxicity, leaching potential, and runoff potential when selecting pesticides. In addition, growers will learn specific pest biology, cultural practices, and sanitation and forecasting systems to improve pest management. Direct technical assistance in the field will be provided. Pre-training and post-growing season surveys will be conducted of all participating farms to determine changes in pest management practices. An in-depth evaluation of pesticide use and other pest management practices will be conducted with several participating growers to compare IPM practices to standard scheduled applications. Measurements of pesticide usage including number of applications and rates will be quantified.

G) NONPOINT SOURCE IMPLEMENTATION PROJECTS (CLEAN WATER ACT, SECTION "319")

The "319" projects are funded by NYSDEC, using Federal money awarded under section 319 of the Clean Water Act (nonpoint source implementation). Suffolk County was historically unsuccessful in obtaining 319 funding. However, due to prioritization in the NEP, the PEP has now received several 319 grants; additional 319 funding is anticipated in the future.

28) Surface Water Pollution Abatement (Town of East Hampton)

The system of dams in Accabonac Harbor and Northwest Creek are being expanded, and two new dams are being installed in the watersheds of Fresh Pond and Three Mile Harbor to reduce runoff into these tidal embayments. Funds will also be used to improve monitoring of water quality in these areas and test effectiveness of the Open Marsh Water Management.

29) Stormwater Mitigation (Goose Creek, Southold)

Stormwater runoff mitigation systems will be constructed at five locations in Goose Creek, a tributary of Southold Harbor. The project will improve water quality, potentially enough to allow shellfishing in the creek on a year-round conditional basis.

30) Stormwater Remediation (Hashamomuck Pond, Southold)

Stormwater runoff mitigation systems will be constructed in three areas of Hashamomuck Pond, a 170-acre tributary to the Peconic Estuary. The project will be monitored for effectiveness, and is expected to improve shellfishing conditions in the area.

31) Vac-Con Sewer Cleaning Machine (Southampton Town)

As a result of Southampton Town's two million dollar Clean Water Bond Act, approximately 330 leaching basins will be installed to mitigate stormwater runoff. The grant award will be used to purchase catch basin maintenance equipment, which will be critical to the long-term success of the treatment systems. The maintenance equipment will extend the life expectancy of the systems beyond the normal expectancy of fifty to seventy-five years.

32) Drainage Improvements (Bay Avenue, Greenport, Southold)

The project will provide treatment via slow sand filtration to stormwater runoff entering Stirling Basin from the existing Bay Avenue drainage system. The watershed consists of 65 acres in the village of Greenport, draining to Stirling Basin, a 55-acre bay.

33) Stormwater Retention/Biofilter (East Creek, Riverhead)

This project will construct a stormwater collection, storage, filtration, and treatment system for the mitigation of water pollution due to highway runoff. A 1.5-acre grading and drainage easement will be obtained, and eight catch basins, a 2,000 cubic yard retention basin, and an 1,800 square yard reed bed will be constructed. Aquatic plants will absorb nutrients from upstream nonpoint sources, suspended solids will settle, and bacteria will die off.

34) Construction of a Wetland (Village of Sag Harbor)

This will reduce stormwater discharges into Sag Harbor Bay, which is part of the Peconic Estuary System.

35) Redirect Stormwater Runoff (Shelter Island)

Stormwater runoff which now flows from many of the Town's roads directly into surface waters will be redirected. Infiltration basins with associated curb inlets, catch basins, and piping will be installed on 17 streets and roads.

H) N.Y.S. CLEAN WATER/CLEAN AIR BOND ACT*

36) Aquatic Habitat Restoration in Lake Montauk (Town of East Hampton)

This project will reestablish eelgrass beds in the southern half of Lake Montauk, a tidal lake, and cut and remove the common reed along the shoreline to reestablish a high quality fringing marsh. The project will include the initiation of a phragmites control program.

Lake Montauk is a State Significant Coastal Fish and Wildlife Habitat and a nursery for winter flounder and other valuable finfish species. It is also a wintering and feeding ground for waterfowl and home to the bay scallop. Increases in eelgrass beds should improve the depressed populations of scallops. The control of the reeds should enable reestablishment of high quality and diverse marsh species along the shoreline of the Lake.

37) Lake Montauk Runoff Pollution Abatement (Town of East Hampton)

This project will install eighty leaching catchment devices, ten infiltrators, and five adjustable weirs at twenty collection points to control pathogens and other pollutants from stormwater runoff that are resulting in shellfish bed closures and reductions in eelgrass beds in the Lake Montauk portion of the proposed project area.

These waters support significant shellfish beds. Pathogens and other pollutants from stormwater runoff have caused closure of these beds and precluded the harvesting of shellfish. This project, together with two other projects also selected for funding under the Clean Water/Clean Air Bond Act, will improve the condition of this system which may allow the reopening of some of the beds.

38) Advanced Wastewater Treatment Facility (Town of Riverhead)

This project will build a 1.4 million gallons per day advanced wastewater treatment facility utilizing Sequencing Batch Reactor technology and ultraviolet disinfection. The project will enable the Town of Riverhead to comply with the conditions of its most recent wastewater discharge permit and reduce the total load of nitrogen to the Peconic Estuary. Funding will be provided in future years for the remainder of the project.

The Peconic River Estuary is a significant recreational and commercial resource. Excessive levels of nitrogen from sewage treatment plants and runoff have increased eutrophication in the estuary, depressed dissolved oxygen and, possibly, contributed to the decline of eelgrass beds. This project addresses the primary point source of nitrogen to the estuary and will improve the condition of the waterbody.

* Project narratives provided by NYSDEC.

39) Stormwater Abatement Activities to Reduce Runoff to Peconic and South Shore Estuaries (Town of Southampton)

This project will install underground stormwater retention and infiltration structures to control pathogens from stormwater runoff that are resulting in shellfish bed closures in Noyac Bay and Wooley Pond. The project was reduced in scope to focus on important shellfish beds in Noyac Bay and Wooley Pond.

These waters support significant shellfish beds. Pathogens from stormwater runoff have caused closure of these beds and precluded the harvesting of shellfish. This project will improve the condition of this system, which may allow the seasonal use of some of the beds.

40) Davis Creek Restoration/Enhancement (Town of Southampton)

This project will create ten acres of restored and new tidal wetlands on four contiguous parcels by removing dredged materials and sand to restore water flow within a Town-owned site located adjacent to the Little Peconic Bay and Davis Creek.

This tidal wetland has historically been home to threatened and endangered species. Past disposal of dredged material has precluded the tidal wetland from functioning as a habitat. This project will fully restore the function of this wetland and all its benefits to the creek. The Davis Creek ecosystem is a significant nesting and feeding area for the State endangered piping plover and least tern, as well as for the threatened osprey, common tern, and diamond backed terrapin, a species of special concern. The creek is also noteworthy as an important commercial shellfish area with hard clams, oysters, and scallops.

41) Remediation of Highway Stormwater Discharge to Peconic Estuary (Suffolk County Department of Public Works)

This project will install recharge basins and in-line leaching basins to control pathogens and other pollutants from stormwater runoff that are resulting in the closures of shellfish growing waters. The scope of the project has been reduced to concentrate on the Lake Montauk, Three Mile Harbor, and Shinnecock Canal portions of the proposed project area.

These waters support significant shellfish beds. Pathogens and other pollutants from stormwater runoff have caused closure of these beds and precluded the harvesting of shellfish. This project, together with two other projects also selected for funding under the Clean Water/Clean Air Bond Act, will improve the condition of this system which may allow the reopening of some of the beds.

42) Animal Waste Treatment System for Flanders Bay (Suffolk County Soil and Water Conservation District)

This project will construct two sealed aeration lagoons and one denitrification tank which will supplement an existing waste treatment system at the Corwin Duck Farm. It will reduce nutrients and pathogens entering Flanders Bay, when excess nitrogen loading has caused stresses (low dissolved oxygen), and where shellfishing is reduced.

43) East Hampton Town Harbor Habitat Restoration (Town of East Hampton)

Aquatic habitat restoration is a priority of the Peconic Estuary Program. Restoring eelgrass beds to improve habitat for scallops is extremely important in the Peconic Estuary because of the devastating effect of Brown Tide blooms to both of these resources over the past ten years. Also, wetlands serve numerous habitat and pollution control functions. This project

will rehabilitate wetland and bottom habitats in East Hampton tidal embayments, particularly: Three Mile, Accabonac, and Napeague Harbors and Northwest Creek. The goals are to restore eelgrass beds in the three harbors and combat *Phragmites* proliferation in 20 acres of tidal wetlands by manual planting and removal, respectively, and by applying open marsh water management techniques to vector control ditches.

44) Hudson Avenue Stormwater Abatement for Coecles Harbor (Town of Shelter Island)

Freshwater wetlands are rare on Shelter Island and this project will increase the wetland acreage. This habitat will be beneficial to various avian species for nesting and feeding such as the red-winged blackbird, common yellowthroat, and marsh wren. Small forage fish will be introduced to control mosquitoes and provide food for wading birds. Nearby shellfish beds will benefit from the improved water quality.

This is a four-phase project to create a freshwater wetlands system to hold stormwater emanating from thirteen up-gradient catchment basins, to improve water quality in Coecles Harbor, and to create a one-acre emergent, forested freshwater wetlands detention basin as a preserve to enhance wildlife habitat and biodiversity. The area will be graded to planting specifications and water control structures will be installed. Plants, interpretative signs, a viewing platform and bird/bat boxes will then be installed.

45) Hashamomuck Pond Stormwater Remediation

This project will acquire approximately 4 acres of land to construct a biological filtration pond to control pathogens and other pollutants from stormwater runoff that are causing shellfish bed closures in Hashamomuck Pond. There is a significant shellfish resource in the Pond, and this effort will mitigate a major coliform source, improving the condition of the system which may allow the reopening of some of the beds.

46) Peconic Estuary Stormwater Remediation

Pathogens and other pollutants from stormwater runoff have caused closure of shellfish beds and precluded the harvesting of shellfish. This project will improve the condition of the system which may allow the reopening of some of the beds. This project will install leaching and retention basins to control pathogens and other pollutants from stormwater runoff that are causing the closures of shellfish growing waters. The scope of the project has been reduced to focus on the Sag Harbor and Coves portion of the project.

47) Route 25 Stormwater Mitigation for Southold Bay

This project will install stormwater mitigation structures at three locations to control pathogens and other pollutants from stormwater runoff that are causing the closures of shellfish growing waters in Southold Bay during part of the year.

48) Sag Harbor Sewage Treatment Plant Upgrade

The Peconic Estuary Program has identified the need to reduce pollutants discharged to the estuary as a priority in order to prevent degradation of water quality. This project will reduce the biochemical oxygen demand and reduce nitrogen discharged to Sag Harbor.

This project will upgrade the existing Sag Harbor sewage treatment plant (STP) by replacing the aeration tanks with sequencing batch reactors. Existing clarifiers will be converted to aerated sludge holding tanks. The upgrading will increase the capacity of the Sag Harbor STP, enhance nitrogen removal, and reduce biochemical oxygen demand in

Sag Harbor Bay. Sag Harbor has been identified as stressed with respect to nitrogen and dissolved oxygen, and the project should assist in alleviating these stresses.

49) Flanders Bay Stormwater Abatement

Southampton Town has launched an aggressive $2 million stormwater mitigation project to minimize coliform, toxics, nutrients, and other pollutants to the estuary. This project will install underground stormwater catch basins to control pathogens and other pollutants from stormwater runoff that are causing the conditional certification of shellfish water in Flanders Bay, augmenting Town funding and remediation efforts in these areas.

50) Southold Bay Stormwater Remediation — Shore Road

Pathogens and other pollutants from stormwater runoff have caused closure of these beds during part of the year and impaired the harvesting of shellfish. This project will improve the condition of this system which may allow the use of the beds year-round.

This project will replace existing catch basins along Shore Road to control pathogens and other pollutants from stormwater runoff that are causing the closures of shellfish beds during part of the year in Southold Bay.

Feb. 2001

Peconic Estuary Program
Related Demonstration/Implementation Projects

PROJECT TITLE	FEDERAL/STATE FUNDING ($)
Near Coastal Waters Grants ($144,385)	
1) Bay Scallop Restoration Project	125,950[1]
2) Filter Strip Project/Stormwater Abatement	10,000
3) Open Marsh Water Management Project	246,385[2]
4) "Saving the Bay" Poster/Pamphlet Project	5,000
5) Corwin Duck Farm — Constructed Wetland	68,000
Action Plan Demonstration Project (APDPs) (FY94) ($75,000)	
6) Bay Scallop Spat Collection and Transplant/Optimization	10,000
7) Composting Waste Public Restroom Facelift	18,730
8) Wetland Restoration Project	36,970[3]
9) Eelgrass Restoration Project (uses $700 in FY95 APDP funds)	20,200
10) Ultraviolet Disinfection/Shelter Island Heights STP	6,800
11) Fish Run Demonstration Project	10,000
FY95 APDP & "Sec. 104(b)" Stormwater Management Grants ($135,000)	
12) Nonpoint Source Pollution Prevention (Coecles Harbor Marina)	47,359[4]
13) Stormwater Quality Management ("Stormtreat")	11,950
14) Shallow Wetland/Biofiltration	19,500
15) Ozone Treatment of Stormwater Runoff	18,850
16) Clam Planting Strategies	29,050
17) Storm Drain Outfall (EcoBoom)	20,000
18) Stormwater Education/Outreach	4,000
FY96 Action Plan Demonstration Projects ($75,000)	
19) Nonpoint Source/Boat Ramps	17,000
20) Artificial Reef Demonstration Project	58,000
FY97 APDP and "Sec. 104(b)" Stormwater Management Grants ($207,519)	
21) Agricultural Environmental Management Initiative[6]	34,500
22) Land Cover Analysis	67,819
23) Project SOLVE	20,200
24) Bacterial Source/DNA Analyses	85,000
EPA Miscellaneous Grants (Pollution Prevention) ($57,500)	
25) Federal Facilities/Pollution Prevention	20,000
26) Native Plantings	20,000
27) Pesticide Reduction Initiative	17,500

PROJECT TITLE	FEDERAL/STATE FUNDING ($)
"Section 319" Nonpoint Source Implementation Grants[5] ($578,700)	
28) Town of East Hampton - Surface Water Pollution Abatement	34,500
29) Stormwater Mitigation at Goose Creek	15,000
30) Hashamomuck Pond Stormwater Remediation	39,000
31) Southampton Vac-Con Sewer Cleaning Machine	180,000
32) Bay Avenue Drainage Improvement	50,000
33) East Creek Stormwater Retention/Biofilter	62,000
34) Village of Sag Harbor - Construction of a Wetland at Havens Beach	157,500
35) Town of Shelter Island - Redirect Stormwater Runoff	40,700
New York State Clean Water/Clean Air Bond Act ($9,647,150)	
36) Lake Montauk and Fort Pond Restoration (Town of East Hampton)	15,000
37) Lake Montauk and Fort Pond Runoff Pollution Abatement (Town of East Hampton)	100,000
38) Wastewater Treatment Facility Construction (1997 and 1998) (Town of Riverhead)	2,922,500
39) Stormwater Abatement Activities (Town of Southampton)	140,000
40) Davis Creek Restoration/Enhancement (Town of Southampton)	25,000
41) Remediation of Highway Stormwater Discharge to Peconic Estuary (Suffolk County Dept. of Public Works)	100,000
42) Animal Waste System for Flanders Bay (SCSWCD)	200,000
43) East Hampton Town Harbor Habitat Restoration (Town of East Hampton)	75,000
44) Hudson Avenue Stormwater Abatement Project (Town of Shelter Island)	196,200
45) Highway Stormwater Remediation to Hashamomuck Pond (Peconic Estuary) (Suffolk County Dept. of Public Works)	600,000
46) Remediation of Highway Stormwater Discharge to Peconic Estuary (SCDPW)	75,000
47) Route 25 Stormwater Mitigation Project (Town of Southold)	45,000
48) Sag Harbor Sewage Treatment Plant Upgrade (1998) (Town of Sag Harbor)	500,000
49) Stormwater Abatement Activities (Town of Southampton)	165,000
50) Stormwater Remediation along Shore Road (Suffolk County DPW)	50,000
51) Wastewater Treatment Facility Construction (1999) (Town of Riverhead)	3,027,500
52) Stormwater Remediation to Peconic Estuary from Mitchell Park (Village of Greenport)	61,450
53) Riverhead Foundation for Marine Research and Preservation Wastewater Treatment (Town of Riverhead)	40,000
54) Sag Harbor Sewage Treatment Plant Upgrade (1999) (Village of Sag Harbor)	1,172,000
55) Sammis Beach Restoration (Town of East Hampton)	137,500
FY00 "Sec. 104(b)" Stormwater Management Grants ($150,000)	
56) Open Marsh Water Management Stormwater Strategy	75,000
57) Downtown Riverhead Stormwater Management	75,000
New York State Environmental Protection Fund ($2,189,450)	
58) East Hampton Town LWRP/LEMP (Town of East Hampton)	60,000
59) Street End Access and Stormwater Mitigation (Town of East Hampton)	25,000
60) Public Outreach and Education (Town of East Hampton)	20,000
61) East Hampton Town Marine and Environmental Science Center (Town of East Hampton)	20,000
62) Coastal Public Education Program (Town of East Hampton)	47,000
63) Scenic Resource Inventory and Analysis (Town of East Hampton)	40,000
64) Landing Lane Road End Refurbishment (Town of East Hampton)	10,000
65) GIS Development (Town of East Hampton)	50,000

PROJECT TITLE	FEDERAL/STATE FUNDING ($)
New York State Environmental Protection Fund ($2,189,450) (continued)	
66) East Hampton Sand Management Program (Town of East Hampton)	30,000
67) Harbor Management Plan (Village of Greenport)	35,000
68) Mitchell Property Design (Village of Greenport)	75,000
69) Design of a Waterfront Park and Harbor Walk (Village of Greenport)	25,000
70) Mitchell Property Redevelopment and Marine Design (Village of Greenport)	75,000
71) Mitchell Dock Westerly Pier Completion (Village of Greenport)	255,000
72) Mitchell Park and Marina Transient Docking Basin (Village of Greenport)	320,000
73) Mitchell Park and Marina - Phase Two (Village of Greenport)	450,000
74) Grangebel Park Revitalization (Town of Riverhead)	14,250
75) Town of Riverhead LWRP (Town of Riverhead)	20,000
76) LWRP Amendment/ Harbor Management Plan (Village of Sag Harbor)	37,500
77) Rysam Street Drainage (Village of Sag Harbor)	100,000
78) Wetlands Restoration Plan (Town of Southampton)	28,900
79) Shinnecock Canal Maritime Development (Town of Southampton)	25,200
80) LWRP/Intermunicipal Waterbody Management Plan/ Harbor Management Plan (Town of Southampton)	70,000
81) Shinnecock Canal Public Access Improvements Design and Engineering (Town of Southampton)	25,000
82) Erosion Management Plan (Town of Southold)	25,000
83) Harbor Management Plan (Town of Southold)	25,000
84) Street End Access and Stormwater Mitigation (Town of Southold)	15,000
85) Street End Access Improvements (Town of Southold)	42,000
86) Seed Clam Growout Program (Town of Southold)	4,800
87) Ferry Impact Workshop (Town of Southold)	3,500
88) Establish GIS Database for Growth Management (Town of Southold)	60,000
89) Road Ends Public Access and Stormwater Control Improvements (Town of Southold)	35,000
90) GIS Implementation (Town of Southold)	18,300
91) Eelgrass Culture Facility for the Peconic Estuary (Town of Southold)	53,000
92) Implementation of Priority LWRP Projects (Town of Southold)	50,000
TOTAL	**$ 13,605,063**

[1] $50,000 Near Coastal Waters grant; project expanded with $75,950 National Marine Fisheries Services grant.
[2] $11,385 Near Coastal Water grant; project expanded with $235,000 U.S. Fish & Wildlife Service grant to NYSDEC.
[3] $9,970 FY94 APDP grant; project expanded with $27,000 U.S. Fish & Wildlife Service grant.
[4] Funded, in part, with Section 319 Nonpoint Source Management grant ($16,409).
[5] Clean Water Act, Section 319 Nonpoint Source Implementation grants are passed through NYSDEC. The Peconic Estuary has been a priority by virtue of its inclusion in the National Estuary Program.
[6] Uses $163,920 in NYS Environmental Protection Fund grant to supplement $30,000 PEP APDP award.

NOTE: Non-federal match & commitments have resulted in project funding levels that are significantly larger. Also, this list does not include citizens' action projects, eelgrass restoration habitat criteria trials, and other action projects funded under "baseline" National Estuary Program management planning grants.

Table 1

State Assisted Projects to Benefit the Peconic Estuary

PROJECT TITLE	STATE FUNDING ($)
New York State Clean Water/Clean Air Bond Act ($9,647,150)	
1) Lake Montauk and Fort Pond Restoration (Town of East Hampton)	15,000
2) Lake Montauk and Fort Pond Runoff Pollution Abatement (Town of East Hampton)	100,000
3) Wastewater Treatment Facility Construction (1997) (Town of Riverhead)	922,500
4) Stormwater Abatement Activities to Peconic and South Shore Estuaries (Town of Southampton)	140,000
5) Davis Creek Restoration/Enhancement (Town of Southampton)	25,000
6) Remediation of Highway Stormwater Discharge to Lake Montauk, Three Mile Harbor, and Shinnecock Canal (Suffolk County Dept. of Public Works)	100,000
7) Wastewater Treatment Facility Construction (1998)	2,000,000
8) Animal Waste System for Flanders Bay (SCSWCD)	200,000
9) East Hampton Town Harbor Habitat Restoration (Town of East Hampton)	75,000
10) Hudson Avenue Stormwater Abatement Project (Town of Shelter Island)	196,200
11) Highway Stormwater Remediation to Hashamomuck Pond (Peconic Estuary) (Suffolk County Dept. of Public Works)	600,000
12) Remediation of Highway Stormwater Discharge to Peconic Estuary (SCDPW)	75,000
13) Route 25 Stormwater Mitigation Project (Town of Southold)	45,000
14) Sag Harbor Sewage Treatment Plant Upgrade (1998) (Town of Sag Harbor)	500,000
15) Stormwater Abatement Activities (Town of Southampton)	165,000
16) Stormwater Remediation along Shore Road (Suffolk County DPW)	50,000
17) Wastewater Treatment Facility Construction (1999) (Town of Riverhead)	3,027,500
18) Stormwater Remediation to Peconic Estuary from Mitchell Park (Village of Greenport)	61,450
19) Riverhead Foundation for Marine Research and Preservation Wastewater Treatment (Town of Riverhead)	40,000
20) Sag Harbor Sewage Treatment Plant Upgrade (1999) (Village of Sag Harbor)	1,172,000
21) Sammis Beach Restoration (Town of East Hampton)	137,500
New York State Environmental Protection Fund ($2,189,450)	
22) East Hampton Town LWRP/LEMP (Town of East Hampton)	60,000
23) Street End Access and Stormwater Mitigation (Town of East Hampton)	25,000
24) Public Outreach and Education (Town of East Hampton)	20,000
25) East Hampton Town Marine and Environmental Science Center (Town of East Hampton)	20,000
26) Coastal Public Education Program (Town of East Hampton)	47,000
27) Scenic Resource Inventory and Analysis (Town of East Hampton)	40,000
28) Landing Lane Road End Refurbishment (Town of East Hampton)	10,000
29) GIS Development (Town of East Hampton)	50,000
30) East Hampton Sand Management Program (Town of East Hampton)	30,000
31) Harbor Management Plan (Village of Greenport)	35,000
32) Mitchell Property Design (Village of Greenport)	75,000
33) Design of a Waterfront Park and Harbor Walk (Village of Greenport)	25,000
34) Mitchell Property Redevelopment and Marine Design (Village of Greenport)	75,000
35) Mitchell Dock Westerly Pier Completion (Village of Greenport)	255,000
36) Mitchell Park and Marina Transient Docking Basin (Village of Greenport)	320,000
37) Mitchell Park and Marina - Phase Two (Village of Greenport)	450,000

PROJECT TITLE	STATE FUNDING ($)
New York State Environmental Protection Fund ($2,189,450) (continued)	
38) Grangebel Park Revitalization (Town of Riverhead)	14,250
39) Town of Riverhead LWRP (Town of Riverhead)	20,000
40) LWRP Amendment/ Harbor Management Plan (Village of Sag Harbor)	37,500
41) Rysam Street Drainage (Village of Sag Harbor)	100,000
42) Wetlands Restoration Plan (Town of Southampton)	28,900
43) Shinnecock Canal Maritime Development (Town of Southampton)	25,200
44) LWRP/ Intermunicipal Waterbody Management Plan/ Harbor Management Plan (Town of Southampton)	70,000
45) Shinnecock Canal Public Access Improvements Design and Engineering (Town of Southampton)	25,000
46) Erosion Management Plan (Town of Southold)	25,000
47) Harbor Management Plan (Town of Southold)	25,000
48) Street End Access and Stormwater Mitigation (Town of Southold)	15,000
49) Street End Access Improvements (Town of Southold)	42,000
50) Seed Clam Growout Program (Town of Southold)	4,800
51) Ferry Impact Workshop (Town of Southold)	3,500
52) Establish GIS Database for Growth Management (Town of Southold)	60,000
53) Road Ends Public Access and Stormwater Control Improvements (Town of Southold)	35,000
54) GIS Implementation (Town of Southold)	18,300
55) Eelgrass Culture Facility for the Peconic Estuary (Town of Southold)	53,000
56) Implementation of priority LWRP Projects (Town of Southold)	50,000
New York State Revolving Fund ($149,480,707)	
57) Land Fill Cap (Town of East Hampton)	4,127,822
58) Non-point Source Drinking Water Protection (Town of East Hampton)	20,000,000
59) Sewage Treatment Plant Modification (Town of East Hampton)	200,000
60) Sewage Treatment Plant Upgrade (Town of Riverhead)	8,046,310
61) Interceptor, Collector, Pump Station, and Force Main (Town of Riverhead)	4,148,000
62) Non-point Source Drinking Water Protection (Town of Southampton)	30,000,000
63) Non-point Source Stormwater Runoff Treatment (Town of Southampton)	1,308,149
64) Non-point Source Stormwater Runoff Treatment (Town of Southampton)	651,400
65) Stormwater Runoff Treatment (Town of Southampton)	691,851
66) Landfill Cap (Town of Southold)	5,641,175
67) Non-point Source Drinking Water Protection (Suffolk County)	74,666,000
TOTAL	**$161,317,307**

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APPENDIX E

Brown Tide
Research Projects

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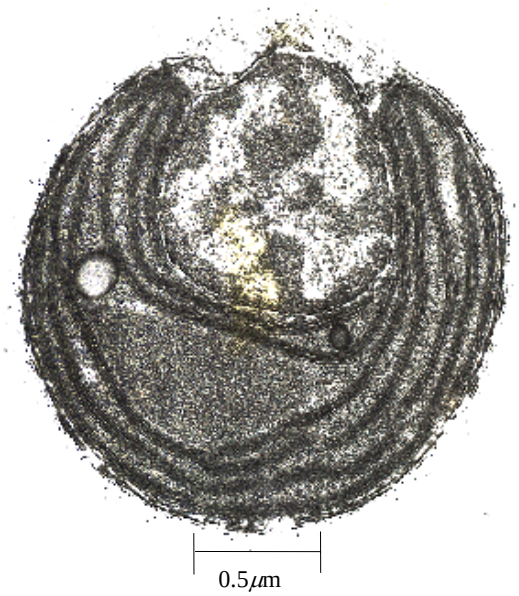
BROWN TIDE RESEARCH SUMMARY



Transmission electron micrograph of the Brown Tide organism. (x47,000)

AUREOCOCCUS ANOPHAGEFFERENS

("golden sphere") *("causing cessation of feeding")*

This package includes a summary of ongoing Brown Tide Research Initiative projects and the Brown Tide Monitoring Network, as well as a list of historic research projects funded by Suffolk County and Sea Grant.

The Brown Tide Research Initiative is a multi-year effort to investigate the onset, persistence, cessation and impacts of the Brown Tide. The Initiative was formalized at the October 1995 Brown Tide Summit and is overseen by a Committee with representatives from Sea Grant (Committee chair), the Peconic Estuary Program (PEP), Suffolk County, the National Oceanic and Atmospheric Administration (NOAA), the Stony Brook University Marine Sciences Research Center, and others.

Ongoing Brown Tide research is being funded with a portion of a $3.0 million commitment from NOAA (over six years), $100,000 in Brookhaven National Lab (BNL) services, and $100,000 of Suffolk County funds to be used as match for the BNL project. Suffolk County has authorized an additional $450,000 (over three years) in Brown Tide research capital funds. Historic Brown Tide research has been funded primarily by Suffolk County and Sea Grant.

Prepared by:

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Peconic Estuary Program, Program Office
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Riverhead, N.Y. 11901
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January, 2001

BROWN TIDE RESEARCH INITIATIVE
PROJECTS LIST
Funded Proposals
(Funded with NOAA Monies)

B1 Robert Andersen, Provasoli-Guillard National Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Sciences. ***Multiple Culture Isolates (Xenic and Axenic) Biodiversity and Ultrastructure of Aureococcoccus anophagefferens***.

The objectives of this program are to establish multiple uni-algal, including axenic (bacteria-free) cultures of *A. anophagefferens* from various areas for use in laboratory studies. The availability of these cultures will allow studies of the organism's physiology to be undertaken in an effort to determine the physical and chemical requirements for its growth. The project also includes examination of strain diversity, genetic studies, and cellular ultrastructure.

B2 Gregory L. Boyer (Chemistry Department, College of Environmental Science and Forestry, SUNY, Syracuse) and Julie LaRoche (Oceanographic and Atmospheric Sciences Division, Department of Applied Science, Brookhaven National Laboratory). ***Ferrodoxin and Flavodoxin as Metabolic Markers for Iron Stress in Aureococcus anophagefferens*.**

There is speculation that blooms of the Brown Tide organism, *Aureococcus anophagefferens*, may be triggered by iron. This proposal will develop a metabolic marker for iron stress that can be used to elucidate if iron is limiting to *Aureococcus*.

B3 David Caron (Biology Dept., Woods Hole Oceanographic Institution) and Darcy Lonsdale, (Marine Sciences Research Center, SUNY, Stony Brook). ***Microzooplankton-Mesozooplankton Coupling and Its Role in the Initiation of Blooms of Aureococcus anophagefferens (Brown Tides)*.**

A study of the effects of zooplankton-zooplankton and zooplankton-phytoplankton predator-prey relationships on the initiation of Brown Tides.

B4 Patricia M. Glibert and Todd M. Kana, Horn Point Environmental Laboratory, University of Maryland. ***Mechanisms for Nutrient and Energy Acquisition in Low Light: Successful Strategies of Aureococcus anophagefferens*.**

Isolation and culture of additional clones of *A. anophagefferens* and a characterization of their photosynthetic and nitrogen uptake capabilities under varying nutrient and light conditions. Similar characterizations will be made on naturally occurring blooms. The proposal is based on the idea that *A. anophagefferens* outcompetes other phytoplankton by having several mechanisms to acquire energy and nutrients in highly turbid waters.

B5 Maureen D. Keller and Michael E. Sieracki, Bigelow Laboratory for Ocean Sciences. ***Physiological Ecology of the Brown Tide Organism, Aureococcus anophagefferens.***

Determination of the photosynthetic and growth characteristics of a variety of isolates of *A. anophagefferens* and other co-dominating nanophytoplankton, in an effort to determine the reason(s) for bloom initiation.

B6 Theodore J. Smayda, Graduate School of Oceanography, University of Rhode Island. ***Analysis of Physical Chemical and Biological Conditions Associated with the Narragansett Bay Brown Tide.***

An analysis of the considerable amount of data collected by URI during the Brown Tide bloom, which occurred in Narragansett Bay in 1985.

B7 Gary H. Wickfors and Richard A. Robohm, Milford Laboratory, NOAA, NMFS. ***Isolation and Propagation of the Brown Tide Alga, Aureococcus anophagefferens, Using Dialysis Culture Techniques.***

Attempts to provide axenic (bacteria-free) cultures of *A. anophagefferens* using a novel culture technique.

B8 Sergio Sañudo-Wilhelmy, David Hutchins (MSRC, SUNY, Stony Brook) and John Donat, Old Dominion University. ***Biogeochemical and Anthropogenic Factors that Control Brown Tide Blooms: The Effects of Metals and Organic Nutrients in Long Island's Embayments.***

Determination of the seasonal and temporal variability of dissolved metals and organic nutrients in an attempt to establish the relative importance of natural processes versus anthropogenic inputs on the development of Brown Tide blooms.

BTRI 1999-2001

B9 Sieracki; ***The Effects of Microbial Food Web Dynamics on the Initiation of Brown Tide Blooms***

Expanding on the work from the Keller and Sieracki BTRI 1996-99 project, this investigator is examining the growth and grazing of *Aureococcus* within the context of the microbial plankton community. The hypothesis is that a picoalgae niche is typically occupied by the algae *Synechococcus* and that *Synechococcus* must be selectively removed or reduced to open the niche to *A. anophagefferens*. This project also addresses the picoplankton community including phototrophic and heterotrophic components, such as bacteria and protozoan grazers.

B10 Kana, MacIntyre, Cornwell and Lomas; *Benthic-Pelagic Coupling and Long Island Brown Tide*

To gain insight into the regional differences in the occurrence of Brown Tide across the Long Island bays, this group is examining several hypotheses regarding the control of Brown Tide by nutrients and the coupling between water column and bottom (benthic-pelagic coupling). The central focus of the project is on the role of sediment and benthos as mediators of nutrient exchange in the water column. A coupled benthic pelagic coupling model is used as a framework for studying the role of sediments in Brown Tide dynamics. Field sampling includes south shore bays, West Neck Bay and Great Peconic Bay. Physiological experiments utilizing technology developed in Gilbert's 1996-99 project, the turbidostat, will allow for accurate bioenergetic measurements of *A. anophagefferens* growth and photosynthesis under diverse organic nutrient conditions.

B11 Lonsdale, Caron, and Cerrato; *Causes and Prevention of Long Island Brown Tide*

This project continues efforts utilizing mesocosms to study and understand the factors leading to Brown Tide outbreaks and possible Brown Tide prevention or mitigation. The team is examining several topics including changes in the plankton community structure that takes place as *A. anophagefferens* increases in relative and absolute abundance within a natural plankton assemblage, and the effects that perturbation to the pelagic food web have on the success or failure of Brown Tide. Investigations will continue exploring how suspension feeding bivalves affect planktonic food web structure, and how their activities affect the absolute and relative abundance of *A. anophagefferens*. This investigation will consider the effects of the chemical form of growth limiting nutrients and the rate of nutrient loading as factors affecting Brown Tide initiation and bloom magnitude.

SUFFOLK COUNTY
Funded Brown Tide Research

Ref. #	Year	Funding	Name/Description
S1	1986	$78,998	**Part I. ($36,058)** Effects of high algal concentrations (field samples) on feeding performance of bay scallop and mussel. Feeding Performance of scallops using "normal" phytoplankton species. (Bricelj)
S2			**Part II. (42,940)** Effects of light limitation on eelgrass growth. (Dennison)
S3	1987	$43,563	(Cosper, Carpenter) Laboratory growth studies of bloom organism (macro-micronutrients, physical/chemical parameters) Positive identification using EM.
S4		$9,300	Supplemental funds for technical assistance on above project.
S5		$16,663	(Dennison) Photographic overflight of Peconic System to map eelgrass. Groundtruthing of aerial overflight imagery. Preparation of eelgrass habitat inventory map.
S6		$9,998	(Siddall, SUNY, Stony Brook) Bay Scallop Landing of 1985-1986 and the Effects of Brown Algal Blooms.
S7		–	(Siddall, SUNY, Stony Brook) Climatology of Long Island Related to the Brown Tide Phytoplankton Blooms of 1985 and 1986.
S8	1988	$46,800	(Cosper) ^{14}C productivity studies.
S9		$24,999	(Anderson) Development of immunofluorescent identification procedure and training of SCDHS personnel.
S10		$6,680	(Levandowsky) Attempts to obtain an axenic culture of *Aureococcus anophagefferens.*
S11	1989	$13,885	(Levandowsky, Haskins Laboratory, NYC) The use of satellite based remote sensing for monitoring the Brown Tide phenomenon.
S12	1994–95	$33,848	(Beltrami, SUNY Stony Brook) Inferring Brown Tide Dynamics in Peconic Bay from Models and Data.
S13		$18,606	(Lonsdale, SUNY, Stony Brook) A Field Study of Microzooplankton Biomass and Grazing Rate.
S14		$5,803	(Mahoney, NMFS, Sandy Hook) Purification of *Aureococcus anophagefferens* Culture.
S15 N7	1994–95	$32,168	($10,000 SCDHS, $22,168 Sea Grant — Wilson and Beltrami, SUNY, Stony Brook)
S16		$31,000	(Boyer, SUNY — Env. Science & Forestry, Syracuse) Iron and Nitrogen Nutrition in the Brown Tide Algae *Aureococcus anophagefferens*
S17	1996–97	$100,000	Brown Tide Monitoring Network (Brookhaven National Lab) This project will use $100,000 in Suffolk County funds with significant match by BNL (minimum $100,000 match in first year). Suffolk County funding will be used to deploy real-time in-situ fluorometers, construct and maintain a Brown Tide home page on the

			World Wide Web reporting resulting data, and determining basic photosynthetic physiology of Brown Tide in the field. BNL is also performing "hind-casting" and autoecological investigations through in-kind match.
S-18	1998–99	$49,945	(Lonsdale & Taylor, SUNY, Stony Brook) Differential Phytoplankton and Microzooplankton Analyses in Long Island Bays. Research to increase knowledge of the plankton ecology of Long Island Bays. The researcher's goal is to describe as completely as possible the temporal and spatial patterns in composition and biomass of phytoplankton and microzooplankton, including protozoa and micrometazoa, at three sites in the Peconic Bays system, and two in south shore bays. Based on experience and the literature, the researchers will categorize where possible the planktonic members by trophic group (*e.g.*, as primary producers, grazers, omnivores, bacteriovores) which is a first step towards characterization and comparison of planktonic food web structure in these bays.
S-19	1998–99	$200,00	(LaRoche *et al*., Brookhaven National Laboratory) Dissolved Organic Nitrogen and Brown Tide Blooms in Long Island's Coastal Waters: Testing the Groundwater Hypothesis. A study to identify the source of DON that is available to *A. anophagefferens* via field and laboratory studies. The laboratory work will involve 1) the identification of the DON components from the Peconic estuary or Great South Bay that can support growth of the alga and 2) characterization of the DON uptake systems and utilization mechanisms that make this alga competitive at utilizing nitrogen 3) the production of immunological probes to major proteins *of A. anophagefferens* involved in the utilization of DON. In the field, BNL will characterize the DON fraction utilized by *A. anophagefferns* during a bloom as well as follow the nitrogen nutrition of this algae using immunological probes. Weekly or biweekly nutrient bioassays and analysis of various dissolved and particulate nitrogen pools will complement the field sampling of Suffolk County Department of Health Services (SCDHS) surface water monitoring program. The result will be analyzed in the context of the groundwater hypothesis, the SCDHS survey and the Brown Tide Research Initiative (BTRI) project.

NEW YORK SEA GRANT INSTITUTE*
Brown Tide Research

Ref. #	Project
N1	R/F-48: Blooms of Brown Tide Phytoplankters in Long Island Bays: Physiological Characteristics. Dr. Edward Carpenter, MSRC, SUNY at Stony Brook. Started: 8/15/86 Ended: 2/28/87 $9,685
N2	R/CMB-2: An Investigation of Coupling Between Phytoplankton Productivity and Zooplankton Dynamics in Long Island Coastal Embayments. Drs. Elizabeth Cosper and Darcy Lonsdale, MSRC, SUNY at Stony Brook Started: 1/01/91 Ended: 12/31/92 $147,529
N3	R/CMB-11: A Study of Viral Activity in the Brown Tide Alga, *Aureococcus anophagefferens.* Dr. Elizabeth Cosper, MSRC, SUNY at Stony Brook Started: 2/01/93 Ended: 3/06/92 $7,936 (Scholar only)
N4	R/CF-5: Environmental Factors Enhancing 'Brown Tide' Blooms: A Field Experimental Approach. Drs. Elizabeth Cosper, Darcy Lonsdale and Edward Carpenter, MSRC, SUNY at Stony Brook Started 2/01/93 Ends: 7/31/95 $150,692
N5	R/CE-7: Impact of Brown Tide (*Aureococcus anophagefferens)* on Microbial Food Web Processes in a Long Island Bay. Dr. Darcy Lonsdale and Gordon Taylor, MSRC, SUNY at Stony Brook. Started: 2/01/94 Ends: 1/31/96 $117,061
N6	R/FBM-16: Relative Susceptibility of Bivalves to the Brown Tide Alga *Aureococcus anophagenfferens:* Comparison among species and life history stages. Dr. Monica Bricelj, MSRC, SUNY at Stony Brook Started: 9/1/95 Ends 8/31/97 $164,387
N7 (S15)	R/CE-10: Causative Factors in the Initiation of Brown Tide Blooms. Robert Wilson, MSRC, and Ed Beltrami, Mathematics, SUNY at Stony Brook 1-year starting 2/01/96 $22K approx. (Plus $10K from Suffolk County) <u>TO BE FORWARDED TO NATIONAL OFFICE FOR FUNDING IN 1996-97 OMINIBUS PROPOSAL:</u> (intended but not yet approved for funding).
N8	R/CMB-12: Cell Cycle Technique for Measurement of Growth Rates and Environmental Effects of the Brown Tide Alga. Edward Carpenter, MSRC, SUNY at Stony Brook 2-year project starting 2/01/96 $35K/year approx.

* Information provided by Sea Grant

ECOHAB
Funded Research

Ref. #	Project
E-1	(Stabile *et al*., 1998-99) Genetic Variability Among Spatially and Temporally Isolated Blooms of the Brown Tide Microalga, *A. anophagefferns*. Final project description is forthcoming.

APPENDIX F

Brown Tide
Interim Workplan

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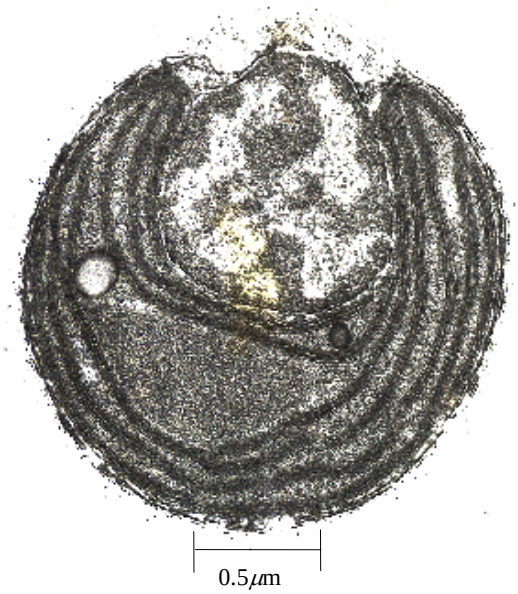
BROWN TIDE WORKPLAN



Transmission electron micrograph of the Brown Tide organism. (x47,000)

AUREOCOCCUS ANOPHAGEFFERENS

("golden sphere") *("causing cessation of feeding")*

An Overview of Ongoing and Historical Research and an Identification of Future Research Priorities

Brown Tide Steering Committee

Coordinated by: Suffolk County, N.Y.
Robert J. Gaffney, County Executive

Interim Workplan — Rev. May, 1998

This interim document has been prepared by the Brown Tide Steering Committee, an ad hoc advisory committee coordinated by the Office of the Suffolk County Executive. For additional information, or to provide comments, please contact: Suffolk County Dept. of Health Services, Office of Ecology, Riverhead County Center, Riverhead, N.Y. 11901, (631) 852-2077.

NOTE: Appendices referenced in this Brown Tide Workplan are available upon request from the PEP Program Office.

FOREWORD

This revised Workplan has been prepared to include newly funded research projects, and is being issued in anticipation of the spring, 1998 Brown Tide Research Initiative Symposium. A more substantial revision of this Workplan, incorporating results of ongoing research initiatives, will be produced subsequent to that Symposium.

The publication history of this Workplan is as follows:

Revised Draft Workplan, May 19, 1997 — The first complete draft Workplan which incorporated comments from the full Brown Tide Steering Committee. Followed the 1997 Brown Tide Research Initiative Symposium.

Interim Workplan, June 3, 1997 — The first official Brown Tide Steering Committee product, which incorporated comments on the May 19, 1997 Revised Draft.

Interim Workplan, Rev. June 17, 1997 — A revised workplan, based on Committee recommendations to include the following priority: mesocosm and laboratory experiments to determine the Brown Tide growth response to additions of selected nutrients and trace elements.

Interim Workplan, Rev. February 23, 1998 — A revised workplan, based on funding of three new projects:

- *Dissolved Organic Nitrogen and Brown Tide Blooms in Long Island's Coastal Waters: Testing the Groundwater Hypothesis* (J. LaRoch *et al*.)
- *Differential Phytoplankton and Microzooplankton Analyses in Long Island Bays* (D. Lonsdale *et al*.)
- *Genetic Variability among Spatially and Temporally Isolated Blooms of the Brown Tide Microalga*, A. Anophagefferens (Stabile *et al*.)

Interim Workplan, Rev. May, 1998 — A revised workplan, based on research results reported in the 1998 Brown Tide Research Initiative Symposium.

BROWN TIDE WORKPLAN

1. SUMMARY

Significant progress has been made with respect to understanding brown tide onset, persistence, cessation, and impacts on shellfish, as well as related biological, physical, and chemical factors. However, substantial additional research is needed. This Workplan estimates that, over the next three years, a total of at least $2.1 to $2.8 million would be necessary to conduct high priority research efforts (see sections A and B below). This initial estimate is probably conservatively low, and is provided for purposes of preparing an interim Workplan based on readily available information.

A) Brown Tide Research Initiative (BTRI)

As a result of the Brown Tide Research Initiative (BTRI) process, three areas of research have been identified as specifically warranting additional funding. Cumulatively, these areas of research would require approximately $400,000 to $600,000. One specific project proposal which has been deemed worthwhile, but which is not being conducted due to funding restrictions, is:

1) Investigations of groundwater, and its various constituents, with respect to Brown Tide blooms.

Additionally, BTRI Committee members recommended development of a Request for Proposals for the following specific research needs:

1) Modelling of nutrient budgets.
2) Investigation of viral/pathogen activity as it may affect Brown Tide.

B) Brown Tide Summit

In addition to the above projects, substantial research should be performed on physical, chemical, and biological factors related to Brown Tide, as well ecological effects of the organism. These additional research priorities are based on a review of *Brown Tide Summit* (Oct. 1995) recommendations in light of historical and ongoing research. *Summit* recommendations are included as Workplan research project priorities only where the *Summit* recommendations address substantively critical topics, where data is needed in the immediate future, and where there is still a research gap (*i.e*., incomplete research, or no ongoing research). The range of funding needed to adequately address these projects is estimated to be approximately $1.4 to $1.8 million to conduct projects in the following areas:

1) Role of allelopathy in securing for the Brown Tide a competitive edge over other microalgae.
2) Autolysis as a factor related to Brown Tide cessation.
3) Possible relationships between benthic-pelagic coupling and the Brown Tide, including:
   a) Benthic filter-feeders and the removal of suspended particles, and
   b) Resuspension of bottom material and “conditioning” of the water column.
4) The relationship between historical data on meteorological and oceanographic parameters and the occurrence and distribution of Brown Tide in the Peconic Bays system and other systems on the East Coast.

5) Quantitatively describing the temporal and spatial (3-dimensional distribution) of biological, chemical, and physical parameters associated with Brown Tide. A Brown Tide bloom detection and monitoring system based on remote sensing should be developed.

6) Continuous monitoring of various chemical and physical parameters in the field before, during and after Brown Tide blooms.

7) Mesocosm and laboratory experiments to determine the Brown Tide growth response to additions of selected nutrients and trace elements. One possible hypothesis that the mesocosm experiments could test is that the Brown Tide has a competitive advantage in conditions of low dissolved inorganic nitrogen DIN supply, and that limited, transient additions of DIN could mitigate Brown Tide blooms.

8) Effects of Brown Tide on commercially important bivalves and other filter feeders, and optimization of shellfish management programs in the presence of Brown Tide.

9) Effects of Brown Tide on other ecosystem elements, such as eelgrass, and optimization of relevant management programs in the presence of Brown Tide.

C) Next Steps

The Workplan is an "interim document", to be refined and updated periodically. The Brown Tide Research and Management Steering Committee *("Steering Committee")* should further analyze research needs, and should consider issuing a Request for Pre-Proposals based on anticipated funding sources.

2. INTRODUCTION

After the Brown Tide bloom in the summer of 1995 (see Brown Tide fact sheet in **Appendix A**), the Brown Tide Summit of October, 1995 again galvanized support behind a comprehensive program of Brown Tide research. Some Summit participants expressed frustration that historic research was intermittent, uncoordinated, and underfunded. At the Summit, significant progress was made in expanding upon historical knowledge of research needs. Recommendations on additional research dealing with physical, chemical, and biological factors related to Brown Tide were made by Summit work groups.

Also at the Summit, critical commitments for Brown Tide research funding were made. The NOAA Coastal Ocean Program announced that $1.5 million, over three years, would be used for Brown Tide funding. Also, Brookhaven National Lab (BNL) and the Suffolk County Executive announced the Brown Tide Monitoring Network (discussed below), which uses $100,000 in Suffolk County funding with at least that much match from BNL.

As a result of the Summit, the Brown Tide Research Initiative ("BTRI") Committee was formed to prepare a Request for Proposals (RFP), review research proposals, and assist in managing the NOAA Coastal Ocean Program funding. That Committee includes NOAA, N.Y. Sea Grant, NYS Dept. of Environmental Conservation, the Suffolk County Executive, the U.S. Environmental Protection Agency (EPA)/Peconic Estuary Program (PEP), a local government representative, a citizen representative, and a South Shore Estuary Reserve (SSER) representative.

Another Committee, the Brown Tide Steering Committee, was also proposed by various Federal, State, and local representatives to more broadly coordinate and guide Brown Tide research and management efforts. The Steering Committee's goals are to:

1) Coordinate research efforts funded and performed by various entities.
2) Assist in dissemination of information.
3) Develop and continually refine and update research work plans, by systematically organizing and summarizing results of previous and ongoing Brown Tide research efforts, and identifying priorities for additional research needs.
4) Estimate funding needs to conduct necessary additional research.

This "Workplan" deals primarily with goals 3 and 4, but also serves to coordinate and disseminate information about ongoing efforts. The Steering Committee, however, should pursue several other mechanisms to further its goals, including routine distribution of progress reports from ongoing research efforts.

As proposed, the Steering Committee (see **Appendix C** for proposed goals and structure) is comprised of BTRI members, as well as several additional members, including elected officials and representatives from various agencies, citizens groups, and estuary programs, such as Barnegat and Narragansett Bays (see **Appendix D** for mailing list). The Steering Committee is coordinated by Suffolk County. Consensus-building is the process proposed for the Steering Committee, which serves in an advisory role to estuarine research and management programs, elected officials, citizens, and agencies funding and overseeing specific research projects.

3. PROCESS OF IDENTIFYING RESEARCH NEEDS

Research needs are identified in two main ways in this Workplan. The first method is by solicitation of ideas from the research community via Requests for Proposals; this results in specific ideas and very detailed cost estimates. This means is usually employed when there are specific amounts of money available to expend on research, and was used by the BTRI in administering NOAA Coastal Ocean Program funding (see Section 4).

The second mechanism is a systematic organization and review of historical research to identify gaps, resulting in recommendations on generalized research efforts and approximate cost estimates. A major charge of the Steering Committee is to review important research issues in the context of historical and ongoing research, and identify remaining research gaps. The Committee will seek input from technical experts as part of the Workplan process.

4. BTRI APPROACH AND RFPs

The Request for Proposals issued by the BTRI in 1996 resulted in numerous proposals. Although NOAA funding was substantial, it was not enough for all worthwhile proposals.
One specific proposal which was ranked highly, but which could not be funded, included:

1) Investigations of groundwater, and its various constituents, with respect to Brown Tide blooms.

Additionally, BTRI Committee members recommended development of a Request for Proposals for the following specific research needs:

1) Modelling of nutrient budgets.
2) Investigation of viral/pathogen activity as it may affect Brown Tide.

The "nutrient budget" comment has also been highlighted as an important issue by the Steering Committee, particularly in light of a recent hypothesis that Brown Tide may thrive in an environment in which the supply of dissolved organic nitrogen is elevated in relation to a low supply of dissolved inorganic nitrogen (Brookhaven National Lab, LaRoche *et al*). The "nutrient budget" project should further test this hypothesis, and evaluate whether human impacts on the ecology of the Peconic Bay may have contributed to causation of Brown Tide. Ultimately, the hope is that human management (*e.g*., controlling nitrogen inputs) may mitigate conditions which favor Brown Tide blooms.

While the recently funded "Dissolved Organic Nitrogen..." project (see **Appendix B**, project S-19) will be an important step in researching the role of DON in brown tide blooms, it will not completely resolve the nutrient budget issue. For example, additional information on sources of various nitrogen constituents (*e.g*., groundwater and sediment flux) is still necessary.

Each of the three research topics would probably require approximately $150,000 to $200,000 over a two year period, for a total funding need of about $450,000 to $600,000. The Brown Tide Steering Committee, or member agencies, should consider issuing a Request for Pre-Proposals based on anticipated funding sources. These include $450,000 in Suffolk County Capital funds ($300,000 authorized but not appropriated, plus $150,000 recently appropriated; see projects S-18 and S-19 in **Appendix B**) and New York State funding of Brown Tide research (discussed but not committed).

5. HISTORICAL AND ONGOING RESEARCH — SYSTEMATIC REVIEW APPROACH

The Workplan's summary and analysis of research efforts is not intended to be an exhaustive discussion or rigorous compendium. Rather, it is useful as a tool to illustrate the nature and extent of previous research efforts in the context of identified research needs, so that future research needs can be more appropriately identified and justified.

A) Previous and Ongoing Research

A list of previous and ongoing research efforts is included in **Appendix B**. For illustrative purposes, all research efforts are assigned an index number based on primary funding source. These index numbers are used in **Table 1**, which groups project types by categories such as organism onset/growth, decline/cessation, and effects on shellfish. The table also differentiates between lab and field studies, and indicates projects performed retrospectively on existing data.

Several other research and management projects may be *related* to the Brown Tide, and are not included on the research table at this time. For example, bay scallop restorations and eelgrass restocking trials have occurred as part of the PEP. The PEP has also conducted investigations regarding surface water quality monitoring, land use, surface water modelling and sediment nutrient flux. These may be quite important in understanding, and possibly managing, the Brown Tide.

However, for purposes of this Workplan, readily available research lists were utilized; these lists deal with scientific "research" which directly and primarily deals with the Brown Tide.

Table 1 essentially encapsulates information available at the time of the Brown Tide Summit, with the addition of the BTRI projects and the Brown Tide Monitoring Network project. At the Summit, workgroups developed detailed recommendations on research needs in the areas of chemical, physical, and biological factors affecting Brown Tide, as well as Brown Tide ecological impacts. Because these topics include extremely detailed recommendations from work groups, they are used in this Workplan's analysis.

B) Development of Priority Research Recommendations

Tables 2 through 5 list the research areas identified as priorities in the Summit. The tables also note where additional research is necessary on a high priority basis. Research needs are highlighted where Brown Tide Summit recommendations were not acted upon (*i.e.*, no high quality proposals submitted, or no funding available), or where research is ongoing, but substantial additional research is believed to be needed.

In considering the importance of research gaps, areas are designated as "high priority" when the need for the project is both substantively and temporally (*i.e.*, necessary immediately) important. For example, comprehensive Brown Tide modelling is believed to be substantively important, but to a large degree cannot effectively occur on a meaningful level until more is understood about basic Brown Tide physiology. Therefore, it is not a high priority for immediate funding. However, information on differential phytoplankton populations, which would be critical to any eventual model, is a high priority, as it would assist in understanding Brown Tide population dynamics and relationships to other organisms.

The timeframe contemplated by this Workplan is roughly in the range of three years, which is how long it would probably take to complete the round of projects identified as priorities. The nature of the scientific research projects makes it nearly impossible to accurately forecast research priorities beyond that time period. Researchers and managers hope that the Brown Tide mystery will be solved, and that management options may be possible to prevent or minimize impacts of future blooms. Conversely, based on prior experience, it is reasonable to assume that, at the end of three years, scientists may have raised substantial additional questions, which would require substantial additional funding. This Workplan contemplates only the short-term, priority research needs. Of course, the research priority-setting process is fluid, and will change periodically based on new findings.

The "systematic" approach is admittedly less than perfectly rigorous. Research priorities and funding estimates are, to some degree, based on subjective evaluations and subject to some degree of error. This is, hopefully, minimized by identifying only projects which are clearly high priorities, and specifying a range of likely project costs which are conservatively low. In this manner, the Workplan specifies a "minimum" of research needs.

Also, research is, by its very nature, somewhat speculative. No one can be sure how useful the results of any one project, or even a set of projects, might actually be in helping to understand or manage the Brown Tide. The fluid nature of the Workplan, which will be periodically updated, should address the need to continually review the results of current research and identify remaining research needs.

Potential problems in the prioritization approach will also be minimized by review of, and input to, the Workplan by a broad range of persons with expertise and interest in the topic. In the final analysis, the Brown Tide Steering Committee, and its Workplan, are advisory in nature, and final funding decisions on specific projects are left to the entities which actually fund research work. The Workplan is intended to guide funding entities, proposers, and policymakers involved in funding decisions. The Steering Committee believes that the Workplan approach is the best way to accomplish these ends.

6. PRIORITY RESEARCH RECOMMENDATIONS

The systematic review of Brown Tide Summit recommendations has resulted in several recommended projects, which would require approximately $1.8 to $2.4 million to perform. Cost estimates for the projects are provided as a range of probable costs of $150,000 to $200,000 per project, assuming two years for each project. The estimates are based on professional judgement and prior experience with comparable projects. It is possible that given projects could be performed for less than the assumed cost range; conversely, some projects could cost substantially more, particularly if significant laboratory analysis and/or field effort is required. For purposes of estimating the approximate range of research funding necessary, the estimates are believed to be reasonable.

It is important to emphasize that the overall cost estimates in this interim Workplan are probably too low, as they were prepared based on readily available information, using cost estimates which are conservatively low and defensible. While a few projects could cost less that $150,000 to $200,000, it is likely that several could cost substantially more, particularly the ones which would be labor-intensive and multiple-year efforts. The estimates are provided for purposes of preparing an interim Workplan, and the Steering Committee should consider expanding upon, or refining, the estimates, as deemed appropriate.

These priority research recommendations are summarized as follows.

A) Biological

Many of the key areas of research recommended by the Brown Tide Summit workgroup are being conducted as part of the BTRI. These include efforts to isolate of multiple and axenic cultures, investigation of iron as a possible trigger for the Brown Tide bloom by development of a metabolic marker, a study of Brown Tide energy and nutrient acquisition in low light, and additional investigations into zooplankton and phytoplankton interactions. However, several other important areas were not addressed. These are discussed below.

1) Role of Allelopathy in Securing for the Brown Tide a Competitive Edge over Other Microalgae

Allelopathy has been suggested as a possible mechanism for Brown Tide blooms, whereby the Brown Tide can interfere with the growth or survival of other organisms through production of toxins or other substances. This is a significant gap in Brown Tide research.

2) Factors Related to Brown Tide Cessation, including Autolysis

Prior research suggests that viruses may be involved in the cessation of Brown Tide blooms. The BTRI identified viruses as an additional research area, recognizing the importance of verifying and characterizing the nature and extent of viruses in ending Brown Tide blooms. Another

research area identified in the Brown Tide Summit is the determination of whether the Brown Tide organism breaks down and lyses itself, as is the case in some marine microalgae.

3) Possible Relationships between Benthic-Pelagic Coupling and the Brown Tide, including: Benthic Filter Feeders and the Removal of Suspended Particles, and Resuspension of Bottom Material and "Conditioning" of the Water Column

Additional research is needed to characterize how benthic filter-feeders impact water column suspended particle loads and the size structure of phytoplankton communities, as well as how human-related shellfishing practices may have affected ecological processes by removal of shellfish or resuspension of sediments.

B) Physical

The most sweeping recommendation, regarding a quantitative model, is probably unrealistic, due to the absence of basic data to construct the model, together with the prohibitively high cost of constructing the model. However, three areas are appropriate priorities for immediate research, as follows.

1) *What Relationship Exists between Historical Data on Meteorological and Oceanographic Parameters and the Occurrence and Distribution of Brown Tide in the Peconic Bays System?*

A comprehensive and systematic review and reporting on all available data has not been performed. Physical scientists/physical oceanographers or others familiar with advanced statistical techniques should evaluate a number of East Coast embayments. Climatic data, such as rainfall and wind direction, should be gathered and analyzed at a fairly high-resolution level, perhaps weekly. Satellite data, and any other available multi-frequency data, should be systematically used. Advanced statistical methods, such as "intervention analysis," should be considered. Specific possibilities which should be considered include geographic orientation of bays (in combination with local wind vectors and poor flushing) and warm core ring water drifting onto the East Coast to "seed" the area with an offshore bloom.

2) *How Can We Best Quantitatively Describe the Temporal and Spatial (3-Dimensional Distribution) of Biological, Chemical, and Physical Parameters Associated with Brown Tide?*

While a comprehensive three-dimensional model is not a realistic short-term goal, data should be collected which could eventually support model development, and which would have independent utility, as well. The following topic deals with such data collection: the development of an effective remote sensing system for Brown Tide blooms to better track the spatial and temporal variability of blooms.

C) Chemical

As with the "biological" recommendations, many of the key areas of research recommended by the Brown Tide Summit workgroup are being conducted as part of the BTRI. These include a study of the effect of metals and organic nutrients with respect to Brown Tide. Several other projects deal jointly with interrelated chemical and biological issues (*e.g.*, iron study discussed above; review of chemical and biological data in Narragansett Bay). The following areas, however, warrant additional investigation.

1) Continuously Monitor Various Chemical and Physical Parameters in the Field before, during and after Brown Tide Blooms.

Although the Brookhaven National Lab Brown Tide Monitoring Network project will initiate some continuous monitoring in 1997, the project will terminate within a year. Additional support will be needed to maintain and, possibly, expand the program. This project would probably require approximately $50,00–100,000.

As with differential phytoplankton data, an "early warning/emergency response" plan may be appropriate (reduce number of stations, and increase when Brown Tide begins blooming). Also, efforts could be concentrated in "bloom initiation" periods (May). However, cost savings in reducing number of continuous stations and/or time periods should be carefully weighed against the value of "out-of-Brown Tide season" data.

2) Perform Mesocosm and Laboratory Experiments to Determine the Brown Tide Growth Response to Additions of Selected Nutrients and Trace Elements.

To test the theory that Brown Tide bloom onset conditions are optimized when supply is elevated in relation to a low DIN supply (discussed above), and to evaluate possible mitigation strategies, field and laboratory experiments should be performed to determine the effects of various nitrogen constituents on Brown Tide. Other nutrients and trace elements could be included as well. A factorial-grid of DON/DIN ratio, timing of DON/DIN manipulation, and competitor phytoplankton species could be useful for a critical evaluation of the hypothesis. Such an approach could be best accomplished with closely coordinated lab and mesocosm experiments. One possible hypothesis that the mesocosm experiments could test is that the Brown Tide has a competitive advantage in conditions of low dissolved inorganic nitrogen DIN supply, and that limited, transient additions of DIN could mitigate Brown Tide blooms.

D) Ecological Effects

While ecological effects are certainly important, the consensus at the Summit seemed to be that the most critical threshold issues relate to the dynamics of the Brown Tide organism itself. Thus, priority research recommendations relate to the Brown Tide, rather than its impacts. The Steering Committee

will revisit this issue to evaluate whether additional priorities should be placed in the area of ecological effects.

With regard to shellfish, since there is a real possibility that the Brown Tide may never be "controllable," scientists and resource managers should also focus on the practical aspects of ecological effects, with special emphasis on the portions of the ecosystem tied to public use. These efforts would involve characterizing Brown Tide impacts on resource species (how much Brown Tide is tolerated, and for how long). Ultimately, the goal would be to characterize the sustainability of various species, and provide guidance on likelihood of resource availability. There are numerous specific and practical management implications of this "research," including identification of species that have the best prospects for long-term sustainability, and in what areas; recommendations on where to site, and how to manage, hatchery facilities; where to transplant scallops to maximize likelihood of survival and population; and ways to manage shellfish in the event of a bloom, such as moving scallops to areas less likely to be impacted.

Also, information on why Brown Tide affects filter feeders may be important to understand why it is so successful.

Specific research area recommendations for shellfish include:

- Identify mechanism by which Brown Tide affect actual (whole) scallops (*e.g.*, chemical mediator affecting feeding mechanism).
- Evaluate threshold density and duration of Brown Tide exposure that impacts scallops.
  - Characterize scallop recovery time after short exposure.
  - Identify "point of no return" after which time scallops will not recover.
- Study impacts on other species (*e.g.*, clams, oysters).

Living resources other than scallops, clams, and oysters which may be of concern with respect to the Brown Tide include submerged aquatic vegetation (particularly eelgrass), finfish, and crustaceans. The negative impacts on eelgrass are suspected but not confirmed; there were massive die-offs of the grasses reported during the first bloom in l985, but apparently not in subsequent blooms. Eelgrass is a critical habitat for scallops and other organisms. Knowledge of Brown Tide impacts on eelgrass, and eelgrass recovery dynamics, may be important in providing guidance on likelihood of resource availability and in directing management programs, such as eelgrass and scallop transplant efforts.

The impacts of the Brown Tide on finfish and crustaceans are completely unknown. There is some anecdotal information that these organisms moved out of the estuary in response to the bloom but these have not been confirmed. The latter impacts may be important with respect to the role of the estuary, particularly the waters in the western end, as a nursery and feeding ground for coastal finfish species as well as crustaceans. Although not of first priority, some consideration should be given in the future to examining the effects of the bloom on crustaceans and species of finfish which use the estuary for spawning and juvenile feeding.

For purposes of this workplan, the "ecological effects" research topics are grouped into the following two areas (based on **Table 5**), although it is highly likely that more than two projects would be necessary to accomplish the above-discussed objectives.

1) How does Brown Tide impact commercially important bivalves and other filter feeders, and how can shellfish management programs be optimized in the presence of Brown Tide?
2) What is the effect of Brown Tide on other ecosystem elements, such as eelgrass, and how can relevant management programs be optimized in the presence of Brown Tide?

Table 1. Concluded and Ongoing Brown Tide Research.

I. LAB STUDIES

A) What factors control the growth of brown tide?

1. Organism Physiology
    a. Role of macro & micronutrients
        Cosper (S3,S4), LaRoche & Falkowski (BNL), Glibert & Kana (B4), Keller & Sieracki (B5), Carpenter (N1), LaRoche *et al*. (S-19)
    b. Role of Light (Photosynthetic Physiology)
        Glibert & Kana (b4), Keller & Sieracki (B5)
    c. Role of trace metals & chelators
        Cosper (B3), Boyer (S16), Boyer & LaRoche (B2)
    d. Growth rate measurements
        Carpenter (N8)
2. Competitive Interactions
    a. Allelopathy (no known research performed to date)
    b. Interspecific competition
        Keller & Sieracki (B5)
    c. Axenic Cultures and Bacterial Associations
        Levandowsky (S11), Wikfors & Robohm (B7), Andersen (B1), Mahoney (S14)
3. Genetics of *Aureococcus*
        Andersen (B1), Stabile *et al*. (E-1)

B) What factors control bloom progress, decline and cessation?

1. Effect of grazers on brown tide
        Lonsdale (S13), Keller & Sieracki (B5), Cosper & Lonsdale (N2)
2. Effect of viruses on brown tide
        Cosper (N3)

C) How does bloom affect the ecosystem?

1. Effect of brown tide on shellfish
        Bricelj (S1, N6)

II. FIELD STUDIES

A) What factors control growth of brown tide?

1. Organism physiology & bloom dynamics
    a. Role of macro & micronutrients
        BTCAMP, PEP, Cosper (N4), Sañudo–Wilhelmy *et al*. (B8), LaRoche *et al*. (S-19)
    b. Role of Light (Photosynthetic Physiology)
        Wirick & Falkowski (S17-BNL)
    c. Role of trace metals and chelators
    d. Productivity studies
        Cosper (S8), Sañudo-Wilhelmy *et al*. (B8)

Table 1. Concluded and Ongoing Brown Tide Research. (continued)

II. FIELD STUDIES (continued)

e. Bloom dynamics
BTCAMP, PEP, Anderson (S9), Levandowsky (S11)
f. Genetic Variability, Stabile *et al*. (G-1)

2. Competitive interactions
a. Microzooplankton-mesozooplankton coupling
Caron & Lonsdale (B3), Lonsdale *et al*. (S-18)

3. Physical Factors
Siddall (S7), BTCAMP, PEP, Beltrami (S12), Wilson & Beltrami (S15-N7)

B) Effects of brown tide on ecosystems

1. Effects of brown tide on eelgrass
Dennison (S2,S5)
2. Effects on scallop landings
Siddall (S6)
3. Effects on microbial food webs
Lonsdale & Taylor (N5)

III. RETROSPECTIVE ANALYSIS

1. Long Island Brown Tide
LaRoche & Falkowski (BNL)
2. Rhode Island Brown Tide
Smayda (B6)

* "N" = NY Sea Grant-funded; "S" = Suffolk County-funded; "B"= BTRI/NOAA COP funded (See **Appendix B**).

Table 2. Brown Tide Summit and Workplan Research Recommendations Biological Factors.

Brown Tide Summit — Recommended Research Category	Brown Tide Workplan — Priority Research Area
1.1 What factors control the growth of brown tide?	
1.1.A. Nutritional requirements of brown tide	
1. *Role of macro-, micro-, and trace organic nutrients in* A. Anophagefferens *growth.*	
2. *Role of variation in light (including shade adaptation and photoperiod) in affecting the nutritional requirements or preferences of* A. anophagefferens.	
3. *Role of various metals and chelating compounds in altering the nutritional requirements/preferences of* A. anophagefferens.	
4. *Role of heterotrophy as a means of supplemental nutrition of* A. anophagefferens.	
1.1.B. Competitive interactions involving the brown tide organism	
1. *Role of allelopathy in securing for the brown tide a competitive edge over other microalgae.*	**X**
2. *Role of bacterial associates in mediating the brown tide organism's response to environmental conditions and particularly in affecting its nutrition.*	
1.2. What factors control the removal of brown tide and how do they relate to bloom dynamics?	
1.2.A. Timing of grazer presence and grazing activity.	
1. *Extensive examination of potential grazers.*	
2. *The palatability/susceptibility of the of the brown tide organism to grazers.*	
1.2.B. Activity of viruses	
1.2.C. Autolysis	**X**
1.3 What aspects of benthic-pelagic coupling may be important in brown tide blooms?	
1.3.A. Benthic filter-feeders and the removal of suspended particles.	**X**
1.3.B. Resuspension of bottom material and "conditioning" of the water column.	**X**
1.4 Basic Organism Physiology — Misc.	
1.4.A. Axenic Culture	

Table 3. Brown Tide Summit and Workplan Research Recommendations Physical Factors.

Brown Tide Summit — Recommended Research Category	Brown Tide Workplan — Priority Research Area
2.1 What relationship exists between historical data on meteorological and oceanographic parameters and the occurrence and distribution of brown tide in the Peconic Bays System? Other systems?	**X**
2.2 Can a simple quantitative model be developed that explains historic and current trends in the variation of these parameters throughout the system?	
2.3 How can we best quantitatively describe the temporal and spatial (3-dimensional distribution) of biological, chemical, and physical parameters associated with brown tide?	**X***

* Differential phytoplankton analysis and remote sensing of brown tide.

Table 4. Brown Tide Summit and Workplan Research Recommendations Chemical Factors

Brown Tide Summit — Recommended Research Category	Brown Tide Workplan — Priority Research Area
3.1 What is the role of major nutrients (*e.g.*, N, P), including organic nutrients, in stimulating a brown tide bloom?	
3.2 What is the role of micronutrients in stimulating brown tide blooms?	
3.3 Research objectives for macro- and micronutrients (Culture based and field experiments)?	
3.3.A. Calculate budgets for the major nutrients (N, P, Si) to the extent possible using existing data.	
3.3.B. Continuously monitor various chemical and physical parameters in the field before, during, and after brown tide blooms.	**X**
3.3.C. In an effort to determine the relative importance of macro- and micronutrients in stimulating the growth of A. anophagefferens, a suite of experiments should be conducted in the field, with mesocosms and with bottle experiments. The goal of these experiments is to determine the growth response to additions of selected nutrients and trace elements. A parallel set of measurements should be conducted in the laboratory using axenic cultures.	**X**
3.3.D. As the efforts proceed to identify chemical factors important in stimulating brown tide blooms, it is necessary to characterize important sources and sinks of such factors. Sources include, but are not limited to, the flux from bottom sediments, groundwater inflow, sewage treatment plan effluent, atmospheric deposition, and stormwater runoff.	

Table 5. Brown Tide Summit and Workplan Research Recommendations Ecological Effects.

Brown Tide Summit — Recommended Research Category	Brown Tide Workplan — Priority Research Area
4.1 How does brown tide impact commercially important bivalves and other filter-feeders?	**X**
4.1.A. Brown tide's effect on bivalve physiology	
1. What is the in vivo mechanism responsible for grazing suppression and other adverse effects?	
2. What are the density- and time-dependent effects of brown tide on survival, growth, and reproduction of bivalves?	
3. How does brown tide cause recruitment failure and other reproductive impacts in bivalve mollusks?	
4.1.B. Development of a brown tide bioassay	
4.2 How can shellfish management programs be optimized in the presence of brown tide?	**X**
4.2.A. Determination of management approaches: How can management practices be improved to reduce losses from brown tide?	
4.2.B. What is the effect of brown tide on other ecosystem elements?	
4.3 What is the effect of brown tide on other ecosystem elements?	**X**
4.3.A. Impacts on submerged aquatic vegetation (SAV)	
4.3.B. Impacts on secondary consumers	
1. Does brown tide-related light attenuation and increased turbidity affect organisms, such as finfish, that rely on visual cues in feeding and predator avoidance?	
2. What are the effects of brown tide-related eelgrass losses on secondary consumers?	
4.4 Are there multiple strains of brown tide of varying relative toxicity?	

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APPENDIX G

Peconic Estuary Program (PEP)
Library Reports

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REPORTS	AUTHOR/SOURCE	DATE
A Plan to Entrap Bay Scallop Spat Subject to Evacuation from Prime Rearing Sites, with an Emphasis on Optimizing Collection Timing and Location and a Goal of Reintroduction to Natural Nursery Areas	J. Aldred, T. Ciccone, C. Hassler, and T. Dornhoffer (E. Hampton Town Shellfish Hatchery)	Aug 2000
Ultraviolet Disinfection of Sewage Treatment Plant Effluent — A Pilot Project	Emerson Hasbrouck, (CCE)	Aug 2000
Habitat Restoration Plan for the Peconic Estuary (Draft)	PEP Habitat Restoration Work Group	Jul 2000
A Characterization of the Resources of the Peconic Estuary with Respect to Toxics	PEP	Jan 2001
Particle Mixing and Sediment Accumulation Rates of Peconic Estuary Sediments: A Sediment Accretion Study in Support of the Peconic Estuary Program	J. K. Cochran, D.J. Hirschberg, and D. Amiel (SUNY)	Jun 2000
Three-Dimensional Hydrodynamic and Water Quality Model of Peconic Estuary (Draft Final)	Tetra Tech, Inc.	Jun 2000
Peconic Estuary Program Eelgrass Restoration Project Final Report 1996–1999	Emerson Hasbrouck and Chris Pickerell (CCE)	May 2000
Framework for Developing a Living Resources Research and Monitoring Plan (Draft)	M. Bortman	Jan 2000
H.F. Corwin and Sons Duck Farm Constructed Wetland and Meetinghouse Creek Relocation — Final Report	USDA — NRCS and SCSWCD	Jan 2000
Tidal Creeks Study	EEA, Inc.	Oct 1999
Post-CCMP Surface Water & Point Source Monitoring Plan (Draft)	SCDHS Office of Ecology	Jun 1999
Evaluating Town Capacity and Needs in Protecting the Peconic Estuary	School of International & Public Affairs, Columbia University	May 1999
Eelgrass Habitat Criteria Study — Volume I, Narrative; Volume II, Appendices	EEA, Inc.	Mar 1999
Recreational and Resource Economic Values for the Peconic Estuary System	EAI	Feb 1999
Federally and State-Funded Demonstration and Implementation Projects	PEP Program Office	Feb 1999
Draft Comprehensive Conservation and Management Plan	PEP Program Office	Sept 1999
Nitrogen Loading Budget and Trends — Major, External, Anthropogenic Nitrogen Sources: Groundwater and Duck Farms	SCDHS, Office of Ecology	Jan 1999
Particle Mixing and Sediment Accumulation Rates of Peconic Estuary Sediments: A Sediment Accretion Study in Support of the Peconic Estuary Program	J. K. Cochran, *et al.*	Jan 1999

Note: List includes PEP reports only. For other listings of informational literature, Brown Tide reports, pre-PEP reports, and education and outreach information, see the PEP webpage at http://www.co.suffolk.ny.us/health/pep.

REPORTS	AUTHOR/SOURCE	DATE
Ground-Water Flow Paths and Travel Time to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York (Water Resources Investigations Report 98-4181)	USGS	1999
Characterization Report of the Living Resources of the Peconic Estuary	Marci Bortman and Nancy Niedowski	Dec 1998
Regional Stormwater Runoff Management Project — Background Information and Description of Data Sets	PEP Program Office	Nov 1998
Peconic Estuary Surface Water Quality: Nitrogen, Dissolved Oxygen, and Submerged Aquatic Vegetation Habitat	SCDHS, Office of Ecology	Oct 1998
Point and Nonpoint Source Nitrogen Loading Overview (Revised draft)	SCDHS, Office of Ecology	Oct 1998
Historic Shellfishing in the Peconic Estuary Based on Baymen's Interviews: 1945–1985	Nancy Solomon (L. I. Traditions)	Oct 1998
Federally and State-Funded Demonstration and Implementation Projects	PEP Program Office	Sept 1998
Sediment Toxicity Testing in the Peconic Estuary/Watershed using the Amphipod, *Ampelisca abdita*	EPA, Region II	Aug 1998
Stormwater Runoff — Best Management Practices for Marinas — A Guide for Operators	Jay Tanski (NY Sea Grant, CCE)	Aug 1998
The Peconic Watershed — Recent Trends in Wetlands and Their Buffers (Draft)	USFWS	Jul 1998
Species Composition, Seasonal Occurrence and Relative Abundance of Finfish and Macro-invertebrates Taken by Small-Mesh Otter Trawl in Peconic Bay, New York	Weber *et al.* (NYSDEC)	Jun 1998
Land Available for Development (Draft)	SCPD	Apr 1998
Saturation Population Analysis (Draft)	SCPD	Apr 1998
Oxygen Uptake and Nutrient Regeneration in the Peconic Estuary	B. Howes *et al.* (UMASS, Dartmouth) S. Aubrey, (Aubrey Consulting, Inc.)	Apr 1998
Surface Water Quality Monitoring Report 1976–1996 (Draft) Volume I, Narrative; Volume II, Data	SCDHS	Apr 1998
An Assessment of Shellfish Resources in the Tributaries and Embayments of the Peconic Estuary	D.E. Lewis, Gregg Rivara (CCE)	Apr 1998
Land Use Change Analysis	SCPD	Mar 1998
Estimated Food Web and Habitat Values for Habitats in the Peconic Estuary System (Review draft)	EAI, Inc.	Jan 1998
Defining Freshwater Outcrops in West Neck Bay, Shelter Island, New York Using Direct Contact Resistivity Measurements and Transient Underflow Measurements	R.J. Paulsen *et al.*	1998
Areas Contributing Ground Water to the Peconic Estuary and Ground Water Budgets for the North and South Forks and Shelter Island, Eastern Suffolk County, New York (Water-Resources Investigations Report 97-4136)	USGS	1998
Protocols for Harvesting and Transplanting Eelgrass in the Peconic Estuary	EEA, Inc; East Hampton Town Natural Resource Dept.; CCE	Aug 1997
Federally and State-Funded Demonstration and Implementation Projects	PEP Program Office	Jul 1997

REPORTS	AUTHOR/SOURCE	DATE
Peconic Bay System: Aquaculture	James L. Anderson Mark J. Spatz (Economic Analysis Inc.)	May 1997
Oxygen Uptake and Nutrient Regeneration in the Peconic Estuary	C. Shubert (USGS)	Apr 1997
An Annotated Bibliography of the Natural Resources of the Peconic Estuary and Adjacent Locations on Eastern Long Island, NY	Michael J. Ahrens (SUNY MSRC)	Apr 1997
Water Dependent Use and Underwater Land Ownership Inventory (Draft)	SCPD	Apr 1997
Draft Water Quality Calibration Results, Preliminary Management Runs	Tetra-Tech, Inc.	Mar 1997
Population Analysis (Draft)	SCPD	Mar 1997
Surface Water Quality Modeling of the Peconic Estuary, Calibration of EFDC Hydrodynamic Model (Interim Report #2)	Tetra Tech, Inc.	Jan 1997
Comprehensive Conservation & Management Plan, Pathogen Contamination, Assessment of Conditions (Draft)	Cynthia Decker (NYSDEC)	Jan 1997
Existing Land Use Inventory (Draft)	SCPD	Jan 1997
An Assessment of Shellfish Resources in the Deep Water Areas of the Peconic Estuary	Daniel Lewis *et al.* (SUNY MSRC)	1997
Contributing Areas to the Peconic Estuary and Groundwater Budgets for the North and South Forks and Shelter Island, Eastern Suffolk, New York	C. Shubert (USGS)	1997
Development and Evaluation of an Ultrasonic Groundwater Seepage Meter	R. J. Paulsen *et al.* (SCDHS/CCE)	1997
Contaminant Distributions in Peconic Estuary Sediments	Arthur D. Little, Inc.	Dec 1996
The Peconic Estuary System: Perspective on Uses, Sectors and Economic Impacts (Revised Final)	EAI, Inc.	Nov 1996
Radioactive Contamination in the Peconic River: A Review of the New York State Environmental Radiation Monitoring Program Data	NYSDOH, Bureau of Environmental Radiation Protection	Sept 1996

REPORTS	AUTHOR/SOURCE	DATE
Selected Natural Resource Mapping and Digitizing of the Peconic Estuary and Watershed	Joseph Dowhan (USFWS)	Jul 1996
Federally and State Funded Demonstration and Implementation Projects	PEP Program Office	June 1996
Statement of Support for the Proposed Modification to the Riverhead Sewage Treatment Plant (STP) Discharge Permit (SPDES #NY-0020061)	PEP Program Office	Apr 1996
Feasibility of Coupled Three-Dimensional Hydrodynamic and Water Quality Modeling of the Peconic Bay System (Interim Report #1)	John M. Hamrick (Tetra-Tech, Inc.)	Apr 1996
Submerged Aquatic Vegetation Study	Cashin Associates, P.C.	Jan 1996
Marine Mammal and Sea Turtle Report (Draft)	Samuel S. Sadove (OKEANOS)	1996
Surface Water Quality Monitoring 1993–1995	SCDHS, Office of Ecology	Dec 1995
Commercial Finfish and Crustacean Landings from Peconic and Gardiners Bay 1980–1992	Alice Weber Christina Grahn (NYSDEC)	Nov 1995
Bay Scallop Restoration, Western Peconic Bay (Draft)	Christopher F. Smith (CCE)	Oct 1995
Rare Plants, Rare Animals and Significant Natural Communities in the Peconic Estuary	Rachel A. Pleuthner (N.Y. Natural Heritage Program)	Aug 1995
Base Program Analysis, Nonpoint Source Management Plan Inventory (Draft)	SCDHS Office of Ecology	Jun 1995
Planting Bay Scallops: Results of Reseeding Bay Scallops in the Peconic Bay New York 1986 to 1992	Peter Wenczel, *et al.*	1993
Proceedings of Workshop on Marine Surface Water Quality Modelling and the Evaluation of Possible Surface Water Quality Guidelines	SCDHS	Dec 1993

APPENDIX H

Agricultural Environmental Management Strategy

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PECONIC ESTUARY PROGRAM AGRICULTURAL ENVIRONMENTAL MANAGEMENT STRATEGY

Foreword

The Agricultural Nitrogen Management Committee extends its deep appreciation to the East End farming community, which has been instrumental in investigating and developing a nutrient and pesticide reduction strategy.

Summary of Goals

To cooperatively develop, with the region's agricultural community, a strategy to lower nutrients and pesticide inputs into the environment. A 20 percent to 30 percent reduction of agricultural fertilizer nitrogen inputs is targeted over a five-year period, and may be measured by voluntary reporting, surveys, fertilizer sales data, and groundwater monitoring.

To maintain, and hopefully increase, farm profitability while demonstrating that changes in farming practices can have measurable environmental improvements.

To emphasize incentive-based pollution reduction strategies (*e.g.*, tax credits). This will be linked to market development and product distribution associated with other agricultural economic planning efforts underway in the region.

To attain 90 percent participation within the farming community in a Long Island Agricultural Environmental Management (AEM) program within five years.

Summary of Recommendations

This Committee strongly recommends that the following tasks be pursued to begin reducing nutrient and pesticide impacts on the Peconic Estuary. The rationale and supporting details of each task is outlined in further detail in the body of this report.

Task I Develop a Long Island component to the New York State Agricultural Environmental Management (AEM) program. The Long Island component would be tailored to the Peconic Estuary Region (as well as other Long Island regions, as appropriate).

Task II Identify potential pilot projects to demonstrate Best Management Practices and test them, where appropriate.

Task III Investigate the creation of a farm insurance plan.

Task IV Provide funding for increased local AEM development and implementation.

Task V Investigate and implement innovative/alternative finance mechanisms for education and outreach and other tasks noted above.

Task VI Gather and analyze economic data on a regular basis and continue to promote and integrate economic analyses and support mechanisms into the AEM initiatives.

Agricultural Nitrogen Management Committee — Background

Because of the need to develop a regional, quantitative nitrogen loading management process, the Peconic Estuary Program (PEP) formed work groups (committees) to deal with agricultural issues, non-agricultural issues and a west estuary total maximum daily load (TMDL). The goal of each committee is to set quantitative loading targets and detailed plans for load management (timing, costs, responsible entities, etc.).

The Agricultural Nitrogen Management Committee was charged with refining existing agricultural nitrogen loading estimates and developing an implementation plan for regional nitrogen load reductions. This effort includes expanding the Agricultural Environmental Management (AEM) initiative and considering the "Purchase of Development Rights" links to farm management plans. The Committee has also expanded its issues to include pesticides.

To date, the Agricultural Nitrogen Management Committee has made significant progress towards its goals, including producing agricultural use geographic information systems (GIS) maps (for the Towns of Southold, Southampton and Riverhead), and determining the nitrogen loading rates and estimates of potential reductions for specific crops (see **Attachment H-2**). These are major tasks that will be described and integrated in future reports.

While these initiatives were developed with a focus on the Peconic Estuary Program's needs, the Committee notes that there will be a countywide benefit for groundwater and surface water. For example, AEM programs will be countywide, and not just targeted at the Peconic Estuary watershed. Thus, benefits will also accrue to the surface waters of the Long Island Sound and South Shore Estuary Reserve.

Introduction

Maintaining a viable farming industry that serves its community (broadly Long Island) is important for the region economically. Suffolk County is the top producer of agricultural products in terms of sales in New York State, representing up to six percent of Suffolk County's gross domestic product. Recent estimates indicate that an estimated 10,000 people are employed by agriculture-related businesses.

Agriculture is a significant underpinning of eastern Suffolk County's tourism-based economy. Residents and visitors enjoy the rural quality of the area and shopping at numerous local farm stands. A survey of 968 residents, second homeowners and tourists in 1995 revealed that the public's overall priority for land protection was protecting farmland. The survey responses imply that the public would be willing to spend $74.5 thousand per acre of farmland protection, using a 25-year time horizon and a seven percent discount rate in 1995 dollars (EAI, 1999).

The State of Agriculture

At the end of World War II, more than 110,000 acres of arable land were cultivated in Suffolk County. In response to the rapid suburbanization of the 1950s and 1960s, the County adopted the nation's first Farmland Protection Program in the mid-1970s. Through the Farmland Protection Program, the county pays farmers for their development interest (rights) and in return, farmers agree not to develop their land in perpetuity. The program gives farmers the opportunity to invest back into

their farms or to settle estate matters with heirs. Presently, Suffolk County owns the development rights to 6,280 acres of agricultural land.

The Agricultural and Farmland Protection Plan (Suffolk County Agricultural and Farmland Protection Board, 1996) states that Suffolk County has had a large decline in the amount of farmland over the last several decades and continues to see a rapid decline in farmland today in spite of conservation efforts. The Plan downgraded the initial goal of farmland protection in Suffolk from 35,000 acres to 20,000 acres. According to the New York Agricultural Statistics Service, about 35,858 acres of Suffolk County land was farmed in 1997. Ten percent of the total land area in the Peconic Estuary watershed (14,539 acres) was agricultural land in 1995, most of which is still located on the north fork (SCPD, 1997). Undoubtedly there are fewer acres of farmland in Suffolk County now than in 1997 and 1995. The Suffolk County Farmland Protection Plan further states that at the present rate of agricultural land loss, there will be only 10,000 acres left in Suffolk in 2012.

Areas at the outskirts of large metropolitan regions are under the greatest threat of losing their farmland resources to sprawl, houses, and commercial developments. This is well documented across the nation. The American Farmland Trust ranked Suffolk County as the 18th most threatened agricultural county in the nation.

While recent efforts to secure new funding for farmland protection have been successful, there is literally a race against time to secure the preservation of critical farmland in eastern Suffolk against the backdrop of ever escalating land values tempting farmers to cash out.

High land values coupled with New York State's continued reliance on property taxes to fund government operations increase the opportunity costs of farming. The fixed costs associated with farming add to the problem and create a situation likely to: 1) accelerate the need to adopt high value-added strategies to support farm enterprises, and 2) drive more marginal commercial farmers out of business.

The future of agriculture is also threatened by the high degree of reliance on rented land for farming in Suffolk County. An estimated 60 percent of Suffolk County farmers rent land. Farmland owners who seek rental payments sufficient to cover property tax obligations will force farmers in turn to seek ever higher value and more land-intensive (*e.g.*, with possible greater environmental impacts) crop production methods. As development pressures increase, so do incentives for conversion of rented farmland to alternative uses (*i.e.*, development and golf courses).

Yellow Wood Associates (YWA), under contract with the Town of Southampton to update the town's agricultural section of its comprehensive plan in 1995, found that agriculture in Southampton has evolved in response to market demand. Agriculture now includes horse farming, nursery and greenhouse production, potatoes, vegetables, sod production, vineyards, duck farms, pheasant farms, orchards, small fruits and row crops. There is an increased emphasis on direct marketing from roadside stands and farm services such as winery tours, horse boarding, breeding, training and riding lessons. These conclusions can be applied to the entire East End.

Citing trends common to areas like the East End, YWA identified the transformation from a commodity-based production to a (mostly) land intensive production of high value crops that can be differentiated in the market. This trend is underway in many urban fringe areas in the northeast and, in fact, represents a kind of agricultural resurgence (See **Attachment H-3**).

Environmental Concerns

Conventional farming practices are typically fertilizer (nitrogen) and pesticide dependent. Nitrogen is a major management issue for the Peconic Estuary Program, since nitrogen contributed from fertilizers has already resulted in adverse environmental impacts, such as depressions in dissolved oxygen (see Nutrient Chapter). Nitrogen is soluble and is particularly mobile in Suffolk County's highly permeable soils. While fertilizers and pesticides have resulted in an increase in crop biomass, much of the byproducts are carried into the estuary by groundwater and, locally, by stormwater runoff.

Overall groundwater total nitrogen loading to the Peconic Estuary is approximately 6,500 pounds per day, about 32 percent of which occurs in the western estuary (Peconic River and Flanders Bay groundwater-contributing area). The dominant sources of total nitrogen to the estuary are agriculture (41 percent of the TN loading) and residential development (40 percent of TN loading). Agriculture has a per-acre TN loading rate of about double the residential land in the study area (SCDHS, 1999). Loading rates for various land uses are illustrated in **Figure H-1**.

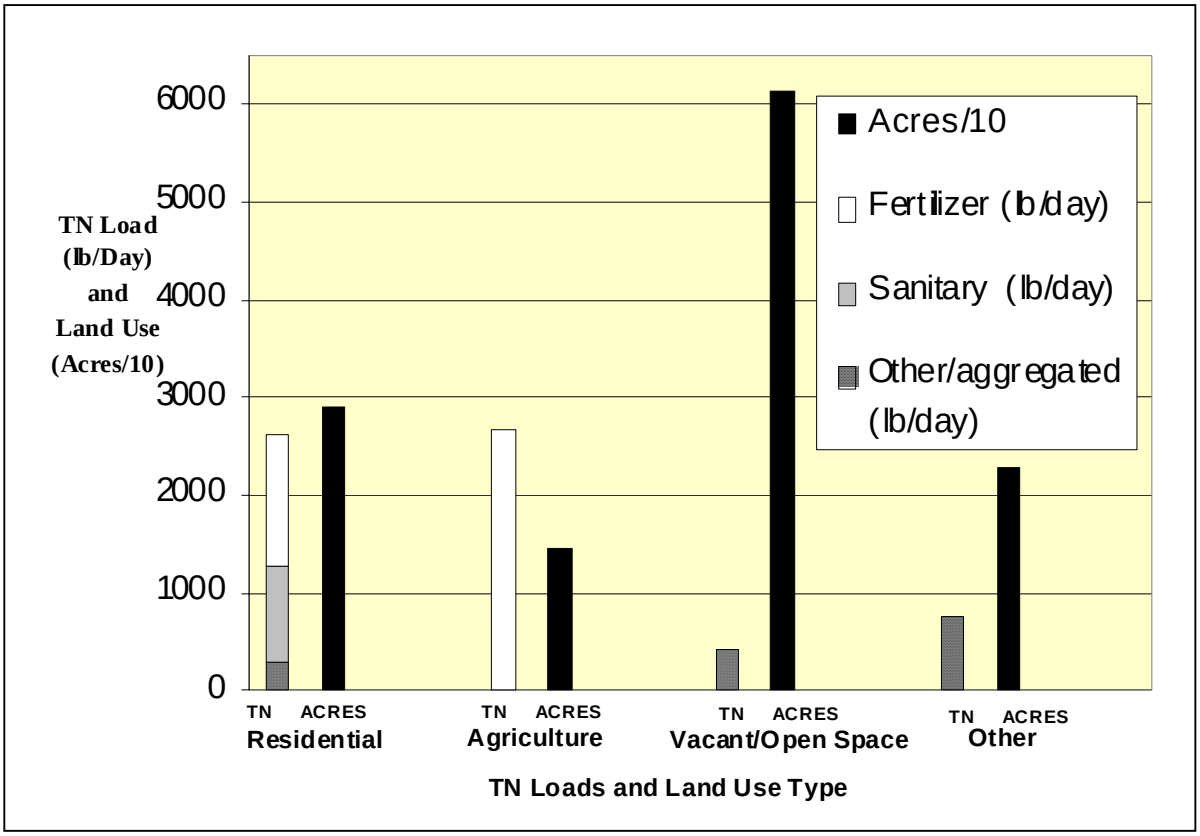

Figure H-1. Total Nitrogen (TN) Load by Land Use.

Public Health

Many studies indicate that nitrogen from synthetic fertilizer is the most important source of nitrate in groundwater. Ingestion of water with high nitrate levels is known to cause methemoglobinemia in infants under one year of age. In addition, the Centers for Disease Control has reported two episodes

of an association between first trimester miscarriages and elevated nitrate concentrations in the drinking water.

The SCDHS monitored ten wells that were primarily down gradient from agricultural land over a 22-year period (SCDHS, 1996). For the 20 year period 1975 through 1994, the average annual nitrate concentration for all ten wells was 11.3 mg/l. The ten well annual averages ranged from a minimum of 9.2 mg/l in 1982 and 1984 to a maximum of 13.7 mg/l in 1988. The EPA and New York State drinking water Maximum Contaminant Level (MCL) for nitrate is 10.0 mg/l.

The impact of agriculture on nitrate concentrations is also reflected in the results of private well testing by the SCDHS. The SCDHS tested 45,985 private wells between the years 1972 and 1994. Of all the private wells tested, 7.4 percent exceeded the nitrate MCL (SCDHS, 1996). The percentage of private wells exceeding the nitrate MCL was significantly greater in the agricultural communities than the countywide average.

Agricultural pesticides have also found their way into Suffolk County's groundwater. Concentrations of the carbamate pesticides, including Aldicarb (Temik), carbofuran (Furadan), and oxamyl (Vydate), have been detected in Suffolk County's monitoring wells but have steadily decreased since their ban in 1979 and 1982. The dacthal metabolite TCPA can be found in some areas despite its removal from the Suffolk County market in 1988. In 1999, the SCDHS concluded an 18-month study of pesticide contamination in the groundwaters of Nassau and Suffolk Counties (SCDHS, 1999). Wells were chosen for testing based upon a variety of considerations including selecting wells that had shown detectable traces of pesticides in previous monitoring. Other criteria included land use type, geographic coverage, and random selection. Of the 1,901 wells tested in Suffolk County, Aldicarb metabolites were the most frequently detected pesticide, followed by the dacthal metabolite TCPA, 1,2-dichloropropane, metalaxyl, and metachlor. These are all agricultural chemicals with the exception of TCPA, which is also used on turf and residential lawns. There were 191 wells found to exceed pesticide MCLs of which 91 percent were impacted by agricultural chemicals (including nursery and sod uses). The towns found to have the greatest percentage of pesticide impacted wells are Southold (51 percent), Riverhead (38.7 percent), and Southampton (34.5 percent); these towns also contain the bulk of Long Island's remaining agricultural land. In response to the pesticide problem, the NYSDEC has recently created a committee to reduce pesticide usage.

Estuarine Health

Excessive levels of nitrogen can be harmful to the estuary. When nutrients are introduced to the estuary at higher than normal rates, they can stimulate aquatic plant growth, including plankton and larger communities of macroalgae. Algae consume oxygen (respire) at night, potentially depleting dissolved oxygen levels in the water column. Also, when algae die, they can settle through the water column to the sediments, where the organic matter is decomposed by bacteria. Bacterial decomposition uses oxygen ("sediment oxygen demand"), as well as releases nitrogen back into the water column ("sediment nutrient flux"). Processes such as diurnal DO depression, sediment oxygen demand, and sediment nutrient flux can result in dissolved oxygen levels which are low enough to be harmful to marine life.

Currently, the estuary is not experiencing widespread low dissolved oxygen levels related to nitrogen loading. However, the western portion of the system (Peconic River and Flanders Bay) has a legacy of nutrient over enrichment and periodic, short-term dissolved oxygen problems. According to the Nitrogen Loading Budget and Trends Report (SCDHS, 1999), nonpoint source loading of nitrogen

has risen dramatically over time, far outweighing historic point source nitrogen loading from duck farms. Considering the trends of nutrient enrichment in the region, implementing nitrogen reduction strategies is critical.

The increased production of microscopic algae caused by increased nutrient enrichment results not only in dissolved oxygen problems but also discolors the water, decreases water clarity and diminishes the amount of light received by rooted aquatic plants (*i.e.*, eelgrass). Submerged aquatic vegetation beds serve as a prime habitat for juvenile fish, a food source and bottom stabilization. Aquatic plants that are at a species' depth limit for clear water conditions would be expected to decline due to the lack of sufficient light energy in turbid waters. Excessive influxes of nutrients will also increase the growth of epiphytes on eelgrass blades, again shading the plant itself and hindering production. Furthermore, species such as red or green macroalgae, which adsorb nutrients more quickly than eelgrass, may competitively exclude eelgrass plants. It is also thought that the lack of a mechanism to terminate nitrate uptake in eelgrass coupled with excessive nitrate in the system results in impaired plant health and a decline in eelgrass shoot production (Cashin Associates, 1996).

Nitrogen levels may also be linked to the Brown Tide. While data suggest that gross concentrations of nitrogen do not trigger blooms, the relative concentrations among the various forms of nitrogen may play a role in Brown Tide blooms. One theory holds that increases in nitrogen in groundwater may play a role in triggering Brown Tide blooms.

Though no causal link has been identified, low levels of pesticides may be affecting aquatic resources, including eelgrass, sensitive larval stages of commercially and recreationally important finfish and shellfish, and other ecologically important species.

Recommendations

The Committee's recommendations are shown in **Table H-1**, which also includes a designation of responsible entity, cost, and timeframe for each recommendation. The following discussion provides additional background and details regarding the recommendations.

Table H-1. Agricultural Nitrogen Committee Interim Workplan Actions.*

Action		Responsible Entity	Timeframe	Cost *	Status
AgN-1 Priority	Develop a Long Island component to the New York State Agricultural Environmental Management (AEM) program.	NYS Dept. of Agriculture & Markets	2000	$250,000–$500,000 for program development (estimated)	R
AgN-2	Identify potential pilot projects to demonstrate Best Management Practices and test them.	Suffolk County & Cornell Coop. Extension	2001	To be determined	C
AgN-3 Priority	Investigate the creation of a farm insurance plan.	PEP Agriculture Nitrogen Management Committee	2000	To be determined	R
AgN-4 Priority	Provide funding for increased local AEM development and implementation.	USDA NRCS, Cornell Coop. Extension, SC Soil and Water Conservation District, Suffolk County & NY State	2000	$175,000/year for staff at SCSWCD; $175,000/year for staff at CCE $1 million annually for implementation start up (from NYS Bond Act, Suffolk County ¼% Sales Tax, and funding sources in AgN-5); Long-term to be determined.	R
AgN-5 Priority	Investigate and implement innovative/alternative finance mechanisms for education and outreach, and actions 1-4.	NY State: fertilizer/pesticide tax; subsidizing capital improvement loans from EFC	2000	To be determined	R
AgN-6	Gather and analyze economic data on a regular basis and continue to promote and integrate economic analyses and support mechanisms into the AEM initiatives	PEP Agriculture Nitrogen Management Committee	2001	To be determined	R

C = Commitment R = Recommendation

*Note: Actions and costs are also contained in the Nutrient Chapter of the PEP CCMP.

Task I The New York State Agricultural Environmental Management Program (AEM)

New York State Department of Agriculture and Markets and the New York State Soil and Water Conservation Committee manage the New York State Agricultural Environmental Management Program wherein whole farm management plans are undertaken with farm operators to reduce environmental impacts. This program has focused on the livestock farmers in upstate New York, with an emphasis on phosphorus reduction and little emphasis on nitrogen reduction (Long Island's primary issue). Total AEM State funding for 1999 was 4.5 million dollars, but the program was still oversubscribed. Expanding this program for Long Island will require a one-time estimated commitment of $250,000–$500,000 of State funds. This cost estimate deals with program planning, design, and development, and *not* implementation, which is discussed below.

The current AEM program is the preferred model for nutrient and pesticide reduction in the Peconic Region since enhancements can be added to the conventional AEM program to satisfy Long Island's program requirements. In a high cost area, like Long Island, AEM must be enhanced with incentives to be viewed as a viable working option to reduce nitrogen and pesticides. The tax credits, cost sharing, and the program itself should be enticing enough so that 90 percent of the farmers working the remaining agricultural acres within the watershed are participating by 2005.

A Long Island AEM Plan outlining the management objectives and the available financial incentives will be developed. The plan will be prepared by the U.S. Department of Agriculture – Natural Resources Conservation Service (USDA–NRCS), Suffolk County Soil and Water Conservation District (SCSWCD), Cornell Cooperative Extension (CCE), and other stakeholders and approved by the New York State Department of Agriculture and Markets and the New York State Soil and Water Conservation Committee. Farmers would than be eligible to have whole farm management plans prepared for them with respect to the LI AEM Plan. Practices such as fertilizing, pesticide application, irrigating, and soil testing would be examined and then a financial/feasibility plan would be prepared showing the farmer how the recommended actions could be financially undertaken.

An ambitious Agricultural Environmental Management (AEM) Initiative program has already been piloted in the Peconic Estuary. Using the AEM approach, a comprehensive inventory and analysis was conducted for most farms within one subwatershed to assess the potential impact the farms may have had on that part of the Peconic Estuary and shallow aquifer. Plans were developed for high priority farms and best management practices (BMPs) were implemented. A total of 13 farms within the watershed implemented the high priority BMPs.

This pilot effort and other limited and localized efforts have been targets for agricultural environmental management by the USDA Natural Resources Conservation Service and the Suffolk County Soil and Water Conservation District. Their success is a promising foreshadowing of a much-needed regional program.

The task before the Peconic Estuary Management Conference is to manage for improved environmental practices without driving farms out of business. Any discussion about environmental improvements should be incentive-driven as it relates to the burdens placed on the farmer. More applications of the same products at reduced loading rates and other best management practices may reduce total pollutant loadings but increases farm operation costs

in terms of fuel, labor, wear on equipment, etc. Since it is within the public interest to seek changes in agricultural practices, the public should offer several incentives to farmers that carry out the recommendations of their whole farm plans. The tax credits option is consistent with school district tax relief practices that the State legislature has provided to farmers.

A recent study by the Northwest Area Foundation compared certain conventional farming practices with aggressive AEM-based approaches. That study concluded that the cost of chemicals decreased in certain instances while labor and managerial costs rose in some cases. Sustainable farming tends to be more labor-intensive than conventional farming. This translates into greater job creation potential. Diversification leads to a more even distribution of labor requirements throughout the year.

Other States have achieved substantial reductions in nutrient loadings as a result of their investment in AEM.

Task II Pilot Projects

To initiate the AEM effort as soon as possible, pilot projects will be identified and carried out. One pilot site that has already been identified is at the Suffolk County Yaphank research farm; others will be sought, as well. Possible pilot projects include:

- Evaluation of fertilizer and pesticide application rates as related to crop yield and quality, as well as leaching rates and pollution potential. Fertilizer trials (CCE) with potatoes show that a substantial reduction in nitrogen can be obtained with no reduction in yield. Overall, nitrogen reductions in the range of 10 to 30 percent are believed to be feasible for most crop types (except grapes and grain);
- Utilization of slow release nitrogen fertilizers. Most suited for nursery stock and longer term crops;
- Irrigation evaluations for water efficiency and nitrogen loads;
- Zero discharge nursery greenhouses currently exist. Others could be retrofitted but new equipment costs money;
- Best management practices for pesticides (IPM);
- Soil testing;
- Pesticide storage handling and application equipment evaluations should be undertaken with a specific intention of improving handling practices etc.;
- Stormwater runoff mitigation practices, including soil loss and erosion control; and
- Agricultural wellhead protection.

Task III Farm Insurance Plan

There is a perceived risk in trying unfamiliar farming practices instead of the accustomed methods. Although proven by researchers and innovative farmers, most growers are reluctant to adopt new practices, even when crop costs can be reduced, because of concerns about yield variability. Necessary to any real environmental improvements is making certain that risks to the farmer in implementing these procedures could be neutralized, possibly by creating a farm insurance program.

The farm insurance plan could be modeled after the Mississippi Soil Conservation District and Campbells Corporation private-sector crop insurance programs. They were designed to raise the comfort level of new farmers participating in conservation programs that depart from traditional farming practices. Similarly, the Agricultural Conservation Innovation Center, in cooperation with the IGF Insurance Company, has designed insurance coverage to help farmers adopt conservation practices (see **Attachment H-5**).

The USDA has undertaken the development of an Adjusted Gross Revenue (AGR) insurance plan to provide an insurance safety net for multiple agricultural commodities in an insurance product. The AGR plan was piloted in New England last year. The USDA intends to expand this program to 16 counties in New York State, including Suffolk County. The AGR insurance plan will replace the Federal government disaster program of the past and the crop insurance which growers found much too expensive for anything near adequate coverage. The AGR plan is not the same as reduced losses due to new practices, however the principles of the plan may be applicable to the proposed farm insurance plan.

Task IV AEM Implementation

The Federal, State and county governments must expand their operating budgets to provide for more staff at the USDA–NRCS, CCE, and SCSWCD to provide technical support to develop 1) the regional plan, 2) whole farm plans and 3) initiate necessary pilot demonstration projects. Respective budgets should appropriate two more staff persons at SCSWCD at $175,000 per year, and 2 more staff at CCE at $175,000 per year specifically for this Committee's initiatives (figures include salaries, benefits, associated equipment and space needs).

In terms of funding to support implementation of the LI AEM, the program should be financed by New York State with at least a $1 million commitment. The New York State Bond Act, Environmental Protection Fund, the new 1/4 percent sales tax water quality improvement fund from the non-point source pollution category, and Suffolk County Capital Funds are all reasonable candidates for additional funding for implementation.

Another option for securing funding to implement AEM plans designed for specific farms is the Suffolk County Farmland Development Rights Program, which is authorized and administered in accord with the criteria in *Laws of Suffolk County*, Volume 1, Part III, Administrative Local Laws, Chapter 8, Development Rights to Agricultural Lands (pp. 801-806). This program is currently limited to the expenditure of funds for the purchase of non-farm development rights in response to recommendations made by the Suffolk County Farmland Committee.

Suffolk County should evaluate the potential and utility of amending Chapter 8 to authorize the payment of additional funds to a willing seller of development rights so as to encourage participation in the AEM program for a specified time period. This offering could be linked to farms in watershed areas that have been identified as having significant impacts on Peconic Estuary water quality, and to farms located within 1500 feet of the regional groundwater divide in order to protect drinking water supplies. The new 13-year, 1/4 percent sales tax extension program will have a funding stream dedicated specifically for purchase of development rights to farms. If authorized, yearly participation payments from this fund could be made to farmers who implement AEM farm plans.

Task V Finance Mechanisms

While some finance mechanisms are noted above (New York State Bond Act, Environmental Protection Fund, the new 1/4 percent sales tax), several other conventional and innovative/alternative finance mechanisms need to be investigated to fund education and outreach, as well as the other tasks. For example, crop insurance, additional personnel, and tax credits could be financed by levying a small fee on all fertilizer and pesticide sales at the wholesale to retail distribution level in Suffolk County. A well-developed marketing and public outreach program targeted to homeowners and larger users should also be developed with these funds. Aspects of this educational program should be extended to large institutional users such as golf courses (See **Attachment H-6**; the Michigan Groundwater Stewardship Program and the Northwest Michigan Groundwater Stewardship Program, both financed by a small fee on nitrogen and pesticides).

Another topic raised by the Committee includes subsidizing capital improvement loans for farms from the Environmental Facilities Corporation. This and other mechanisms need to be explored more fully.

Task VI Gather and analyze economic data

Economic data need to be gathered and analyzed on a regular basis, and the Committee needs to continue to promote and integrate economic analyses and support mechanisms into the AEM initiatives. Ideas posed by the Committee include securing an agricultural economist and creating a Farm Development Agency.

Summary of Costs and Benefits

Developing a LI AEM program will require an estimated commitment of $250,000 to $500,000. While the cost of long-term implementation of the plan is unknown, $350,000 is needed to fund additional staff at CCE and SCSWCD for agriculture-related issues, and a minimum of $1 million is required to support initial implementation efforts. The costs of providing State tax credits to farmers, conducting pilot projects, and developing and implementing farm insurance plans have not yet been developed.

Environmental benefits of nutrient management are well documented in the PEP CCMP, and include attainment of dissolved oxygen standards throughout the estuary. Other benefits include public health/drinking water considerations (attainment of standards), as well as support of a sustainable agricultural community, which is essential to the economy and quality of life in the Peconic Estuary watershed.

Conclusions

AEM enhanced with tax credits as presented herein can be initiated now. If so, it will accelerate the conversion of conventional agriculture to lower impact practices. This may lead to organic, community-supported agriculture and niche farming or other innovations. A successful AEM program will result in less pollution to the groundwater, and consequently the Peconic Estuary, and reduce pesticide use in the region by providing direct economic incentives to farmers.

YWA concludes its report by stating, "Sustainable farming is not universally financially sustainable or profitable. The crucial factor in financial sustainability is good management, particularly necessary since many sustainable farms are highly diversified. Ecological sustainability in agriculture requires use of modern, emerging technologies that are information-driven and management centered. Sustainable agriculture requires a highly adaptive management technology that responds to the ecology of the farm, and will spread as environmental constraints grow. The ability to farm sustainably will be in increased demand as environmental constraints grow because it has real and measurable environmental benefits."

The State and the County have robust economic development programs, investing millions of dollars each year. In order to address AEM correctly we must augment this effort to other agricultural-related economic assistance programs in order to fully support the conversion of the region's current agricultural economy to one that is more environmentally harmonious with groundwater and surface water protection issues.

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ATTACHMENT H-1

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AGRICULTURAL NITROGEN MANAGEMENT COMMITTEE MEMBERSHIP

Name	Agency
George Proios, Chairman	Suffolk County Executive Office/Suffolk County Soil & Water Conservation District
Kevin McDonald, Co-Chairman	Group for the South Fork/Peconic Estuary Program CAC
Bill Sanok	Cornell Cooperative Extension
Joe Sieczka	Cornell Cooperative Extension
Mary Barbato	East End Initiative
Mary McGlone	East End Initiative
Joe Gergela	Long Island Farm Bureau
Marci Bortman	The Nature Conservancy
Stuart Lowrie	The Nature Conservancy
Alpa Pandya	The Nature Conservancy
Matthew Sclafani	New York State Department of Environmental Conservation/Peconic Estuary Program
John Wildeman	New York State Soil and Water Conservation Committee
Debbie O'Kane	North Fork Environmental Council
Susan Dodson	Suffolk County Department of Health Services
Martin Trent	Suffolk County Department of Health Services
Walter Dawydiak	Suffolk County Department of Health Services/Peconic Estuary Program
Vito Minei	Suffolk County Department of Health Services/Peconic Estuary Program
Laura Klahre	Suffolk County Department of Health Services/Peconic Estuary Program
DeWitt Davies	Suffolk County Planning Department
Lauretta Fischer	Suffolk County Planning Department
Steve Jones	Suffolk County Planning Department
Thomas J. McMahon	Suffolk County Soil & Water Conservation District
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Rick Balla	United States Environmental Protection Agency

Other Contributors:
Long Island Agricultural Stewardship Working Group
Peconic Land Trust
Town of Southampton
Town of Southold

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ATTACHMENT H-2

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NITROGEN LOADING RATES AND POTENTIAL REDUCTIONS*

Category	Fertilizer Load Rate Reduction (lb N/ac/yr)	Potential (%)
Vineyards	40	5-10
Mixed Vegetables	125-175	10
Potatoes	150-200	10-20
Orchards	60-80	20
Nurseries	160-250	20-30
Sod**	250	25
Grain	0-50	0
Greenhouse (inc. Container Stock)	***	–
Field Corn	120-180	15
Christmas Trees	160-200	20

* All values result from the publication "Protection and Restoration of Groundwater in Southold, NY" Cornell University C.E.R., April 1983, Draft, and subsequent discussions with the Long Island Agricultural Stewardship Working Group Meeting at the Cornell Cooperative Extension of Suffolk County on June 22, 2000.

** Sod values were further refined with input from Tamsen Yeh from the Cornell Cooperative Extension of Nassau County in July and August, 2000.

*** Approximately 80 percent of container stock greenhouses use slow release fertilizers instead of liquid feeding.

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ATTACHMENT H-3

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AGRICULTURAL TRENDS ANALYSIS FOR TOWN OF SOUTHAMPTON

Yellow Wood Associates (YWA) analyzed the existing agricultural and fisheries resources and developed recommendations for fostering an economically and environmentally viable climate for the natural resource-based economy of Southampton, New York. They identified several important components to changes in the agriculture industry. The major components of their trends analysis are listed below and incorporate a strategy to assess capacity and develop a response strategy.

1. The transformation from commodity production to specialty crop production may contribute positively to environmental sustainability. This will depend, in large part, on the capacity of farmers to employ more information and management-intensive approaches to production. Farmers will need to have the financial capital to invest in modern technologies. This transformation will depend as well on continued growth in consumer demand for organic or "green" products and services.

2. Diversification of agricultural production will increasingly include service provision in tourism, recreation and education, whether through direct marketing (*e.g*., roadside stands, pick your own) or activities such as farm vacations, school field trips, riding lessons, hay rides, wine tasting events or farm tours. There are two reasons for this trend. First, services provide an additional income opportunity to farmers who face ever-higher costs of production. Second, consumers rank the ocean as their #1 most popular vacation setting, followed in third place by rural destinations.

3. The long-term success of agriculture, based on product differentiation and services depends heavily on economical provision of appropriate infrastructure (*e.g*., parking, signage, and sewage disposal) and market infrastructure development in both retail and wholesale markets. Market diversification is as important as product diversification to ensure the long-term viability of agriculture. East End farmers must be able to capture local sales and tap more distant markets as appropriate.

4. One of the substantial challenges facing agricultural entrepreneurs is that of matching the scale of production to market demand. Another is in securing the range of professional services from translating to graphic design, labeling, packing, transportation and pricing information required to survive in a highly competitive marketplace. A third is developing the supply relationships, market relationships and information systems needed to meet demands for "just-in-time" deliveries. Advantages to the East End farmers include proximity to major markets, but proximity alone is not enough to ensure marketing success.

5. The requirements of agricultural diversification into specialty products and related production and marketing requirements can lead to increased vertical integration of farm operations.

6. Diversified agricultural activity, with a significant service and processing component, will require new approaches to land use regulation.

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ATTACHMENT H-4

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IATP'S NUTRIENT MANAGEMENT YARDSTICK

The Institute for Agriculture and Trade Policy (IATP) uses a Nutrient Management Yardstick to promote on-farm efficiency and environmental protection for use on Minnesota farms. This is a summary of that program.

Summary

The Nutrient Management Yardstick measures nutrient inputs and outputs that go beyond the farm boundary. An imaginary boundary is drawn around the farm, so that nutrients that remain on the farm are not counted; but those that enter or leave the farm boundary are measured. Nutrients that enter the farm from beyond the boundary include nitrogen in rainfall, feed and livestock inputs, fertilizer and manure inputs, nitrogen-fixing plants, and nitrogen in irrigation water. Nutrients that leave the boundary may include exported crops, volatilization and denitrification into the atmosphere, runoff into surface water, and leaching into groundwater.

The project, based on a successful Dutch program, is in its second year in the United States and Canada. The Yardstick is a bookkeeping tool to help farmers understand and better manage the flow of primary nutrients (nitrogen, phosphorus, potassium) on their farms. By providing farmers with a method of measuring nutrient utilization, unnecessary inputs can be eliminated, reducing costs as well as excess nutrients flowing to the environment.

Excess nutrients are measured using a simple equation: inputs — outputs = excess nutrients. The farmer completes worksheets, entering estimated figures, and calculates a score that indicates the pounds per acre of excess nitrogen, phosphorus, and potassium on the farm. Cash-grain farms tend to have minimal (-50 pounds per acre) nutrient excesses. Scores are used by the farmer to more fully understand the nutrient flows on the farm; since conditions vary from farm to farm and year to year, the scores should not be used for comparison purposes. The Yardstick is not a regulatory tool; scores are kept confidential.

Determining Nutrient Outputs

Crop farmers need the following information to complete the worksheets:

- amount of fertilizers used;
- amount of crops that left the farm;
- if legumes are grown, the acreage, cutting, and type of stand; and
- if irrigation is used, the nitrate content and volume of water used.

The program describes how to convert the dry matter weight of crop products that were sold or removed from the farm and determines the nutrient content of sold crop products. A useful chart of nutrient contents of common crops and forages is included. The farmer then determines the nutrients in purchased fertilizer and manure and the nitrogen fixated by legumes. Finally, environmental inputs are estimated from deposition and irrigation water.

Once all known factors are figured in, the farmer totals all nitrogen, potassium, and phosphorus inputs and outputs, then determines the difference. The final result is a score for excess pounds per acre for each of the three nutrients.

SIGNIFICANCE OF SCORES

The closer a yardstick score is to zero, the more efficient is the on-farm nutrient use. The document includes criteria that increase or decrease efficiency, and fertilizer data.

ATTACHMENT H-5

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BMP-PLUS™: INSURANCE COVERAGE FOR INNOVATIVE PRACTICES

Conservation Practices Could Be More Widely Adopted if RISKS Could be Neutralized

Best Management Practices (BMPs) are research-proven, cost-reducing farming methods designed to optimize crop income while protecting the land. Yet it is hard for farmers to change the way they farm. They stick with accustomed methods because of concerns about yield variability that tend to outweigh either cost-cutting appeal or environmental impact reduction concerns. Until farmers have seen that the risks have been worked down, they continue to use current practices.

THE BMP-PLUS™: Conservation Innovation Policy

To boost adoption of proven conservation techniques, the Agricultural Conservation Innovation Center (ACIC) has designed insurance coverage for innovative practices. The approach uses split fields (or orchards) to isolate the risk. The innovative steps are followed on one half while conventional methods are used on the other. All other practices must be identical across the split field system to make sure that the conservation practice is the only thing that is different in the two portions. The yield difference between the two halves is insured.

Sponsoring organizations play a pivotal role. Proposals originate with them and they screen participants. They identify technicians who'll guide growers as the innovative practice is implemented. They track yields, analyze differences in the split field results, and help process any claims.

ACIC empanels expert committees to evaluate conservation practices for their suitability. Other criteria may become evident as proposals are processed.

A Specialized Insurance Policy Can Resolve This Dilemma

To boost adoption of proven conservation practices, the ACIC and IGF Insurance Company have designed insurance coverage to help farmers adopt conservation practices.

How It Works and What It Costs

1. A split field approach is commonly used to demonstrate a different practice or product. For BMP-PLUS™ split fields will be used to isolate risk in proven conservation methods. The innovative procedure is followed in one half while conventional methods are continued in the other. All other farming practices must be identical across the split field system to make sure that the conservation practice is the only thing that is different. Yield variance between the two halves is then insured neutralizing a grower's risk as innovative conservation practices are adopted.

2. The BMP-PLUS™ insurance will have premiums set at 50 percent of the established Multiple Peril Crop Insurance (MPCI) rates for any crop.

Sponsoring Groups

The enhanced AEM program proposed herein recognizes that the County and State (Department of Agriculture and Markets) have a bona fide stake in conservation. Their leadership makes the whole process work by:

- Identifying conservation proposals;
- Clarifying the benefits and the risks;
- Communicating with farmers;
- Screening farmer participants;
- Ensuring sufficient technical support; and
- Assisting in loss adjustment.

How the BMP-PLUS™ Policy Works

1. A bona fide conservation practice is identified (in this case, AEM practices);
2. Either a sponsoring organization persuades farmer members to enroll crop acreage or a producer persuades his organization to sponsor a proposal;
3. A simplified description of the conserving practice is submitted by the sponsoring organization to ACIC for an initial review;
4. ACIC reviews the concept and the needs, responding to the applicant organization with assistance in either making a full application or in obtaining more information and refining how the proposal may be specified more effectively;
5. The sponsoring organization:
    a. Nominates the producer participants;
    b. Vouches for the participants;
    c. Identifies the field support for farmers using the practice; and
    d. Certifies that the split fields have comparable productive capacity.
6. ACIC initially rates the insurance based on a non-probability premium structure developed jointly with IGF Insurance Company:

a. Empanels a vetting committee to assess the technical aspects of the proposal; and

b. Customizes the innovation insurance policy to fit the circumstances.

7. IGF Insurance Company writes and distributes the BMP-PLUS™ policy via agents;
8. The producer grows his crops according to the split field method;
9. The sponsoring organization provides technical support for enrolled producers and oversees the steps of the recommended conservation practice;
10. The sponsoring organization performs the initial adjustment process and prepares a preliminary report if a loss occurs and verifies that all other farming practices were consistent across both portions of the split field system; and
11. IGF Insurance Company performs the final adjustment process and pays out claims as necessary.

Source: Agricultural Conservation Innovation Center, 1999

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ATTACHMENT H-6

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Mission

To provide information and assessment tools for pesticide and nitrogen fertilizer users which help them identify risks to groundwater associated with their pesticide and nitrogen fertilizer use practices and to coordinate local, State, and Federal resources to help individuals reduce those risks.

The Michigan Groundwater Stewardship Program is designed to be voluntary, to be locally driven, to address the concerns of individuals, and to maintain a focus on the financial and technical constraints which drive real-world decisions.

The Michigan Groundwater Stewardship Program is relatively narrow in focus addressing only risks to groundwater associated with pesticide and nitrogen fertilizer use. However, it has a wide scope and addresses the many uses of these materials, including agricultural, turfgrass, and household uses.

Local Programs

Local Groundwater Stewardship Programs are being funded through a competitive grants program. Technical assistance personnel are hired to help individuals complete an on-site evaluation of risks and help implement practices which reduce those risks.

Farm *A* Syst (FAS)

Farm *A* Syst (FAS) identifies potential risks posed by farmstead operations. Fact sheets provide educational information and list reference people to contact if questions arise. F*A*S* work sheets use a simple question-and-answer format to evaluate farmstead practices that may pose a risk to groundwater.

Farm *A* Syst is voluntary and confidential. All Farm *A* Syst materials stay with you on your farm. It is important to recognize that Farm *A* Syst only identifies risk. It does not tell you if you have contaminated water or that you will never have contaminated water.

Technical assistance with completing Farm *A* Syst evaluations is available free of charge from the Michigan Groundwater Stewardship Program.

Home *A* Syst

Home *A* Syst helps homeowners identify and lower risks to groundwater and surface water, protecting human health and the environment. A home assessment system to help you identify and

lower risks to groundwater and surface water. Groundwater is a limited resource. Its contamination can occur in several ways:

- Contaminants moving down well casings of unused or unusable wells;
- Excess or poorly timed use of yard and garden fertilizers and pesticides, leading to groundwater or surface water contamination;
- Poorly maintained septic systems; and
- Improper disposal of wastes.

Groundwater Stewardship Practices

Technical assistance personnel may work with landowners to develop a Groundwater Stewardship Plan describing the cost-share and technical assistance resources available to implement Groundwater Stewardship Practices.

The practices not only provide easy-to-access information about reducing risks but also can provide technical assistance and cost-share for closing abandoned wells.

One-Stop Shopping

In the past, individuals have gone to MSU Extension for general information on implementation of the Groundwater Stewardship Practices. Then they would go to the Natural Resources Conservation Service for technical standards, visit the Consolidated Farm Service Agency for cost-share information, and finally work through the Natural Resources Conservation Service and the local conservation district to set up technical assistance and learn about other cost-share opportunities.

To address this problem, a series of Groundwater Stewardship Practice Manuals have been developed by the Michigan Groundwater Stewardship Program which integrate:

- MSU Extension descriptive information
- Natural Resources Conservation Service technical standards
- State and Federal legal requirements
- Information on State and Federal cost-share opportunities, and
- Evaluation tools.

Groundwater Stewardship Teams

These teams determine the mixture between cost-share, technical assistance, and/or demonstration provided by the local program. They ensure coordination of local resources and make sure the local program meets the groundwater protection needs of local pesticide and fertilizer users.

Groundwater Stewardship Teams (GST) are a part of Michigan's Groundwater Stewardship Program (GSP). They provide a collective voice of pesticide and nitrogen fertilizer users in determining the direction of the statewide program. GSTs help ensure that local information, technical assistance, demonstration projects and cost-share opportunities supported by the Michigan Groundwater Stewardship Program meet local needs and interests. They can also serve as local forums to

communicate the groundwater protection activities, needs, and concerns of the pesticide and nitrogen fertilizer users to the nonagricultural community.

Field *A* Syst

Field *A* Syst is designed to help individuals identify ways to reduce the risk of groundwater contamination associated with field applications of pesticides and nitrogen fertilizers.

Field *A* System is a series of worksheets and fact sheets that help identify and offer ways to reduce the risk of groundwater contamination associated with pesticide and nitrogen fertilizer use. These in-field risk assessment tools are based on the highly popular Farm *A*Syst program which is used to evaluate farmstead practices and structures that may pose a risk to groundwater.

Currently, Field*A*Syst materials are available for the following topics:

- General Pesticide & Nutrient Management Work Sheets;
- General Irrigation Management Field Screening Work Sheets; and
- Corn Nutrient & Pesticide Management.

The general pesticide, nutrient and irrigation management packages focus on practices such as: split nitrogen application, nitrate testing, pesticide selection, sprayer calibration, and pesticide safety.

The field screening worksheets help evaluate the impact of soils, subsurface geology, cropping practices, and depth to the water table on the relative vulnerability of the fields you manage. The idea is that if you are going to try using a groundwater stewardship practice, you'll get the biggest benefit using it on your most vulnerable fields.

The materials are designed to integrate MSU Extension bulletins and recommendations into a single fact sheet, using the same easy Farm*A*Syst question-and-answer format to help you apply the recommendations to your own fields. Just like Farm*A*Syst, the Field*A*Syst program is voluntary and confidential. All materials stay with you on your farm.

Funding

Funds for this program come from industry-supported pesticide and fertilizer registration fees on specialty and agricultural products. Registration fees are paid for by companies that register their products for use in Michigan. A tonnage fee on bulk nitrogen fertilizers is also a source of funding. Nitrogen tonnage fees are paid directly by bulk fertilizer users.

Pesticide registration fees account for about 72 percent of the revenues with the remaining being provided by nitrogen fertilizer users. Specialty (household) products generate approximately 40 percent of the total revenues with the remaining coming from agriculture and other wide-area pesticide uses.

Over 85 percent of the revenues generated by these fees are returned directly to pesticide and fertilizer users through education, technical-assistance, applied research, and cost-share programs.

Funding Revenues

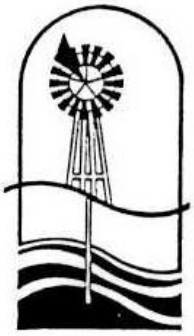
Funds for the Michigan Groundwater Stewardship Program come from industry-supported pesticide and fertilizer registration and tonnage fees.

Pesticide registration fees are paid for by companies which register both specialty (homeowner) and wide-area (agricultural, right of way, golf course, etc.) pesticides for use in Michigan. The rate for specialty pesticides is $100/product while the rate for wide-area pesticides is equal to three-quarters of one percent of the annual wholesale value with a $150/product minimum.

Specialty fertilizer registration fees are equal to $100 for each product and grade registered for sale. Nitrogen fertilizer tonnage fees are set at one-and-a-half cents per percent of nitrogen in each ton of fertilizer sold. For example, the fee on one ton of 28-0-0 would be 28 x .015 or $0.42. So, if 28-0-0 were selling at $160/ton, the groundwater fee would raise the price by two-tenths-of-one-percent.

Pesticide registration fees account for about 74 percent of program revenues with the remaining being provided by nitrogen fertilizer users. Specialty products generate approximately 40 percent of the total revenues with the remaining coming from wide-area pesticide uses.

Total annual revenues were about $2 million in 1994 and $3.5 million in 1995. Revenues not spent in one year are carried forward to fund the next year's programs and are not returned to the general fund.



Northwest Michigan
Groundwater Stewardship Program

The Northwest Michigan Groundwater Stewardship Program is here to be of service to you.
The Program offers:

- Farmstead Assessments (Farm*A*Syst);
- Homestead Assessments (Home*A*Syst);
- Cost-share Funding; and
- An Information Network/Partnership.

It's about Risk Reduction to improve the quality of our region's groundwater and your personal groundwater supply. This program is funded through PA216 of 1994, which assesses a surcharge on nitrate fertilizers and pesticides. The revenues generated are to be used to help farmers and homeowners to undertake management changes that will reduce the threat of groundwater contamination on their property. The bulk of the grant funds will be used to deliver on-site technical

assistance to landowners and to provide cost-share funds to landowners for closing abandoned wells, installing anti-backflow devices on agricultural wells and implementing other practices that protect groundwater.

Groundwater Facts and Trivia

- The earth is a closed system; there is the same amount of water here today as there was three billion years ago;
- Water moves through the hydrologic cycle, changing from solid to liquid to gas (water vapor) over and over again;
- Ninety-seven percent of the earth's water is salt water, only three percent is fresh water. Of the freshwater, 77 percent is frozen in ice and glaciers, 22 percent is groundwater, and less than 1 percent is found in lakes, marshed, rivers, and streams;
- About 95 percent of the United States' total supply of fresh water is groundwater. The remaining is surface water found in lakes and streams;
- About 27 trillion gallons of groundwater are withdrawn for use in the United States each year;
- Three-quarters of the cities in the United States use groundwater as part of their water supply. Almost 350 municipalities throughout Michigan use groundwater for their public water supply system;
- More than 800,000 new water wells are drilled in the United States each year;
- Unconsolidated sands and gravels compose nearly 90 percent of all aquifers developed for water supplies. Porous sandstone, limestone, and highly fractured crystalline and volcanic rock make up most other aquifers;
- Forty-three percent of Michigan's residents depend on groundwater for drinking;
- Thirty-seven percent of Michigan's farmers use groundwater for irrigating crops and watering livestock;
- Groundwater supplies water to many of our streams, lakes, and wetlands. In fact, about 30 percent of stream flow in the U.S. is from groundwater discharge;
- Rainfall is the main source of fresh groundwater. About 25 percent of rainfall in the United States becomes groundwater. That is equal to about 300 trillion gallons per year;
- Groundwater is constantly moving. The rate of movement may be as fast as 50 feet per day or as slow as 50 feet per 500 years;
- Groundwater nearly always contains more mineral matter than nearby surface water, but is generally much cleaner;
- About a quarter of the Earth's population drink contaminated water;
- The two major groundwater problems are overdraft (withdrawing more water than is being naturally replenished), and unnatural contamination;
- Since water will dissolve more things than any other substance it is very susceptible to contamination;

- Groundwater contamination has been found in every State. Groundwater is known to be contaminated at about 1,300 sites in Michigan;
- Agricultural activities constitute the single largest use of groundwater; and
- Approximately one-fifth of the earth's fresh water is contained in the Great Lakes Basin.

*Farm*A*Syst*

A Farm*A*Syst is an assessment to help identify potential risk of groundwater contamination posed by farmstead operations. Fact sheets provide education information. F*A*S worksheets use a simple question-and-answer format to evaluate farmstead practices that may pose a risk to groundwater. A groundwater technician will come out to the farm and work with you to identify practices which would help reduce the risk of contamination on you farm and develop a Groundwater Stewardship Plan.

Farm*A*Syst areas which are addressed are:

- Well location and condition;
- Pesticide and/or fertilizer storage and handling;
- Fuel storage (see EQIP info for cost-share info);
- Hazardous waste management;
- Household and milking center wastewater treatment;
- Livestock manure storage;
- Livestock yard management;
- Silage storage;
- Emergency preparedness planning; and
- Overall farmstead assessment.

After doing a Farm*A*Syst, one is eligible to apply for cost-share funding to help implement safer groundwater practices. For more information about the Farm*A*Syst program, please contact Ginger Bardenhagen at (616) 941-4191 or email her at: spice@northlink.net.

*Home*A*Syst*

Home*A*Syst is a home assessment system to help you identify and lower risks to groundwater and surface water. The packet fact sheets can be done alone or with assistance and cover the following topics:

- Drinking Water Well Management;
- Yard and Garden Care;
- Household Wastewater;
- Stormwater Management;
- Hazardous Household Products;
- Household Trash;
- Liquid Fuels; and
- Homesite Assessment.

The assessment will allow you to:

- Protect your drinking water;
- Learn the basics about your home septic system;
- Reduce runoff which may harm lakes and streams;
- Gain information on the health and environmental impact of your yard and gardening activities;
- Lower risks from hazardous household products;
- Reduce and improve handling of household waste; and
- Safely manage liquid fuel storage (gas, fuel oil, kerosene, etc.).

For more information or for a Home*A*Syst packet contact:

Kelly Wood-Arnold
Phone: 616-935-1514
Fax: 616-922-4633

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APPENDIX I

Environmental Monitoring Plan

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Peconic Estuary Program

Environmental Monitoring Plan

2001

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Introduction

An effective monitoring program is necessary to assess the status and trends in the Peconic Estuary's water and sediment quality and in the health and abundance of the estuary's habitats and living resources. Assessing status and trends includes both spatial and temporal variations. This information will provide insights into the effectiveness of current management strategies, indicate where goals have been met, if actions should continue, and whether more stringent controls or management is warranted.

Monitoring the changes in a watershed is not a simple task. Watersheds, by their very nature, are dynamic systems where populations of fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult.

This Environmental Monitoring Plan describes the region's existing monitoring efforts as well as recommendations for expanding some existing programs and establishing new monitoring programs. The Plan also describes the environmental changes these data can be used to assess. While agencies or organizations carrying out monitoring programs may extend their efforts beyond the Peconic Estuary Program study area boundaries, the evaluation of the monitoring programs described in this document, whether existing or proposed, applies only to activities within the Peconic Estuary Program study area. By reporting on environmental changes, the Peconic Estuary Program will be able to evaluate whether measurable environmental results have been achieved and whether the goals and objectives of the Comprehensive Conservation and Management Plan (CCMP) are being met. Efforts from Federal, state, county and local government agencies, non-governmental organizations, and private citizens comprise the extant monitoring in the region. Monitoring has been and continues to be performed for water quality, habitats, land uses, and populations. Specific monitoring efforts are described in detail in this document. The Peconic Estuary's study area boundary and waterbodies are shown in Figures 1 and 2.

Monitoring can be divided into output monitoring and outcome monitoring. Output monitoring is programmatic and addresses CCMP implementation issues (resulting in Implementation Reports). Outcome monitoring focuses on changes in ambient conditions, ecological functions, and biological populations and communities (resulting in Environmental Status Reports). This Environmental Monitoring Plan mainly focuses on outcome monitoring.

Monitoring Plan Basis

The pollutants, biological indicators and performance criteria included in this Environmental Monitoring Plan were selected based on the priority management topics in the CCMP and the measurable goals the Program established for each priority management topic. The priority management topics were initially identified in the Peconic Estuary nomination document for inclusion in the National Estuary Program. These topics (and lead agencies) are: Brown Tide (SCDHS), nutrients (SCDHS), habitats and living resources (NYSDEC), pathogens (NYSDEC), and toxics (EPA). In the final CCMP, these topics are joined by critical lands protection, an overarching issue, to form the priority management issues for the Program, along with public education and outreach, financing, and overall implementation. The SCDHS along with The Nature Conservancy, the Suffolk County Department of Planning, and the Citizens Advisory Committee serves as the lead for critical lands protection. These priority issues have been selected, both initially and currently, based on impacts, threats, and importance in meeting the overall goals of the Peconic Estuary Program.

For each priority management topic, the PEP has developed measurable goals. In many cases, these measurable goals are first order estimates based on best available information and on management conference judgment. Each measurable goal in the final CCMP is linked to one or more of the actions in the final CCMP. Each element of the Environmental Monitoring Plan is also linked to one or more of the measurable goals. The relationship between a monitoring program element (and the parameters contained therein) and a CCMP measurable goal is the basis for its inclusion in this Environmental Monitoring Plan.

The Peconic Estuary Program's Environmental Monitoring Program consists of numerous existing monitoring programs, many of which have been expanded due primarily to the existence of the Peconic Estuary Program. The Peconic Estuary Program participants, in preparing this Plan, did not observe any duplication of effort among the agencies or organizations currently conducting monitoring in the estuary and its watershed. Where gaps in and among monitoring programs were identified, recommendations have been made to expand existing monitoring programs or establish entirely new monitoring programs. The Peconic Estuary Program Office in the Office of Ecology of the Suffolk County Department of Health Services serves as the overall coordinator of monitoring efforts in the estuary and watershed. The effectiveness of the Environmental Monitoring Plan will be reviewed as part of the Implementation Report as well as the Environmental Status Report. Recommendations for redirection of efforts will be included in these reports as needed; these proposed changes will be subject to public review.

The Peconic Estuary Program has developed a candidate list of indicators to be used in reporting on environmental outcomes. This list will be refined and finalized in the 2001-02 timeframe. The candidate indicators, related to key measurable goals in the CCMP and elements of the Environmental Monitoring Plan, are as follows:

- Brown Tide Levels
- Dissolved Oxygen Levels
- Nitrogen Levels
- Water Clarity
- Eelgrass and Tidal Wetlands Coverage
- Extent of Shoreline Hardening
- Finfish and Shellfish Landings
- Acres Open to Shellfish Harvesting
- Toxics in the Environment (sediments, biota, and loadings)
- Habitat Restoration (and Land Acquisition/Protection)

Output Monitoring

Programmatic output monitoring will track the products from implementing the CCMP. Monitoring will help keep managers abreast of all implementation programs and the degree to which the programs are or are not achieving their intended outcomes. This type of monitoring holds designated lead organizations accountable for specific actions and steps outlined in the CCMP. Programmatic monitoring can also be used to assess whether an educational outreach program has reached its intended audience.

The Peconic Estuary Program will report on the status of the CCMP actions ("output monitoring") through periodic bulletins and has committed to a full accounting on the status of all CCMP actions every three years, consistent with EPA National Estuary Program Guidance, in the form of an Implementation Report. This reporting commitment is an action in the Post-CCMP Chapter of the final CCMP. The report will evaluate whether the CCMP actions and steps should be modified in order to achieve the CCMP goals and objectives. Where appropriate, resources and efforts may be redirected to attain the desired outcomes of the Program. Recommendations for the redirection of efforts will be subject to public review.

Outcome Monitoring

Outcome monitoring assesses the success in attaining CCMP goals and objectives rather than the implementation of specific actions. For each measurable goal in the CCMP, the associated monitoring parameters provide a measure of success. Characterization reports prepared for the CCMP and summarized in the CCMP, as well as numerous existing monitoring efforts, represent outcome monitoring activities.

The Peconic Estuary Program will provide information on environmental quality ("outcome monitoring") through periodic bulletins and a report every three years on progress in achieving all of the measurable goals described in the CCMP in the form of an Environmental Status Report. This reporting commitment is an action in the Post-CCMP Chapter of the final CCMP. Through the outcome monitoring process, a report on environmental status and trends will be prepared, existing and planned monitoring efforts will be incorporated, critical information gaps will be identified, and standardizing and coordinating future monitoring efforts will be attempted. As with the Implementation Report, the Environmental Status Report will include recommendations for redirection of efforts as needed; these proposed changes will be subject to public review.

Monitoring Plan Elements

Compiling monitoring program information into one document, such as this one, promotes cooperation among agencies and stakeholders, clarifies the need for existing programs as well as for expanded or new programs, and provides an avenue for integrating results from different monitoring programs and projects for scientific, regulatory and general interests. The Peconic Estuary Program has identified thirty-two core monitoring plan elements, which are necessary to determine whether the CCMP measurable goals are being met.

The monitoring plan elements are geared towards the chemical, physical and biological conditions of the estuary. As such, the workplan elements focus on the priority management topics. Other modules such as Public Education and Outreach and Financing will be dealt with in other reports. The Critical Lands Protection Strategy Chapter outlines all the milestones that need to take place in developing a Critical Lands Protection Plan. Actual environmental goals and a monitoring workplan for critical lands protection will be developed as part of the Critical Lands Protection Plan.

The Peconic Estuary Program's technical report *Research, Monitoring & Assessment Priorities for Habitats and Living Resources of the Peconic Estuary* (Peconic Estuary Program, 2000) recommends additional monitoring activities for consideration in the future.

Data Management

The *Peconic Estuary Program Data Management Strategy* (Peconic Estuary Program, 1993) designated the SCDHS Office of Ecology as the repository of water quality data and most Geographical Information System (GIS) data. The Program Office also is the prime repository for natural resource data on a provisional basis. Since that time, the USFWS has worked on several mapping efforts and has provided GIS coverages to the Program Office for storage and distribution. For the foreseeable future, the Program Office in the SCDHS will continue its role as the data repository and data management agency. The Peconic Estuary Program is committed to reviewing the *Peconic Estuary Program Data Management Strategy* as part of the Post-CCMP Implementation Report.

The Peconic Estuary Program intends to develop a real-time, web-based accountability system that will house information related to the CCMP goals and actions. Reports, newspaper articles, photographs and monitoring data will be available through the internet and in hard copy form. Monitoring data will be posted directly via links to a database. The intent of the accountability system is that all PEP-related information will be web-accessible.

CCMP and NEP Requirements

Consistent with EPA guidance, each of the individual elements of this Environmental Monitoring Plan includes the following:

- Program Objective(s): Program objectives are defined and performance criteria are specified (i.e., parameter needed to guide management decisions).
- Lead Entity: The lead entity is named or proposed.
- Program Status: Program status describes whether the program is existing, existing but there are recommended expansions, or is new.
- Monitoring Extent and Frequency: The geographical extent of the monitoring and sampling frequency is described.
- Monitoring Hypotheses: Testable hypotheses are provided.
- Measurable Goal: The Peconic Estuary Program measurable goal (or goals) related to the monitoring program element is specified.
- Program Description: Summary information addressing the particular monitoring program is included. In many cases, especially where there are existing programs, reference is made to an acceptable sampling and quality assurance/quality control project plan. Those who are interested in the details and specifics of a particular program are encouraged to consult these existing documents. For monitoring programs that do not exist at the current time, but are recommended in this monitoring plan, complete information for all these factors has likely not yet been specified, but will be prior to the initiation of any environmental monitoring effort.
- Costs: Information on costs, including estimates of current efforts and estimates for proposed new or expanded efforts is provided.

The program descriptions and the referenced sampling and quality assurance/quality control project plans together include the following, where this information is available:

- Specification of monitoring variables, including sampling locations and frequency, field sampling locations, field and laboratory analytical procedures, quality assurance and control procedures.
- Specification of the data management system and statistical test that will be used to analyze the monitoring data.
- Description of the expected performance of the initial sampling design (i.e., the minimum difference that can be detected in measured variables over time and between locations).
- Provision of a timetable for analyzing data and assessing program performance.

Finally, information on costs is specified. If the monitoring activity is part of an existing or ongoing base program of an agency or organization, a cost is typically not specified. If it is a recommendation for a new or expansion of an existing monitoring program, to the extent possible, the cost has been estimated for planning purposes. These cost estimates will be the basis for securing additional funds. Potential sources of funding include agency or organization base programs, special funding sources (i.e., the Suffolk County 1/4 percent Sales Tax Program, receipts from selective sales fees, special project grants through governmental and non-governments sources).

Core Monitoring Workplan Elements

Brown Tide Issues
- Brown Tide

Nutrients Issues
- Nutrients
- Dissolved Oxygen
- Light Extinction
- Groundwater
- Point Sources
- Land Use

Habitat and Living Resources Issues
- Eelgrass
- Finfish and Macroinvertebrates
- Wetlands
- Shoreline Hardening
- Piping Plovers, Shorebirds, Raptors, and Other Birds
- Dredging
- Restoration
- Bay Scallops
- Aquaculture and Transplanting Activities

Pathogens Issues
- Coliform Bacteria
- *Pfiesteria* and *Alexandrium*
- Vessel Waste No Discharge Areas

Toxics Issues
- Sediment
- Coastal 2000
- Biota (Fish, Shellfish, and Crustaceans)
- NOAA Mussel Watch Program
- Surface Water
- Groundwater
- Hazardous Waste Sites
- Point Source Discharges
- Federal Toxics Release Inventory
- Pesticide Use
- Two Stroke Marine Engines
- Underground Storage Tanks
- Treated Lumber in the Marine Environment

The technical report *Research, Monitoring & Assessment Priorities for Habitat and Living Resources of the Peconic Estuary* (Peconic Estuary Program, 2000) recommends additional monitoring activities for consideration in the future.

Measurable Goals

For each priority management topic, the PEP has developed measurable goals. In many cases, these measurable goals are first order estimates based on best available information and on management conference judgment. Each measurable goal in the final CCMP is linked to one or more of the actions in the final CCMP. Each element of the Environmental Monitoring Plan is also linked to one or more of the measurable goals. The relationship between a monitoring program element (and the parameters contained therein) and a CCMP measurable goal is the basis for its inclusion in this Environmental Monitoring Plan. However, not all measurable goals are linked to the environmental monitoring plan elements as some measurable goals are related to programmatic concerns.

The PEP's measurable goals with respect to Brown Tide blooms include:

- Continue to better coordinate, focus, and expand Brown Tide research efforts (measured by funding appropriated, frequency of Brown Tide symposiums and frequency of updating the Brown Tide Workplan and coordinations within the Brown Tide Steering Committee).
- Continue the current level of water quality sampling in the Peconic Estuary (measured by the number and frequency of samples taken per year and the number of bays and peripheral embayments sampled). Currently, the Suffolk County Department of Health Services conducts biweekly monitoring at 32 stations in the Peconic Estuary throughout the year, resulting in over 830 samples taken annually.

The PEP's measurable goals with respect to nutrients include:

- Decrease the total nitrogen concentrations in the western estuary to a summer mean of no more than 0.45 mg/l (based on 1994-96 model verification conditions, and measured by surface water nitrogen concentrations as compared to the PEP nitrogen guidelines).
- Improve the dissolved oxygen concentrations in the western estuary to ensure that the New York State dissolved oxygen standard (currently 5.0 mg/l) is not violated (measured by surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard).
- Ensure that the total nitrogen levels in shallow waters remain at or below 0.4 mg/l to help optimize water clarity, maintaining and potentially improving conditions for eelgrass beds, a critical habitat (based on 1994-96 model verification conditions, and measured by light extinction coefficients as compared to the recommended eelgrass habitat optimization goal of at or below $0.75 \pm 0.05\ m^{-1}$).
- Ensure that the existing total nitrogen and dissolved oxygen levels are maintained or improved in waters east of Flanders Bay (*i.e.*, do not increase TN nor decrease DO) (measured by surface water total nitrogen concentrations as compared to the PEP nitrogen guidelines and surface and bottom dissolved oxygen levels as compared to the New York State dissolved oxygen standard).
- Develop a quantitative total nitrogen load allocation strategy for the entire estuary (measured by development of a strategy and timely endorsement by local and State agencies). Preliminary work group estimates, and work performed by other programs, indicate that a 10-25 percent fertilizer reduction goal is a reasonable first order target for existing residential and agricultural fertilizing programs.
- Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program, as well as other recommendations, which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters).

- Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal, which may include groundwater performance standards (*e.g*., nitrogen concentrations in groundwater resulting from post-development discharge/recharge), implementing fertilizer and clearing restrictions, and zoning.
- Continue sponsoring and coordinating research and information gathering (measured by funding appropriated, and research conducted, relative to PEP recommendations).
- Continue and expand open space acquisition programs (measured by funding appropriated and acres acquired in target areas).

The PEP's measurable goals with respect to habitat and living resources include:

- Protect the high quality habitats and concentrations of species in the Critical Natural Resource Areas (measured by acres of open space protected and development of model ordinances).
- Maintain current linear feet of natural shoreline and over the next 15 years reduce shoreline hardening structures by five percent (measured by the percent change of natural vs. hardened shorelines through GIS mapping).
- Maintain current eelgrass acreage (2,100 acres in main stem of the estuary) and increase acreage by ten percent over 10 years (measured by inter-annual aerial surveys with GIS and SCUBA assessments).
- Maintain and increase current tidal and freshwater marsh acreage, and restore areas that have been degraded (*e.g.*, restricted flow, *Phragmites australis* dominated, hardened shoreline) (measured as number of acres of marsh with GIS).
- Maintain a policy of no new mosquito ditches and not re-opening ditches that have filled-in by natural processes; and restore 10-15 percent of mosquito ditched marshes through Open Marsh Water Management (measured by the number of acres of restored tide marsh using Open Marsh Water Management).
- Increase the number of piping plover pairs to 115 with productivity at 1.5 (over a three-year average), distributed across the nesting sites in the Peconic Estuary (measured by annual piping plover surveys).
- Develop recommendations and guidelines to reduce impacts to marine life from dredging-related activities (measured by amount of reduced dredging volumes and protected benthic habitat acreage).
- Foster sustainable recreational and commercial finfish and shellfish uses of the Peconic Estuary that are compatible with biodiversity protection (measured by juvenile finfish trawl surveys, bay scallop landings, and identifying, protecting, and restoring key shellfish and finfish habitat).
- Enhance the shellfish resources available to harvesting through reseeding, creation of spawning sanctuaries and habitat enhancement (measured by scallop and clam abundance/landings).
- Link land usage with habitat quality in tidal creeks (measured by continued funding of benthic and water quality surveys to measure the quality/impacts to the habitats within selected tidal creeks).
- Ensure that the existing and future aquaculture (shellfish and finfish) and transplanting activities are situated in ecologically low-productive areas of the estuary and that they are mutually beneficial to the aquaculture industry, natural resources, and water quality (measured by the extent and location of aquaculture/transplant facilities, water quality measures, and natural resource data).

- Annually initiate five percent of the projects identified in the Habitat Restoration Workgroup Plan for the Peconic Estuary (measured by the number of projects funded and implemented annually).

The PEP's measurable goals with respect to pathogens include:

- Maintain current level of lands available to shellfish harvesting, with the ultimate aim of re-opening lands currently closed to harvesting (measured through coliform levels and numbers of acres of shellfish beds available to harvest).
- Maintain and improve water quality of the estuary through a reduction of overall stormwater runoff, particularly key areas identified through the Regional Stormwater Runoff Study (measured through the number of stormwater remediation projects implemented).
- Eliminate all vessel waste discharge to the estuary (measured by the adoption/implementation of a Vessel Waste No Discharge Area in the Peconic Estuary, the number of pump-out facilities and the volume of waste pumped annually).
- Attain a zero discharge of stormwater runoff in new subdivisions (measured by site plans for new developments that achieve this goal and the development of new ordinances and Habitat Protection Overlay Districts).

The PEP's measurable goals with respect to toxics are:

- Improve the quality of the ambient environment (surface waters, groundwaters, sediments and biota) where there is evidence that human inputs impair or threaten these resources (as measured by surface water, groundwater, sediment and biota monitoring programs).
- Comply with schedules for conducting site characterizations, remedial actions and post-remedial monitoring at hazardous waste sites; effectively characterize risks and protect human health and the environment at hazardous waste sites; ensure compliance with permit limits for point source discharges (as measured by compliance with schedules at hazardous waste sites; conducting effective characterizations; and point source monitoring).
- Decrease overall emissions of reportable toxics from the five East End towns (as measured by the Federal Toxics Release Inventory).
- Eliminate holdings of banned, unneeded and unwanted pesticides and hazardous substances by 2005 (as potentially measured by collections during "Clean Sweep" programs, household hazardous waste collection programs and events, or surveys of farmers/commercial landscapers/homeowners).
- Decrease overall agricultural/residential/institutional pesticide applications in the five East End towns (as potentially measured by point-of-sale surveys, surveys of residents, or commercial applicator tallies).
- Eliminate to the maximum extent practicable, pesticide applications on turf grass on all publicly held land by 2003 (as potentially measured by resolutions passed [or equivalent]).
- Eliminate underground storage tanks exempt from current replacement requirements via incentive programs and public education and outreach (as potentially measured following baseline established of number of underground storage tanks [USTs] and monitoring of the number of underground tanks removed, retired, and replaced).
- Decrease the total amount of treated lumber installed in the marine/estuarine environment (as potentially measured by baseline established from shoreline surveys and monitoring of permits issued for bulkheading installations, replacements, and removal).

- Reduce the number of two stroke marine engines in use in the estuary (as potentially measured by harbormaster conducted surveys).

The PEP's measurable goals with respect to education and outreach are:

- Annually, embark on one new, substantial public education effort addressing each of the following areas:
  - Conducting Brown Tide education and outreach;
  - Reducing residential fertilizer use in the Peconic Watershed;
  - Improving, protecting or enhancing habitats and living resources;
  - Reducing pathogen loadings to the estuary; and
  - Reducing the use and loadings of toxics substances to the estuary.

  (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory committee).
- Annually, conduct one major watershed effort involving students in estuary management (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee).
- Annually, conduct one major watershed-wide event to educate those who live, work, or recreate in the Peconics (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee).
- Annually, support the establishment of one new local embayment or tidal creek association (as measured by the Peconic Estuary Program Office and the PEP Citizens Advisory Committee).

The PEP's measurable goals with respect to financing are:

- Effectively use existing funding and secure new or additional governmental funding for CCMP implementation from the following sources:
  - Federal Government, particularly the U.S. Department of Agriculture;
  - State Government, particularly the Clean Water/Clean Air Bond Act and State Revolving Loan Fund;
  - County Government, particularly the Suffolk County ¼% Sales Tax Program;
  - Town Governments; and
  - Village Governments.

  (as measured by the Peconic Estuary Program Office).
- Secure new or additional private sector funding for CCMP implementation, from the following sources:
  - Businesses; and
  - Not for profit organizations.

  (as measured by the Peconic Estuary Program Office).

The Peconic Estuary Program's measurable goals with respect to post-CCMP management and implementation are:

- Implement the Peconic Estuary Program Environmental Monitoring Plan. [See Action M-2]
- Produce annual reports. [See Action M-3]
- Update municipal officials. [See Action M-4]
- Develop sub-watershed implementation plans (as measured by the number of sub-watershed plans initiated). [See Action M-5]

Brown Tide Issues

Brown Tide Monitoring

Program Objective
To track the changes in abundance and distribution of the Brown Tide organism in the estuary and relate the changes to conventional water quality parameters (e.g., dissolved organic and dissolved inorganic nutrients) as well as provide support to Brown Tide researchers. Monitoring coupled with research may further elucidate the processes involved with these phenomena.

Monitoring Hypothesis
Incidences of Brown Tide blooms (duration and extent) are decreasing, most likely in response to changes resulting from some combination of the following factors: the implementation of point and nonpoint source management practices; meteorological conditions; or ecological changes.

CCMP Measurable Goal
Continue the current level of water quality sampling in the Peconic Estuary.

Lead Entity
Suffolk County Department of Health Services; New York Sea Grant is the lead for Brown Tide Research Initiative projects.

Program Status
Brown Tide monitoring is part of an existing program of the Suffolk County Department of Health Services. Existing Brown Tide Research Initiative Projects will be completed in 2002-03.

Monitoring Extent and Frequency
Suffolk County Department of Health Services monitors estuary wide and year round (weekly or biweekly) for Brown Tide cell counts and related water quality parameters. Monitoring under Brown Tide Research Initiative projects is in accordance with approved workplans.

Program Description
Brown tide was first detected in the Peconic Estuary in June of 1985. The Brown Tide organism, *Aureococcus anophagefferens*, is a particularly small phytoplankton species and is only problematic under "bloom" conditions. Brown tide can persist for unusually long periods of time over large areas and has no predictable onset, duration, or cessation. Brown tide has recurred since 1985 and has had a serious impact on natural resources, the local economy, the general aesthetic value of the estuary, and possibly regional tourism. Brown Tide cell counts are included as part of the monitoring programs described below. See Figure 3 for areas of Brown Tide occurrence on Long Island.

SCDHS Surface Water Quality Monitoring: In 1988 the Suffolk County Department of Health Services (SCDHS) Office of Ecology expanded its monitoring operations in an effort to determine the cause of Brown Tide (see Figure 4 for Post-CCMP monitoring stations). While the cause of Brown Tide is still not known, the study's resulting final report, the Brown Tide Comprehensive Assessment and Management Program (BTCAMP) (SCDHS, 1992), served as the initial Brown Tide characterization for the Peconic Estuary Program.

Brown Tide cell counts are now part of the regular SCDHS surface water quality monitoring protocol. Refer to the SCDHS Surface Water Quality Monitoring section in the Nutrient Monitoring Workplan for more information and other parameters sampled by the SCDHS. The *SCDHS Surface Water Quality Monitoring Standard Operating Procedure* (SCDHS, 2000) and the *Quality Assurance Project Plan for the Peconic Estuary Program Surface*

Water Monitoring Program (SCDHS, 1994) describe the standard operating procedures and the QA/QC methods for the entire SCDHS Surface Water Quality Monitoring Program, which includes Brown Tide cell counts..
Brown Tide Research Initiative (BTRI) Committee: The Brown Tide Research Initiative (BTRI) Committee, chaired by the New York Sea Grant, follows the research and monitoring funded primarily through the National Oceanic and Atmospheric Administration's Coastal Ocean Program and Suffolk County. The BTRI program was developed to increase knowledge concerning Brown Tide by identifying the factors and understanding the processes that stimulate and sustain Brown Tide blooms. The Peconic Estuary Program is part of the BTRI Committee. The Initiative is composed of peer-reviewed research projects that were selected from two national calls for projects. Brown tide research and characterizations are systematically updated through New York Sea Grant's Brown Tide Research Initiative Reports.

Brown Tide Steering Committee (BTSC): The Brown Tide Steering Committee (BTSC) was formed to broadly coordinate Brown Tide research efforts both inside and outside New York through the development of a comprehensive Brown Tide research and management plan or Brown Tide Workplan (see Appendix F for the most recent Workplan). The BTSC includes representatives from various agencies and environmental groups as well as elected officials, commercial fisherman, and other interested parties. The Committee is coordinated by Suffolk County.

Costs

Base Programs: Continued research and monitoring depends on continued funding. The SCDHS Surface Water Monitoring Program, along with the SCDHS Routine Point Source Monitoring Program, is funded in part by $20,000 in Post-CCMP EPA funds awarded to SCDHS and by in-kind match from Suffolk County, a minimum grant commitment of $120,000 per year to satisfy the EPA local match requirements. As with prior years, the costs for the monitoring program are likely substantially higher than the EPA grant.

Brown tide research is currently funded through many specially funded government grants. NOAA, through its Coastal Ocean Program, is providing Brown Tide research funding totaling $3.0 million over six years (funding started in 1997). Between 1997 and 2000, Suffolk County has appropriated $583,000 to support Brown Tide monitoring and investigation efforts. Suffolk County has authorized $150,000 each year for the next three years (2001-2003) from the capital budget for more Brown Tide research and monitoring.

Nutrients Issues

Nutrients Monitoring

Program Objective
To track the long-term trends in nutrient loading and the short-term variations in nutrient concentrations in relation to the PEP nitrogen guidelines (based on 1994-96 conditions) and to refine the guidelines as needed. This will support our review of the effectiveness of the CCMP actions in attaining dissolved oxygen standards.

Monitoring Hypothesis
Nutrient levels (as measured by various forms of nitrogen) are decreasing in areas of the Peconic Estuary, where nutrient guidelines have been exceeded and being maintained where they are currently achieved, in response to the implementation of point and nonpoint source management practices.

CCMP Measurable Goals
Decrease the total nitrogen concentrations in the western estuary to a summer mean of no more than 0.45 mg/l; Ensure that the existing summer mean total nitrogen levels are maintained or improved in waters east of Flanders Bay; Ensure that the summer mean total nitrogen levels in shallow waters remain at or below 0.4 mg/l.

Lead Entity
Suffolk County Department of Health Services.

Program Status
Nutrient monitoring is part of an existing program of the Suffolk County Department of Health Services.

Monitoring Extent and Frequency
Suffolk County Department of Health Services monitors estuary wide (32 stations) and year round (biweekly) for nutrients and related water quality parameters.

Program Description
Nitrogen is the nutrient of primary concern in the Peconic Estuary although the surface water quality conditions with respect to nitrogen levels are generally good. In the summer months, when environmental stresses are at their peak, nitrogen is the "limiting nutrient" for algal growth. Excessive nitrogen inputs stimulate algal growth, which may cause diurnal dissolved oxygen problems. Excessive nitrogen inputs may also harm eelgrass, a critical habitat, due to algal shading, stimulation of epiphytes, and, possibly, direct adverse metabolic impacts. In addition, increased nitrogen levels may affect the duration and/or intensity of a Brown Tide bloom.

SCDHS Surface Water Quality Monitoring: The Suffolk County Department of Health Services (SCDHS) Office of Ecology samples for a suite of nitrogen components (NH3, NOx, NO2, NO3, Urea, TKN, and TDKN) in the Peconic Estuary. Other parameters sampled by the SCDHS include Secchi depth, Temperature, Dissolved Oxygen, Salinity, Total Coliforms, Fecal Coliforms, TPO4, TDPO4, O-PO4, TOC, DOC, SiO3, TSS, Total Chl-a, Fractionated Chl-a, *Aureococcus*, Ambient Irradiance, depth at 20% of Ambient Irradiance, depth at 10% of Ambient Irradiance, and depth at 1% of Ambient Irradiance. While limited sampling began in 1976, the number of stations and samples taken in the Peconics has increased through the years. Currently, the SCDHS conducts biweekly monitoring at 32 stations throughout the year.

The *Post-CCMP Surface Water and Point Source Monitoring Plan* (SCDHS, 1999) further describes the post-CCMP efforts of the SCDHS in the Peconics. As indicated in the *Post-CCMP Surface Water and Point Source Monitoring Plan*, this program continues to adhere to the *Quality Assurance Project Plan for the Peconic Estuary Program Surface Water Monitoring Program* (SCDHS, 1994), on file at SCDHS. The *SCDHS Surface Water*

Quality Monitoring Standard Operating Procedure (SCDHS, 2000) document describes the standard operating procedures for the entire SCDHS Surface Water Quality Monitoring Program.

Costs
Base Programs: Information on costs for the Suffolk County Department of Health Services Surface Water Quality Monitoring Program is included under Brown Tide Issues in this document.

Dissolved Oxygen Monitoring

Program Objective
To track the long-term trends and the short-term variations in dissolved oxygen concentrations in relation to the New York State dissolved oxygen standard.

Monitoring Hypothesis
Dissolved oxygen levels in the Peconic Estuary are improving in response to the implementation of point and nonpoint source nutrient management practices.

CCMP Measurable Goals
Ensure that the New York State dissolved oxygen standard (currently 5.0 mg/l) is not violated in the estuary;
Ensure that the existing dissolved oxygen levels are maintained or improved in waters east of Flanders Bay where dissolved oxygen levels are currently better than standards require.

Lead Entity
Suffolk County Department of Health Services.

Program Status
Dissolved oxygen monitoring is part of an existing program of the Suffolk County Department of Health Services.

Monitoring Extent and Frequency
Suffolk County Department of Health Services monitors estuary wide (32 stations) and year round (biweekly) for dissolved oxygen and related water quality parameters.

Program Description
Dissolved oxygen conditions in the Peconics are generally excellent although diurnal dissolved oxygen variations are a primary water quality management issue. The Peconic Estuary is a relatively shallow, well-mixed estuary and as such is not subject to periods of severe dissolved oxygen depression, as can occur in deeper, more stratified estuaries like the Long Island Sound. Areas with limited flushing and/or highly organic sediments exhibit bottom water, and sometimes surface water values below 5 mg/l (see Figure 5).

SCDHS Surface Water Quality Monitoring: The SCDHS Office of Ecology has been recording dissolved oxygen levels, along with other water parameters, at numerous stations in the Peconic Estuary since 1976. With the help of the Peconic Estuary Program the number of stations and samples taken has increased through the years. Some stations that historically have had low dissolved oxygen measurements are sampled in the morning and afternoon. The Office of Ecology has also done intensive dissolved oxygen surveys (sampling every two hours for 24 hours)

in Flanders Bay, Meetinghouse Creek, and the Peconic River. The *Post-CCMP Surface Water and Point Source Monitoring Plan* (SCDHS, 1999) further describes the efforts of the SCDHS in the Peconics.

Costs

Base Program: Information on costs for the Suffolk County Department of Health Services Surface Water Quality Monitoring Program is included under Brown Tide Issues in this document.

Light Extinction Monitoring

Program Objective

To track the long-term trends and short-term variations in water clarity in relation to the PEP recommended eelgrass habitat optimization goal. By improving water clarity, eelgrass habitat and growth will be optimized (see eelgrass monitoring section).

Monitoring Hypothesis

Water clarity, as measured by light extinction, is improving in the Peconic Estuary, in areas where goals are not being attained and maintained in areas where criteria are being attained, in response to the implementation of point and nonpoint source management practices.

CCMP Measurable Goal

Maintain and potentially improve water clarity conditions for eelgrass beds, a critical habitat in shallow waters. The PEP-recommended eelgrass habitat optimization goal is a light extinction coefficient (Kd) of 0.75 +/- 0.05 m-1.

Lead Entity

Suffolk County Department of Health Services.

Program Status

Light extinction monitoring is part of an existing program of the Suffolk County Department of Health Services.

Monitoring Extent and Frequency

Suffolk County Department of Health Services monitors estuary wide (32 stations) and year round (biweekly) for light extinction and related water quality parameters. Detailed long term investigations are taking place at three eelgrass beds in the estuary.

Program Description

The single most important factor controlling the distribution of submerged aquatic vegetation, light attenuation, is partially linked to the amount of nutrient loading in a waterbody. The average summer light extinction coefficients for the non-Brown tide years 1994and 1996 are shown in Figure 6. High nutrient loading in the shallow waters of the estuary may stimulate algal blooms, decreasing the light penetrating into the water column and consequently hindering eelgrass' ability to photosynthesize. Rooted aquatic plants that are at a species' depth limit for clear water conditions would be expected to decline due to the lack of sufficient light energy in turbid waters.

SCDHS Surface Water Quality Monitoring: The SCDHS Office of Ecology has an extensive monitoring program in the Peconics, measuring light extinction and chlorophyll-a, among other parameters. The *Post-CCMP Surface Water and Point Source Monitoring Plan* (SCDHS, 1999) further describes the efforts of the SCDHS in the Peconics.

Submerged Aquatic Vegetation Long Term Monitoring Program: First initiated in 1997, three existing SAV beds were monitored to determine the annual and long-term variations in eelgrass bed health and the cause of those variations. In 1999, the project was expanded to include three more locations. Monitoring of each site includes the following measures: depth and position of deeper edge of the eelgrass bed, biomass, shoot density, infauna, epifauna, light extinction, chlorophyll-a, total suspended solids, dissolved inorganic nitrogen, and dissolved inorganic phosphorus, among others.

In 2000, the program will include a system-wide survey based on aerial photographs and site visits. These data will be compared against the 1994 Cashin Associates report, *Submerged Aquatic Vegetation Study* to determine trends taking place in the estuary.

Costs

Base Program: Information on costs for the Suffolk County Department of Health Services Surface Water Quality Monitoring Program is included under the Brown Tide Issues in this document.

Information on the Submerged Aquatic Vegetation Long Term Monitoring Project is included in the Eelgrass Monitoring section of this document.

Groundwater Monitoring

Program Objective

To track the long-term trends and short-term variations in groundwater contaminants and better define the zones of groundwater input.

Monitoring Hypothesis

Nutrient levels in the groundwater of the Peconic Estuary Study Area is decreasing to natural background levels in response to the implementation of point and nonpoint source management practices.

CCMP Measurable Goals

Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal which may include groundwater performance standards, implementing fertilizer and clearing restrictions, and zoning.

Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program as well as other recommendations which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters).

Lead Entity

Suffolk County Department of Health Services.

Program Status

Groundwater nutrient monitoring is part of an existing program of the Suffolk County Department of Health

Services; special projects have been completed in specific areas of concern.

Monitoring Extent and Frequency

Suffolk County maintains a network of wells throughout the study that are sampled year round area to monitor the quality (and quantity) of the groundwater supply, and conduct studies and investigations of the county's hydrology.

Program Description

Groundwater is one of the largest external sources of nitrogen to the estuary, contributing approximately 7,560 pounds per day or about 21% of the total nitrogen load.

The nitrogen in the groundwater originates from fertilizer use, sanitary system waste and other sources. Dominant sources of total nitrogen to the estuary are agriculture (41% of TN loading) and residential development (40% of TN loading) (SCDHS, 1999). Industrial and commercial uses contribute less than 10% of the total nitrogen load to the estuary.

Nitrogen from synthetic fertilizer, applied as nitrate, ammonium salt or urea, may be the most important source of nitrate in the groundwater. Ammonium oxidizes to nitrate in the soil. Nitrate is leached to the groundwater supply through the sandy soils by the recharge of precipitation and by crop irrigation water.

Nitrate contamination in drinking water is a serious concern. The SCDHS tested 45,985 private wells from 1972 to 1994 and 7.4% of the wells exceeded the nitrate Maximum Contaminant Level (MCL) (SCDHS, 1996). The USEPA and New York State drinking water MCL for nitrate is 10.0 mg/l.

The SCDHS Bureau of Groundwater Resources selected ten wells in the county monitoring network to examine the effect of agriculture on groundwater quality from 1975 to 1994 (SCDHS, 1996). For the 20 year period, the average annual nitrate concentration for all ten wells was 11.3 mg/l, with an annual average range of 9.2 mg/l in 1982 to a maximum of 13.7 mg/l in 1988. A monitoring well in Southold contained the highest average nitrate concentration over the 20 year period (15.3 mg/l) and also the highest individual sample concentration detected (33.0 mg/l in 1990). Nitrate concentrations from a more recent study by the SCDHS, *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (1999) are consistent with these 1996 study figures.

The SCDHS has also monitored groundwater for impacts from pesticide and fertilizer use on golf courses (SCDHS, 1999). A total of 41 samples were collected from 31 wells at 18 separate golf courses. Nitrate concentrations in the Suffolk County golf course wells averaged 4.3 mg/l with a median concentration of 2.6 mg/l. The SCDHS has done a follow-up study this year with an expanded list of analytes and with new monitoring wells at five more courses in the county, including Shinnecock, National, and Maidstone.

The United States Geological Survey (USGS) has delineated the groundwater-contributing areas, as well as preliminary sub-boundaries for the main bays system. The USGS further characterized the Peconic River and Flanders Bay subwatersheds in 1999 by defining the sub-sediment geology through seismic reflections. The Cornell Cooperative Extension together with the SCDHS developed an ultrasonic low flowmeter for use in Flanders Bay and West Neck Bay. The flowmeter data will be used to determine the quality, quantity and location of groundwater discharging into the estuary.

SCDHS Groundwater Monitoring: The SCDHS Bureau of Groundwater Resources maintains a network of wells throughout the county to monitor the quality and quantity of the groundwater supply, and conduct studies and investigations of the county's hydrology. The Bureau will continue to produce groundwater measurement reports. The Peconic Estuary Program will in turn review the trends and modify the CCMP actions and steps accordingly. See Figure 7 for the groundwater quality delineations in the Peconic Estuary study area.

Suffolk County Groundwater Model (Contractor Camp, Dresser, and McKee): A groundwater model is being developed for all of Suffolk County. The model will provide additional information on the groundwater flow paths and travel times in the Peconic watershed.

Costs

Base Program: The NYSDEC has been funding the SCDHS (pesticide) groundwater monitoring program for three years at about $100,000 per year. The NYSDEC recently agreed to a three-year one million-dollar contract with the SCDHS to expand the monitoring program, but funding is based on approval of an annual work plan. This work takes place throughout Suffolk County, not just in the Peconic Region.

Point Source Monitoring

Program Objective

To track the short term and long term variations in point source nutrient loadings into the Peconic Estuary.

Monitoring Hypothesis

Total nutrient loadings to the Peconic Estuary from point sources are at a minimum being maintained, consistent with the PEP "no net increase" policy of surface water point source discharges.

CCMP Measurable Goal

Implement a quantitative nitrogen load allocation strategy for the entire estuary (measured by attaining the PEP recommendations including the implementation of the recommended Agricultural Environmental Management (AEM) program as well as other recommendations which may include fertilizer reduction programs, sanitary system upgrade programs, point source controls, etc., as well as monitoring for the impacts on measurable groundwater quality parameters).

Lead Entity

New York State Department of Environmental Conservation and Suffolk County Department of Health Services

Program Status

Point source discharge monitoring requirements and the Suffolk County Department of Health Services point source monitoring programs are existing program.

Monitoring Extent and Frequency

Point source dischargers are required to monitor effluent quality in their state-issued discharge permit, typically monthly monitoring is required. The Suffolk County Department of Health Services monitors ten routine point source influenced locations in the estuary during the year.

Program Description

Point sources are minor nitrogen sources in the whole estuary, but may still be significant for water quality in specific embayments. There are four major sewage treatment plants (STP) in the Peconic region: Brookhaven National Lab, Riverhead, Sag Harbor, and Shelter Island Heights. The Brookhaven National Laboratory STP is

assumed to be subsumed into the Peconic River baseline flow and loading. Operation of the Riverhead STP "avoids" 43 pounds of residential total nitrogen loading into the estuary each day (i.e., groundwater TN load would have occurred, but for the STP collecting and treating the sanitary waste that would have been generated in the absence of a sewage treatment plant). The remainder of the Riverhead STP loading (roughly 100 lbs/day) is assumed to be "imported" sanitary waste TN loads to surface waters, mainly from commercial and institutional activity served by the facility (SCDHS, 1999). The discharges from the Sag Harbor and Shelter Island Heights STPs are much less than 1% of the total nitrogen loadings in the eastern estuary (SCDHS, 1999).
Major sewage treatment plant upgrades at Riverhead and Sag Harbor are being funded, in large part, by New York State. The upgrades at the Riverhead STP include building a 1.4 million gallons per day advanced wastewater treatment facility utilizing Sequencing Batch Reactor technology, including ultraviolet light disinfection. The Village of Sag Harbor has received NYS Bond Act funding to upgrade their STP to a denitrification system.

SCDHS Routine Point Source Monitoring: The SCDHS Office of Ecology monitors ten routine point source influenced locations including sites in the Peconic River, Meetinghouse Creek, Crescent Duck Farm, Fish Cove and the local sewage treatment plants on a monthly basis. To minimize the effects from the adjacent saltwater portion of Meetinghouse Creek, the two Corwin Duck Farm sites are sampled as close as possible to low tide.

New York State Pollutant Discharge Elimination System (SPDES) Program: The SPDES program is administered by the New York State Department of Environmental Conservation. Permits are written to ensure that point source discharges do not cause or contribute to the violation of ambient water quality standards. There are eight permitted surface water dischargers in the Peconic Estuary System: Brookhaven National Lab, Navy Weapons Industrial Reserve Plant at Calverton, Riverhead Foundation Aquarium, Bayview Ventures, the Plum Island Animal Disease Center and the sewage treatment plants at Riverhead, Sag Harbor, and Shelter Island Heights. Each facility is required to monitor their effluents for a suite of parameters and report to the NYSDEC. The NYSDEC is responsible for reviewing the data and enforcing the permit.

Costs
Base Programs: Funding for the SCDHS Routine Point Source Monitoring Program in the Peconic Estuary was calculated along with the SCDHS Surface Water Quality Monitoring Program. Information on costs for the Suffolk County Department of Health Services Surface Water Quality Monitoring Program is included under Brown Tide Issues in this document.

Land Use Monitoring
Note: This monitoring program element does not include direct environmental measurements.

Program Objective
To track the short-term and long-term trends in land uses in the Peconic watershed.

Monitoring Hypothesis
The total amount of protected open space in the Peconic Estuary Program Study Area is increasing due to acquisition programs and other land protection measures.

CCMP Measurable Goals
Continue and expand open space acquisition programs; Ensure that there is no substantial net increase in nitrogen loading to areas east of Flanders Bay and reductions in the Peconic River/Flanders Bay region so that an increase in new development would be offset by reductions in loads from pre-existing uses. The nitrogen work groups will develop means of attaining this goal which may include groundwater performance standards, implementing fertilizer and clearing restrictions, and zoning.

Lead Entity
Suffolk County Department of Planning.

Program Status
Land use monitoring for the study areas is part of an existing program of the Suffolk County Department of Planning that was initiated with the Peconic Estuary Program.

Monitoring Extent and Frequency
Land uses (and other related information such as zoning and ownership) at a tax map scale have been determined for the entire Peconic Estuary Program Study, including both upland areas and underwater lands. The SCPD will be developing a strategy for updating the GIS land use and zoning databases.

Program Description
Land protection programs and other regulatory and non-regulatory land planning efforts are critical to nitrogen management. Forty percent of the Peconic watershed was available for development in 1995 (SCPD, 1997). If open space programs were not implemented and all 40% were developed at low density residential land uses, the current nitrogen loads to the western estuary, South Fork, and Shelter Island would more than double, as compared with existing conditions (SCDHS, 1999).

Suffolk County Planning Department (SCPD) Land Use Monitoring: The SCPD established an accurate Geographic Information System (GIS) database for existing land uses at a tax map scale for the Towns of Riverhead, Southold, Shelter Island, Southampton, East Hampton, and the Peconic River corridor in the Town of Brookhaven (SCPD, 1997). The SCPD also has a verified GIS database for existing zoning in this same region. With these databases, the Department is able to quantify the land use acreage by general categories, by jurisdiction and by watershed zone. The thirteen general categories of land use include low density residential, medium density residential, high density residential, commercial, industrial, recreation and open space, and vacant, among others. As a follow-up to the report *Peconic Estuary Program Existing Land Use Inventory* (SCPD, 1997) detailing the existing land uses in eastern Suffolk County in 1995, the SCPD is in the final stages of preparing the report *1999 Existing Land Use Inventory - Eastern Suffolk County*.

The SCPD will develop a strategy for updating the GIS land use and zoning databases, to be included in the first post-CCMP report. The update and maintenance of the GIS databases will require coordination of activities among the Suffolk County Planning Department, Suffolk County Real Property Tax Service Agency (SCRPTSA), town tax assessors and town planners. Current land uses will be compared to the PEP Existing Land Use Inventory (SCPD, 1997) to determine the rate of converting vacant or agriculture land to developed uses. Methods may include tax assessor codes, aerial photographs, building permits, and site inspections.

Other Programs: Several other programs will be addressed in the annual post-CCMP report including open space and farmland preservation, Harbor Protection Overlay Districts (HPODs)/local ordinances, and clearing restrictions.

Costs
Base Programs: Land use monitoring will be funded through base programs.

Habitat and Living Resource Issues

Eelgrass Monitoring

Program Objective
To monitor the abundance and quality of eelgrass beds in the estuary.

Monitoring Hypothesis
Eelgrass bed abundance (and aerial coverage) is increasing and health (as measured by density, growth, epiphyte coverage, and other ecological measurements) is improving in the Peconic Estuary due to the implementation of point and nonpoint source controls and management practices.

CCMP Measurable Goals
Maintain current eelgrass acreage (2,100 acres in main stem of the estuary); Increase eelgrass acreage by 10% over 10 years.

Lead Entity
Cornell Cooperative Extension of Suffolk County

Program Status
The Submerged Aquatic Vegetation Long Term Monitoring Project is an existing program. Aerial photo analyses of eelgrass coverage estuary-wide was performed in 2000. It is recommended that aerial photo analyses of eelgrass coverage be repeated periodically, at an interval to be determined

Monitoring Extent and Frequency
The Submerged Aquatic Vegetation Long Term Monitoring Project involves intensive investigations at a limited number of sites (presently six) in the estuary. Aerial photo analyses of eelgrass coverage estuary-wide was performed in 2000. It is recommended that aerial photo analyses of eelgrass coverage be repeated periodically, at an interval to be determined (perhaps every three years).

Program Description
Submerged Aquatic Vegetation Long Term Monitoring Project: In 1997, Cornell Cooperative Extension's Marine Program began SAV monitoring at three sites in the Peconic Estuary: Orient Harbor, Town of Southold; Northwest Harbor, Town of East Hampton; and Bullhead Bay, Town of Southampton. A minimum of three stations was sampled per site for SAV, sediment analysis, and water quality analysis. SAV measurements include: species composition, dry weight biomass of algae and eelgrass, depth and position of deep edge of eelgrass bed, shoot density, presence and dry weight biomass of epiphytes, and presence of wasting disease. Each site was sampled twice a year. Cornell Cooperative Extension uses water quality data from the SCDHS surface water quality monitoring program. These data consist of the following parameters: chlorophyll-a, total suspended solids, dissolved inorganic nitrogen, dissolved inorganic phosphorus, and light attenuation (for further information see: Nutrients monitoring section). In addition, water temperature, salinity, and light measurements at the surface and at one meter increments are taken at the time of SAV sampling. Sediment measurements include grain size and percent organic matter.

In response to external scientific peer-review, the monitoring program was revised (1998 sampling) as follows: SAV sampling was performed annually during the summer, the number of samples collected per site was increased to 12, and sediment sampling will be repeated every five years for each site. In 1999, Cornell Cooperative Extension expanded its monitoring program to include three additional sites in Gardiners Bay, Town of Shelter Island; Three Mile Harbor, Town of East Hampton; and Southold Bay, Town of Southold. Furthermore, underwater video of each site was also taken in 1998 and 1999. In 2000, the sampling plan was further refined to

improve statistical replication and reduce any potential impacts of the sampling methods to the extant eelgrass beds. Within each of the six monitoring sites, six stations were sampled. At each station, eelgrass stem density counts were performed for six quadrats. Plants sampled from an additional four quadrats were cut to determine eelgrass shoot and algal biomass, epiphytes, wasting disease, and stem density. This sampling protocol results in a total of 60 samples of eelgrass stem density, and 24 samples of shoot and algal biomass per monitoring site. Furthermore, the eelgrass roots are left intact to allow for regrowth. Aerial photo analyses of the eelgrass coverage estuary-wide are being performed in 2000 in cooperation with the US Fish and Wildlife Service. Aerial photos will provide a more extensive view of existing eelgrass beds and provide estimates of percent cover.

See Dumais and Smith (1997) for further details on the data analysis and quality control and quality assurance of this project.

Costs

Base Program: The Submerged Aquatic Vegetation Long Term Monitoring Project is funded at approximately $71,000 per year. Approximately $50,000 was provided from EPA Post-CCMP funds awarded to SCDHS. The remainder is provided by in-kind matching funds from Cornell Cooperative Extension.
New Costs: External funding for future annual sampling has been estimated at approximately $30,000. A source of funding to carry out this work has not yet been identified.

Finfish and Macroinvertebrate Monitoring

Program Objective

To determine the temporal and spatial distribution, abundance, and different life stage habitat requirements of finfish and macroinvertebrate species throughout the Peconic Estuary.

Monitoring Hypothesis

Finfish and macroinvertebrate abundance, diversity, distribution and health are improving due to the implementation of harvesting regulations and habitat protection.

CCMP Measurable Goals

Identify the important and sensitive recruitment and spawning areas of targeted finfish and macroinvertebrates; Increase the abundance of finfish species through protection of their habitats, food sources and restoration of degraded spawning and recruitment areas.

Lead Entity

New York State Department of Environmental Conservation

Program Status

Existing Program west of Shelter Island; recommended expansion of program to areas east of Shelter Island.

Monitoring Extent and Frequency

NYSDEC has run an annual monitoring survey of juvenile finfish west of Shelter Island since 1987. Sampling is performed on a block grid design superimposed over the Peconic Estuary (77 sampling blocks). Sixteen stations are randomly selected each week and sampled with an otter trawl during daylight hours.

Program Description

The CCMP recommends monitoring of finfish and macroinvertebrate species through: (1) habitat utilization mapping (subtidal habitats including SAV beds), (2) seine surveys, and (3) trawl surveys to develop a species occurrence list throughout their life cycle and identify sensitive recruitment and spawning areas.

NYSDEC Juvenile Finfish Survey: While there are currently no monitoring efforts in the Peconics for the adult finfish, the NYSDEC runs an annual monitoring survey of juvenile finfish west of Shelter Island since 1987. Sampling is performed on a block grid design superimposed over the Peconic Estuary (77 sampling blocks). Sixteen stations are randomly selected each week and sampled with an otter trawl during daylight hours. The original intent of the surveys was to develop an annual index of recruitment of juvenile weakfish and examine the relationship between parental stock size and environmental factors (water temperature, salinity, dissolved oxygen and secchi disc) on year class strength for weakfish (*Cynoscion regalis*). Data collection was later expanded to derive similar information on several other finfish species including winter flounder (*Pleuronectes americanus*), scup (*Stenotomus chrysops*), bluefish (*Pomatomus saltatrix*), tautog (*Tautoga onitis*), butterfish (*Peprilus triacanthus*), and northern puffer (*Sphoeroides maculatus)*. The surveys also provide important data on more than 70 other species of finfish and crustacea. In the 1998 report, "Species Composition, Seasonal Occurrence and Relative Abundance of Finfish and Macroinvertebrates Taken by Small-Mesh Otter Trawl in Peconic Bay, New York" (Weber *et al.*), nine years of data are compiled and evaluated.

While the NYSDEC's survey is extensive, it should be expanded to the east of Shelter Island. This information is essential to better understand the significance of the Peconics to important finfish and invertebrate species. Additional efforts should focus on resident species such as winter flounder, tautog, as well as transient species such as alewife (*Alosa pseudoharengus*), weakfish, scup, windowpane flounder (*Scopthalmus aquosus*), summer flounder (*Paralichthys dentatus*), northern puffer, butterfish, etc. Data on invertebrate species vulnerable to these gear types such as squid, horseshoe crabs, lady, blue, and green crabs, mantis shrimp, whelk, etc. should also be reported. For information on the trend analyses and QA/QC, see Weber et al. (1998). Ideally, trawl data should be entered into a geographic information system (GIS) to analyze spatial aspects of the data and to enable comparisons with habitat maps. Multivariate statistical analyses linking water quality and finfish data should also be performed.

Benthic Macroinvertabrate Survey: A program should be established to regularly conduct surveys of benthic macroinvertebrates (abundance, distribution, and diversity) in the Peconic Estuary.

Costs

Base Program: The NYSDEC Peconic Bay Trawl Survey is annually funded by the Wallop-Breaux Sport Fish Restoration Program.
New Costs: Analysis and GIS mapping of the Peconic Bay Trawl Survey data would require an additional $45,000 annually. Expansion of the trawl survey East of Shelter Island has been estimated at approximately $500,000 and an additional $100,000 would be needed annually for staff. Costs for annual benthic macroinvertebrate sampling have not been determined.

Wetlands Monitoring

Program Objective

To monitor the abundance, distribution, diversity and quality of fresh and salt water wetlands in the Peconic Estuary.

Monitoring Hypothesis

Wetlands in the Peconic Estuary are increasing in abundance and distribution in response to the implementation of management and restoration programs.

CCMP Measurable Goals

Maintain and increase current tidal and freshwater marsh acreage; Restore degraded tidal and freshwater wetlands (e.g. restricted flow, *Phragmites australis* dominated, shoreline-hardened); particularly those identified in the Habitat Restoration Workgroup Plan over 10 years; Restore 10-15% of the mosquito-ditched saltwater marshes through Open Marsh Water Management (OMWM) over the next 10 years, and maintain a policy of no new ditching.

Lead Entity

New York State Department of Environmental Conservation, with the U.S. Fish and Wildlife Service.

Program Status

NYSDEC and USFWS mapping efforts (described below) were completed as part of existing program. An expansion of the existing program is necessary for additional work to be completed (also described below). Future surveys and trend analysis is recommended.

Monitoring Extent and Frequency

The NYSDEC has performed GIS mapping of saltwater wetlands in the Peconic Estuary east of Shelter Island only (includes spatial distribution, acreage, and marsh types). Funding is needed to complete the survey west of Shelter Island and routinely track the trends of wetland coverage approximately every 5 years. The U.S. Fish and Wildlife Service surveyed wetlands in the entire Peconic Estuary watershed as part of the National Wetlands Inventory in 1997.

Program Description

USFWS National Wetlands Inventory: In 1997, the United States Fish and Wildlife Service surveyed wetlands in the Peconic Estuary watershed as part of the National Wetlands Inventory. The data were GIS mapped and are useful for tracking wetland trends over time. See the USFWS (1998) report by Tiner for details on trend analyses and data QA/QC.

NYSDEC Wetlands Inventory: The NYSDEC has also performed GIS mapping of saltwater wetlands in the Peconic Estuary East of Shelter Island only (includes spatial distribution, acreage, and marsh types). The NYSDEC performs such GIS mapping through a combination of aerial photo surveys and ground truthing. Funding is needed to complete the survey west of Shelter Island and routinely track the trends of wetland coverage approximately every 5 years. This is particularly important in light of the increasing rate of developmental pressure and sea-level rise. A program to assess wetland quality and map sensitive areas at risk should be established.

Costs

New Costs: At this time, no new or additional funding has been identified to finalize the NYSDEC mapping of saltwater wetlands west of Shelter Island. Finer-scale survey saltwater wetland analysis and mapping west of Shelter Island is estimated at $500,000. Routine trend analysis would require an additional $50,000 annually. Marsh restorations have been funded through a variety of funding sources including: NYS Bond Act, USFWS, Towns and the private sector. Costs of establishing a program to assess wetland quality and mapping sensitive areas at risk have not been developed.

Shoreline Hardening Monitoring

Program Objective
To quantify estuarine-wide shoreline hardening, characterize changes to the coastlines (erosion, deposition), assess impacts to habitat and living resources, and develop "environmentally friendly" systems to assist in implementing a CCMP priority of "no net increase" in shoreline hardening throughout the estuary.

Monitoring Hypothesis
The rate of loss of natural shoreline in the Peconic Estuary is slowing in response to the implementation of PEP policies and education and outreach efforts.

CCMP Measurable Goals
Maintain current linear feet of natural shoreline and over the next 15 years reduce shoreline hardening structures by 5%; Maintain and increase current tidal and freshwater marsh acreage, and promote new growth through the removal of existing shoreline hardening structures.

Lead Entity
New York State Department of Environmental Conservation, in concert with the Peconic BayKeeper, the U.S. Fish and Wildlife Service and Cornell Cooperative Extension of Suffolk County.

Program Status
A one time monitoring survey of shoreline hardening structures (including aerial and ground truthing surveys) was completed in 2000 through the Peconic Estuary Program. Future surveys and trend analysis of shoreline hardening structures is recommended

Monitoring Extent and Frequency
The entire Peconic Estuary Shoreline was monitored in this one time survey in 2000.

Program Description
Quantitative mapping is an important first step and will be carried out through aerial photo interpretation by the US Fish and Wildlife Service under contract to the PEP during the year 2000. The Peconic BayKeeper, Cornell Cooperative Extension and the NYSDEC PEP Program Coordinator will assist in ground truthing. Once the baseline information is established (e.g. percent coverage of hardened shoreline, types of structures, etc.), trend analysis of percent shoreline hardened will be tracked by future aerial and ground truthing surveys through GIS mapping and analysis. An assessment of detrimental effects of hardened shoreline and docks on the estuary is also needed to fully understand impacts on habitat and natural resources. The analysis will also include a characterization of all shoreline hardening found in the Peconics and an investigation of "environmentally friendly" systems. Future funding for additional surveys and trend analysis of shoreline hardening structures is recommended, but not yet appropriated.

Costs
Base Program: This monitoring is funded in part by the PEP Natural Resources Subcommittee funds at $19,000 and Suffolk County Capital Budget Funds ($49,000). New Costs: Biennial trend analysis using GIS mapping is estimated at $70,000.

Piping Plovers, Shorebirds, Raptors and Other Birds

Program Objective
To determine piping plover habitat use, availability, and prey abundance in the Peconic Estuary and to assess affects of habitat changes to make recommendations to enhance plover breeding and productivity. To ensure that shorebirds, raptors and other birds and their habitats are monitored for productivity.

Monitoring Hypothesis
The abundance and distribution of shorebirds, raptors, waterfowl and other birds in the estuary is increasing due to improvements in habitat quantity and quality, food abundance, and controls on predators.

CCMP Measurable Goals
Increase the number of piping plover pairs to 115 with productivity at 1.5 (over a 3-year average), distributed across the nesting sites in the Peconic Estuary; Maintain current linear feet of natural shoreline and over the next 15 years reduce shoreline hardening structures by 5% to increase habitats for shorebirds.

Lead Entity
The NYSDEC in cooperation with The Nature Conservancy, and the U.S. Fish and Wildlife Service.

Program Status
Existing program for monitoring piping plovers and least terns in the Peconic Estuary Program Study Area. Recommended expansion of existing program for other birds and for enhancing habitat to improve shorebird productivity.

Monitoring Extent and Frequency
Piping plover and osprey surveys in the Peconic Estuary Program Study Area are funded annually by NYSDEC and The Nature Conservancy. Waterfowl surveys in the Peconic Estuary Program Study Area are also conducted by U.S. Fish and Wildlife Service

Program Description
Endangered Species Program: The NYSDEC in cooperation with the The Nature Conservancy monitor for piping plovers and least terns in the Peconic Estuary through the Endangered Species Program. Initial review of piping plover productivity data indicates that populations are down at a number of Peconic Estuary sites. The reasons are unclear, as there are multiple factors that can play a role in breeding success and overall productivity. Throughout Long Island, there is an interest in "enhancing" habitat to improve shorebird productivity. Therefore, baseline data on prey abundance and shorebirds' microhabitat (i.e., intertidal zone -- sand and cobble patches, wrack, areas where there is sparse vegetation, beach berm, and moist swales) preferences is important information, particularly in the Peconic Estuary, which consists of habitats that do not readily fit typical habitat descriptions found in the literature.

Furthermore, it is recommended that a comprehensive monitoring plan be developed for the Peconic Estuary that ties together other monitoring programs (e.g. ospreys, terns waterfowl) and recommendations for improved comprehensive monitoring in this region be developed.

Costs
Base Program: Piping plover and osprey surveys are funded annually by NYSDEC and The Nature Conservancy. Waterfowl surveys are also conducted by USFWS.

New Costs: Costs for developing and implementing the comprehensive monitoring plan for ospreys, terns and waterfowl have not yet been developed.

Dredging

Note: This monitoring program element does not include direct environmental measurements.

Program Objective

To track the volumes and locations of dredging in the Peconics and reduce impacts to critical marine habitats.

Monitoring Hypothesis

The total amount of dredging for navigational purposes in the Peconic Estuary is decreasing due to the implementation of sediment control practices and stormwater management.

CCMP Measurable Goal

Develop recommendations and guidelines to reduce impacts to marine life from dredging-related activities.

Lead Entity

(proposed) New York State Department of Environmental Conservation, in coordination with the PEP Program Office and the Suffolk County Department of Public Works.

Program Status

Proposed new program.

Monitoring Extent and Frequency

Proposal is to develop a tracking system of all dredge-related activities (public and private) that occur annually within the Peconic Estuary Program Study Area.

Program Description

While there are no tracking programs yet established to evaluate the locations and volumes of annual dredging within the Peconic Estuary (i.e., public and private), the NYSDEC maintains a permitting system that records all dredging activities in NY marine waters. Coordination between the PEP and NYSDEC Environmental Permitting should be established so as to. Additionally, Suffolk County Department of Public Works maintains records of navigational maintenance dredging that they perform in the estuary and therefore, should also be included in the coordination efforts.

Costs

New Costs: A funding source for this monitoring has not been identified yet. Initial project cost is estimated at $30,000 (contractor fee) with a biennial maintenance cost estimated at $15,000.

Restoration Monitoring

Note: Portions of this monitoring program element does not include direct environmental measurements.

Program Objective

To track and assess the success of habitat restoration projects in the Peconic Estuary.

Monitoring Hypotheses

The extent and distribution of habitat restoration sites in the Peconic Estuary study area is increasing due to the implementation of the Peconic Estuary Program's "Habitat Restoration Plan for the Peconic Estuary" (Dec. 2000) and the availability/allocation of funding to carry out specific projects.

Habitat restoration efforts in the Peconic Estuary study area are successful, as measured by success criteria and monitoring protocols. The ecological function of restored habitats are equivalent to similar natural areas or reference sites, specific to a habitat type.

CCMP Measurable Goals

Annually initiate 5% of the projects identified in the Habitat Restoration Workgroup Plan for the Peconic Estuary and identify reference wetlands for comparative purposes such as functionality; Restore degraded tidal and freshwater wetlands (e.g., restricted flow, *Phragmites australis* dominated, shoreline-hardened); particularly those identified in the Habitat Restoration Workgroup Plan over 10 years; Restore 10-20% mosquito-ditched saltwater marshes through Open Marsh Water Management (OMWM) over the next 10 years, and maintain a policy of no new ditching.

Lead Entity

(proposed) Peconic Estuary Program Habitat Restoration Workgroup, in concert with the New York State Department of State and Cornell Cooperative Extension of Suffolk County, sponsors of individual habitat restoration projects.

Program Status

Proposed new program(s).

Monitoring Extent and Frequency

Proposal is to develop a tracking system of all habitat restoration activities (public and private) that occur annually within the Peconic Estuary Program Study Area, including both short and long-term monitoring evaluations, and monitoring before, during, and after restoration as needed to evaluate success of restoration efforts. Individual restoration projects would also be assessed according to success criteria and monitoring protocols.

Program Description

The CCMP recommends evaluating the success of restoration efforts. While restoration efforts can be successful in reaching their goals, there have also been examples in the Peconics of restoration efforts that have not resulted in actual long-term recovery of the targeted habitat. Therefore, it is essential to quantitatively assess and monitor restoration projects in order to take steps, if necessary, to correct any problems. A number of restoration projects are now underway as a result of available funding from the NYS Clean Air Clean Water Bond Act. More restoration projects are expected to be funded in the future. It is critical for restoration projects to build in the capacity to monitor sites upon completion of restoration. Restoration assessment needs to be linked to the reference sites in order to make quantitative comparisons of functionality. As part of assessment, monitoring before, during, and after restoration is also needed to evaluate success of restoration efforts. It is strongly recommended that the Habitat Restoration Workgroup's Plan for the different types of restoration projects in the Peconic Estuary be followed as an initial guideline. The development of a tracking database for each restoration project should also be developed for both short and long-term monitoring evaluations.

Costs
New Costs: A funding source for this monitoring has not been identified yet. An estimated cost of $35,000 is required to initiate such monitoring and an additional $15,000 is necessary for database maintenance on an annual basis. Appropriate monitoring associated with individual restoration projects should be included in the cost of the effort; costs will vary according to habitat type, scale, and location of the project.

Bay Scallops

Program Objective
To monitor the quantity and quality of bay scallops in the estuary and evaluate the success of enhancement efforts. To perform a distribution-focused study of the survival dynamics of juvenile bay scallops including and examination of settlement, recruitment, and size frequency and year class-abundance of bay scallops located inside and outside of eelgrass beds.

Monitoring Hypothesis
Bay scallop abundance and distributions are related to water quality, predator abundance and habitat quantity and quality in the estuary, as well as to commercial and recreational harvests.

CCMP Measurable Goal
Enhance the shellfish resources available to harvesting through reseeding, creation of spawning sanctuaries and habitat enhancements.

Lead Entity
(proposed) New York State Department of Environmental Conservation, in coordination with the PEP Program Office, the National Marine Fisheries Service and Cornell Cooperative Extension of Suffolk County.

Program Status
Proposed new program.

Monitoring Extent and Frequency
Proposal is to annually monitor the quality and quantity of bay scallops an evaluate the success of enhancement efforts in the Peconic Estuary Program.

Program Description
A program should be established that tracks the annual recruitment success and survival dynamics of bay scallops. Anecdotal information indicates that adult bay scallops were once abundant enough that they were found outside of eelgrass beds in deeper waters where they were harvested by dredging. Today, bay scallops are harvested almost entirely in eelgrass beds because they are not as abundant and are no longer found in deeper waters. Given the huge fluctuations that have occurred in bay scallop populations as a result of Brown Tide, it is important to perform a distribution-focused study of the survival dynamics of bay scallops and to monitor for changes in abundance and distribution and evaluate the effectiveness of reseeding efforts.

NMFS Commercial Landings Program: The National Marine Fisheries Service (NMFS) is in charge of coordinating the yearly landings and economic data on bay scallops caught in the Peconic Estuary and they have well established QA/QC and statistical procedures.

Costs
Base Program: NMFS provides funding for landings and economic data annually.

New Costs: A funding source for the recruitment and survival monitoring has not been identified yet. It is estimated that a full evaluation and tracking of the parameters of interest would cost $200,000 over three years.

Aquaculture and Transplanting Activities

Program Objective
To monitor the locations and extent of aquaculture and transplanting activities in the Peconic Estuary to minimize potential impacts to critical habitats and conflicts with other uses.

Monitoring Hypotheses
Aquaculture activities have no short or long-term impacts on the water quality in the Peconic Estuary.

Transport activities have no impact on natural populations of shellfish species in non-bed areas.

CCMP Measurable Goal
Ensure that the existing and future aquaculture (shellfish & finfish) and transplanting activities are situated in ecologically low-productive areas of the estuary, and that they are mutually beneficial to the aquaculture industry, natural resources and water quality.

Lead Entity
(proposed) New York State Department of Environmental Conservation, in coordination with the PEP Program Office, the Suffolk County Department of Planning and Cornell Cooperative Extension of Suffolk County.

Program Status
Proposed new program.

Monitoring Extent and Frequency
Proposal is to annually monitor the locations and extent of aquaculture and transplanting activities in the Peconic Estuary.

Program Description
There are no coordinated monitoring programs for either aquaculture (shellfish/finfish) or transplanting activities in the Peconics. The NYSDEC issues permits for aquaculture and transplanting activities and therefore, can better monitor the types, scale and locations of these activities in the estuary annually through GIS mapping. Long-term monitoring should be established to best situate culturing and transplanting activities that are mutually beneficial to the estuary and the aquaculturists. This coordination should also include the Suffolk County Planning Department, as Suffolk County is ultimately responsible for the development of an aquaculture plan for the Peconic Estuary.

Costs
Base Program: The NYSDEC annually funds the permitting of aquaculture and transplanting activities.
New Costs: The initial cost to develop a GIS map is estimated at $10,000. Annual maintenance cost of the GIS map is estimated at $5,000. Mapping and ground-truthing of the entire estuary bottom is estimated to cost $700,000.

Pathogen Issues

Coliforms Monitoring

Program Objective
To monitor and evaluate water quality in designated New York State Shellfish Growing Areas throughout the Peconic Estuary. Monitoring is necessary to properly classify growing areas for the safe harvest of shellfish to protect the public health.

Monitoring Hypotheses
The total acreage of open shellfish beds in the Peconic Estuary is increasing in response to improved water quality resulting from the implementation of nonpoint source controls and management practices.

The number of beach closures is decreasing due to the implementation of nonpoint source controls and management practices.

CCMP Measurable Goals
Maintain current acreage of areas available to shellfish harvesting, with the ultimate aim of re-opening lands currently closed to harvesting; Maintain and improve water quality of the estuary through a reduction of overall stormwater runoff, particularly key areas identified through the Regional Stormwater Runoff Study.

Attain a zero discharge of stormwater runoff in new subdivisions.

Lead Entity
New York State Department of Environmental Conservation (lead for the Shellfish Land Certification Program) and the Suffolk County Department of Heath Services (lead for the bathing beaches and swimming pools program).

Program Status
The New York State Department of Environmental Conservation Shellfish Land Certification Program and the Suffolk County Department of Heath Services' Bathing Beaches and Swimming Pools Program Surface Water Quality Monitoring Programs are existing efforts.

Monitoring Extent and Frequency
Monitoring takes place on a regular basis in the thirty shellfish growing areas under the Shellfish Land Certification Program (a minimum of six times per year at each sampling station). Suffolk County Department of Health Services (SCDHS) Bureau of Marine Resources routinely monitors for pathogen indicators at public beaches, and includes coliform sampling in the routine monitoring program estuary wide (32 stations) and year round (biweekly).

Program Description
New York State Shellfish Land Certification Program: The New York State Shellfish Land Certification Unit classifies all shellfish growing areas in the New York State Marine District. New York State defines shellfish as oysters, scallops, mussels and clams. There are seventy-five individual shellfish growing areas in New York State. Approximately thirty growing areas are located within the Peconic Estuary. The Shellfish Land Certification Unit classifies all shellfish growing areas using the guidelines established in the National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish. These guidelines require the establishment of water sampling stations to effectively evaluate all pollution sources that may affect a growing area.

New York State uses the NSSP Systematic Random Sampling (SRS) Method of water sample collection and the Total Coliform Standard to evaluate shellfish growing areas. SRS requires that water sample collection be

scheduled sufficiently far enough in advance to support random collection with respect to environmental conditions. Samples are collected under wet and dry weather conditions in warm and cold weather months. Surface and bottom temperature and salinity measurements are also collected at selected stations in each growing area in the Peconics. SRS samples are collected a minimum of six times per year at each station. Following the collection of thirty SRS water samples the area is evaluated to determine proper classification for shellfish harvesting based on the NSSP total coliform criteria for certified shellfish growing areas. It is imperative that all growing areas be properly classified for shellfish harvesting for the protection of public health.

SCDHS Bathing Beaches and Swimming Pools Program: In order to protect beach goers from the human health risks associated with pathogens, the Suffolk County Department of Health Services (SCDHS) Bureau of Marine Resources routinely monitors for pathogen indicators at public beaches. When water quality parameters fail to meet the established human health criteria, beaches are closed. In addition, the SCDHS generally recommends the closure of bay beaches for two tidal cycles after large rainfall events.

SCDHS Surface Water Quality Monitoring: The SCDHS Bureau of Marine Resources includes coliform bacteria counts in their suite of monitoring parameters for their sampling sites in the Peconic Estuary. Refer to the SCDHS Surface Water Quality Monitoring Section in the Nutrients Monitoring Workplan for more information about SCDHS' Program.

Costs

Base Program: The shellfish land certification monitoring is funded annually by the NYSDEC. The SCDHS Bathing Beaches and Swimming Pools Program is funded annually by SCDHS. The SCDHS Surface Water Quality Monitoring Program is funded in part by PEP Post-CCMP EPA funds and in-kind match from Suffolk County (see discussion under Brown Tide Issues in this document).

***Pfiesteria piscicida* and *Alexandrium tamarense* Monitoring**

Program Objective

To monitor for the presence of harmful algal blooms and ensure public health and safety. Harmful algal blooms may be due to poor water quality conditions in combination with meteorological events and other factors.

Monitoring Hypothesis

Pfiesteria piscicida and *Alexandrium tamarense* are not present in concentrations that are toxic or threaten public health and safety, due to improving water quality conditions in the Peconic Estuary.

CCMP Measurable Goal

Prevent the human ingestion and exposure to marine organisms that are affected by harmful algal blooms through routine monitoring.

Lead Entity

New York State Department of Environmental Conservation, in cooperation with the Suffolk County Department of Health Services for *Pfiesteria piscicida*; Suffolk County Department of Health Services for *Alexandrium tamarense*.

Program Status

The existing program of *Pfiesteria piscicida* sampling was conducted in 1999-2000; it is recommended this program be expanded to be conducted annually. Sampling for *Alexandrium tamarense* has been performed periodically; it is recommended this program be expanded to be conducted annually

Monitoring Extent and Frequency

A comprehensive characterization survey for *Pfiesteria piscicida* in the Peconic Estuary was conducted in 1999-2000. The Suffolk County Department of Health Services is currently estimating the concentration of *Alexandrium* at seven sites in the Peconic Estuary.

Program Description

Pfiesteria: The unusual dinoflagellate, *Pfiesteria piscicida*, has been implicated in major fish kills in the brackish coastal waters of North Carolina and several areas within the Chesapeake Bay. It has also been implicated in human health effects, the severity of which are apparently dependent on the length of contact with the organism, or an airborne toxin released by the organism. *Pfiesteria* normally occurs in non-toxic forms unless triggered to develop into a toxic form; the exact conditions triggering toxin production are poorly understood.

Preliminary studies by SCDHS in 1998 showed the organism to be present at seven of the sixteen sites sampled within Suffolk County and at two of the three sites sampled within the Peconic Estuary. In the summer of 1999, the NYSDEC and the Nassau and Suffolk County Health Departments (SCDHS) and the Town of Hempstead undertook a comprehensive monitoring effort to assess the marine waters of the state for the presence of *Pfiesteria* cells. The *SCDHS Surface Water Quality Monitoring Standard Operating Procedure* (SCDHS, 2000) and the *Quality Assurance Project Plan for the Peconic Estuary Program Surface Water Monitoring Program* (SCDHS, 1994) contain the standard operating procedures and the QA/QC methods for *Pfiesteria* monitoring.

Water samples were tested for *Pfiesteria* along with a suite of other parameters, including dissolved oxygen, water temperature, and salinity. The test, using a molecular probe in the laboratory, detects the presence of *Pfiesteria* but not the toxicity. Water samples are shipped to Dr. Parke Rublee of the University of North Carolina where they are analyzed for *Pfiesteria* using their rigorously established QA/QC standards.

The SCDHS is currently testing for the presence of *Pfiesteria* at fifteen sites, three of which are located in the Peconic Estuary. This project is meant to provide a comprehensive temporal analysis as samples are being collected from each of the fifteen stations on a biweekly basis from April to October 2000. Differential phytoplankton counts and water quality analysis (including tests for nutrient levels) will be conducted in the lab. This monitoring is a cooperative effort with the NYSDEC and is being coordinated with funds from a Federal Program. It is recommended that monitoring for *Pfiesteria piscicida* continue annually.

Alexandrium: Paralytic shellfish poisoning (PSP) red tides caused by the organism *Alexandrium tamarense* have been a problem mainly in the northern New England states. The organism produces a neurotoxin that can be concentrated by shellfish which, when consumed by humans can result in PSP. In a four year monitoring study, from 1986 to 1989, SCDHS found that a spring bloom of *A. tamarense* consistently occurred in Reeves Bay and also noted blooms in Terry's and East Creeks in 1989, the one year in which they were investigated. No other stations in the Peconic Estuary were sampled.

The SCDHS Bureau of Marine Resources is currently estimating the concentration of *Alexandrium* at seven sites in the Peconic Estuary. The investigation entails the placement of mussels (*Mytilis edulis*) at the study sites, and their collection at specified intervals for PSP toxin analysis. The *SCDHS Surface Water Quality Monitoring Standard Operating Procedure* (SCDHS, 2000) and the *Quality Assurance Project Plan for the Peconic Estuary Program Surface Water Monitoring Program* (SCDHS, 1994) contain the standard operating procedures and the QA/QC methods for PSP monitoring.

The present study is limited to the Peconic Estuary. Present plans are to investigate the south shore bays of the County in 2001 and the north shore bays the following year.

Costs

Base Program: The estimated cost for handling and analyzing the water samples for this year's *Pfiesteria* monitoring project is $25,000. The estimated cost for handling and analyzing the samples for this year's *Alexandrium* monitoring project is $35,000. Neither estimate includes the cost of labor and boat maintenance.

New Costs: Additional funding is needed ($25,000 for *Pfiesteria* and $35,000 for *Alexandrium*) to annually continue these projects.

Vessel Waste No Discharge Areas

Program Objective

To determine the amount of vessel waste collected in pump-out facilities as the result of education/outreach programs and the designation/implementation of a vessel waste no discharge area for the Peconic Estuary. The collection of such wastes may improve water quality in poorly flushed areas.

Monitoring Hypothesis

The amount of vessel wastes collected in pump-out facilities will increase, as a result of education/outreach programs and the designation/implementation of a vessel waste no discharge area for the Peconic Estuary.

CCMP Measurable Goal

Eliminate all vessel waste discharges to the estuary upon adoption of the Vessel Waste No Discharge Area.

Lead Entity

(proposed) Peconic BayKeeper, in cooperation with the New York State Department of State, the east end towns, public and private marinas, and the Peconic Estuary Program Office. (Note: This monitoring program element should be coordinated with Coliform Monitoring also contained in this monitoring plan).

Program Status

Proposed new program.

Monitoring Extent and Frequency

Annual monitoring of boat waste collected from pump out facilities estuary-wide.

Program Description

The Peconic Estuary may be designated as a No Vessel Waste Discharge Area by the 2001 boating season. The volume of boat waste collected from pump-out facilities within the Peconic Estuary each year should be monitored with trend analysis. In addition, a comparative study evaluating the effectiveness of Vessel Waste No Discharge Areas at improving water quality should be done. An evaluation of the pertinent parameters to be measured is necessary, and the statistical analyses employed to compare these zones should be fully replicated.

Costs

New Costs: A funding source for this monitoring has not been identified yet. Monitoring of boat waste collected from pump out facilities is estimated at a cost of $5,000 annually.

Toxics Issues

Sediment Monitoring

Program Objective
To monitor the quality of estuarine sediments to determine the levels of specific toxic substances and overall sediment toxicity.

Monitoring Hypotheses
The quality of estuarine sediments is improving; New or emerging pollutants of concern or areas will be detected by monitoring sediments.

CCMP Measurable Goal
Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Lead Entity
U.S. Environmental Protection Agency, in cooperation with the Suffolk County Department of Health Services.

Program Status
Sediment surveys were conducted in 1998, 2000 and 2001, and will be conducted annually hereafter.

Monitoring Extent and Frequency
Up to 30 estuarine locations will be sampled annually. To date, bulk chemistry and overall toxicity data is available on approximately 60 embayments, harbors and tributaries. Sediment quality does not change rapidly. The Peconic Estuary Program is pursuing a program whereby depositional areas are monitored to identify areas of concern for follow up work.

Program Description
Peconic Estuary sediments are now being regularly collected and analyzed for a broad range of contaminants and overall or cumulative toxicity. In the fall of 1994, the PEP contracted with the firm of A.D. Little, Inc. to analyze field collected sediments for toxic contaminants. In all, sediments from 12 sites were analyzed. In 1998, the USEPA Region II conducted a survey that involved the collection and sampling of sediments for chemical contaminants and overall sediment toxicity from 34 sites representative of a range of typical land uses across the estuary (see Figure 8). Toxicity testing is a valuable gauge, in addition to chemical specific analyses, because the results provide an assessment of the overall toxicity resulting from exposure to multiple contaminants. In August 2000, EPA conducted a survey similar to the 1998 survey, again involving the collection and sampling of sediments for chemical contaminants and overall sediment toxicity. Some previously sampled sites were revisited for follow-up work and some new sampling locations were selected (see Figure 9). Additional sites were sampled in 2001 (see Figure 10).

Future monitoring efforts should be used to describe trends in sediment quality (both for individual contaminants and overall toxicity) at previously sampled sites and the sediment quality status at any newly sampled sites. Sediment sampling, collection, analysis, and testing procedures should be consistent with those employed previously by EPA and are described in *Peconic Estuary Tributaries Sediment Toxics Survey Field Sampling Plan/Quality Assurance Project Plan* (USEPA Region II, August 1998) and the *2000 Peconic Estuary Tributaries*

Sediment Toxics Survey - Field Sampling Plan/Quality Assurance Project Plan (USEPA Region II, August 2000). The EPA target analyte list of polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticides, and metals, should also be matched, to the extent possible, but supplemented with any toxic substances of emerging concern, particularly with respect to pesticides.

Costs

Sample collection and analysis for toxic substances and toxicity is relatively expensive. Analysis alone can be several hundreds dollars to over one thousand dollars per sample, particularly if substances such as dioxins or furans are on the target analyte list. Typically more than one sample per location is necessary and QA/QC samples must also be analyzed. Analysis alone for a limited survey can be upwards of $25,000 with additional resources necessary for sample collection. Interpretation of the results must be conducted after the analysis is complete.

To the extent possible, the PEP should seek to undertake annual sediment sampling until all major embayments in the estuary are sampled, and areas of concern are re-sampled. Base programs of the USEPA and the SCDHS can provide sample collection and preparation costs.

New Costs: An estimated $25,000 per year will be necessary over three years to complete sample collection and analysis.

Coastal 2000

Program Objectives

Assess the health or condition of the estuarine waters of the United States and trace changes in that condition through time.

Utilize the approach to identify reference conditions for estuarine waters in the United States.

Utilize existing state monitoring programs as appropriate.

CCMP Measurable Goal

Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Lead Entity

U.S. Environmental Protection Agency, in cooperation with the New York State Department of Environmental Conservation.

Program Status

Program will be conducted in 2000-01.

Monitoring Extent and Frequency

Twelve sites in the Peconic Estuary will be sampled, six in 2000 and the remaining six in 2001.

Program Description

Coastal 2000 is a Federal EPA program to assess the ecological condition of our nation's estuarine resources using EPA's EMAP designs and methodologies. Unlike EMAP, which took on the entire task itself, Coastal 2000 has worked with the coastal states to form partnerships, incorporating the monitoring needs of the individual states into the overall design and providing funding to build up infrastructure for monitoring in the future. Such monitoring

may be ideally suited to Clean Water Act Section 305(b) reporting. The EPA NHEERL laboratory in Narragansett, RI has worked with New York to develop probabilistic monitoring plans, and identified who will take the lead in carrying out the sampling. A number of core indicators will be monitored at each station; however, individual states can add to this list as they desire. The core suite includes water quality parameters, sediment chemistry, sediment toxicity, benthic community composition, fish community composition, fish pathology, and contaminants in fish. Twelve sampling stations were planned for the Peconic Estuary.

Update as of August 2000: The monitoring plan was developed in cooperation with the NYSDEC, the EPA Long Island Sound Program, and the State University at Stonybrook. Karen Chytalo, Chief, Estuary Management Unit of NYSDEC initiated the cooperative agreement. Larry Swanson, Marine Science Research Unit of the Waste Reduction and Management Institute at Stonybrook has taken the lead for monitoring. He will be assisted by county and New York City monitoring staff.

Future Action: The Narragansett staff will meet with the agencies from New York in the early fall of 2000 to discuss how the monitoring went and what improvements or changes need to be made for the monitoring that will be done in 2001.

Costs

Base Program: Current funding levels have allowed for sampling at half the stations in New York in 2000 with the other half planned for monitoring in the summer of 2001. All the cooperative agreements have been awarded and sampling has begun by all entities involved. All analyses will be provided by the Coastal 2000 Program.

Biota (Fish, Shellfish and Crustacean) Monitoring

Program Objective

To monitor the quality of estuarine biota with respect to individual toxic substances, and provide updated information to be used in the establishment of Human Health Advisories.

Monitoring Hypotheses

The quality of estuarine biota is improving; New or emerging pollutants of concern can be detected using biota.

Lead Entity

U.S. Environmental Protection Agency, in cooperation with the New York State Department of Environmental Conservation, the New York State Department of Health and the Suffolk County Department of Health Services.

Program Status

In 1999 EPA conducted a one time survey involving the collection of finfish and shellfish samples for toxic analyses. Any efforts including compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity.

Monitoring Extent and Frequency

Conducted as a one time survey of finfish and shellfish quality. Various species of finfish and shellfish were collected from locations throughout the Peconic Estuary. No further biota sampling is recommended until data analysis, evaluation and data interpretation is completed.

CCMP Measurable Goal
Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Program Description
At present, no entity has established a program whereby Peconic Estuary biota is regularly collected and analyzed for a broad range of contaminants. In 1999, EPA Region II conducted a Peconic Estuary Fish, Shellfish and Crustacean Survey. A primary objective of this survey was to determine whether the toxic compounds identified by the New York State Department of Health as being important for the issuance of human health advisories for the consumption of aquatic species are relevant in edible tissues of selected fish and shellfish, and tissues and hepatopancreas (tomalley) of selected crustacean species in the Peconic Estuary.

Future monitoring efforts should be used to describe trends in biota quality and to identify new or emerging chemicals of concern. Biota sampling, collection, analysis, and testing procedures should be consistent with those employed previously by EPA and described in the *Peconic Estuary Fish, Shellfish and Crustacean Toxics Survey Quality Assurance Project Plan for Field Collection Effort* (USEPA Region II, 1999). The EPA target analyte list of dioxins and furans, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticides, metals, and radionuclides should also be matched, to the extent possible, but supplemented with any toxic substances of emerging concern, particularly with respect to pesticides. Target species in any future efforts should be carefully selected and may focus on bivalves.

Costs
Sample collection and analysis for toxic substances is relatively expensive. Analysis alone can be several hundreds dollars to over one thousand dollars per sample, particularly if substances such as dioxins or furans are on the target analyte list. Typically more than one sample per location is necessary and QA/QC samples must also be analyzed. Analyses alone for EPA's 1999 survey was approximately $100,000 with additional resources necessary for sample collection and preparation. Interpretation of the results must be conducted after the analysis is complete.

No further biota sampling is recommended until analysis is completed for the 1999 EPA samples and data interpretation is completed.

NOAA Mussel Watch Program

Program Objective
The objective of the NOAA Mussel Watch Program is to measure concentrations of a broad suite of trace metals and organic chemicals in the whole soft parts of mussels and oysters.

Monitoring Hypotheses
A nationwide program of monitoring mussels and oysters can address national concerns over the quality of the coastal marine environment and identify chemicals of concern.

CCMP Measurable Goal
Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Lead Entity
U.S. Environmental Protection Agency, using NOAA data

Program Status
The NOAA Mussel Watch Program is an existing program. Compiling, evaluating and interpreting data represents a new program activity.

Monitoring Extent and Frequency
One site in Gardiners Bay is included in this national program, which is sampled annually.

Program Description
The NOAA Mussel Watch Program is part of the NOAA National Status and Trends (NS&T) Program, the purpose of which is to measure concentrations of a broad suite of trace metals and organic chemicals in surface sediments and the whole soft parts of mussels and oysters. At present, one sampling site in Gardiners Bay is included in this national program. See *Chemical Contaminants in Oysters and Mussels* (Tom O'Connor, National Oceanic and Atmospheric Administration (NOAA), 1998 (on-line)) and NOAA's State of the Coast Report (Silver Spring, MD: NOAA. URL: http://state-of-coast.noaa.gov/bulletins/html/ccom_05/ccom.html) for more information.

Costs
Base Program: Sampling and analysis at this site is part of a national program.

Surface Water Monitoring

Program Objective
To monitor the quality of the surface waters with respect to individual toxic substances and overall toxicity.

Monitoring Hypotheses
The quality of surface waters is improving due to the implementation of point and nonpoint source control programs; new or emerging pollutants of concern or areas will be detected by monitoring.

CCMP Measurable Goal
Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Lead Entity
(no lead entity has been identified at present)

Program Status
No existing programs. Various programs, typically of limited duration and scope, have been conducted in the past, investigating tidal creeks and the freshwater Peconic River. Compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity.

Monitoring Extent and Frequency
Various programs, typically of limited duration and scope, have been conducted in the past including sampling of tidal creeks on the North Fork and the freshwater Peconic River. The need and specifications for a new ongoing surface water monitoring program should be investigated/determined, and any effort should be coordinated with other monitoring efforts, particularly groundwater monitoring.

Program Description

At present, no entity has established a program whereby surface water samples are regularly collected and analyzed for a broad range of contaminants and overall or cumulative toxicity. Monitoring for toxics in surface waters has occurred on a limited basis in the Peconic Estuary System. Detailed new investigations have focused on sediments and fish tissues where toxics tend to accumulate. Notably, the pesticide Aldicarb also has been detected in the surface waters of East Creek and other North Fork Creeks. While Aldicarb is no longer in use, its presence is likely due to the drainage of agricultural areas containing residues of Aldicarb. Another emerging concern is MTBE (methyl *tert*-Butyl Ether), an octane booster in gasoline, which has been showing up in surface water samples, including Sag Harbor Creek near Havens Beach (perhaps related to an active recovery operation nearby), the Peconic River, and other surface waters. An ongoing North Fork Creek Study and other programs are described below.

North Fork Creeks Study: The SCDHS Office of Ecology samples sixteen north fork creeks, located from Sawmill Creek to Narrow River, bimonthly with eight locations done each month. Sampling is done during the last of the ebb tide at each station in an attempt to quantify impacts that the stream may have on the estuary. Samples from each site are analyzed for 109 organic solvent and pesticide compounds.

Other Programs: In 1997, New York State and the U.S. Geological Survey began a cooperative effort to monitor pesticides in State waters, including one station in the Peconic River. Samples were analyzed for 47 pesticides, including herbicides, insecticides and their degradation products. The pesticide concentrations measured in this survey probably do not reflect maximum annual concentrations because most of the samples were collected during base flow (low-flow) conditions. While no pesticides with water quality criteria available were identified present in excess of the applicable criteria, two pesticides (atrazine and simazine) were detected in surface water samples (USGS, 1997).

Some trace metals analysis has been performed on Peconic Estuary waters (see *Distribution of Trace Metals and Dissolved Organic Carbon in a Brown Tide Influenced Estuary: The Peconics,* E. Breuer, May 1997). Results for the metals sampled for which New York State has adopted and EPA has approved aquatic life based water column criteria (cadmium, copper, lead, nickel, and silver), while showing evidence of anthropogenic (man-made) inputs, did not exceed the established criteria.

Recommendations for Monitoring: Periodic surface water sampling should continue and special projects supported, particularly investigations on pesticides. Such studies should, to the extent possible, be done in conjunction with sediment surveys and sample collection and analysis procedures should be consistent with those employed by EPA. The EPA target analyte list of polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticides, and metals, should also be matched, to the extent possible, but supplemented with any toxic substances of emerging concern, particularly pesticides. Overall water toxicity testing should also be employed. Toxicity testing is a valuable gauge, in additional to chemical specific analyses, because the results provide an assessment of the overall toxicity resulting from exposure to multiple contaminants. See *Pesticide Concentrations in Surface Waters of New York State in Relation to Land Use - 1997* (U.S. Geological Survey, June 1998) and *Pesticides in Streams in New Jersey and Long Island, New York and Relation to Land Use* (U.S. Geological Survey, May 1999) for additional information.

Costs

Base Program: The North Fork Creeks Study is funded by the Suffolk County Department of Health Services.

Sample collection and analysis for toxic substances and toxicity is relatively expensive. Analysis alone can be several hundreds dollars to over one thousand dollars per sample, particularly if substances such as dioxins or furans are on the target analyte list. Typically, more than one sample per location is necessary and QA/QC samples

must also be analyzed. Analysis alone for a limited survey can be upwards of $50,000 with additional resources necessary for sample collection. Interpretation of the results must be conducted after the analysis is complete.

No new surface water sampling programs for toxics are recommended at the present time.

Groundwater Monitoring

Program Objective
To monitor the quality of groundwater (in the groundwater contributing area of the Peconic Estuary) with respect to individual toxic substances to determine public health and ecological threats.

Monitoring Hypotheses
The quality of groundwater is improving in the Peconic Estuary Program study area in response to the implementation of point and nonpoint source control programs.

Monitoring of groundwater will identify chemicals of concern in the raw water supply (and ultimately chemicals that may be of concern in the estuarine environment). New or emerging pollutants of concern will be detected by monitoring these media.

CCMP Measurable Goal
Improve the quality of the ambient environment (surface waters, groundwater, sediments and biota) where there is evidence that human inputs impair or threaten these resources.

Lead Entity
Suffolk County Department of Health Services, with support from the New York State Department of Environmental Conservation.

Program Status
Numerous studies have been conducted in the past. At present, the SCDHS to is carrying out a three year pesticides in groundwater monitoring program. It is likely that it will be recommended this program be continued annually thereafter.

Monitoring Extent and Frequency
Groundwater is sampled throughout the study area. The Suffolk County Health Department has identified thousands of private wells in the Peconic Estuary Study Area that should be monitored due to the high risk of pesticide contamination.

Program Description
The Suffolk County Department of Health Services Bureau of Groundwater Resources monitors the quality and quantity of the groundwater supply and conducts studies and investigations of the county's hydrology. Suffolk County is completely dependent on its groundwater resource for drinking water supply. The focus of groundwater protection measures has been on contamination caused by humans, from sewage to chemicals such as petroleum, solvents, degreasers, fertilizers, pesticides and herbicides. In eastern Suffolk County, agricultural chemicals are the primary contaminant of concern.

Groundwater discharge provides the base flow for the County's rivers and streams. Relatively small fluctuations in water table elevations can have a significant effect on wetlands, stream flow and lake levels. Stream flow and groundwater underflow to embayments influence the salinity of surface waters and effect the ecology, having impacts on the ability of shellfish and finfish to reproduce. The Bureau of Groundwater Resources is involved with several active groundwater investigations, contaminant studies and at superfund and hazardous waste sites. The Bureau of Groundwater Resources' Pesticide Monitoring Program is especially important, including investigations done in conjunction with the USGS and NYSDEC. There is an ongoing program involving public and private well monitoring. Groundwater impacts from vineyards and golf courses are being specifically evaluated. See *Pesticides and their Metabolites in Wells of Suffolk County, New York 1998* (U.S. Geological Survey, June 1999) and *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (Suffolk County Department of Health Services, June 1999) for more information.

The Suffolk County Health Department has identified thousands of private wells in the Peconic Estuary Study Area that should be monitored due to the high risk of pesticide contamination. Significant funding is needed to monitor for pesticide residues in potentially impacted residential and public water supply wells in the study area.

Costs

Groundwater monitoring is occurring under many specially funded studies and investigations as well as an ongoing program involving public and private well monitoring. The SCDHS has requested that the NYSDEC accelerate funding to test all 6,000 to 7,000 wells at risk in high pesticide use areas under the Pesticide Reporting Law.

The NYSDEC has been funding the SCDHS pesticide groundwater monitoring program for three years at about $100,000 per year. The NYSDEC recently agreed to a three-year one million-dollar contract with the SCDHS to expand the monitoring program, but funding is based on approval of an annual work plan. The SCDHS has requested that the full one million dollars be allocated to expand the monitoring program.

Hazardous Waste Site Monitoring

Program Objective

Perform monitoring as part of remedial investigations and following the implementation of remedies at hazardous waste sites; monitor compliance with clean-up schedules.

Monitoring Hypothesis

Discharges of toxic substances entering the Peconic Estuary Program study area from hazardous waste sites are decreasing in response to clean-ups and remedial actions.

CCMP Measurable Goals

Comply with schedules for conducting site characterizations, remedial actions and post-remedial monitoring at hazardous waste sites; effectively characterize risks and protect human health and the environment at hazardous waste sites; ensure compliance with permit limits for point source discharges.

Lead Entity

U.S. Environmental Protection Agency, New York State Department of Environmental Conservation, and the Suffolk County Department of Health Services.

Program Status

Permittees, property owners, potentially responsible parties, and government agencies are investigating various sites and performing monitoring to document the effectiveness of remedial measures as part of existing programs. Compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity.

Monitoring Extent and Frequency
At numerous sites throughout the study area, site investigations and post-remedial monitoring is taking place according to compliance schedules, workplans and records of decisions.

Program Description
Federal and State hazardous waste laws require monitoring as part of the remedial investigation process and once remedial actions are undertaken. The current program is effective to assess human health and ecological risks at hazardous waste sites.

Costs
Base Programs: Costs are borne by permittees, property owners, potentially responsible parties, or the government. At this time, no new or additional investigations or monitoring is being recommended in the Peconic CCMP, outside of that required by existing authorities. The PEP will monitor compliance with schedules, as described in the Toxics Chapter in the PEP Comprehensive Conservation and Management Plan.

Point Source Monitoring

Program Objective
Perform monitoring of regulated point sources to determine compliance with permit limitations and conditions.

Monitoring Hypothesis
Discharges of toxic substances entering the Peconic Estuary Program study area from point sources are decreasing in response to improved treatment practices and process substitutions.

CCMP Measurable Goals
Comply with schedules for conducting site characterizations, remedial actions and post-remedial monitoring at hazardous waste sites; effectively characterize risks and protect human health and the environment at hazardous waste sites; ensure compliance with permit limits for point source discharges.

Lead Entity
U.S. Environmental Protection Agency, New York State Department of Environmental Conservation, and the Suffolk County Department of Health Services.

Program Status
Permittees perform monitoring of discharges part of existing programs. Compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity.

Monitoring Extent and Frequency
Permittees perform monitoring of discharges at various locations throughout the estuary at a frequency specified in their permits.

Program Description
National Pollutant Discharge Elimination System (NPDES/SPDES) Program: The National and State Pollutant Discharge Elimination System (NPDES/SPDES) Programs establish thresholds on discharges (concentration or mass based) for toxic (and other) pollutants in the form of permit limitations and conditions. Permittees are also required to self-monitor their discharge and demonstrate compliance status with these limits/conditions. This information is reported to regulatory agencies in the form of Discharge Monitoring Reports (DMRs). The NYSDEC also inspects and samples discharges for compliance with permit requirements.

Costs
Base Programs: Sampling and reporting costs are borne by permittees and ongoing compliance programs of regulatory agencies. At this time, no new or additional investigations or monitoring is being recommended in the Peconic CCMP, outside of that required by existing authorities.

Federal Toxics Release Inventory

Program Objective
To monitor major releases of toxics to the environment

Monitoring Hypothesis
Releases of toxic substances to the Peconic Estuary Program study area are decreasing in response to the implementation of best management practices, product substitutions, etc.

CCMP Measurable Goal
Decrease overall emissions of reportable toxics from the five east end towns.

Lead Entity
U.S. Environmental Protection Agency.

Program Status
Reporting is required as a part of an existing program. Compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity

Monitoring Extent and Frequency
A limited number of facilities in the Peconic Estuary watershed report annually under the requirements for the Toxics Release Inventory.

Program Description
Existing Federal program and reporting requirement.

Costs
Base Program: Reporting costs are borne by regulated entities. At this time, no new or additional monitoring is being recommended in the Peconic CCMP, outside of that required by existing authorities.
New Costs: A mechanism needs to be established by the PEP to assemble and interpret the Federal Toxics Release Inventory data for the Peconic Estuary.

Pesticide Use Monitoring

Note: This monitoring program element does not focus on direct environmental measurements.

Program Objective

Measure types and quantities of pesticides used, and unneeded and unwanted pesticides that are collected for proper disposal. Information should also be used to identify priority areas for monitoring based on pesticide usage data.

Monitoring Hypothesis

Pesticide use and proper disposal, including trends in types and quantities, can be measured by various means.

CCMP Measurable Goals

Eliminate to the maximum extent practicable, pesticide applications on turf grass on all publicly held land by 2003; Eliminate holdings of banned, unneeded and unwanted pesticides (and other hazardous substances) by 2005; Decrease overall agricultural/residential/institutional pesticide applications in the five East End towns.

Lead Entity

(proposed) New York State Department of Environmental Conservation and the U.S. Environmental Protection Agency.

Program Status

Reporting is required as a part of an existing program. Compiling, evaluating and interpreting data for the Peconic Estuary Study Area represents a new program activity.

Monitoring Extent and Frequency

Information is available annually for the Peconic Estuary Program Study Area.

Program Description

The existing New York State Pesticide Reporting Law allows information about the amounts and types of pesticides being applied in the State to be obtained by health researchers. Under the Law, certified pesticide applicators are required to report for each pesticide application the name of the product applied, the product's U.S. Environmental Protection Agency (EPA) Federal registration number, the quantity applied, the product's unit of measure, the date of application, the county, street address, municipality and zip code of the application. Commercial permittees who sell pesticides to private applicators at wholesale and retail, must report for each sale the name of the product purchased, its EPA Federal registration number, the quantity sold, the product's unit of measure, the date sold, as well as the county, street address, municipality and zip code of the intended application.

There may be other useful mechanisms for monitoring pesticide use and the safe disposal of unneeded or unwanted pesticides, including surveys of farmers/commercial landscapers/homeowners, point-of-sale surveys, residential use surveys, commercial applicator tallies, collections during "Clean Sweep" programs, or household hazardous waste collection programs and events, or resolutions passed (or equivalent) by state or local government to eliminate or reduce pesticide usage. These other mechanisms must be more fully developed by the Peconic Estuary Program.

Costs

Base Program: Reporting costs under the State Pesticide Reporting Law are borne by regulated entities.
New Costs: The cost and details of the other potential monitoring mechanisms has not been fully developed at this point by the Peconic Estuary Program. A preliminary estimate for compiling, evaluating and interpreting data is

$25,000 annually.

Two Stroke Marine Engine Inventory

Note: This monitoring program element does not focus on direct environmental measurements.

Program Objective

To monitor the progress of conversion/replacement from 2 stroke to 4 stroke marine engines in the estuary.

Monitoring Hypothesis

Hydrocarbon loadings to the estuary will be reduced as the number of 2 stroke marine engines used in the estuary is reduced.

CCMP Measurable Goal

Reduce the number of 2 stroke marine engines in use in the estuary.

Lead Entity

(proposed) Peconic Estuary Program Office

Program Status

New proposed program

Monitoring Extent and Frequency

Monitoring will be collected annually for the Peconic Estuary Program Study Area

Program Description

Federal requirements require the manufacturers of marine engines to phase in cleaner burning 4 stroke engines. The progress of the conversion from 2 stroke to 4 stroke marine engines takes place in the estuary can be monitored. If the pace of conversion/replacement appears slow, the PEP may establish or recommend incentives to speed the conversion. A potential monitoring mechanism is harbormaster-conducted surveys. The costs or details of the potential monitoring mechanism have not been fully developed at this point by the Peconic Estuary Program.

Costs

New Costs: The costs or details of this potential monitoring mechanism have not been fully developed at this point by the Peconic Estuary Program. A preliminary estimate is $10,000 annually.

Underground Storage Tank Inventory

Note: This monitoring program element does not focus on direct environmental measurements.

Program Objective

To monitor the progress of underground storage tank removal, retirement and replacement.

Monitoring Hypotheses

The threats and occurrences of leaking underground storage tanks are being reduced as the number of tanks exempt from current removal/replacement retirement requirements in use in the estuary's watershed is reduced.

CCMP Measurable Goal

Eliminate underground storage tanks exempt from current replacement requirements.

Lead Entity
(proposed) Peconic Estuary Program Office

Program Status
New proposed program

Monitoring Extent and Frequency
Monitoring will be collected annually for the Peconic Estuary Program watershed.

Program Description
No program is currently in place to establish a baseline on the number of tanks currently in use that are exempt from current removal/replacement/retirement requirements or to track the number of tanks that are removed, retired and replaced. A potential monitoring mechanism is to establish a baseline and then track the number of underground storage tanks that are removed, retired and replaced.

Costs
New Costs: The costs or details of these potential monitoring mechanisms have not been fully developed at this point by the Peconic Estuary Program. Estimate for establishing baseline: $50,000; estimate for updating inventory: $10,000 per year.

Treated Lumber in the Marine Environment Inventory
Note: This monitoring program element does not focus on direct environmental measurements.

Program Objective
To monitor the extent of treated lumber installed in the marine environment.

Monitoring Hypotheses
Reducing the amount of treated lumber installed in the marine environment is reducing the toxic impacts in the estuary.

CCMP Measurable Goal
Decrease the cumulative amount of treated lumber installed in the marine/estuarine environment.

Lead Entity
(proposed) Peconic Estuary Program Office

Program Status
New proposed program (in conjunction with shoreline hardening monitoring also described in this Plan)

Monitoring Extent and Frequency
Monitoring will be collected annually for the Peconic Estuary Program Study Area

Program Description

A potential monitoring mechanism would need to include both establishing a baseline on the amount of treated lumber presently installed in the marine environment and updating this baseline to reflect changes due to new installations, replacements, and removals. A portion of this potential mechanism is included in the section of this Plan addressing monitoring for Habitat and Living Resource concerns (under the heading "Shoreline Hardening"). This proposed monitoring mechanism will need to be expanded to further include information on whether the existing shoreline hardening material is treated lumber.

Costs

New Costs: Costs of these potential monitoring mechanisms are included in the Shoreline Hardening discussion of this Environmental Monitoring Plan.

Monitoring Program Summary

Monitoring Program	Base Programs		New Costs	
	One-Time	Annual	One-Time	Annual
Aquaculture and Transplanting Activities		X	$710,000	$5,000
Bay Scallops (recruitment success and survival dynamics)			$200,000 (over three years)	
Benthic Macroinvertebrate Surveys		X	TBD	TBD
Biota (Fish, Shellfish, Crustacean) Monitoring for Toxics	X			
Brown Tide Research Initiative		X		
Brown Tide Steering Committee		X		
Coastal 2000		X		
Dredging			$37,500	$7,500
Endangered Species Program		X		
Federal Toxics Release Inventory		X		
Hazardous Waste Site Monitoring		X		
National Pollutant Discharge Elimination System (NPDES) Program		X		
NMFS Commercial Landings Program		X		
Vessel Waste No Discharge Areas				$5,000
NOAA Mussel Watch Program		X		
NYS Pesticide Reporting Law		X		
NYS Pollutant Discharge Elimination System (SPDES) Program		X		
NYS Shellfish Land Certification Program		X		
NYSDEC Juvenile Finfish Survey		X		$645,000*
NYSDEC Wetlands Inventory	X		$500,000	$50,000*
Osprey, Terns and Waterfowl				TBD
Pesticide Use Monitoring		X		$25,000
Restoration Monitoring			$35,000	$15,000
SCDHS Alexandrium Monitoring	X			$35,000
SCDHS Bathing Beaches and Swimming Pools Program		X		
SCDHS Groundwater Monitoring (for nitrogen and pesticides)		X		
SCDHS North Creeks Study		X		
SCDHS Pfiesteria Monitoring	X			$25,000
SCDHS Routine Point Source Monitoring		X		
SCDHS Surface Water Quality Monitoring		X		
SCPD Land Use Monitoring		X		
Sediment Monitoring				25,000
Shoreline Hardening Monitoring	X			35,000
Submerged Aquatic Vegetation Long Term Monitoring	X			$30,000
Suffolk County Groundwater Model	X			
Surface Water Monitoring for Toxics	X			
Two Stroke Marine Engine Inventory				$10,000
Underground Storage Tank Inventory			$50,000	$10,000
USFWS National Wetlands Inventory	X			
Total			**$1,332,500**	**$922,500**

* Additional costs for other elements to be determined.

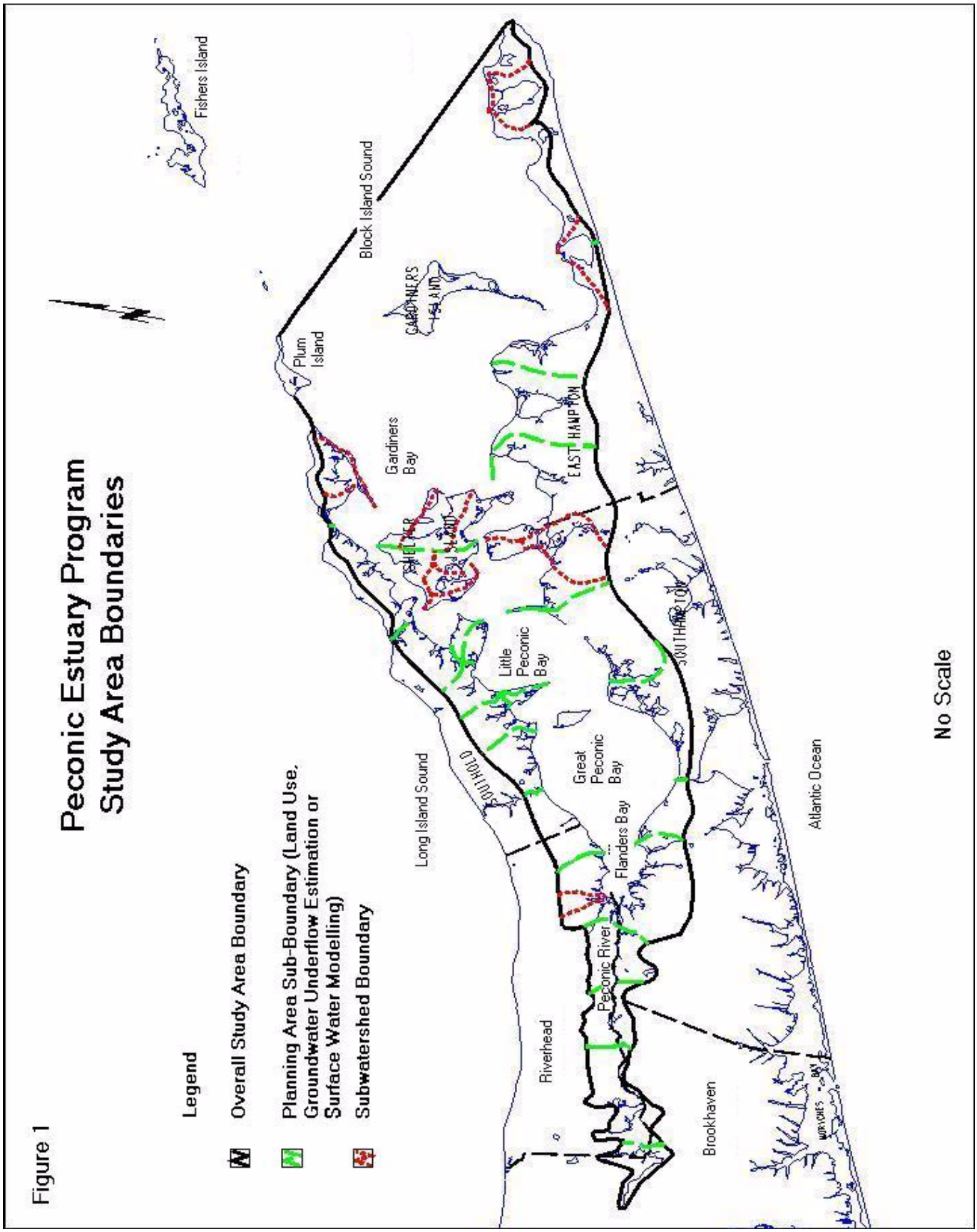
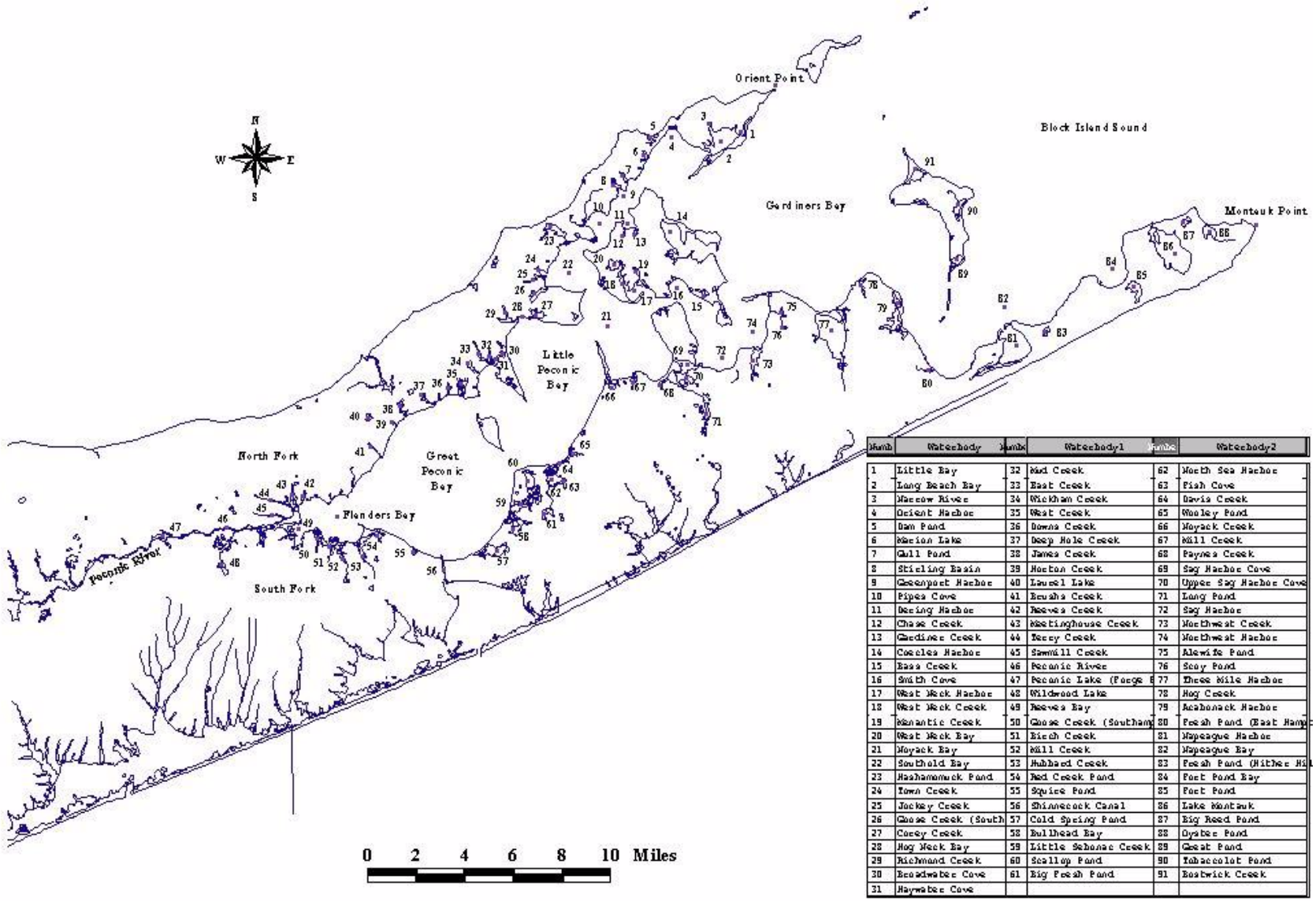


Figure 1
Peconic Estuary Program
Study Area Boundaries
Legend
Overall Study Area Boundary
Planning Area Sub-Boundary (Land Use, Groundwater Underflow Estimation or Surface Water Modelling)
Subwatershed Boundary
Fishers Island
Block Island Sound
Plum Island
Gardiners Bay
Long Island Sound
Little Peconic Bay
Great Peconic Bay
Flanders Bay
Peconic River
Riverhead
Brookhaven
Atlantic Ocean
No Scale

Figure 2

Peconic Estuary Program Study Area
Harbors, Embayments, Tidal Creeks, Ponds and Lakes



Numb	Waterbody	Numb	Waterbody1	Numbe	Waterbody2
1	Little Bay	32	Mud Creek	62	North Sea Harbor
2	Long Beach Bay	33	East Creek	63	Fish Cove
3	Marcow River	34	Wickham Creek	64	Davis Creek
4	Orient Harbor	35	West Creek	65	Wooley Pond
5	Dam Pond	36	Downs Creek	66	Moyack Creek
6	Marion Lake	37	Deep Hole Creek	67	Mill Creek
7	Gull Pond	38	James Creek	68	Paynes Creek
8	Stirling Basin	39	Horton Creek	69	Sag Harbor Cove
9	Greenport Harbor	40	Laurel Lake	70	Upper Sag Harbor Cove
10	Pipes Cove	41	Terrys Creek	71	Long Pond
11	Dering Harbor	42	Reeves Creek	72	Sag Harbor
12	Chase Creek	43	Meetinghouse Creek	73	Northwest Creek
13	Cherdiner Creek	44	Terry Creek	74	Northwest Harbor
14	Coecles Harbor	45	Sawmill Creek	75	Alewife Pond
15	Bass Creek	46	Peconic River	76	Scoy Pond
16	Smith Cove	47	Peconic Lake (Forge R	77	Three Mile Harbor
17	West Neck Harbor	48	Wildwood Lake	78	Hog Creek
18	West Neck Creek	49	Reeves Bay	79	Acabonack Harbor
19	Manantic Creek	50	Goose Creek (Southam	80	Fresh Pond (East Hamp
20	West Neck Bay	51	Birch Creek	81	Napeague Harbor
21	Moyack Bay	52	Mill Creek	82	Napeague Bay
22	Southold Bay	53	Hubbard Creek	83	Fresh Pond (Hither Hi
23	Hashamomuck Pond	54	Red Creek Pond	84	Fort Pond Bay
24	Town Creek	55	Squire Pond	85	Fort Pond
25	Jockey Creek	56	Shinnecock Canal	86	Lake Montauk
26	Goose Creek (South	57	Cold Spring Pond	87	Big Reed Pond
27	Corey Creek	58	Bullhead Bay	88	Oyster Pond
28	Hog Neck Bay	59	Little Sebonac Creek	89	Great Pond
29	Richmond Creek	60	Scallop Pond	90	Tobacco Pot Pond
30	Broadwater Cove	61	Big Fresh Pond	91	Eastwick Creek
31	Haywater Cove				

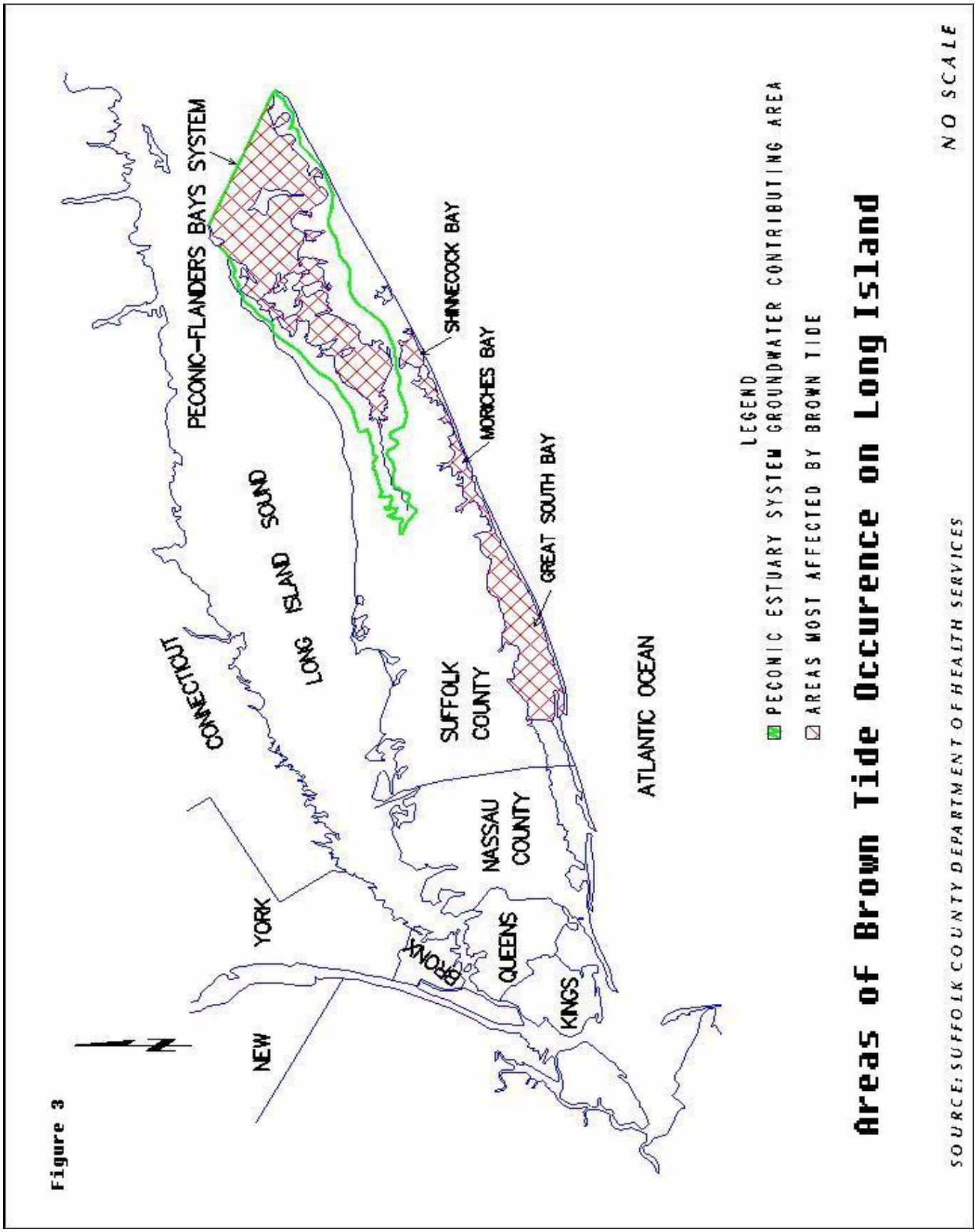

Areas of Brown Tide Occurence on Long Island
NO SCALE
SOURCE: SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
LEGEND
PECONIC ESTUARY SYSTEM GROUNDWATER CONTRIBUTING AREA
AREAS MOST AFFECTED BY BROWN TIDE
PECONIC-FLANDERS BAYS SYSTEM
SHINNECOCK BAY
MORICHES BAY
GREAT SOUTH BAY
LONG ISLAND SOUND
CONNECTICUT
NEW YORK
SUFFOLK COUNTY
NASSAU COUNTY
BRONX
QUEENS
KINGS
ATLANTIC OCEAN

Figure 3

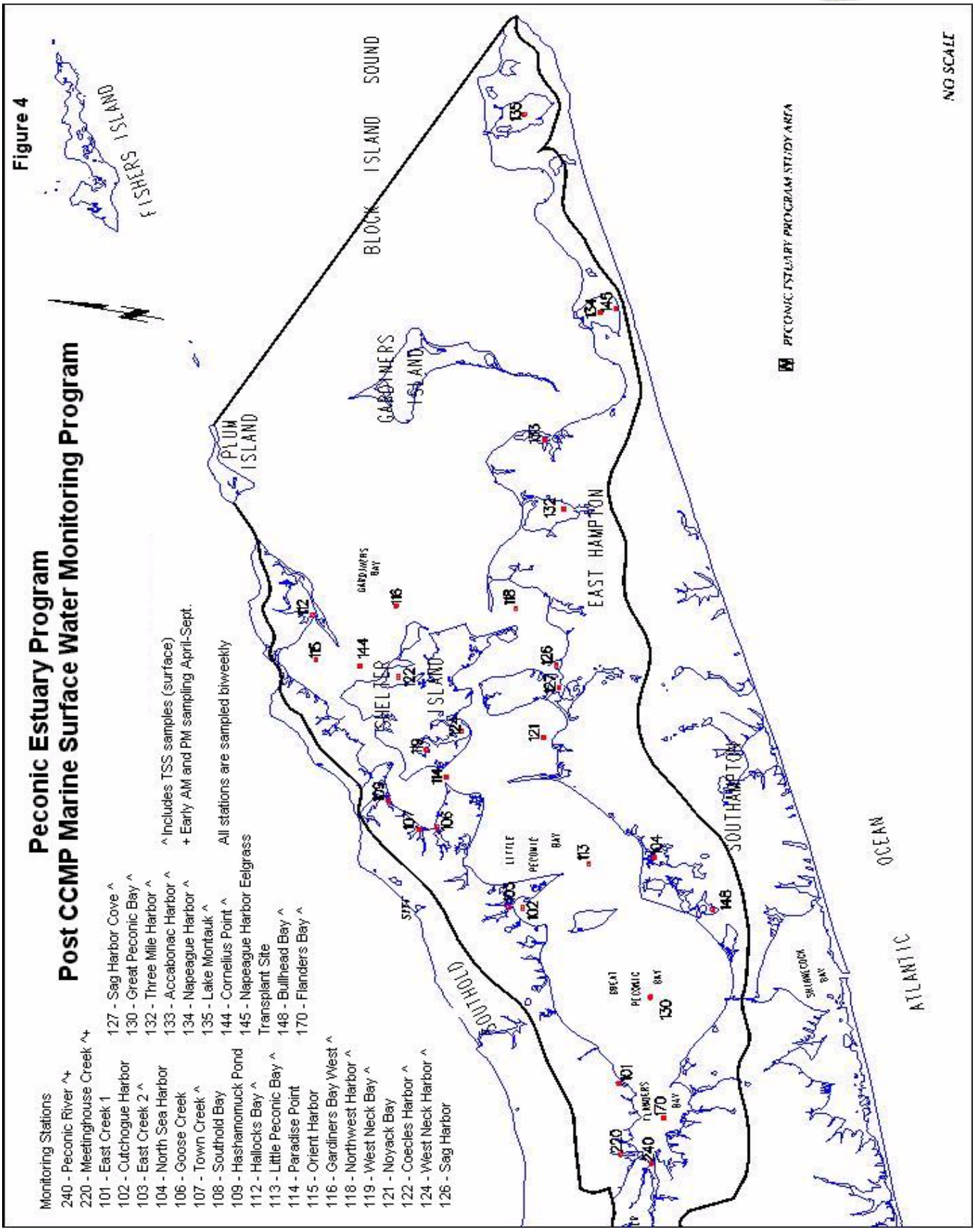


Figure 4
Peconic Estuary Program
Post CCMP Marine Surface Water Monitoring Program
Monitoring Stations
240 - Peconic River ^+
220 - Meetinghouse Creek ^+
101 - East Creek 1
102 - Cutchogue Harbor
103 - East Creek 2 ^
104 - North Sea Harbor
106 - Goose Creek
107 - Town Creek ^
108 - Southold Bay
109 - Hashamomuck Pond
112 - Hallocks Bay ^
113 - Little Peconic Bay ^
114 - Paradise Point
115 - Orient Harbor
116 - Gardiners Bay West ^
118 - Northwest Harbor ^
119 - West Neck Bay ^
121 - Noyack Bay
122 - Coecles Harbor ^
124 - West Neck Harbor ^
126 - Sag Harbor
127 - Sag Harbor Cove ^
130 - Great Peconic Bay ^
132 - Three Mile Harbor ^
133 - Accabonac Harbor ^
134 - Napeague Harbor ^
135 - Lake Montauk ^
144 - Cornelius Point ^
145 - Napeague Harbor Eelgrass Transplant Site
148 - Bullhead Bay ^
170 - Flanders Bay ^
^ Includes TSS samples (surface)
+ Early AM and PM sampling April-Sept.
All stations are sampled biweekly
PECONIC ESTUARY PROGRAM STUDY AREA
NO SCALE
FISHERS ISLAND
BLOCK ISLAND SOUND
PLUM ISLAND
GARDINERS ISLAND
GARDINERS BAY
ISLAND
EAST HAMPTON
SOUTHAMPTON
SOUTHOLD
LITTLE PECONIC BAY
GREAT PECONIC BAY
SHINNECOCK BAY
FLANDERS BAY
OCEAN
ATLANTIC

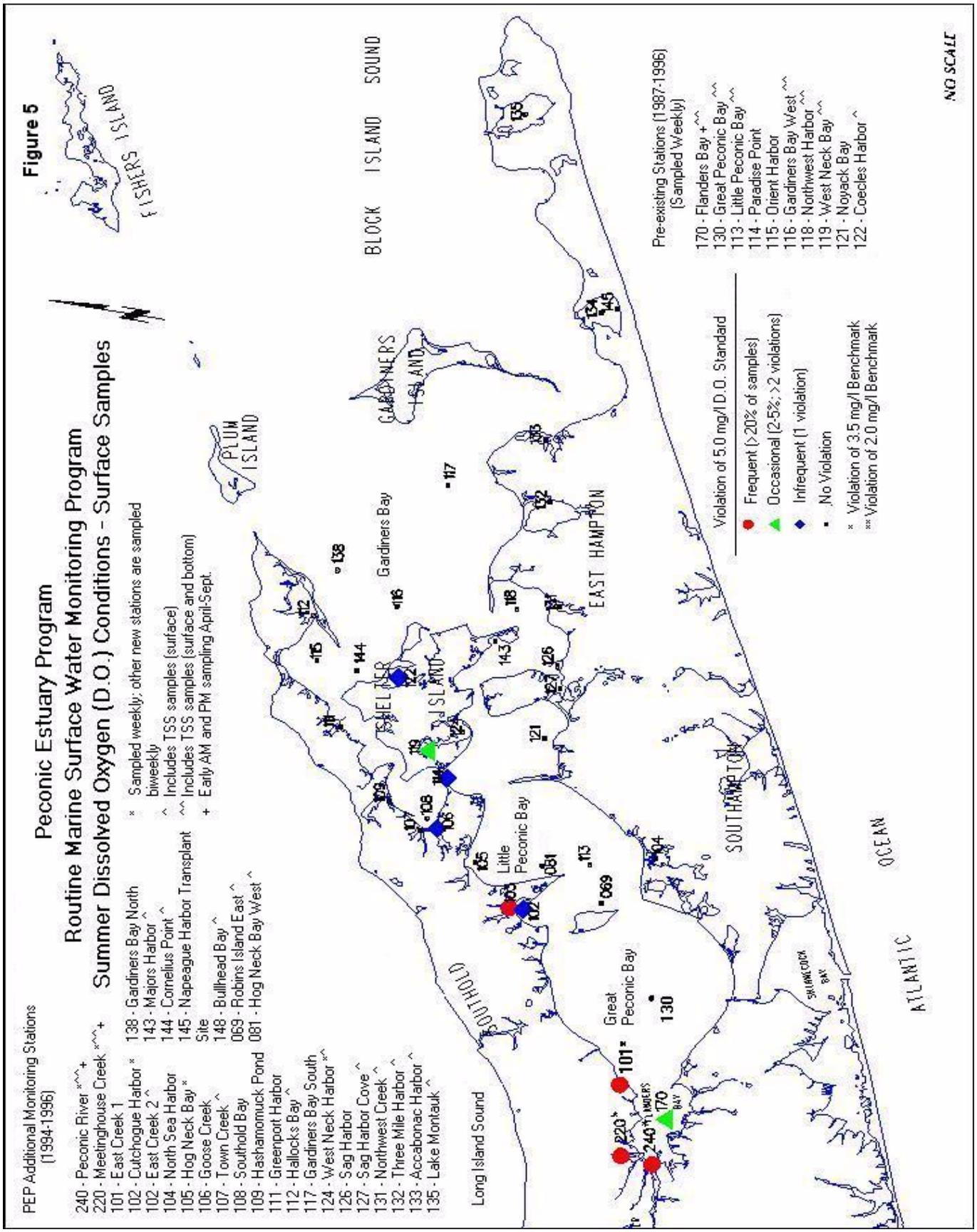


Figure 5
Peconic Estuary Program
Routine Marine Surface Water Monitoring Program
Summer Dissolved Oxygen (D.O.) Conditions - Surface Samples
PEP Additional Monitoring Stations (1994-1996)
240 - Peconic River *^^+
220 - Meetinghouse Creek *^^+
101 - East Creek 1
102 - Cutchogue Harbor *
102 - East Creek 2 ^
104 - North Sea Harbor
105 - Hog Neck Bay *
106 - Goose Creek ^
107 - Town Creek ^
108 - Southold Bay
109 - Hashamomuck Pond
111 - Greenport Harbor
112 - Hallocks Bay ^
117 - Gardiners Bay South
124 - West Neck Harbor *^
126 - Sag Harbor
127 - Sag Harbor Cove ^
131 - Northwest Creek ^
132 - Three Mile Harbor ^
133 - Accabonac Harbor ^
135 - Lake Montauk ^
138 - Gardiners Bay North
143 - Majors Harbor ^
144 - Cornelius Point ^
145 - Napeague Harbor Transplant Site
148 - Bullhead Bay ^
069 - Robins Island East ^
081 - Hog Neck Bay West ^
* Sampled weekly; other new stations are sampled biweekly
^ Includes TSS samples (surface)
^^ Includes TSS samples (surface and bottom)
+ Early AM and PM sampling April-Sept.
Violation of 5.0 mg/l D.O. Standard
Frequent (> 20% of samples)
Occasional (2-5%; >2 violations)
Infrequent (1 violation)
No Violation
* Violation of 3.5 mg/l Benchmark
** Violation of 2.0 mg/l Benchmark
Pre-existing Stations (1987-1996) (Sampled Weekly)
170 - Flanders Bay + ^^
130 - Great Peconic Bay ^^
113 - Little Peconic Bay ^^
114 - Paradise Point
115 - Orient Harbor
116 - Gardiners Bay West ^^
118 - Northwest Harbor ^^
119 - West Neck Bay ^^
121 - Noyack Bay
122 - Coecles Harbor ^
NO SCALE
Long Island Sound
SOUTHOLD
Great Peconic Bay
Little Peconic Bay
Gardiners Bay
PLUM ISLAND
GARDINERS ISLAND
SHELTER ISLAND
SOUTHAMPTON
EAST HAMPTON
BLOCK ISLAND SOUND
FISHERS ISLAND
OCEAN
ATLANTIC

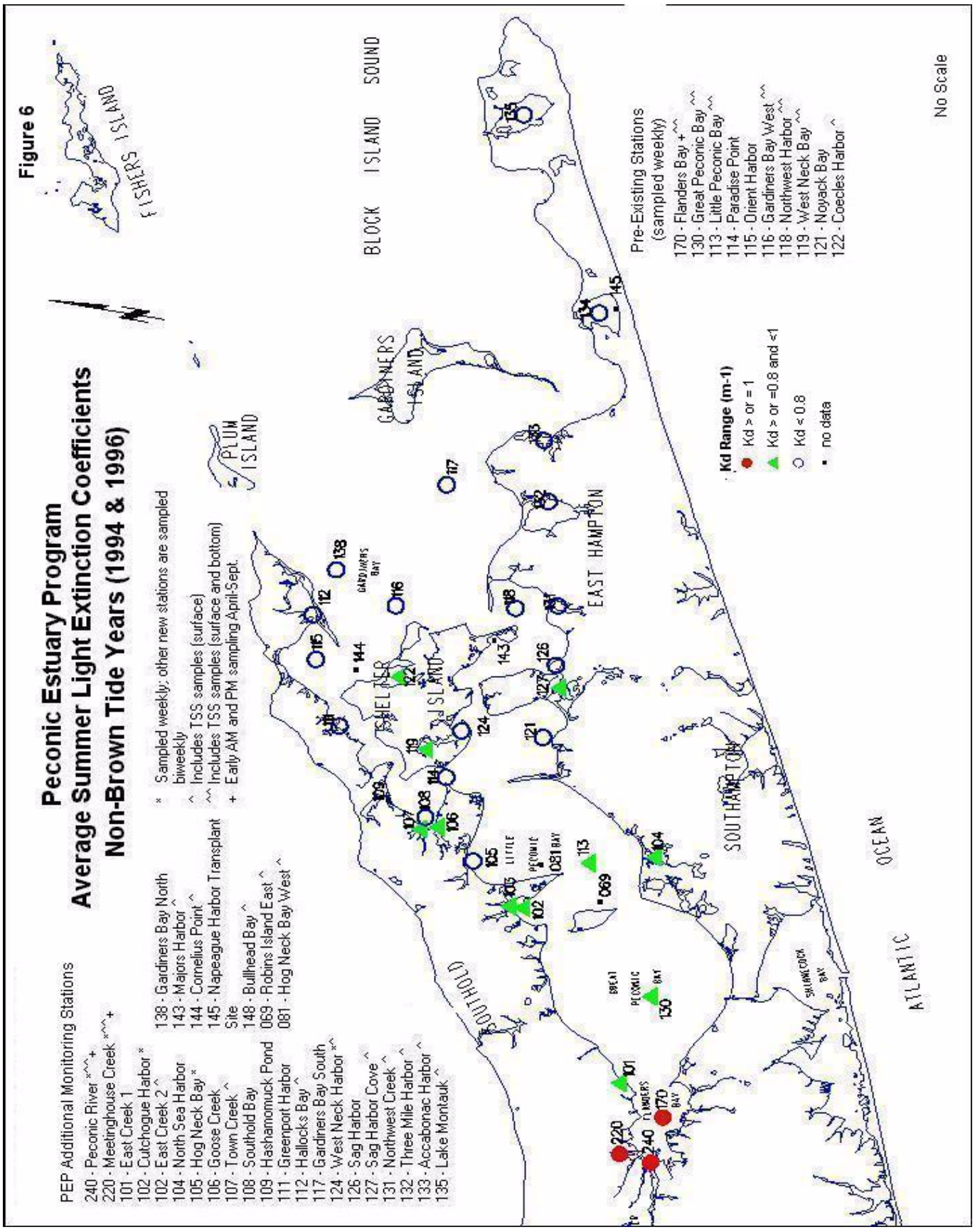
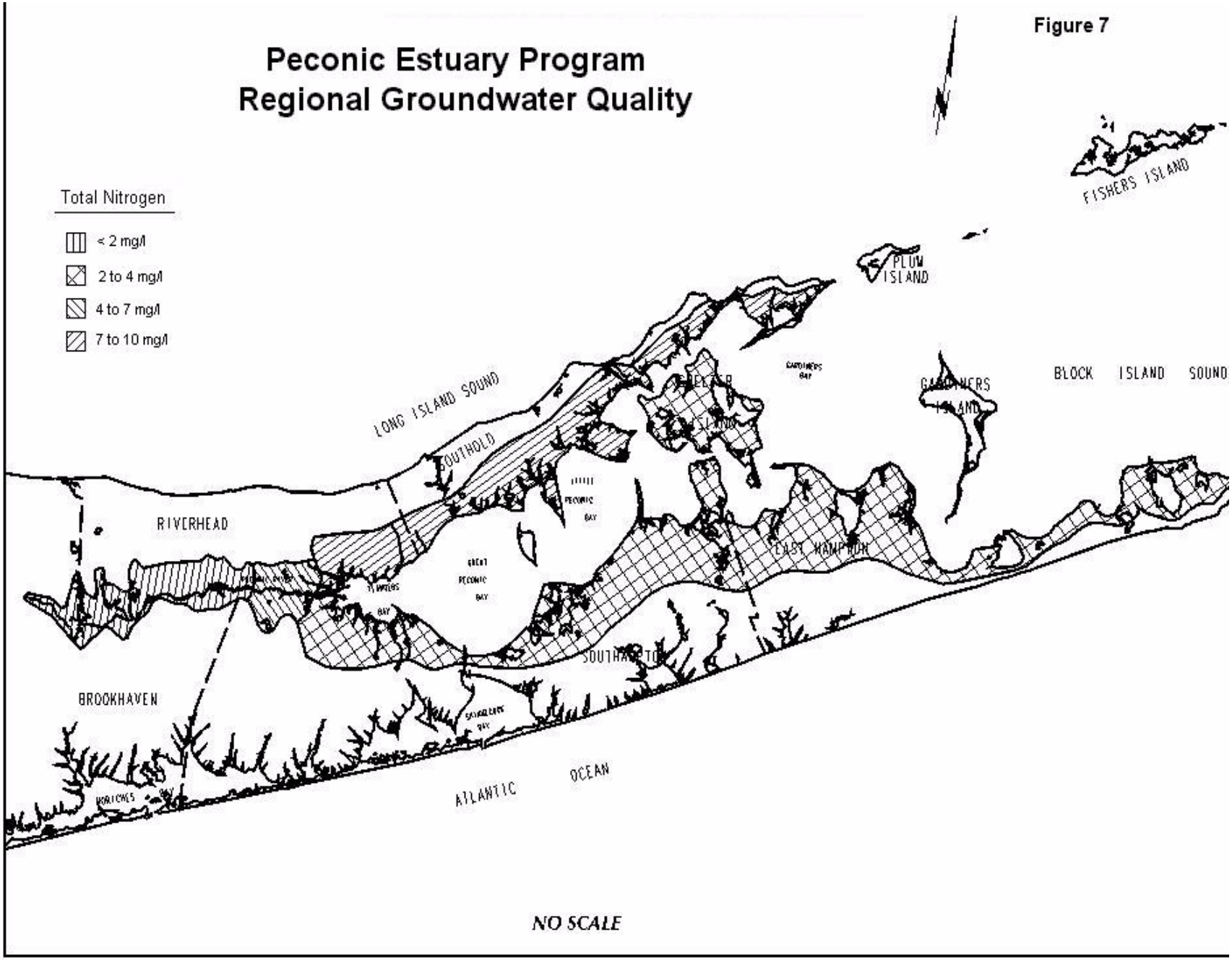


Figure 6
Peconic Estuary Program
Average Summer Light Extinction Coefficients
Non-Brown Tide Years (1994 & 1996)
PEP Additional Monitoring Stations
240 - Peconic River x^^+
220 - Meetinghouse Creek x^^+
101 - East Creek 1
102 - Cutchogue Harbor x
102 - East Creek 2 ^
104 - North Sea Harbor
105 - Hog Neck Bay x
106 - Goose Creek ^
107 - Town Creek ^
108 - Southold Bay
109 - Hashamomuck Pond
111 - Greenport Harbor
112 - Hallocks Bay ^
117 - Gardiners Bay South
124 - West Neck Harbor x^
126 - Sag Harbor
127 - Sag Harbor Cove ^
131 - Northwest Creek ^
132 - Three Mile Harbor ^
133 - Accabonac Harbor ^
135 - Lake Montauk ^
138 - Gardiners Bay North
143 - Majors Harbor ^
144 - Cornelius Point ^
145 - Napeague Harbor Transplant Site
148 - Bullhead Bay ^
069 - Robins Island East ^
081 - Hog Neck Bay West ^
x Sampled weekly; other new stations are sampled biweekly
^ Includes TSS samples (surface)
^^ Includes TSS samples (surface and bottom)
+ Early AM and PM sampling April-Sept.
Pre-Existing Stations
(sampled weekly)
170 - Flanders Bay +^^
130 - Great Peconic Bay ^^
113 - Little Peconic Bay ^^
114 - Paradise Point
115 - Orient Harbor
116 - Gardiners Bay West ^^
118 - Northwest Harbor ^^
119 - West Neck Bay ^^
121 - Noyack Bay
122 - Coecles Harbor ^
Kd Range (m-1)
Kd > or = 1
Kd > or =0.8 and <1
Kd < 0.8
no data
No Scale
FISHERS ISLAND
PLUM ISLAND
GARDINERS ISLAND
BLOCK ISLAND SOUND
EAST HAMPTON
SOUTHAMPTON
SOUTHOLD
ATLANTIC OCEAN

Figure 7

Peconic Estuary Program
Regional Groundwater Quality



plot file pep-rgqbw1.gra

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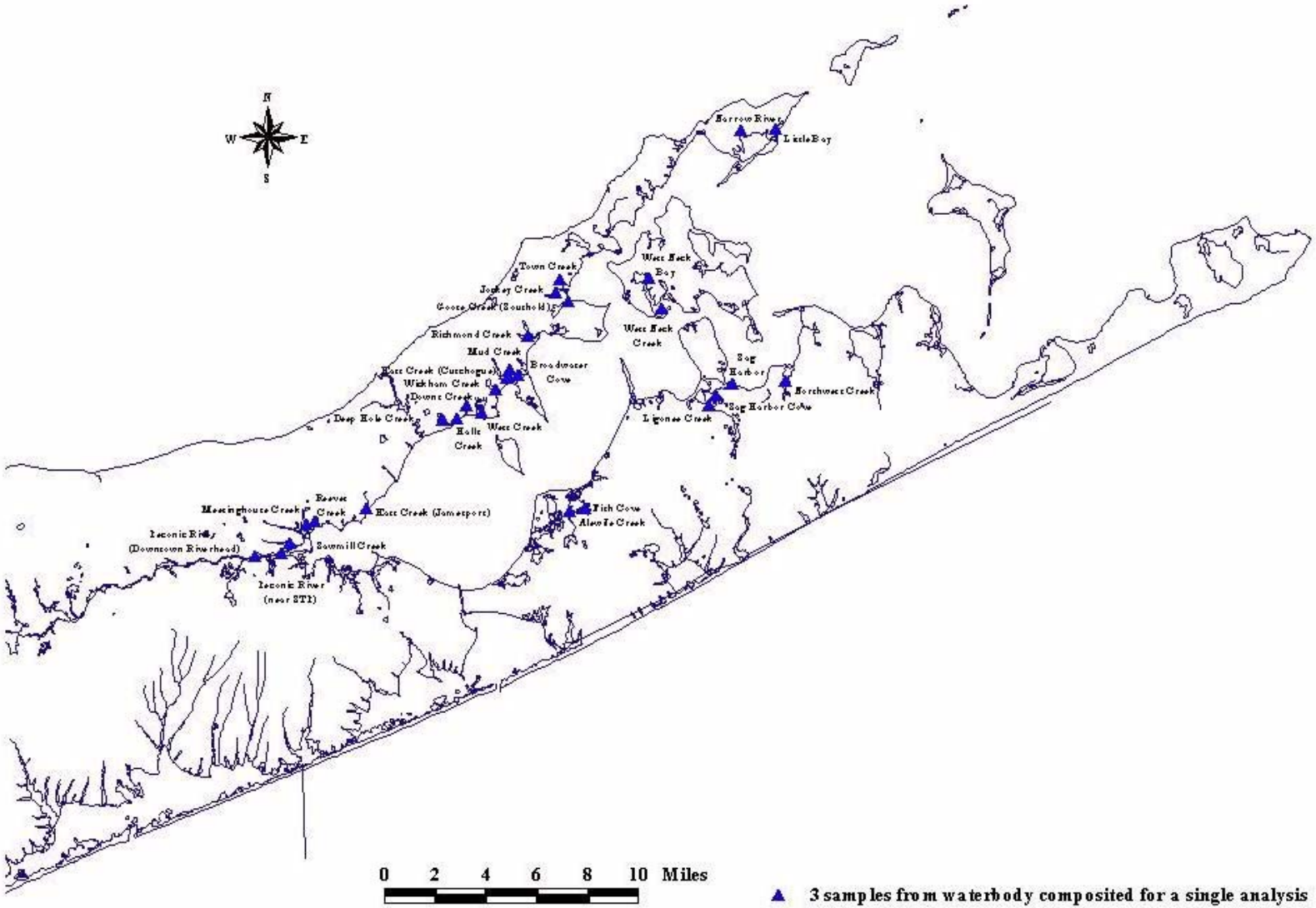
Figure 8

Peconic Estuary Program Study Area
May 1998 Sediment Monitoring Sites



Peconic Estuary Program Study Area
August 2000 Sediment Monitoring Sites

Figure 9

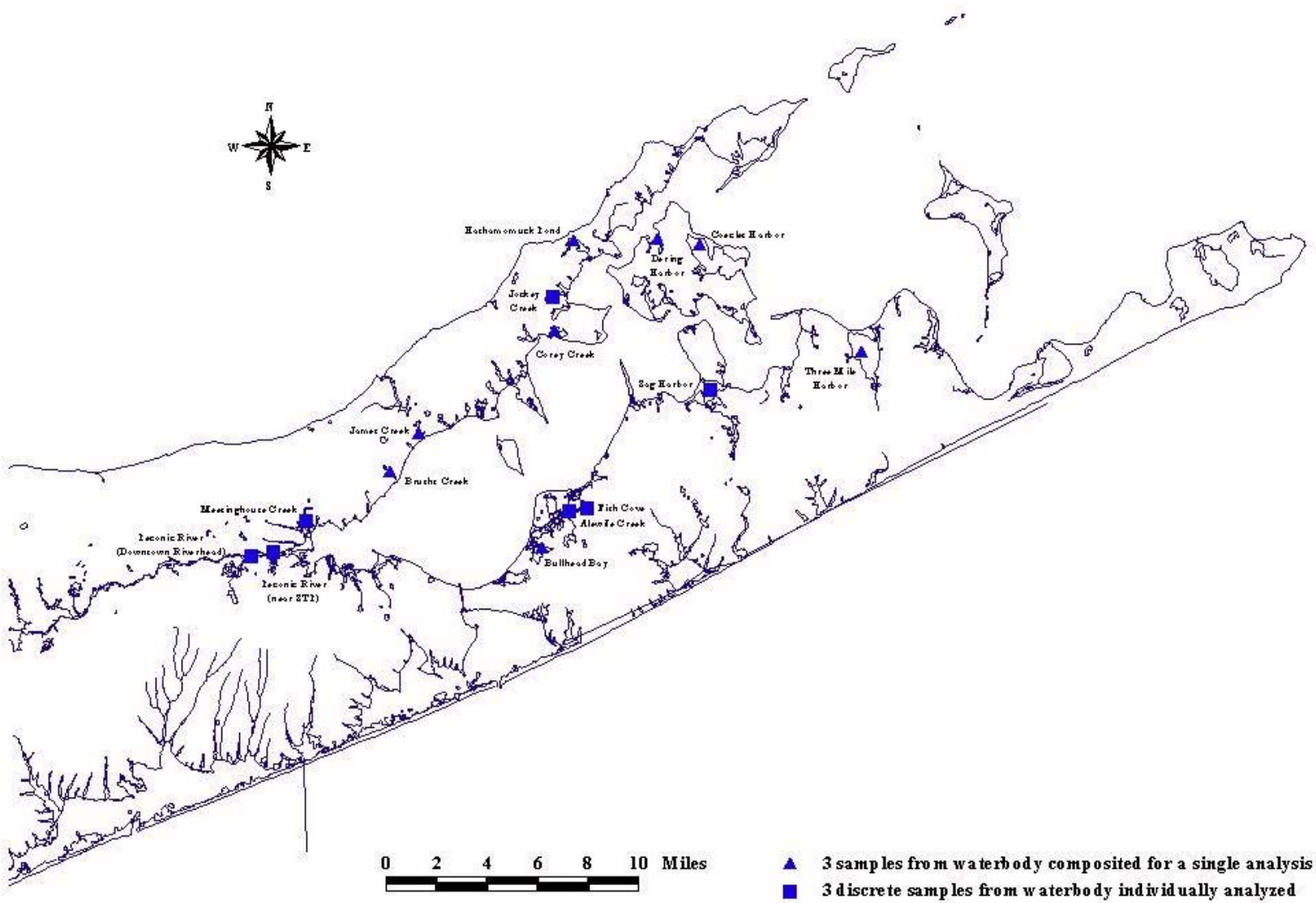
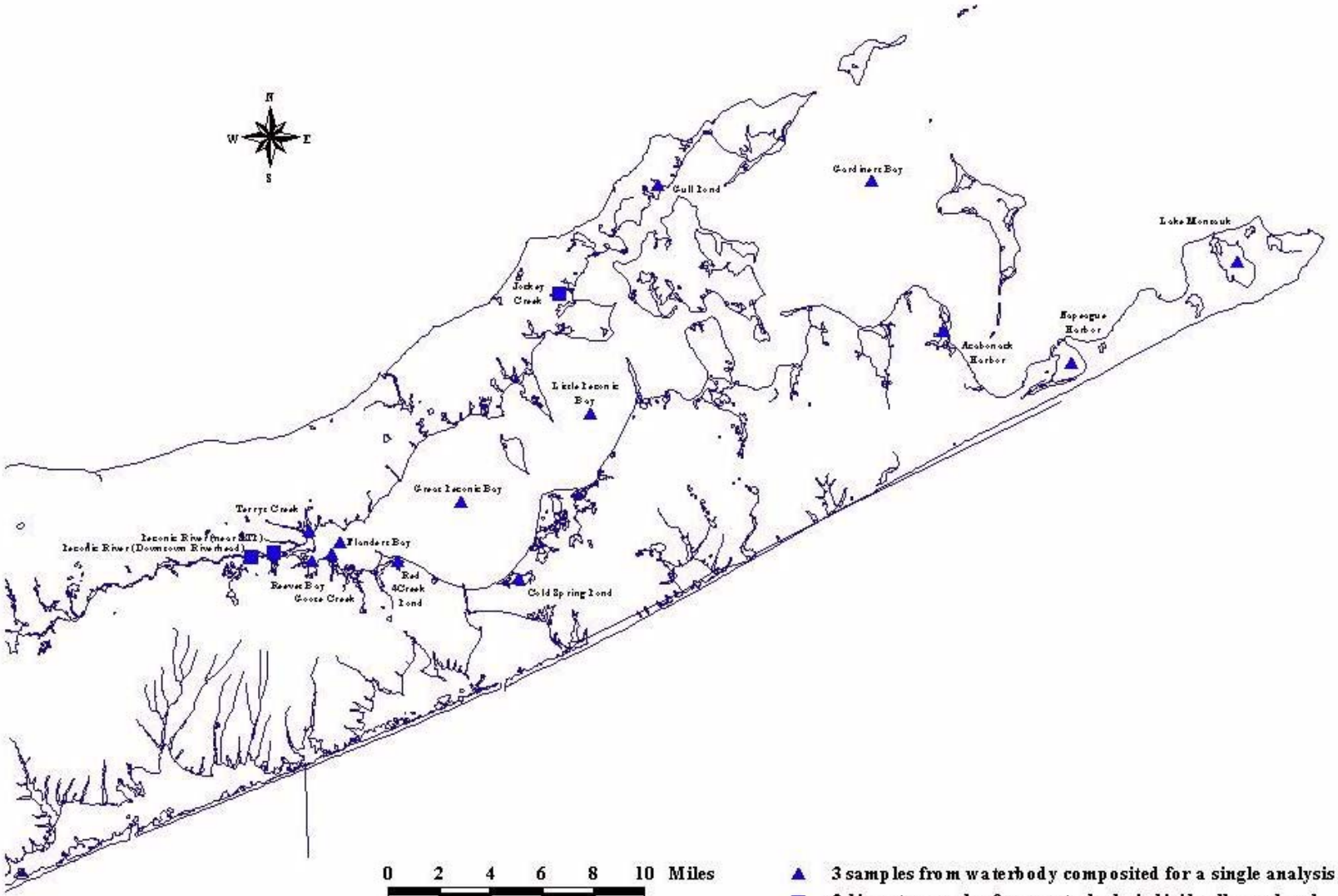


Figure 10

Peconic Estuary Program Study Area
Proposed 2001 Sediment Monitoring Sites



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ATTACHMENT I-1

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Research, Monitoring and Assessment Priorities for Habitats and Living Resources of the Peconic Estuary

Natural Resources Subcommittee
Peconic Estuary Program

October 2000

Marci Bortman, Ph.D.
Marine Conservation Planner
The Nature Conservancy

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Research, Monitoring, and Assessment Priorities for Habitats and Living Resources of the Peconic Estuary

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

The National Estuary Program was established in 1987. The purpose of the National Estuary Program is to develop and implement comprehensive conservation and management plans (CCMP) for "Estuaries of National Significance." The CCMP is a framework for managing an estuary based on recommendations to reduce ecosystem threats and protect estuarine resources. To date, the National Estuary Program consists of 28 estuaries in various phases of developing and implementing CCMPs.

In 1992, the Peconic Estuary was included in the National Estuary Program and the Peconic Estuary Program (PEP) was created to develop a CCMP for the Peconic bays. PEP participants include federal, state and local government, citizens' groups, academia, environmental groups, and private organizations. A draft CCMP was developed in September 1999. A final CCMP is expected by December 2000.

As part of developing the CCMP, the PEP identified the need to create a living resources research and monitoring program. The PEP recognizes that there continue to be numerous gaps in our information about the ecology of the estuary and the relationship of human impacts to ecosystem health and biodiversity. One of the objectives in the habitat and living resources chapter of the PEP Comprehensive Conservation and Management Plan (CCMP) is to:

> Develop and maintain an estuary-wide research and monitoring program to guide and evaluate management decisions concerning the estuary and to ensure management and policy decisions are based on the best available information.

Two priority actions in the habitat module are to:

> Develop and implement a research plan for the Peconic Estuary and its watershed to investigate natural processes, impairments and links to water quality, maintenance of systems and species and effects of recreation and pollution on biodiversity, among other research needs.
>
> Develop a long term plan for monitoring living resources in the Peconic Estuary that is coordinated with the development of a research plan and ongoing research and monitoring efforts.

Therefore, as a first step, this document provides a framework for integrated, system-wide ecological research, monitoring, and assessment to understand the dynamic, multi-scale ecological patterns and processes that sustain biota and their supporting natural systems in the Peconic Estuary.

An important aspect of this document will be its coordination with ongoing water quality monitoring, juvenile finfish monitoring, and brown tide research. Efforts will be made to link these recommendations for research, monitoring, and assessment with the Suffolk County Department of Health Services (SCDHS) surface water monitoring program, the NYS DEC finfish and macroinvertebrate survey (by small-mesh otter trawl), and the Brown Tide Research Initiative (BTRI) administered by New York State Sea Grant. This Living Resources Research, Monitoring, and Assessment Framework would be the fourth major initiative and would round out efforts in the Peconics to provide a more complete evaluation of the system.

Priorities for research, monitoring, and assessment included in this document are based on information gaps identified in the Characterization Report of the Living Resources of the Peconic Estuary (Bortman and Niedowski 1998), the Habitat Module of the CCMP, PEP Natural Resources Subcommittee meetings, and recommendations made in the Living Resources Research and Monitoring (LRRM) workshop held on June 24, 1998 by the PEP Natural Resources Subcommittee at The Nature Conservancy's Mashomack Preserve on Shelter Island, NY.

2. BACKGROUND

Estuaries are where land and sea meet with both contributing to an ecosystem of specialized plants and animals all interacting within a complex food web. Beaches and dunes, salt marsh, intertidal mud and sand flats, tidal creeks, and eelgrass meadows are only some of the important habitats found in estuaries. These habitats provide food, shelter, spawning and nursery areas to a wide range of animals. People are attracted to estuaries because of their beauty, for their recreational opportunities, and the potential to make a living from the rich resources estuaries provide.

With population increasing in the watershed, the Peconic Estuary is being threatened by over-development and overuse of its resources. To fully realize the impacts of people and their activities on this system, there must be a better understanding of how the Peconic Estuary functions ecologically. This knowledge can only be achieved through comprehensive research, monitoring, and assessment of the entire ecosystem.

Ecological research, monitoring, and assessment are essential components for guiding management decisions. Research is performed to answer particular questions and fill information gaps. Monitoring, which involves the multi-year collection of data, is carried out to evaluate trends in natural variability as well as changes that may occur due to management or other influences. Data from monitoring can act as an "early warning" system about the health of the estuary. Assessment is the characterization of a resource through synthesis of existing data or new surveys to obtain baseline information. In the Peconic Estuary Program (PEP), assessments have often been the first step in obtaining scientific information, which has spurred the development of specific research questions or the identification of monitoring needs.

Research, combined with ongoing monitoring of certain sensitive species and communities as overall indicators of ecosystem health, is essential to better understand the natural dynamics of the Peconic Estuary and to target effective management activities. The information gained from research and monitoring can be used to plan, manage, and improve estuary protection programs at all levels of government and the private sector, assess progress being made and inform the public of status and trends. Therefore, a properly designed research and monitoring program should provide important and useful information to scientists, managers and citizens. In fact, the purpose of developing research monitoring and assessment priorities for habitats and living resources is to better understand the Peconic ecosystem by linking research and monitoring, fostering partnerships among scientists, government agencies, and the public, and ensuring that research and monitoring results are synthesized into useful products.

3. GOAL

The long-term goal of this PEP initiative is to develop a strategy of coordinated research, monitoring, and assessment to fill significant information gaps and assist in the planning, conservation, and management of the Peconic Estuary. A key component of this strategy is to develop an applied, multi-scale, integrated approach to gain a better understanding of the estuary. To achieve this goal, this document sets up guidelines for a detailed Living Resources Research, Monitoring, and Assessment Plan to set priorities, define issues, identify novel research questions, and create a compelling living resources research, monitoring, and assessment program. The short-term goal of this initiative is to provide a stimulus for funding agencies and organizations and researchers.

The objectives of this document are to:

(1) Establish a process to develop and implement a living resources research, monitoring, and assessment program;

(2) Identify priority living resources targets (i.e., particular organisms and habitats) qualified in the CCMP as important either due to their commercial or recreational value or their role in the food web and ecosystem;

(3) Identify threats (i.e., stresses and sources of stress) to the targets so as to improve resource protection through management and conservation;

(4) Develop an initial set of research, monitoring, and assessment priorities to better understand the targets and threats to targets.

4. STRUCTURE OF A RESEARCH, MONITORING, AND ASSESSMENT PROGRAM

It is important that a research, monitoring, and assessment program be well-designed in order to maximize its effectiveness in environmental management. Sound science is the foundation for effective planning, management, and regulation. A well-designed research, monitoring, and assessment program fits needs that are defined *a priori* rather than simply collecting data and determining later how it is to be evaluated. Data are more meaningful when evaluated not only qualitatively but also quantitatively and can withstand statistical rigor. Thus, a program that is well-designed and well-planned has a much higher likelihood of success.

The following bullets outline 10 characteristics of a successful environmental monitoring program adapted from the National Research Council (1990).

- Authority and control of the program should be clearly established and fiscal controls should be compatible with program goals and objectives

- Know clearly how data are to be used -- ensure a link between research and monitoring information and decision making

- Goals should be clearly defined and achievable scientifically, technologically, logistically, and financially

- Before any data are collected, feedback loops should be clearly established between a decision making system and a research and monitoring program

- Communication channels should be interconnected and functional among agencies and other participating groups and individuals

- Regulatory, data and management needs and responsibilities of local, state and federal agencies should be integrated to optimize use of available resources

- Mechanisms should be established to involve the scientific community and the public as program participants early and often

- Mechanisms should be established to ensure that data results are communicated to decision makers and the public in language they can understand and act on

- Mechanisms should be established for periodic review and easy alteration of redirection of efforts when results or new information from other sources justifies a change

- Management action(s) recommended in response to both expected results and unexpected but possible outcomes should be identified in advance

These elements should be incorporated in the development of a Living Resources Research, Monitoring, and Assessment Plan. Figure 1 illustrates the relationship among research, monitoring, and assessment objectives, methods, and evaluation of a research and monitoring program along with management goals and information needs.

A coordinator is needed to implement recommendations made in this document. A coordinator could (1) provide strong leadership, (2) help seek and direct funds from existing grant programs to research and monitoring efforts in the Peconic Estuary, (3) find new funds from public and private groups, and (4) leverage funds wherever possible. A coordinator would focus efforts on applied research and monitoring necessary to effectively implement components of the CCMP. Under the auspices of this framework, a coordinator would focus scientific attention on management concerns of the estuary, lead the periodic update and next phase of research and monitoring priorities, coordinate and target funding, and assure that research and monitoring results are available to agencies, decision makers and the community at large.

In addition to needing a coordinator for this program, a science advisory panel should be developed. This panel should consist of experts both in and outside of the region who can help establish and evaluate research, monitoring, and assessment priorities. Scientists are necessary to review program design and evaluate research and monitoring results. The coordinator would be responsible for organizing the science advisory panel and incorporating their comments in the Living Resources Research, Monitoring, and Assessment Plan.

At present, there is no established fund for this living resources coordination or specific research and monitoring projects. It is expected that there will be multiple sources of funds; but to date, there is no established agency or organization to administer or coordinate grants for research and monitoring. A coordinator is needed. This position, along with a science advisory panel, should be established as part of the implementation phase of the CCMP.

5. LIVING RESOURCE TARGETS

It is an insurmountable effort to study every aspect of the Peconic Estuary ecosystem. Therefore, focusing efforts on living resource targets that are commercially or recreationally significant or are of ecological importance to the Peconic Estuary ecosystem is one of the most feasible methods to understand ecological effects caused by human activities or the likelihood that adverse effects might occur.

The following seven habitat and living resource targets are a good representation of the

Peconic Estuary system. These targets correspond to species or habitats that are of regional importance, highly threatened or have special conservation or management requirements, or represent biodiversity (Bortman and Niedowski 1998). These living resource targets are recognized in the CCMP as important either due to their commercial or recreational value or their role in the food web and ecosystem. The seven living resource targets are:

1. **Beach, Bluff, and Dune Complex** – sandy and cobbly beaches, spits, bluff and dunes

2. **Tidal Wetlands** – vegetated and non-vegetated wetlands

3. **Seagrass** -- eelgrass and widgeon grass

4. **Resident Finfish** -- Those species that spend a large portion of their lifecycle in the estuary (i.e., spawning, nursery). Examples include: weakfish, forage fish, flounder, scup, porgy, tautog, bluefish, alewife, American eel

5. **Beach-Dependent Species** -- Piping plovers, and least, common, and roseate terns and horseshoe crabs

6. **Shellfish** -- bay scallop, hard and soft clams

7. **Diverse Phytoplankton Community** – encompasses full range of diverse phytoplankton populations typically found in temperate estuaries (diatoms and dinoflagellates and smaller pico- and nano-plankton). Phytoplankton in the Peconics have not been well-inventoried. Therefore, composition is unknown. A healthy phytoplankton community is diverse, varying daily, seasonally and annually.

6. THREATS TO LIVING RESOURCE TARGETS

Threats such as localized poor water quality, shoreline stabilization, brown tide and invasive species are only a few of the concerns currently threatening the living resources of the Peconic Estuary. Because many small, persistent disturbances can lead to widespread cumulative damage of natural communities throughout the system, it is important to focus research on measuring cumulative impacts. Understanding the extent of these threats through research and monitoring can guide management actions to lessen, and in some cases, eliminate their impacts. Tables 1, 2, and 3 in the PEP living resources threats analysis (Sclafani and Bortman 1999; in the appendix) show some of the threats identified in the Peconics and their relationship to causes of different stresses. Any research and monitoring efforts related to understanding these threats and lessening or eliminating them is considered to be a high priority. Assessment of management recommendations in the CCMP is also required to determine their effectiveness and evaluate progress of CCMP implementation.

7. INITIAL RESEARCH, MONITORING, AND ASSESSMENT PRIORITIES

Listed below are an initial set of priority research, monitoring, and assessment projects that were developed as a result of the Characterization Report of the Living Resources of the Peconic Estuary (Bortman and Niedowski 1998), the Habitat Module of the CCMP, PEP Natural Resources Subcommittee meetings, and recommendations made in the Living Resources Research and Monitoring (LRRM) workshop. The level of description of these priority projects range from being relatively general in some instances to specific in others.

Priority projects will be refined further as the CCMP is finalized, a conceptual ecological model is completed, and sampling protocols are fully developed to ensure quality assurance and quality control as well as some degree of consistency among projects. As priorities are finalized, project costs will also be estimated to determine the amount of funding needed to perform the work.

This section divides the priorities into three categories: (1) threats, (2) biology and ecology of living resource targets and system-wide studies of the Peconic ecosystem; and (3) restoration. Within each category, priorities are numbered and identified as either research, monitoring, or assessment. The living resource target(s) addressed by each priority is also listed. Other important research, monitoring, and assessment initiatives are provided in bullet form in the appendix. Cost estimates of specific projects are also in the appendix; however, it is important to note that these estimates are very rough and need to be revised as proposals are developed for each project.

7.1. LIVING RESOURCE THREATS-RELATED RESEARCH, MONITORING AND ASSESSMENT PRIORITIES

(1) SHORELINE ENGINEERING & HARDENING

Targets: **Beach, Bluff, and Dune Complex**
Tidal Wetlands
Beach-Dependent Species

Assessment

Purpose: To quantify estuarine-wide shoreline engineering or manipulation from seawalls,

bulkheads, docks and other hard structures, assess impacts on habitat and living resources, and develop "environmentally friendly" systems to assist in implementing a CCMP priority of "no net increase" in shoreline engineering and hardening throughout the estuary.

Brief description: Development in the Peconic Estuary watershed has been occurring at a rapid pace. In many instances, seawalls, bulkheads, docks and other hard structures are being erected following the construction of homes and other structures along the Peconic Estuary shore. The cumulative impact of these hard structures is of concern. Quantitative mapping is an important first step and will be carried out through aerial photo interpretation by the US Fish and Wildlife Service under contract to the PEP during the year 2000. The Peconic BayKeeper and the NYS DEC PEP Program Coordinator will assist in ground truthing. An assessment of detrimental effects of hardened shoreline and docks on the Estuary is also needed to fully understand impacts on habitat and natural resources. Included in this analysis should be a characterization of all shoreline hardening found in the Peconics and an investigation of "environmentally friendly" systems.

(2) SEA LEVEL RISE

Target: Tidal Wetlands

Assessment

Purpose: To assess the viability of salt marshes in the Peconics by evaluating their response to sea level rise and large-scale storm events.

Brief description: Salt marsh wetlands are critical to the viability of the Peconics and other marine ecosystems because they provide habitats and breeding grounds for a variety of marine organisms and serve as filters to prevent contaminants from entering the system. Yet these wetlands are increasingly stressed by both sea level rise and development pressures. Development can effectively prevent the landward migration of salt marshes as a response to rising sea level (currently about 3 mm per year in the New York area). Thus an important step in characterizing the health of salt marshes in the Peconics is to determine their response to sea level change and unusual events such as hurricanes. One method for assessment could include using radionuclides (e.g., Pb-210) to establish the chronology of marsh accretion, determine whether the accretion rate is sufficient to keep pace with sea level rise, and evaluate historical accretion patterns.

(3) *CODIUM FRAGILE*

Targets: Seagrass
Shellfish

Research

Purpose: To understand the influence of the introduced species *Codium fragile* on the ecology of the estuary, particularly its effect on eelgrass (*Zostera marina*) and species dependent on eelgrass.

Brief description: The macroalgae *Codium fragile* was introduced to the Peconics in the 1950s. Since that time, the species has become widespread throughout the entire estuary and is the dominant macroalgal species. Its impact on eelgrass abundance and distribution is unclear. There are also questions related to its effects on survival and growth of some benthic (e.g., bay scallop larval settlement/recruitment habitat) and pelagic species. Given the vast extent of *Codium fragile*'s occurrence in the estuary, and the PEP interest in eelgrass preservation and restoration, it is critical to begin answering these questions now to better understand the influence of this macroalgae on the ecology of the estuary. This research would be integrated into the SAV priority research described later in this document.

(4) *PHRAGMITES AUSTRALIS*

Target: Tidal Wetlands

Research

Purpose: To understand: (1) the causes of *Phragmites* expansion; (2) ecological effects on communities, species, and food webs; (3) its adequacy in stormwater control; and (4) whether there are differences in genotype.

Brief description: The common reed, *Phragmites australis*, is an invasive herbaceous grass. The plant can reach up to approximately 7 m (20 ft) tall. Associated with disturbed areas, *Phragmites* can spread rapidly, far beyond its original bounds. *Phragmites* tends to form dense, monotypic stands after invasion of an area resulting in a reduction in species diversity and availability of critical nesting habitat for certain species. However, some researchers have found that *Phragmites* may provide habitat of comparable value as *Spartina* spp. for fiddler crabs, grass shrimp, and larval mummichogs (J. Weis, personal communication, 1998). An investigation of its ecological effects, effectiveness of current control efforts, and possible biological controls should also be incorporated into studies.

(5) TOXIC CONTAMINANTS

Targets: **Seagrass**
Resident Finfish
Shellfish

Research

Purpose: To understand the impacts of lethal, sublethal, and synergistic effects of toxic contaminants on (1) eelgrass and (2) sensitive stages of species in the estuary such as larval and juvenile finfish and shellfish. This priority should be broken down into multiple research projects that further specify research on impacts of particular toxic contaminants on eelgrass, finfish, and shellfish.

Brief description: Toxic contaminants from pesticides, herbicides, road runoff, sewage, boats, and other sources may be impacting Peconic estuarine organisms impairing growth, reproduction, spawning, recruitment, settlement, or other sensitive stages in their lifecycle. Lytle and Lytle (1998) found a correlation in the use of the pesticide, atrazine, and growth inhibition of the estuarine marsh plant *Juncus roemerianus*. Other studies focusing on phytoplankton and SAV macrophytes found declines with increased use of atrazine. Atrazine is one of the pesticides used by farmers in Suffolk County. Recent pesticide use data from the NYS DEC indicates that Suffolk County has the greatest pesticide usage in the entire state of New York.

Eelgrass in the Peconics has been in decline at least since 1985 when brown tide first occurred. Pesticides may be playing a role in the overall decrease of eelgrass throughout the estuary, particularly in areas west of Shelter Island. Toxic contaminants may also be having effects on organisms that use the estuary during critical life stages such as when they are larvae or juveniles or during periods of reproduction, recruitment, and settlement. There is a paucity of data on this type of information in the Peconics and it is therefore in need of further study.

7.2 RESEARCH, MONITORING, AND ASSESSMENT FROM SYSTEMS TO SPECIES

Natural systems are vastly complex assemblages of species with elaborate internal and external biotic and abiotic processes and interactions that help maintain the entire system (Noss *et al*. 1997). System-wide research and monitoring of biotic and abiotic processes are essential for understanding ecosystem productivity, land-bay-ocean linkages, benthic-pelagic coupling, biological links to water quality and other interconnections that drive habitat functions and biodiversity. More specific research, monitoring, and assessment of living resource targets is also needed to further understand their role in the larger Peconic Estuary system.

(1) CONCEPTUAL ECOLOGICAL MODEL

Targets: **Beach, Bluff, and Dune Complex**
Tidal Wetlands
Seagrass
Resident Finfish
Beach-Dependent Species
Shellfish
Diverse Phytoplankton Community

Assessment

Purpose: To describe relationships among biotic, abiotic, and anthropogenic components of the Peconic Estuary system and highlight information gaps in order to help prioritize research and monitoring needs.

Brief description: A conceptual ecological model is needed to establish a baseline from which we can identify the importance of various estuarine species, energy flows and key linkages among human perturbations, physical processes, habitats, and biological elements of the system in need of management. One recommended approach is to follow Odum (1971), which is a systems-based method that describes the flow of energy among external forces and inputs, producers, consumers, storages, and interaction among these components. Because of its potential to help focus research and monitoring efforts, the development of a conceptual ecological model is one of the highest priorities.

A conceptual ecological model is needed as part of this Living Resources Research and Monitoring framework. A conceptual ecological model is a presentation of ecosystem components and linkages among components in a schematic format (Montagna *et al*. 1996). The model would link the categories of research and monitoring in this framework by describing major components of the Peconic ecosystem and the interrelationship among them. A model would highlight known information – our understanding of the biotic and abiotic factors affecting the estuary and their linkages, and what is not known about the system – the gaps that exist in our understanding that may limit effectiveness in developing strategies and managing the Peconic Estuary. Therefore, the development of a conceptual ecological model is an important organizing principle to help direct research and monitoring priorities.

(2) ROLE OF WETLANDS

Target: Tidal Wetlands

Research

Purpose: To understand the role of wetlands in the Peconics as habitat, sites of nutrient flux, and shoreline stabilization.

Brief description: Along the Peconic Estuary coast, salt marsh wetlands are found around small embayments especially in areas where tidal creeks enter the estuary. It is one of the most productive habitats in terms of biomass while also playing a critical role in the detrital food web. Wetlands are also sensitive hydrologic indicators of water quality parameters such as turbidity, pH, nutrient, and presence of various pollutants. According to Tiner *et al*. (2000 [draft]), approximately 2,271 ha (5,679 ac) of the Peconic estuary consists of wetland (salt marshes and intertidal flats) habitat. To improve our understanding of this critical habitat, it is important to obtain information on its habitat importance to commercial, recreational, and rare species as well as its role in nutrient cycling, and shoreline stabilization.

(3) WETLANDS MONITORING

Target: Tidal Wetlands

Monitoring

Purpose: To monitor the abundance, distribution, diversity and quality of fresh and saltwater wetlands in the Peconic Estuary.

Brief description: In 1997, the U. S. Fish and Wildlife Service surveyed wetlands in the Peconic Estuary watershed as part of the National Wetlands Inventory. The data was GIS mapped and useful for tracking wetland trends over time. The NYS DEC has also performed GIS mapping of saltwater wetlands in the Peconic Estuary East of Shelter Island only (includes spatial distribution, acreage, and marsh types). The NYS DEC performs such GIS mapping through a combination of aerial photo surveys and ground truthing. This effort should be extended to complete the survey west of Shelter Island and routinely track the trends of wetland coverage approximately every 5 years. This is particularly important in light of the increasing rate of developmental pressure and sea-level rise.

(4) SUBMERGED AQUATIC VEGETATION ECOLOGY

Target: Seagrass

Research

Purpose: To assess community importance of different SAV to understand their role in primary production, habitat value, nutrient cycling, and sediment stabilization.

Brief description: Eelgrass once flourished throughout the Peconic Estuary. Largely as a result of wasting disease in the 1930s and more recently brown tide in the 1980s and 1990s, eelgrass is now found only along the eastern end of the estuary (with exception of Bullhead Bay, Southampton). Since the introduction of *Codium fragile* in the 1950s, this invasive macroalgae is now found widely throughout the estuary near eelgrass beds and in areas where there used to be eelgrass. Eelgrass in the Peconic Estuary may also be effected by other SAV species (epiphytic or non-epiphytic algal species). Given the changes in SAV abundance and distribution, it is important to assess community importance of SAV and rank each in terms of their community importance individually and as a whole to focus efforts on: (1) arresting current declines in SAV habitat value and function; (2) managing in favor of natural species; and (3) restoring historic species and distributions. Assessments of historic locations should follow rigorous, scientific methods such as sediment core analyses (e.g., pollen counts).

(5) EELGRASS

Target: Seagrass

Monitoring

Purpose: To adequately monitor aerial extent of eelgrass to assess trends.

Brief description: Adequate mapping and monitoring of SAV to track trends in areal extent and quality of eelgrass is a priority. In 1997, Cornell Cooperative Extension began monitoring SAV at three sites (see section 5.1.4.). This was expanded to a total of six sites in 1999. Aerial photo analysis is being undertaken in 2000-2001. In the LRRM workshop, annual aerial photo interpretation and ground truth information using transect surveys at 10-12 sites (for eelgrass) and up to a total of 20 sites for all SAV was recommended. All SAV should be surveyed every couple of years to assess the spatial and temporal variability of (1) depth of edges; (2) incidence of disease; (3) elemental tissue composition (of nitrogen); (4) general anatomical measures; (5) crown density; (6) light attenuation; and, (7) overall abundance.

(6) FORAGE FISH

Target: Resident Finfish

Research

Purpose: To determine (1) forage fish temporal and spatial distribution and abundance in the nearshore habitats included in the shallow water zone (≤ 3 m) of the Peconic Estuary, and (2) to evaluate the effects of land use patterns, water dependent activities, and urbanization on these habitats.

Brief description: The Peconic Estuary provides particularly valuable habitat for commercially and recreationally important finfish because of the availability of prey such as forage fish (e.g., larval and juvenile finfish, adult mummichog, sand lance, silversides, bay anchovy, herring spp.). However little is known about their distribution and abundance in the estuary, particularly at inshore areas such as the small embayments and tidal creeks of the system. An investigation of forage fish and invertebrates would provide an understanding of their importance and aid in development of management strategies to identify and address the impacts of land use and other activities in areas adjacent to these habitats.

Work should initially begin on a subset of the tidal creeks described and studied in past surveys (i.e., the PEP tidal creek survey), selected as representative of tidal creeks that were rated overall as "highly impacted systems" or "low impacted systems." Diurnal and seasonal use of various creek segments by larval, juvenile, and adult forage fish species should be investigated. Sampling will need to occur at least biweekly, at sampling locations progressing from the head to the mouth of the creek and out into surrounding nearshore areas adjacent to the mouth of the creek. Sampling should take into account tidal stage, and will require the evaluation and use of a variety of sampling gears (e.g., stop nets, seines, plankton nets, beam trawls) to ensure capture and identification of the different life stages of forage species that inhabit these nearshore areas.

The second component of this priority research is to evaluate the possible effects of adjacent land use and degree of urbanization on the use of these creeks by forage fish species. Results of surveys of forage fish abundance and distribution within selected creeks should be compared to individual and overall ratings of water quality, macrobenthic invertebrates, and land use ratings developed in the PEP tidal creek study to identify possible impacts and provide information for developing management strategies to maintain and enhance tidal creek productivity.

(7) FINFISH AND MACROINVERTEBRATES

Target: Resident Finfish

Monitoring

Purpose: To determine the temporal and spatial distribution, abundance, and different life stage habitat requirements of finfish and macroinvertebrate species throughout the Peconic Estuary.

Brief description: Monitoring of targeted finfish and macroinvertebrate species should be performed through: (1) habitat utilization mapping (subtidal habitats including SAV beds), (2) seine surveys, and (3) trawl surveys to develop a species occurrence list throughout their life cycle and identify sensitive recruitment and spawning areas. While there are currently no monitoring efforts in the Peconics for the adult stages of finfish, the NYS DEC runs an annual monitoring survey of juvenile finfish west of Shelter Island since 1987. The NYS DEC should expand their annual monitoring and analysis of juvenile finfish by trawling to the east of Shelter Island. This information is essential to better understand the importance of the Peconics to important finfish, crustacean, and other species. Efforts should focus on resident species such as winter flounder (*Pleuronectes americanus*), tautog (*Tautoga onitis*), as well as transient species such as alewife (*Alosa pseudoharengus*), weakfish (*Cynoscion regalis*), scup (*Stenotomus chrysops*), windowpane flounder (*Scopthalmus aquosus*), summer flounder (*Paralichthys dentatus*), northern puffer (*Sphoeroides maculatus)*, butterfish (*Peprilus triacanthus*), etc. Data on invertebrate species vulnerable to these gear types such as squid, horseshoe crabs, lady, blue, and green crabs, mantis shrimp, whelk, etc. should also be reported. Trawl data should be entered into a geographic information system (GIS) to analyze spatial aspects of the data and to enable comparisons with habitat maps.

(8) WINTER FLOUNDER

Target: Resident Finfish

Assessment

Purpose: To identify and map specific locations within the Peconic Estuary that provide critical spawning habitat for local populations of winter flounder.

Brief description: Winter flounder spawning in inshore waters is known to occur from December through April. Spawning occurs at temperatures of 1º C to 10º C and bottom salinities of 10 ppt to 35 ppt. Eggs are adhesive and demersal, attaching to each other and various substrates,

resulting in concentrations of eggs on spawning grounds. To identify critical spawning areas within the estuary, a fall and winter survey to collect egg and larval winter flounder should be performed biweekly at locations throughout the estuary during peak spawning times for a minimum of two sampling seasons. Sampling gear should include appropriate icthyoplankton sampling gear, such as bongo nets and epibenthic sleds. Egg and larval spatial and temporal distribution should be mapped and can be used to identify winter flounder spawning habitats and to provide specific information for managers in developing optimal seasonal windows for dredging that will minimize mortality of local stocks of winter flounder.

(9) PIPING PLOVERS

Target: Beach-Dependent Species

Assessment

Purpose: To determine piping plover habitat use, availability, and prey abundance in the Peconic Estuary and to assess affects of habitat changes to make recommendations to enhance plover breeding and productivity.

Brief description: Initial review of piping plover productivity data indicates that populations are down at a number of Peconic Estuary sites. The reasons are unclear as there are multiple factors that can play a role in breeding success and overall productivity. Throughout Long Island, there is an interest in "enhancing" habitat to improve shorebird productivity. Therefore, baseline data on prey abundance and shorebirds' microhabitat (i.e., intertidal zone -- sand and cobble patches, wrack, areas where there is sparse vegetation, beach berm, and moist swales) preferences is important information, particularly in the Peconic Estuary, which consist of habitats that do not readily fit typical habitat descriptions found in the literature.

(10) HORSESHOE CRABS

Target: Beach-Dependent Species

Assessment

Purpose: To identify and protect potential spawning habitat of horseshoe crabs in the Peconic Estuary.

Brief description: The 1998 Fishery Management Plan (FMP) for Horseshoe Crabs (*Limulus polyphemus*) adopted by the Atlantic States Marine Fisheries Commission (ASMFC) has identified habitat destruction and modification, overharvesting, and anthropogenic environmental changes as potential causes of concern relating to the status of horseshoe crab populations along the east coast. Horseshoe crabs are important to migrating shorebirds and sea turtles as sources of food, are critical to biomedical research and pharmaceutical testing, and are commercially harvested as bait for American eel, conch (or whelk), and baitfish. Horseshoe crabs have been

reported to spawn primarily during spring tidal phases, at the height of the daily tides on the upper intertidal zone of protected beaches with well-drained sandy substrates. The ASMFC has developed guidelines for delineation and assessment of horseshoe crab spawning habitat which include the following: using coastal zone management erosion data and topographic and navigational charts to predict potential spawning habitat; public participation using volunteers to provide information on time and location of observed spawning activity; aerial overflights at low tide; interviews with harvesters; and ground truth with surveys for nighttime spawning and for monitoring juvenile presence throughout the summer. Water quality degradation, bulkheading and sea wall and groin construction, dredging and beach renourishment, beach front development, and increased boat traffic and all-terrain vehicle use have all been identified as possible factors affecting horseshoe crab reproductive success. Initial landings data collected by the NYSDEC indicates that the Peconic/Gardiners Bay system is the major source of commercial landings of horseshoe crabs in New York, and presumably provides the largest concentration of productive spawning habitat in our local waters. This study would provide specific information for managers for protecting important spawning sites as required in the FMP.

(11) HARD CLAM, SOFT SHELL CLAM, BAY SCALLOP

Target: Shellfish

Assessment

Purpose: To assess hard clam, soft shell clam, bay scallop, and oyster temporal and spatial distribution; spawning, recruitment, and settlement; and population growth rates for improved management of these species.

Brief description: Shellfish are extremely vital to the Peconic estuary both ecologically and commercially. Shellfish can filter incredible volumes of bay water over relatively short time periods. Therefore, decreased shellfish abundance may be resulting in significant ecological changes to the system. For example, preliminary findings by Caron and Lonsdale (Dooley 1999) have resulted in a working hypothesis that the rapid decline in the shellfish population prior to the first brown tide may have led to significant reduction in grazing pressure on phytoplankton, thereby allowing the onset of brown tide. Understanding abundance and population growth rates as well as spawning, recruitment, and settlement of these important shellfish species is key to restoring shellfish populations and promote sustainable harvesting of these species.

(12) BAY SCALLOP

Target: Shellfish

Research

Purpose: To perform a distribution-focused study of the survival dynamics of bay scallops including an examination of settlement, recruitment, and size frequency and year class abundance of bay scallops located inside and outside of eelgrass beds.

Brief description: Anecdotal information indicates that adult bay scallops were once abundant enough that they were found outside of eelgrass beds in deeper waters where they were harvested by dredging. In some of these deeper areas, scallops may have been be two-years old, surviving to spawn two successive years. These two-year old scallops may have played an important role in the persistence of scallop populations, particularly following years in which brown tide interfered with normal recruitment resulting from the spawning of one-year old scallops. Today, bay scallops are harvested almost entirely in eelgrass beds because they are not as abundant and are no longer found in deeper waters. Given the huge fluctuations that have occurred in bay scallop populations as a result of brown tide, it is important to perform a distribution-focused study of the survival dynamics of bay scallops.

(13) SLIPPER SHELL

Target: Shellfish

Research

Purpose: (1) To understand slipper shell (*Crepidula* spp.) temporal and spatial distribution; spawning, recruitment, and settlement; and population growth rates to understand the role they play in the estuary; and, (2) to use slipper shells as a model for understanding benthic filter feeder dynamics with planktonic communities.

Brief description: Based on Lewis *et al*. (1997) and Lewis and Rivara (1997), slipper shells are in great numbers throughout the Peconics with maximum abundances of 5,840 individuals pr 9.29 sq. meters. *Crepidula* spp. were found at 48% of the stations sampled in 1995 as compared to only 11% by NYS DEC in 1979 Lewis *et al*. (1997). In fact, *Crepidula fornicata* was the most abundant species surveyed by Lewis *et al*. (1997). It is not clear whether populations have increased in response to ecological changes to the system such as brown tide and decreases in bay scallop abundances. More information is needed on slipper shells as well as on benthic-pelagic coupling occurring in the estuary. Slipper shell would be a good model to understand the ecological relationship between benthic filter feeders and planktonic communities.

(14) BENTHOS

Targets: **Seagrass**
Shellfish

Assessment

Purpose: To obtain baseline information on bay bottom structure, substrate, and benthic community structure for evaluating changes that may occur over time for better management of benthic resources and the estuary as a whole.

Brief description: Mapping of the bay bottom using a high resolution remote sensing system will provide information on shellfish, submerged aquatic vegetation, and sediment characteristics. Such information is essential for proper management of Peconic estuarine resources, improving shellfish productivity, restoring degraded benthic habitat, and improving shellfish harvest in the system. Maps will also be useful for linking land usage (e.g., developed vs. undeveloped areas) and water quality data to benthic habitat quality. Ultimately, benthic data will be employed as a long-term indicator of the overall "health" of the Peconic Estuary. It is also intended that the data be used to assess the spatial distribution of habitats and structures that are important to juvenile finfish survival and recruitment into the fishery. In addition to seafloor mapping with remote sensing equipment, ground-truthing will be performed to confirm occurrences of particular species and significant concentrations of species and habitats.

(15) CRITICAL NATURAL RESOURCE AREAS

Targets: **Beach, Bluff, and Dune Complex**
Tidal Wetlands
Seagrass
Resident Finfish
Beach-Dependent Species
Shellfish

Assessment

Purpose: To organize existing data, collect new data to fill information gaps, and perform a threat assessment for each Critical Natural Resource Area (CNRA) in order to fulfill recommendations made in the draft CCMP and develop an implementation strategy by the Towns to protect these important areas of high biodiversity.

Brief description: The CCMP identifies CNRAs within the Peconic Estuary watershed (spanning

land and estuarine waters) that represent the highest quality remaining natural resources. All existing information on the different habitat and organisms of importance and their diversity of function found in the CNRAs needs to be collected and organized into one inventory. Biological data need to be quantified and information gaps need to be filled through additional data collection and geographic information system (GIS) analysis. This analysis can then be used to modify or confirm boundaries and develop buffer and core areas within CNRAs. A detailed threats assessment is also needed. The threats assessment can then be linked to the CNRA inventory and protection measures can be developed to reduce impacts and maintain their high quality.

(16) ECOSYSTEM STRUCTURE AND PRODUCTIVITY

Targets: **Beach-Dependent Species**
Shellfish
Diverse Phytoplankton Community

Monitoring

Purpose: To obtain baseline information on the trophic structure through monitoring and to perform analyses to determine whether there are changes, if any, in ecosystem productivity as a result of changes in species composition.

Brief description: The PEP has identified there is a paucity of information on the dynamics of the food web in the Peconic Estuary. In order to determine whether there are shifts in food sources (including submerged aquatic vegetation and plankton) related to habitat degradation, water quality changes, invasive species, or other factors, and whether these shifts have led to alterations in species composition, comprehensive assessment and monitoring of the different trophic levels is needed. More specific research questions related to cause and effects of changes in trophic structure need to be developed. Monitoring needs include: (1) phytoplankton production, abundance, and identification and distribution of species assemblages (including picoplankton); (2) microzooplankton abundance and identification and distribution of species assemblages; (3) mesozooplankton abundance and identification and distribution of species assemblages; (4) abundance and distribution of dominant benthic invertebrate species assemblages; (5) abundance, distribution, density and size/weight of selected shellfish and finfish species; (6) abundance and distribution of selected colonial waterbirds, shorebirds, and wintering waterfowl; and (7) sightings/occurrences of marine mammals and sea turtles.

(17) BIOINDICATORS

Targets: **Tidal Wetlands**
Seagrass
Resident Finfish
Beach-Dependent Species
Shellfish
Diverse Phytoplankton Community

Research & Monitoring

Purpose: To identify and use a suite of indicator species at different trophic levels (e.g. plankton, finfish [nekton], benthos) to assess estuarine diversity and abundance and productivity in the Peconics and evaluate habitat changes and environmental stresses at varying multiple temporal and spatial scales.

Brief description: Bioindicators consist of organisms that reflect changes to their habitat in a predictable and repeatable manner. Bioindicators can represent changes at different scales, ranging from biomolecular responses to population-level and community-level responses. These are typically used to assess the effects of environmental stresses on the diversity and abundance of marine organisms. These bioindicators need to be linked to the conceptual ecological model representing different temporal and spatial scales. The indicators should provide technical information about the condition of the estuary and be capable of linking improvements to particular management actions undertaken or help identify management actions that are needed to improve conditions. Examples of specific indicators may include: bay scallops, winter flounder, tautog, osprey, eelgrass, sponges, and diamondback terrapins.

7.3 RESEARCH, MONITORING, AND ASSESSMENT RELATED TO RESTORATION

(1) RESTORATION

Targets: **Beach, Bluff, and Dune Complex**
Tidal Wetlands
Seagrass
Resident Finfish
Beach-Dependent Species
Shellfish

Assessment & Research

Purpose: To assess restoration projects to measure success of restoration efforts and to identify novel techniques to improve restoration efforts.

Brief description: An action in the CCMP recommends evaluating the success of restoration efforts. There have been examples in the Peconics of restoration efforts that have not resulted in actual long-term recovery of the targeted habitat. Therefore, it is essential to both assess and monitor restoration projects in order to take steps, if necessary, to correct any problems. A number of restoration projects are now underway as a result of available funding from the NYS Clean Air Clean Water Bond Act. More restoration projects are expected to be funded in the future. It is critical for restoration projects to build in the capacity to monitor sites upon completion of restoration. Restoration assessment needs to be linked to the reference sites in order to make quantitative comparisons of functionality. As part of assessment, monitoring before, during, and after restoration is also needed to evaluate success of restoration efforts and is considered a priority. Restoration projects should also strive to set aside a certain amount of effort in performing experimental methods to improve efforts and identify key restoration priorities. Also, research is needed to assess functional attributes necessary for restoration of natural communities.

(2) EELGRASS CULTURING

Target: Seagrass

Research

Purpose: To develop a nondestructive method of culturing eelgrass to prevent impacts to existing beds.

Brief description: Eelgrass restoration has been identified as a priority in the CCMP and the Habitat Restoration Plan. It is important to preserve existing beds while restoring eelgrass to other areas. Therefore nondestructive methods need to be pursued and national research protocols on tissue culture and seed base need to be followed. As part of this research, there should be an examination of flowering phenology, seed production and viability, eelgrass colonization of unvegetated areas, sediment deposition due to eelgrass and possible changes in sediment type after loss of eelgrass.

(3) REFERENCE SITES

Targets: **Beach, Bluff, and Dune Complex**
Tidal Wetlands
Seagrass
Resident Finfish
Beach-Dependent Species
Shellfish

Assessment

Purpose: To develop a suite of reference sites that represent different habitats as controls for gauging restoration projects as well as for comparative analyses.

Brief description: One of the most common assessment designs involves the comparison of a control or reference site (i.e., a place far enough from an activity under investigation to be relatively unaffected by it) and an impact site (near an activity under investigation and therefore assumed to show signs of an effect if one exists). Control-Impact and Before-After-Control-Impact (BACI) are two examples of important sampling designs used in coastal ecology that require the establishment of reference sites (Osenberg and Schmitt 1996). Sites used in previous research, monitoring, and characterization efforts such as the SCDHS surface water quality monitoring (Figure 2), tidal creek characterization (Figure 4), and Natural Heritage Program sites need to be taken into consideration when reference sites are chosen. Pristine versus impacted sites need to be identified and characterized as reference sites. Reference sites should represent the functional value of different habitats (e.g., saltmarsh, eelgrass beds) in order to assess success of habitat/resource restoration. Location maps need to be developed. Reference site data should be made accessible to anyone involved in research, monitoring and restoration in the Peconics.

8. IMPLEMENTATION STRATEGY

A key aspect of implementing a research and monitoring program is to have continued interest by decision makers as well as an adequate and continuous funding source. Periodic review of the program and redirection of effort by decision makers may also be necessary if new information justifies a change in the research and monitoring program. A successful research and monitoring program will also rely on participation by both the local scientific community and the public.

Involvement of the scientific community over and above the creation of a science advisory panel can spark opportunities for associated research and monitoring. A management recommendation made in the CCMP Habitat Module is to promote research and monitoring opportunities in the Peconic Estuary at local schools, colleges, universities, and institutes by establishing funding and scientific platforms and other incentives to facilitate basic and applied marine research.

One management recommendation in the CCMP is to seek opportunities to link research and monitoring in the Peconics to related estuaries and regional studies. Other National Estuary Programs have embarked on research projects, which have resulted in significant findings about marine systems that are applicable to many estuaries. The PEP should participate in coordinated research and information exchange with other National Estuary Programs as well as other estuaries where coordinated, large-scale research and monitoring efforts are underway.

Public participation is also beneficial for successful program implementation. Citizens as advisory representatives ensure that the scope of the program addresses the needs of the community and that information is in an understandable format. There are numerous examples of programs having effective volunteer citizen monitoring programs as part of a larger research and monitoring initiative. The Peconic Baykeeper intends to develop a volunteer citizens monitoring effort, coordinated with this framework, that will focus on monitoring shoreline changes.

8.1. LINKS TO OTHER PROGRAMS

A key aspect of the Living Resources Research and Monitoring program will be its coordination with brown tide research efforts, the existing SCDHS surface water monitoring program, NYS DEC annual trawl survey, and Cornell Cooperative Extension's SAV monitoring to minimize redundancy and leverage efforts wherever possible. The following is a brief description of each of the four programs.

8.1.1. SCDHS SURFACE WATER MONITORING

A major finding stressed at the LRRM workshop was the importance of the SCDHS surface water monitoring program and the need to expand its efforts or develop partnerships with other entities to incorporate a larger living resource component to its monitoring efforts. There are already a number of living resource PEP projects (e.g., tidal creek study, SAV monitoring, eelgrass/water quality) that are designed to work with SCDHS monitoring to obtain the most complete information while minimizing unnecessary redundancy in water quality data collection. A second recommendation made in the LRRM workshop was for the SCDHS to expand its efforts to monitor groundwater flow and content such as nutrients and toxic contaminant levels. Given the prevailing hypothesis by La Roche *et al*. (1997), which associates brown tide with nutrient inputs from groundwater, monitoring ground water seepage and nutrient levels would be an important expansion to SCDHS efforts.

Since 1986, the SCDHS has routinely analyzed samples for a broad array of water quality and other parameters at 35 stations and 10 point source stations (Figure 2). Several intensive

water collection surveys have also been performed at Sag Harbor and West Neck Bay. The SCDHS surface water monitoring program consists of weekly water sampling of 15 sites with the remaining 20 sites sampled on an alternating biweekly schedule and biweekly sampling of 10 point source stations. Sample analyses include nutrients (NH_3, $NO_2 + NO_3$, TPO_4, $TDPO_4$, OPO_4, TKN, DKN, urea, TOC, DOC, Si), total and fractionated (< 10 μm) chlorophyll-a, salinity, total suspended solids, total and fecal coliform bacteria, and the brown tide organism *Aureococcus anophagefferens*. Field measurements include temperature, dissolved oxygen, secchi depth, and photosynthetically active radiation by irradiometry. Three stations are sampled each week on a diurnal (morning and afternoon) basis in an effort to relate diurnal dissolved oxygen concentrations to chlorophyll-a and nitrogen levels. Special sampling events include wet weather sampling to determine changes in water quality due to rainfall (in Sag Harbor and West Neck Bay), intensive sampling of every two to four hours over a 24-hour period to investigate diurnal dissolved oxygen variation (in Peconic River, Meetinghouse Creek and Flanders Bay), and intensive sampling along the eastern boundary of the Peconic Estuary for input to the water quality model being developed by Tetra Tech on behalf of the PEP.

8.1.2. BROWN TIDE RESEARCH

In the decade following the first brown tide in 1985, New York Sea Grant and Suffolk County funded brown tide research performed by scientists at SUNY Stony Brook, Brookhaven National Laboratory (BNL), Southampton College and elsewhere. In 1996, the NOAA Coastal Ocean Program funded $1.5 million for brown tide research as part of the Brown Tide Research Initiative (BTRI) administered by New York Sea Grant. An additional $1.5 million for brown tide research was funded by the Coastal Ocean Program of NOAA as part of the Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) program. ECOHAB is an interagency program consisting of NOAA, Sea Grant, National Science Foundation, Environmental Protection Agency, Office of Naval Research, and National Aeronautics and Space Administration. Studies supported by BTRI, New York Sea Grant, and the NOAA Coastal Ocean Program have included:

- Physiological characteristics of brown tide
- Phytoplankton productivity and zooplankton dynamics (predator-prey relationships)
- Viral activity
- Environmental factors enhancing brown tide blooms
- Impact of brown tide on microbial food web
- Susceptibility of shellfish to brown tide
- Physical oceanographic study on the causative factors in the initiation of brown tide blooms
- Genetics
- Historical occurrence of brown tide blooms
- Reconstruction of the effects of brown tide blooms on the growth of hard clams

8.1.3. NYS DEC FINFISH & MACROINVERTEBRATE TRAWL SURVEY

Since 1987, the NYS DEC has performed annual trawl surveys west of Shelter Island. The original intent of the surveys was to develop an annual index of recruitment of juvenile weakfish and examine the relationship between parental stock size and environmental factors on year class strength for weakfish (Weber *et al*. 1998). Data collection was later expanded to derive similar information on several other finfish species including winter flounder, scup, bluefish, tautog, butterfish, and northern puffer. The surveys also provide important data on more than 70 other species of finfish and crustacea (Weber *et al*. 1998).

8.1.4. CORNELL COOPERATIVE EXTENSION SAV MONITORING

In 1997, Cornell Cooperative Extension's Marine Program began SAV monitoring at 3 sites in the Peconic Estuary: Orient Harbor, Town of Southold, Northwest Harbor, Town of East Hampton, and Bullhead Bay, Town of Southampton. A minimum of three stations were sampled per site for SAV, sediment analysis, and water quality analysis. SAV measurements include: species composition, dry weight biomass of algae and eelgrass, depth and position of deep edge of eelgrass bed, shoot density, presence and dry weight biomass of epiphytes, and presence of wasting disease. Samples for SAV were taken 2 times per year. Cornell Cooperative Extension uses water quality data from SCDHS surface water monitoring program (see above). These data consist of the following parameters: chlorophyll-a, total suspended solids, dissolved inorganic nitrogen, dissolved inorganic phosphorus, and light attenuation. In addition, water temperature, salinity, and light measurements at the surface and at one meter increments are taken at the time of SAV sampling. Sediment measurements include grain size and percent organic matter.

Upon completion of the 1997 SAV monitoring report, two recognized experts in the field were asked to review the monitoring program. As a result of this expert review, the monitoring program was revised and the following 1998 sampling program was initiated: SAV sampling was performed once per year during the summer, the number of samples collected per site was increased to 12, and sediment sampling will be repeated every five years for each site. In 1999, Cornell Cooperative Extension expanded its monitoring program to include three additional sites in Gardiners Bay, Town of Shelter Island, Three Mile Harbor, Town of East Hampton, and Southold Bay, Town of Southold (Figure 3). Underwater video of each site was also taken in 1998 and 1999. Aerial photo analysis of eelgrass coverage estuary-wide will be performed in 2000 in cooperation with the US Fish and Wildlife Service. Aerial photos will provide a more extensive view of existing eelgrass beds and provide estimates of percent cover.

9. PRODUCTION & DISSEMINATION OF INFORMATION

Dissemination of research and monitoring information is essential to evaluate progress made in restoration and conservation efforts, to develop improved methods for research, monitoring, and stewardship of our important natural resources, and to provide public with information about the state of the estuary. Results of research and monitoring should be available in peer reviewed scientific journals and conferences as well as in newsletter and other formats that are understandable to the public and decision makers.

9.1. DATA MANAGEMENT

A Living Resources Research and Monitoring program would generate a vast amount of data over a relatively short period of time. How these data are managed and their availability will influence how the information is used. A database manager must be identified early on in the development of this program. Database management could be undertaken by Suffolk County under the auspices of the PEP Program Coordinators, NYS DEC, or could be contracted out to a university or private entity.

Regardless of which entity manages the data, the information must be available in different formats depending on how it will be used. The program coordinator should be required to set up a procedure on how the scientific data are transformed into information and made available in various forms that can be used not only by other scientists, but also by resource managers, decision makers, and the public at large. For example, different forms in which information is needed include raw data of field and laboratory results, summary results from data analyses, highly summarized data designed to explain generally about the health of the Peconics, technical reports and publications on analyzed data, and public information such as news accounts and press releases based on results from data analyses. Periodic fact sheets distributed in a newsletter or made available electronically on the PEP web site are other important information dissemination tools that should be provided by a living resources research and monitoring coordinator.

One recommendation made in the CCMP Habitat Module is to organize an annual or biennial conference to report research and monitoring results to the public and guide management decisions. Such a biennial conference will provide an opportunity for scientists to meet along with managers and the public to review and discuss findings.

9.2. GEOGRAPHIC INFORMATION SYSTEMS

A geographic information system (GIS) is a computer system for the entry, management, display, and analysis of geospatial data. Information is in the form of maps, or data layers, with related tables of descriptive information that are linked to the graphic features on the map. Uses of GIS parallel and support three of the major functions of the living resources research and monitoring framework: information gathering, communication, and scientific analysis. Examples of GIS applications include habitat delineation and assessment, threats assessment, change analyses, process and flow modeling, and spatial measurements, as well as publication and presentation graphics and data management. Some of the priorities discussed in this document call for the use of GIS in developing maps and performing spatial analyses.

Some GIS applications are best performed by specialists with advanced systems, while others can be done by individuals with minimal training and desktop systems. Given that GIS is such a powerful tool for managing and analyzing data, it would be imperative that GIS be used for various aspects of the Living Resources Research and Monitoring program activities related to data management, map production, spatial analysis, and information dissemination.

10. IDENTIFICATION OF FINANCIAL RESOURCES

The cost of implementing a comprehensive research and monitoring program can be wide-ranging depending on the scope of projects and staff needed to administer the program. At least $500,000 annually would be needed to adequately perform only a few of the research and monitoring projects identified as priorities in the CCMP. An additional $100,000 annually would be required for program administration, oversight and coordination, and public involvement and outreach. At least $3 million over the next five years would be required to adequately implement a comprehensive living resources research and monitoring program.

The PEP Management Conference should aggressively seek funding as part of its budget process for implementation of this program. Funding sources could be existing or new sources from NYS DEC, NYS DOS, USEPA (including NEP implementation), NOAA, National Science Foundation, Suffolk County, and private sources. Initial seed money could be sought from an allocation by the New York State Legislature as a Member item or by federal representatives.

10.1. COORDINATION WITH EXISTING GRANT PROGRAMS

Coordination and partnership of individual competitive grants will play a major role in the success of this program. Examples of competitive grants include but are not limited to: (1) National Science Foundation grants; (2) US EPA Sustainable Development Challenge Grant; (3) US EPA Project EMPACT (Environmental Monitoring for Public Access and Community Tracking); (4) US EPA Water and Watershed Research; (5) US EPA Coastal 2000; (6) US EPA NCERQA; (7) NOAA ECOHAB; (8) NOAA Essential Fish Habitat; (9) NOAA Coastal Services Center Coastal Change Analysis Program; (10) US Fish and Wildlife Service Aquatic Nuisance

Species program; (11) Coastal Intensive Network Sites (CISNet); and, (12) National Environmental Monitoring Initiative -- Committee on the Environment and Natural Resources, White House Office of Science & Technology Policy.

Special designations of sites in the Peconics could make funding available from NOAA National Estuarine Research Reserve and/or National Science Foundation Land Margin Ecological Research program.

11. CONCLUSION & NEXT STEPS

Research and monitoring should be used as tools in environmental decision- making to provide technical assessments of problems while the wider public is involved in determining the desirability of action based on the scientific evidence (Fairweather 1993). This document which highlights research, monitoring, and assessment priorities for habitats and living resources of the Peconic Estuary could provide the appropriate science needed to help decision makers implement the recommended management actions in the CCMP and fill information gaps needed to modify existing or develop new strategies to protect and conserve the estuary.

Living resources research and monitoring coordination, advocacy, and fundraising is necessary to make this framework a reality. Strong leadership will be essential for success of this program. A coordinator is needed to effectively implement this framework, focus research and monitoring needs highlighted in the CCMP, and coordinate existing efforts. One of the most important responsibilities of a coordinator will be to ensure that scientific results generated by this framework be tailored into information that managers and the public can understand and use.

The ideas recommended in this document are consistent with new paradigms in biodiversity conservation and management that embrace species, ecosystems, and the dynamic multi-scale ecological processes that sustain them (Peters *et al*. 1997).

Next steps include identifying a coordinator, raising funds for specific projects, and developing specific “scope of work” descriptions, cost estimates, and timelines for projects that fall under each research and monitoring priority. The results of each priority project must ultimately fulfill a management need identified in the CCMP. Therefore, specific management needs must be finalized.

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APPENDICES

A1. SAMPLING PROTOCOLS

Cost effective sampling protocols are needed to ensure consistency among projects, quality assurance and quality control, and allow comparisons of results from different projects. Since the intent of this program is to support long-term research and monitoring, sampling protocols are especially important for trend analyses. Until an expert panel is convened to develop specific sampling protocols, sampling should follow methods found in Puget Sound Estuary Program's *Estuarine Habitat Assessment Protocol* (Simenstad *et al.* 1991). Sampling stations should be consistent with sites used in the SCDHS surface water quality monitoring program (Figure 2), eelgrass monitoring by Cornell Cooperative Extension (Figure 3), the PEP tidal creek characterization study (Figure 4), and the Critical Natural Resource Areas (Figure 5) described later in this report.

A2. PAST & ONGOING EFFORTS

A2.1. WATER QUALITY AND SEDIMENT DYNAMICS

The PEP is supporting the development of a hydrodynamic water quality model of the Peconic Estuary. Model results are expected in the near future.

The NYS DEC Bureau of Shellfisheries Shellfish Sanitation Unit is responsible for water quality monitoring for the harvest of bivalve molluscs. Water samples are collected and analyzed for total and fecal coliform bacteria. The Systematic Random Sampling Method is used whereby NYS DEC samples at least six times per year (ideally once every two months) at each shellfish growing area. Sampling can occur either during wet or dry weather but must be taken on an ebbing tide. Shellfish growing areas are closed on a "temporary emergency basis" after three inches of rainfall (or greater) within a continuous 36-hour period. When this occurs, the affected growing area is closed to harvesting and must be tested to document that water quality has returned to acceptable coliform levels. The area can then be re-opened to shellfish harvesting. NYS DEC does not currently monitor coliform bacteria in all areas in the estuary closed to shellfish harvesting.

In 1997, the PEP funded an eelgrass habitat water quality criteria study to correlate water quality conditions with health of eelgrass beds. Water and sediment quality and general hydrodynamic trends were evaluated in areas where eelgrass density was highest, lowest, transitional, stressed, and non-existent. Data were compared to criteria developed for Long

Island Sound and Chesapeake Bay. Additional work included an analysis of eelgrass transplant techniques to determine the most successful methodology for the Peconics.

The PEP funded a survey by Howes *et al*. (1998) on sediment nutrient flux at 10 stations in the Peconic Estuary. Rates of sediment and water column oxygen consumption and nutrient regeneration were measured throughout the system to determine the potential for occurrences of bottom water hypoxia and the magnitude of organic matter cycling throughout the system. Using radionuclides, Cochran *et al*. (1999) evaluated sediment mixing and accumulation patterns at the same 10 sites. Carbon burial rates were estimated to be 0.3 to 1.8 mg $C/cm^2/y$.

A2.2. TOXIC CONTAMINANT ANALYSES

In 1994, Arthur D. Little (1996), Inc. was contracted by the PEP to survey bottom sediment for toxic contaminants throughout the estuary. Sediment samples were collected from 12 locations and analyzed for a wide range of naturally occurring and human-made substances. Pollutant concentrations were compared to "Effects Range-Low" and "Effects Range-Median" values developed by NOAA. Both the low and median values correspond to concentrations below which contaminant induced effects are unlikely. None of the samples exceeded the medium range values. Arsenic and lead concentrations exceeded the low values at 10 stations. Copper, mercury, silver, cadmium, and zinc exceeded low values in East Creek.

Recently, in 1998 and 2000, the U. S. Environmental Protection Agency performed a survey to sample sediment toxicity (e.g., metals, pesticides, organics) at 28 sites throughout the estuary. Typically, most measurements were low to below detection. There were detectable levels of pesticides including DDT and its breakdown products in Jockey Creek and Sawmill Creek in Southold. The U.S. EPA also completed a survey in 1999 to examine possible bioaccumulation of contaminants, including radionuclides, in finfish and shellfish. Results are not yet available.

A2.3. BIOLOGICAL INVENTORIES

D. Lonsdale and G. Taylor, scientists from the Marine Sciences Research Center, State University of New York , Stony Brook, are currently performing a taxonomic survey of phytoplankton and microzooplankton including temporal and spatial patterns in composition and biomass, at three sites in the Peconics. The sites are at SCDHS water quality sampling stations in Flanders Bay (#170), West Neck Bay (#119), and Great Peconic Bay (#130).

The Peconic Estuary Program contracted EEA, Inc. to survey macrobenthic invertebrate communities of 10 tidal creeks. Land use, water quality, bathymetry, hydrodynamics, physical chemistry, sediment grain size, and wildlife was also evaluated. The data collected suggest an interesting relationship between a diverse benthic community and presence of surrounding salt marsh, even in instances where there was only a fringe of salt marsh between the creek and development in the watershed (EEA, Inc. 1999).

The New York Natural Heritage Program (NYNHP) inventoried rare and endangered species and natural communities in the Peconic Estuary watershed. Results of their inventory are

found in Pleuthner (1995). The U. S. Fish and Wildlife Service mapped critical natural resource areas, including habitat and species distribution maps, which reflect the results of two PEP experts workshops in 1996.

The NYS DEC performs ongoing wetland status and trends in the Peconic Estuary watershed. In 1997, the U. S. Fish and Wildlife Service also surveyed wetlands in the Peconic Estuary watershed as part of the National Wetlands Inventory (Tiner et al. 2000 [draft]).

In 1995, the PEP funded a deep (1.8 to 8.5 m) water shellfish survey by Lewis *et al*. (1997) and in 1997, a shallow (0.3 to 1.85 m) water shellfish survey by Cornell Cooperative Extension (Lewis and Rivara 1997) to evaluate distribution and abundance of sediment type, shellfish, and other macrofauna. In the deep water survey, sampling was performed at 124 stations spaced approximately 0.5 nautical miles apart. An earlier shellfish survey was performed in 1979 and 1980 by NYS DEC in the deep waters of the Peconic Estuary from Flanders Bay to Shelter Island Sound at 246 stations. Sampling methods were the same as the deep water survey performed by Lewis *et al*. (1997). Therefore, comparisons between surveys were made in some areas.

The East End towns monitor a variety of finfish populations on different scales at different locations. Commercial landings of finfish and crustaceans are also documented annually by the National Marine Fisheries Service.

The PEP funded a SAV survey performed by Cashin Associates (1996). They reviewed historical patterns of SAV abundance and distribution and performed field surveys throughout the estuary. Their survey encompassed stations throughout the estuary in areas where shellfish growing areas or eelgrass beds currently exist or may have occurred in the past based on anecdotal and qualitative information from marine scientists, harbor masters, bay constables, and other local officials. More detailed surveys were performed in North Sea Harbor, Three Mile Harbor, West Neck Harbor, and Long Beach Bay. They also used aerial photos from October 1994 to add stations around Shelter Island and to the east and to determine spatial extent of eelgrass beds and other SAVs between sampling stations. A total of 214 stations were sampled between September and October 1994. Aerial coverage was estimated by visual surveys within an approximately 30 m (100 ft) radius of each sampling station.

The PEP will be funding a second set of aerial photo interpretation by the U.S. Fish and Wildlife Service in cooperation with Cornell Cooperative Extension and the Peconic BayKeeper as part of eelgrass long-term monitoring. Unlike Cashin (1996), photos will be collected according to protocols developed by NOAA to obtain the most accurate interpretation of eelgrass characteristics using aerial photography. The photos will also be used to obtain quantitative, baseline information on the amount of shoreline hardening that currently exists along the Peconic Estuary.

A2.4. LAND USE ANALYSES

In 1995, the PEP supported the Suffolk County Department of Planning to inventory land use and population and develop parcel-specific land use maps for every Suffolk County Tax Map parcel in the PEP. Maps were also developed to show land available for development and underwater ownership of submerged lands.

A2.5. GROUNDWATER STUDIES

From 1993 to 1996, the U. S. Geological Survey investigated the distribution and magnitude of ground water discharge to the Peconic Estuary and identified ground water flow paths and travel time to Meetinghouse Creek, Sag Harbor Cove and West Neck Bay. Water levels were measured at 246 wells during March-April 1994 and at 195 wells in March 1995. Modeling combined with hydrogeologic data from 43 observation wells and borehole-geophysical surveys at 24 wells were used to determine ground water flow paths, travel time and a water budget.

A continuously recording ultrasonic seepage meter was used by Paulsen *et al*. (1997) to measure ground water underflow 65 ft offshore in Coecles Harbor, Shelter Island in an effort to understand the relationship between tidal fluctuations and groundwater underflow and to locate the salt/fresh water interface.

A2.6. BROWN TIDE INVESTIGATIONS

In addition to the brown tide research and monitoring described earlier, BNL has initiated the Brown Tide Monitoring Network to deploy real-time in-situ fluorometers and examine basic photosynthetic physiology of brown tide in the field. BNL has also performed "hindcasting" and autoecological investigations.

Initial studies on brown tide include those of Bricelj and Kuenstner (1989) on the effects of brown tide on shellfish and Dennison *et al*. (1989) who investigated the effect of the brown tide algal bloom on eelgrass. Studies performed by Cosper *et al.* have included physiological analyses, ^{14}C productivity data, and the effects of macronutrients and micronutrients on bloom formation. Anderson *et al.* (1993) developed an immunoflourescent procedure for detecting brown tide cells. Lonsdale (1996) examined predator-prey relationships. New York State, local towns, baymen's groups and Cornell Cooperative Extension have been involved in shellfish reseeding and monitoring efforts (New York Sea Grant 1998).

A3. ADDITIONAL RESEARCH & MONITORING INITIATIVES

There were numerous recommendations made at the LRRM workshop and PEP Natural Resources Subcommittee meetings. Although not identified as priorities, the following research and monitoring recommendations are nevertheless important and should be considered further as

the development of this program evolves. There is some overlap of research and monitoring recommendations among each other and the priorities listed above.

A3.1. *LIVING RESOURCES THREATS-RELATED RESEARCH, MONITORING & ASSESSMENT*

- It is intended that this LRRM program be linked to ongoing brown tide research and monitoring efforts. Nevertheless, in discussions at the LRRM workshop and during Natural Resources Subcommittee meetings, it was identified that there is a need for efforts to focus on the *ecological effects* of brown tide. Some specific examples recommended are to: (1) research the changes in energy pathways as a result of the present occurrence of noxious/toxic algal blooms -- quantify the "ripple" effects of brown tide on living organisms throughout the estuary; (2) examine brown tide process studies and rate measurements such as nitrogen conversion; (3) investigate the role of benthos with respect to brown tide; and (3) research the lethal, sublethal, and synergistic effects of brown tide on the reproduction and behavior of finfish species.

- Integrated research on human impacts on "valued species" early life stages, productivity, and reproduction. Human impacts include (1) physical effects from tributary blocking (e.g., culverts), shoreline hardening, and dredging; (2) chemical effects from nutrients (e.g., carbon export, eutrophication) and toxics (e.g., PAHs, pesticides, herbicides, endocrine disrupters).

- Investigate changes in energy pathways as a result of anthropogenic inputs (e.g., pesticides). Quantify the "ripple" effects of nutrient and toxic inputs on living organisms throughout the estuary.

- Examine the effects of toxics in localized sediments on the food chain (bioaccumulation and any sublethal effects on eggs and/or larvae).

- Determine the effects of navigational dredging on shallow water communities and the recovery time of benthic communities exposed to dredging. Dredging currently being done in the Peconics should be examined on a site-specific basis to determine the magnitude of impacts on the natural community in comparison with the economic benefits of the activity.

- Monitor water quality and benthos of Flanders Bay (plus some control sites) to evaluate the effectiveness of upgrading the Riverhead sewage treatment plant.

- Evaluate impacts of navigational dredging on larval, juvenile, and adult fish and clams by sampling before, during and after a maintenance or navigational dredging operation.

- Develop environmental report cards to track improvements (both environmental and economic).

- Monitor coliform bacteria in closed shellfish areas with the goal of re-opening beds.

- Assess the intensity and extent of oyster disease in the Peconics.

- Evaluate the effects of boating, local fishing, and shellfish harvesting practices on eelgrass. As part of this research, best management practices (BMPs) should be developed and presented to each town in the Peconics.

- Assess the effects of swans and Canada geese on the use of shellfish resources in the Peconics for human consumption.

- Assess the improvement in habitat due to reduction in nonpoint source pollution in the western Peconics by management actions.

A3.2. *RESEARCH, MONITORING, & ASSESSMENT FROM SYSTEMS TO SPECIES*

- Study the ecological interactions of: (1) northern puffers and bay scallops; (2) lady crabs, hard clams, and tautog; (3) lady crabs and winter flounder; and, (4) bluefish, forage fish, and young of the year habitats for forage fish.

- Study the similarities and differences of the ecology of fish in Peconics and Gardiners Bays.

- Identify dredging windows compatible with life cycle and habitat of finfish in the estuary.

- Focus research to determine the effects of SAV on the growth, survival, and abundance of different fish species.

- Perform an evaluation of distribution, abundance, and role of higher trophic level organisms (e.g., diamondback terrapin) in the Peconic Estuary food web.

- Perform research on the ecology of food of sea turtles to evaluate the importance of the Peconic Estuary and potential threats to these endangered and threatened species.

- Monitor the impact of availability and quality of forage fish on seabirds and other fish-eating wildlife. Evaluate finfish grazing and other interactions and the needs of piscivorous birds, humans and others for improved management.

- Examine the importance of sponges in the in the Peconics by examining their distribution, abundance, and habitat preferences.

- Characterize the importance of crustacean grazing, their population trends and importance as a food source.

- Perform research and monitoring of conch and American eel throughout the estuary to understand their distribution (temporal and spatial), abundance, habitat preferences, and different life stage requirements to develop management strategies and importance to other species.

- Elucidate relationships among nutrients, SAV, and valuable resource species. This examination should include the quantification and determination of possible links between nitrogen loads west of Shelter Island and water quality requirements of SAV.

- Determine the effectiveness of monitoring eelgrass by monitoring occurrence and abundance of eelgrass in beach wrack.

- Determine economic values (market and non-market) of Peconics' ecological services and resources to help prioritize management endpoints.

- Evaluate how different Peconic Estuary management strategies may conflict and determine whether management endpoints should be prioritized.

- Consider marine sanctuaries as control sites and limit activity. Monitor sanctuaries and evaluate threats from development on these critical habitats.

- Perform "new production" (i.e., resulting from allocthonous or external sources of nitrogen such as riverine, terrestrial, and atmospheric inputs, and upwelling) studies to examine system-wide ecosystem changes whereby primary production is measured from nutrient sources coming into the system such as upwelling and atmospheric deposition. If it is assumed that only new production can be exported from the system, a nitrogen mass balance can be developed to determine how much is being exported. Data needs for this approach would be consistent with SCDHS water quality data collected.

- On a subwatershed basis, investigate correlations and study affects of adjoining land use on adjacent ecological communities.

- Evaluate nutrient recycling by grazing and decomposition.

- Perform specific local benthic processes studies. One approach may be to first stratify the system based on sediment type and identify sites that are representative of the spectrum to study local processes.

- Examine meroplankton as an indicator of health of economically important species. In addition, collect data on phytoplankton populations to determine what affects the base of the food chain such as: (1) viruses and bacteria; (2) sediment flux; and, (3) total suspended solids.

- Elucidate the plankton-benthic linkage as it relates to carbon and its role in the food web.

- Analyze the effectiveness of current wetland regulations and their implementation on wetland buffers.

A3.3. *RESEARCH, MONITORING, & ASSESSMENT RELATED TO RESTORATION*

- Determine whether particular species will return if the habitat is restored or enhanced, particularly in areas influenced by duck farms in the past as well as areas currently impacted by agricultural practices in existence today. There should also be an evaluation of water quality improvements and subsequent species utilization/recolonization of these improved habitats.

PECONIC ESTUARY PROGRAM

NATURAL RESOURCES SUBCOMMITTEE

APPENDIX 1: SUMMARY OF THREATS TO THE LIVING RESOURCES OF THE PECONIC ESTUARY

FINAL DRAFT: 6/17/99

Prepared By:

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BACKGROUND

The Peconic Estuary Program's (PEP) Comprehensive Conservation and Management Plan (CCMP) has identified threats that have, or have the potential to, negatively impact the water quality and living resources in the Peconic watershed. The CCMP contains actions that address these threats to improve and protect the health of the Peconic ecosystem. The actions in the Habitat chapter of the CCMP specifically deal with threats to the living resources of the Peconic Estuary. In addition to the Habitat chapter, the literature-based Characterization Report of the Living Resources in the Peconic Estuary (Bortman and Niedowski 1998, *Herein referred to as*: Characterization report) also provides a detailed description of the Peconic ecosystem and the threats they have been subjected to.

The threats to the living resources in the Peconic Estuary are wide ranging and include both human and non-human factors that have negatively impacted many habitats and species. For example, the decline in eelgrass (*Zostera marina*) beds within the Peconic Estuary has been attributed to the reduction of light penetration during extensive brown-tide (*Aureococcus anophagefferens*) algal blooms, nutrient over-enrichment from fertilizers and failing septic systems, and competition with non-native macro-algae (*Codium fragile*). While any one of these threats could be responsible for the decline of eelgrass beds, it is also possible that the combination or interaction of all three threats lead to the reduction of eelgrass abundance. Additionally, cumulative losses from seemingly minor threats may only become noticeable over extended time periods; often when damage to the resources is very severe. Such threats are also of concern to the PEP.

A first step to managing these threats is to identify them and characterize their impacts to the biota in the watershed. The characterization report and habitat chapters have identified and characterized the threats and impacts to the living resources within the Peconic Estuary, but a summary of this information is lacking. Therefore, the goal of this document is to concisely present the threats and their impacts to living resources that have been identified in the Characterization report. We were also interested in determining if these threats were addressed by actions in the Habitat and Living Resources chapter of the CCMP. It was decided by the natural resources subcommittee (NRSC) that this document will be included as an Appendix to the Characterization Report of the Living Resources.

GENERAL THREATS AND ASSOCIATED IMPACTS

Our first goal was to extract all of the threats to the living resources in the Peconic Estuary that were identified in the Characterization report. We then listed the impacts that are "generally" associated with each threat in a matrix (Table 1). The major impacts associated with these threats fell into seven categories that were consistent with the impacts found in the Habitat chapter. However, this is not an exhaustive list of impacts that can result from each threat. It is also important to note that the impacts associated with each threat were not necessarily derived from studies in the Peconic Estuary. The impacts, however, are known to result from threats observed and studied elsewhere (e.g. Newell et al. 1998: dredge impacts). Additionally, many of the impacts in Table 1 have not yet been studied, or are not fully understood. We coded these *potential* impacts with a "P" (Table 1).

Table 1 should therefore, be viewed as an inventory list of identified threats to the living resources in the Peconic Estuary and the impacts that typically result from them. Table 1 does not reflect the extent or magnitude of the impacts to any particular habitat or species. An example of how to interpret Table 1 follows: navigation dredging has been identified as a threat to the living resources in the Peconic Estuary because it is known to cause a loss of benthic habitat, has the *potential* to reduce population abundance and recruitment of certain organisms (e.g. clams, worms), creates physical disturbances to the system, reduces water quality (e.g. turbidity plumes, resuspension of toxins) and has the *potential* to reduce food availability.

Table 1. Direct threats to the living resources of the Peconic Estuary and their resulting impacts. Asterik (*) denotes that these are observed or known impacts resulting from the threat, while a "P" indicates potential impacts that are not fully understood.

Threats	**Impacts**						
	Habitat loss & degradation	Reduced population abundance	Reduced recruitment of organisms	Physical disturbance	Alteration of genetic stock	Reduces Water Quality	Reduced food availability
Navigational dredging & spoil disposal	*	**P**	**P**	*		*	**P**
Shellfish dredging	*	*	**P**	*		*	*
Wasting disease	*	*			*		*
Brown tide	*	*	**P**	*	*	*	*
Codium & other invasive non-native sp.	*	*	**P**		**P**	**P**	*
Development	*	*	*	*		*	*
Water clarity (turbidity)	*	*	**P**	*		*	*
Excess nutrients	*	*	**P**			*	*
Shoreline hardening	*	**P**	**P**	*		**P**	*
Phragmites	*	*	*				*
(Over)harvesting fish		*	*		*		*
(Over) harvesting shellfish		*	*		*		*
Boating	*	**P**		*		*	
ORVs	*	*		*			
Beach use	*	**P**	**P**	*			
Predation imbalance		*			*		*
Aquaculture: Finfish	*			**P**	**P**	*	**P**
Aquaculture: Shellfish	**P**			**P**	**P**		**P**
Artificial reefs	**P**	**P**	**P**	*			**P**
Toxic contamination	*	*	*		**P**	*	*
Marinas, docks & mooring areas	*	*	*	*		*	
Tidal flow Obstruction	*	*	*	*		*	**P**
Mosquito control	*	**P**	**P**	*		**P**	
Sea level rise	*	**P**	**P**	*			
Marine debris	*			*			

CONSEQUENCES OF THREATS TO LIVING RESOURCES

While Table 1 provides an inventory of the threats to the living resources in the Peconic Estuary and their associated impacts, it is also important to consider how these impacts affect the different types of living resources in the Peconic Estuary. Table 2 gives examples of consequences that can result from the impacts, or "Stressors", on particular habitats and species ("Targets"). Although the list of "Targets" in Table 2 is not exhaustive, it covers a range of living resources that are of interest to the NRSC and can easily be applied to other species and habitats as needed. As previously mentioned, many of the threats and their consequences have not been studied in the Peconic Estuary. Therefore, we relied on examples from the literature and personal observations to determine the expected effects, or consequences on some of the targets in Table 2. An example from Table 2 follows: saltmarshes can be stressed from direct losses and degradation (e.g. filling, reduced connectivity with tidal flow), which has the consequences of reducing primary productivity, decreasing buffer zones for wildlife and lowering nutrient-uptake from runoff.

Table 2. Examples of consequences from different stressors on particular targets

TARGETS	STRESSORS	CONSEQUENCES/EFFECTS OF STRESS
Interconnected land and seascape	Habitat loss & degradation	•Loss of interconnectedness between land and sea environments •Loss of buffer & land/sea gradation
Beach & dunes	Habitat loss & degradation	•Reduced nesting habitat for piping plovers and terns •Reduced suitable habitat for sea beach knotweed •Less egg-laying habitat for horseshoe crabs and other wildlife •Reduced ability to withstand storms, reduced erosion and flood protection
Saltmarsh, tidal creek & sand/mudflat complex	Loss & degradation of saltmarsh	•Reduction in primary productivity and detrital-based energy •Loss of buffer leading to greater impact to land from storms & increased runoff to bays •Reduction in nonpoint source nutrient uptake •Loss & degradation of spawning, breeding & feeding habitat for shellfish, invertebrates, finfish, diamond-backed terrapins, shorebirds and mammals •Reduced vigor and ability to withstand storms •Loss of rare plants (saltmarsh loosestrife, swamp sunflower, saltmarsh bulrush)
	Alteration of tidal creeks	•Loss of spawning and nursery habitat for a variety of marine organisms •Loss of shorebird and terrapin nesting habitat
	Loss of mud/sandflats	•Loss of feeding habitat for shellfish and other invertebrates, wading and shorebirds
Eelgrass	Habitat loss & degradation	•Increased suspended sediment and reduced storm/flood protection to coastline •Loss of shelter & feeding habitat for bivalves, crabs & other invertebrates, sea turtles, finfish •Loss of spawning and nursery areas for juvenile bay scallops and other bivalves, grass shrimp and other invertebrates, Atlantic silversides and other finfish •Loss of feeding habitat for diamond-backed terrapins & shorebirds •Reduction of detrital-based energy •Conversion of eelgrass beds to macroalgae (including *Codium*?)
Forage fish	Reduced forage	•Decreased food availability for predatory fish and birds

Table 2. Examples of consequences from different stressors on particular targets (continued)

TARGETS	STRESSORS	CONSEQUENCES/EFFECTS OF STRESS
Commercial & recreational fish	Poor recruitment of winter flounder, scup & weakfish	•Decreased commercial & recreational landings
	Low levels of spawning stock of winter flounder, scup & weakfish	•Reduced recruitment, reduced genetic diversity and shift in community structure •Changes in trophic dynamics
Piping plovers & least terns	High level of physical disturbance	•Mortality of plover and tern adults and chicks •Reduced nesting & feeding of plovers and terns leading to reduced productivity
	Habitat loss & degradation	•Fragmentation of large tern colonies which reduces their ability to repel predators •Reduced nesting & feeding of plovers and terns leading to reduced productivity
Sea turtles	Physical disturbance	•Sublethal and lethal harm
Bay scallops	Habitat loss and degradation	•Increased mortality and reduced recruitment
	Alteration of genetic stock	•Less able to withstand temporary, localized disturbances. Increased susceptibility to diseases?
	Poor water quality	•Reduction in stock abundance and quality
Osprey	Loss and degradation of available food	•Reduced productivity •Mortality of chicks

SUMMARY TABLE OF THREATS TO PECONIC ESTUARY LIVING RESOURCES

The previous two tables provided a list of the threats, the general impacts associated with them and some expected consequences to the living resources in the Peconic Estuary. We decided to provide a more comprehensive table of the identified threats with respect to the different habitats and living resources in the Peconic Estuary. Table 3 was developed with the intention of assessing threats that are known to be impacting, or have the potential to impact the living resources within the Peconic Estuary as identified within the Characterization report.

The threats listed in Table 3 are the same as those in Table 1, except that we added the following threat: domestic animals/pets. We included a wide range of habitat complexes and living resources in the Peconic watershed, including those of particular interest to the NRSC. Several of the living resources of particular interest to the NRSC, however, were not specifically discussed as a category in the Characterization report and they required special coding[1]. These were: connectivity of land/sea, tidal creeks, sand/mudflat complexes and bay scallops. We coded each cell in the table with one of the following:

I= Identified as a known threat within the Characterization report that is impacting the living resources in the Peconic Estuary.

P= Potential threat to living resources (limited evidence/data) of which impacts are known from other study areas, but not directly documented for the Peconic Estuary.

Empty= The resource is assumed to be unaffected by this threat.

Finally, we used Table 3 as a means to determine if the identified and potential threats to each living resource were addressed by an action plan in the Habitat chapter. If an action was addressed within the Habitat chapter, the matrix cell was shaded in Table 3. If an action was addressed within a chapter other than the Habitat chapter, the matrix cell was shaded diagonally.

CONCLUSIONS

This report has summarized the threats and impacts to the living resources of the Peconic Estuary that were discussed in greater detail within the Characterization report and Habitat chapter of the CCMP. Although the analysis of threats was not quantitative it provides us with a concise and comprehensive overview of the threats and the impacts to the living resources in the Peconic watershed. Unfortunately, we were unable to rank the magnitudes or extent of the impacts due to the lack of studies in the Peconic Estuary. Additional investigations and monitoring that determine the extent of these threats would be of great value to the PEP, particularly since the watershed is experiencing rapid increases in growth and development. Studies should be quantitative to provide "baseline" information for analyzing long-term status and trends of the resources, and to determine the successes of implemented CCMP actions.

This report has also identified which of the threats to the living resources in the estuary have been addressed by management actions in the Habitat and Living Resources chapter. Many of the actions in the Habitat chapter are intended to reduce and eliminate the threats and to protect, restore and enhance the impacted resources. Clearly, the threats that have not been covered in the Habitat chapter or by other chapters should be examined for future consideration as new actions. Additionally, those threats classified as "*potential*" warrant further research and monitoring to determine if they are having a significant impact on the living resources.

Finally, this report has also indicated the paucity of studies that directly examined the threats and the extent of impacts to the living resources in the Peconic Estuary. The tables also provide a quick reference to areas that require further investigation. For example, in Table 3, although shoreline-hardening

structures are distributed throughout the estuary, their extent and impacts to the habitats and living resources the Peconic Estuary remains unknown. It is also important to recognize that each threat on its own may not be causing a noticeable impact to the resource, but the combination of various stressors or their interactions may be adversely affecting them. Additionally, sub-lethal effects to organisms from threats at "low" or "background" levels (e.g. low concentrations of oil, toxins, brown-tide) may also be reducing the overall health of the ecosystem over time. Such effects can further be confounded or go undetected because they often target the early life history stages of organisms that are not commonly monitored such as: eggs and larvae. In support of this, recent studies of marine fish eggs and larvae exposed to extremely low concentrations of crude oil yielded significant effects on their behaviors and development, which ultimately decreased their overall survival. We must also be prepared for new and unexpected threats to living resources within the estuary. This is perhaps best exemplified by the appearance of the brown-tide algae, which can be argued as a major impetus for establishing the Peconic Estuary Program.

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[1]The following habitats and living resources were included in Table 3, but were not specifically categorized or discussed in the Characterization report: a) connectivity of land and sea, b) tidal creeks, c) sand/mudflat complex and d) bay scallops They were included in this chart since they are of special concern to the PEP and we handled the coding (i.e. "*I*" or "*P*") as follows:

a) Impacts from the threats to Connectivity of Land and Sea category were equated with those of Beach and Dunes since beaches and dunes are a connection between the land and sea. Therefore, threats assigned to beaches and dunes were also assigned to the Connectivity of Land and Sea category, unless specified otherwise in the Characterization report.
b) We treated Tidal Creeks as a having impacts associated with both the benthos (e.g. tide creek beds) and salt marsh (e.g. fringe marsh) habitats and therefore, they received similar impact codes as these two habitats. If the codes were different between the two categories for a particular threat (e.g. an "*I*" for benthos and a "*P*" for salt marsh) we would use our best judgement to decide which code to assign for that particular threat category. This happened in only three cases.
c) Impacts from threats to the Sand/Mudflat complex were treated as the Benthos habitat and therefore, were equated with them for coding.
d) Bay scallops are expected to experience similar impacts from threats to Suspension Feeders and, therefore, were equated with them.

REFERENCES

Bortman, M. and N. Niedowski (1998) Characterization report of the living resources of the Peconic Estuary. Peconic Estuary Program Office, SCDHS.

Newell, R.C., Seiderer L.J. and D.R. Hitchcock (1998) The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Ocean. and Mar. Biol.: Annual Review: 36: 127 178

Table 3. Summary table of threats listed within the Characterization of Living Resources Report.

Direct Threats	Habitat								Living Resources									
	Connectivity of Land and Sea	Beach & dunes	Saltmarsh	Tidal creeks	Sand/mudflat complex	Eelgrass Beds	Upland /Terrestrial	Freshwater Wetlands & River	Finfish & Forage Fish	Shorebirds (plovers, terns)	Waterfowl & other birds	Diamondback terrapins	Sea turtles	Plankton	Benthos	Suspension feeding organisms (bay scallops, clams, etc.)	Bay scallops	Marine mammals
Navigational dredging &/or spoil disposal	P	P	I	I	I	P	P	P	P	P	P		P		I	I	P	
Shellfish dredging			P	P	P	I			P		P				I	P	P	
Wasting disease						P											P	
Brown tide				P	P	I			P		P			P	I	I	I	
INVASIVE SPECIES		P	I	I		P	I	I							I	P		
Development	I	I	I	I	P		I	I		P	I	I			I	P	P	
Excess turbidity						I		P	P	P				I	I	P	I	
Excess nutrients			I	I	P	P		I	P				P	I	I	P	P	
Shoreline hardening	I	I	P	P	P				P			I	P		P			
(Over)harvesting fish				P				P	I	P			P		P			P
(Over)harvesting shellfish			I	P	I	P			P						I	P	P	
Boating			P	P	P	P		P	P	P	P	P	I		P	P		P
ORVs	P	I					P			P		P	P					
Beach use										P		P						
Predation imbalance				P	P	P	P	P	P	I	P		P	P	P	P	P	P
Aquaculture: Shellfish				P	P						P		P					
Aquaculture: Finfish				P	P	P			P		P		P	P	P	P	P	P
Artificial reefs						P			P		P		P		P	P	P	P
Toxic contamination			P	I	I			I	P	P	I				P	P	P	

Table 3. Summary table of threats listed within the Characterization of Living Resources Report (continued).

Direct Threats	Habitat								Living Resources									
	Connectivity of Land and Sea	Beach & dunes	Saltmarsh	Tidal creeks	Sand/mudflat complex	Eelgrass Beds	Upland /Terrestrial	Freshwater Wetlands & River	Finfish & Forage Fish	Shorebirds (plovers, terns)	Waterfowl & other birds	Diamondback terrapins	Sea turtles	Plankton	Benthos	Suspension feeding organisms (bay scallops, clams, etc.)	Bay scallops	Marine mammals
Marinas, docks & moorings	P	P	I	I	I	P									I	P	P	
Tidal flow /Hydrologic Obstructions			I	I	I			I	I							P		
Mosquito control			I	I	I										I	P		
Oil spills: Catastrophic	P	P	P	P	P	P			P	P	P	P	P	P	P	P	P	P
Marine debris		P		P						P	P	P						P
Domestic Animals/Pets				P			I			P		P						

I: Identified as a known threat within the "Characterization of Living Resources" report for the Peconic Estuary, **P**: Potential threat to Peconic living resources (i.e. limited evidence/data), of which the impacts are known from studies in other areas. **Light Shading** : Indicates that a CCMP Management action has been desi in the Habitat & Living Resources Module**.** **Dark Shading**: Indicates that a CCMP Management action has been designated in a chapter other than the Habitat & Living Resources Module.

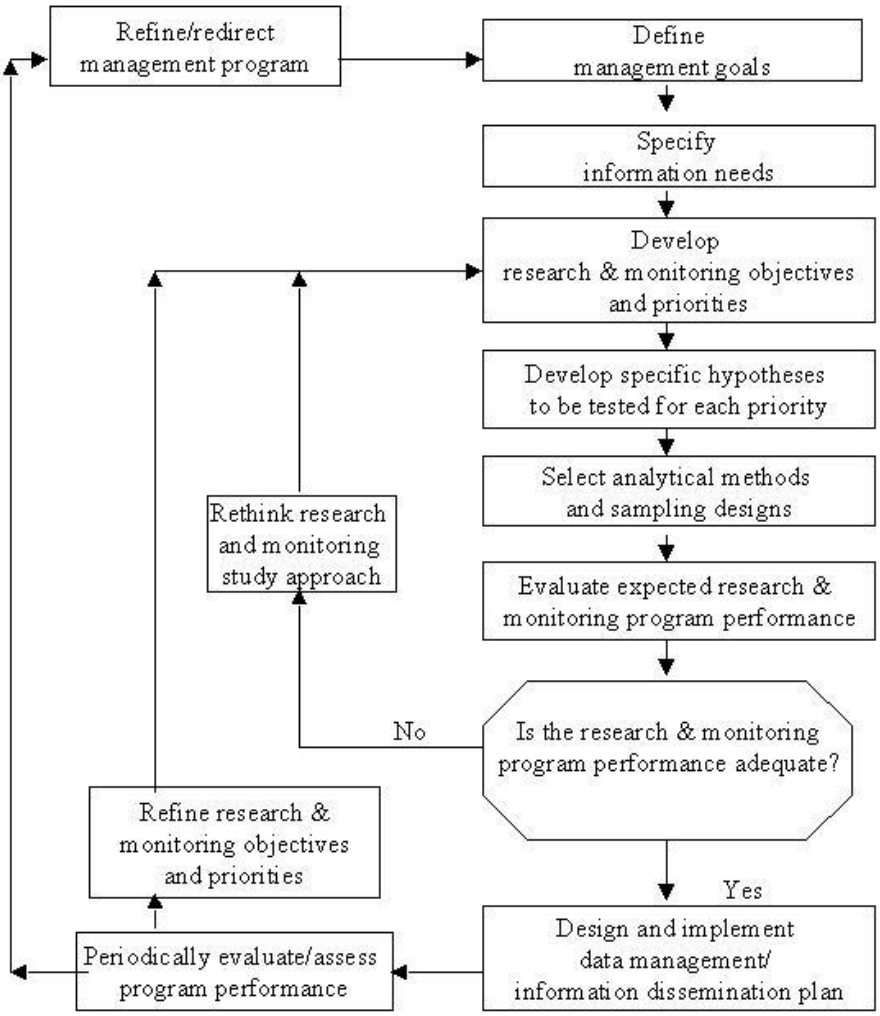
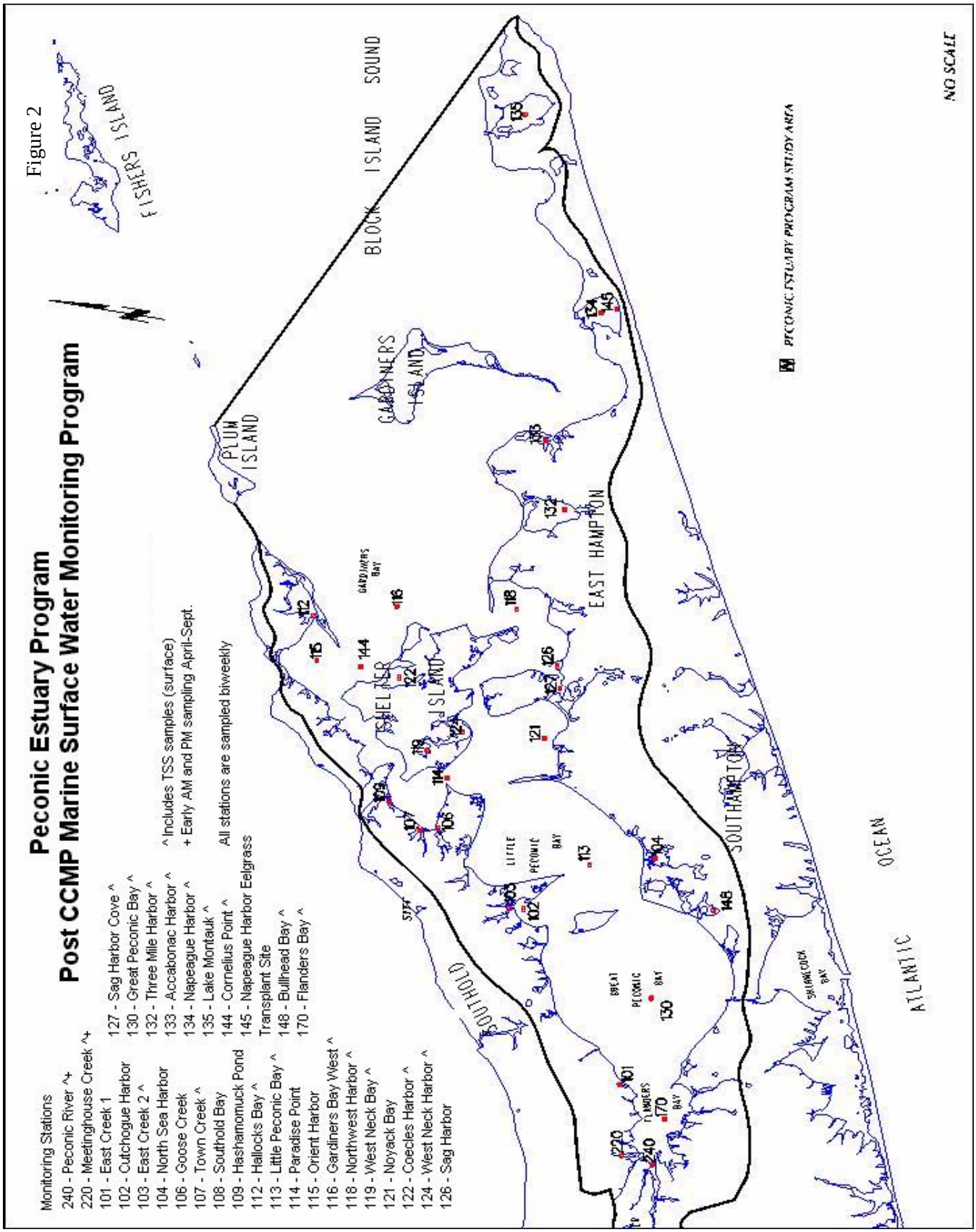


Figure 1. Schematic of Living Resources Research and Monitoring program design. Modified from the Galveston Bay National Estuary Program (1994).

Figure 2


Peconic Estuary Program
Post CCMP Marine Surface Water Monitoring Program
Monitoring Stations
240 - Peconic River ^+
220 - Meetinghouse Creek ^+
101 - East Creek 1
102 - Cutchogue Harbor
103 - East Creek 2 ^
104 - North Sea Harbor
106 - Goose Creek
107 - Town Creek ^
108 - Southold Bay
109 - Hashamomuck Pond
112 - Hallocks Bay ^
113 - Little Peconic Bay ^
114 - Paradise Point
115 - Orient Harbor
116 - Gardiners Bay West ^
118 - Northwest Harbor ^
119 - West Neck Bay ^
121 - Noyack Bay
122 - Coecles Harbor ^
124 - West Neck Harbor ^
126 - Sag Harbor
127 - Sag Harbor Cove ^
130 - Great Peconic Bay ^
132 - Three Mile Harbor ^
133 - Accabonac Harbor ^
134 - Napeague Harbor ^
135 - Lake Montauk ^
144 - Cornelius Point ^
145 - Napeague Harbor Eelgrass Transplant Site
148 - Bullhead Bay ^
170 - Flanders Bay ^
^ Includes TSS samples (surface)
+ Early AM and PM sampling April-Sept.
All stations are sampled biweekly
PLUM ISLAND
GARDINERS ISLAND
SHELTER ISLAND
BLOCK ISLAND SOUND
FISHERS ISLAND
EAST HAMPTON
SOUTHAMPTON
SOUTHOLD
ATLANTIC OCEAN
PECONIC ESTUARY PROGRAM STUDY AREA
NO SCALE

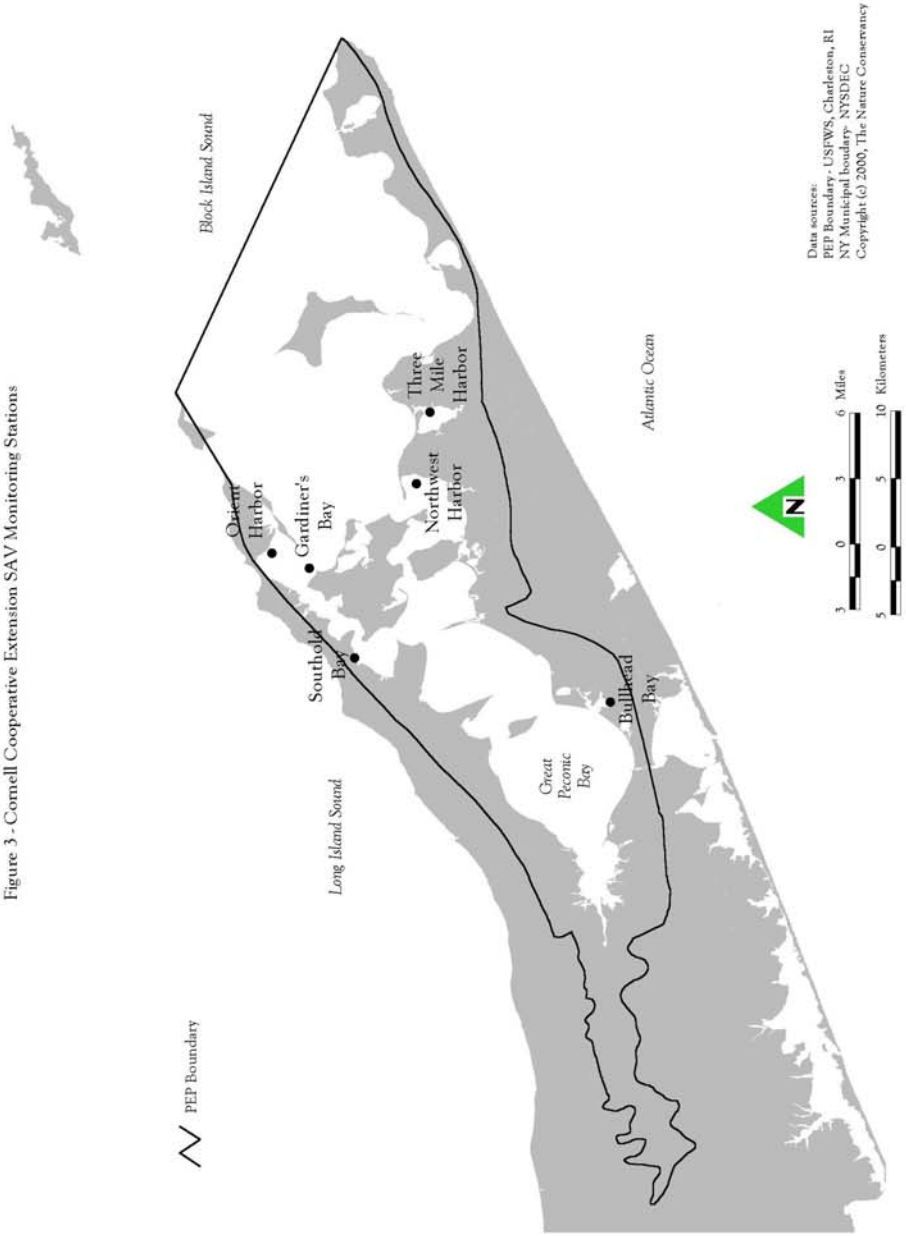


Figure 3 - Cornell Cooperative Extension SAV Monitoring Stations

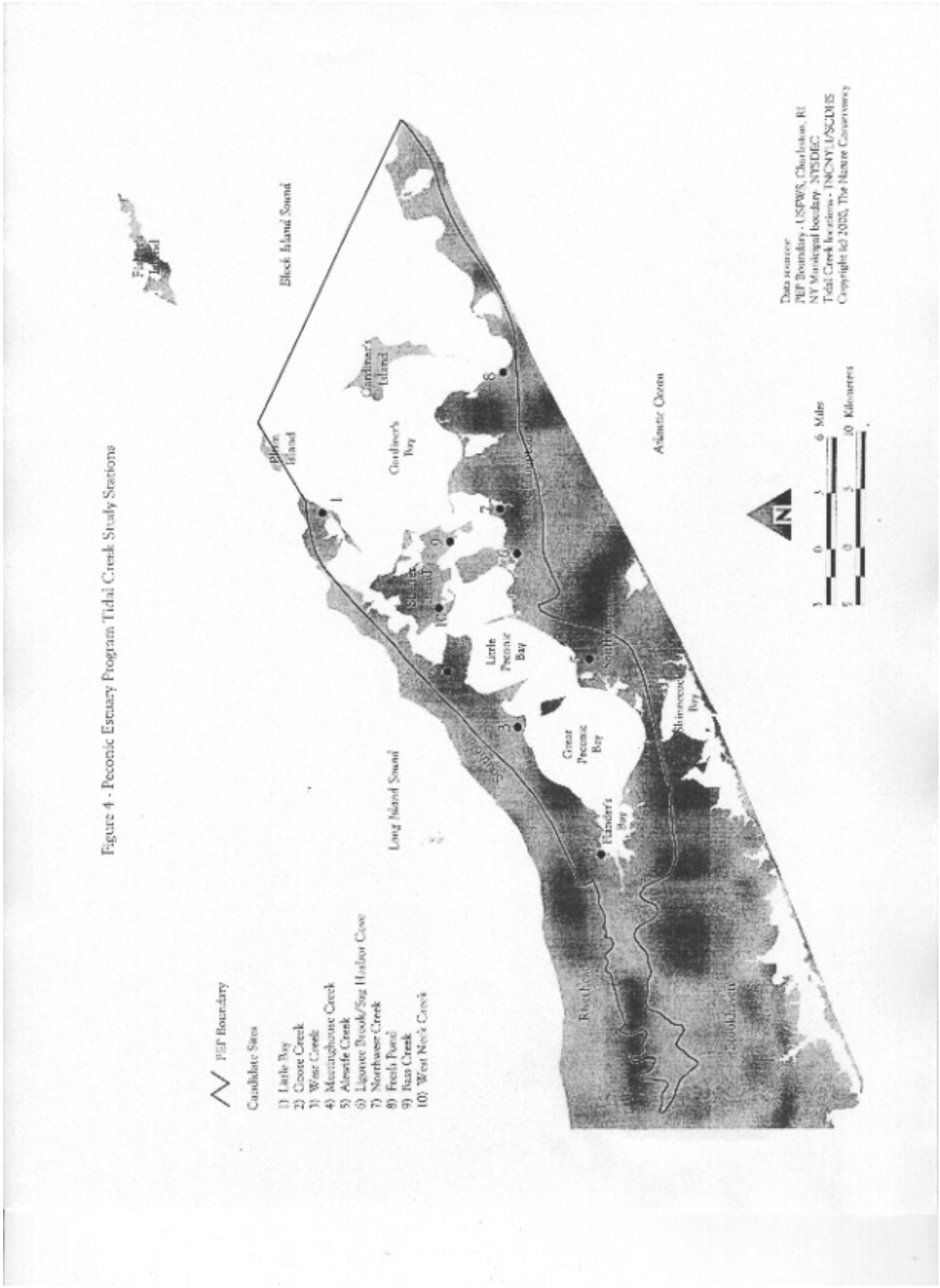


Figure 4 - Peconic Estuary Program Tidal Creek Study Stations

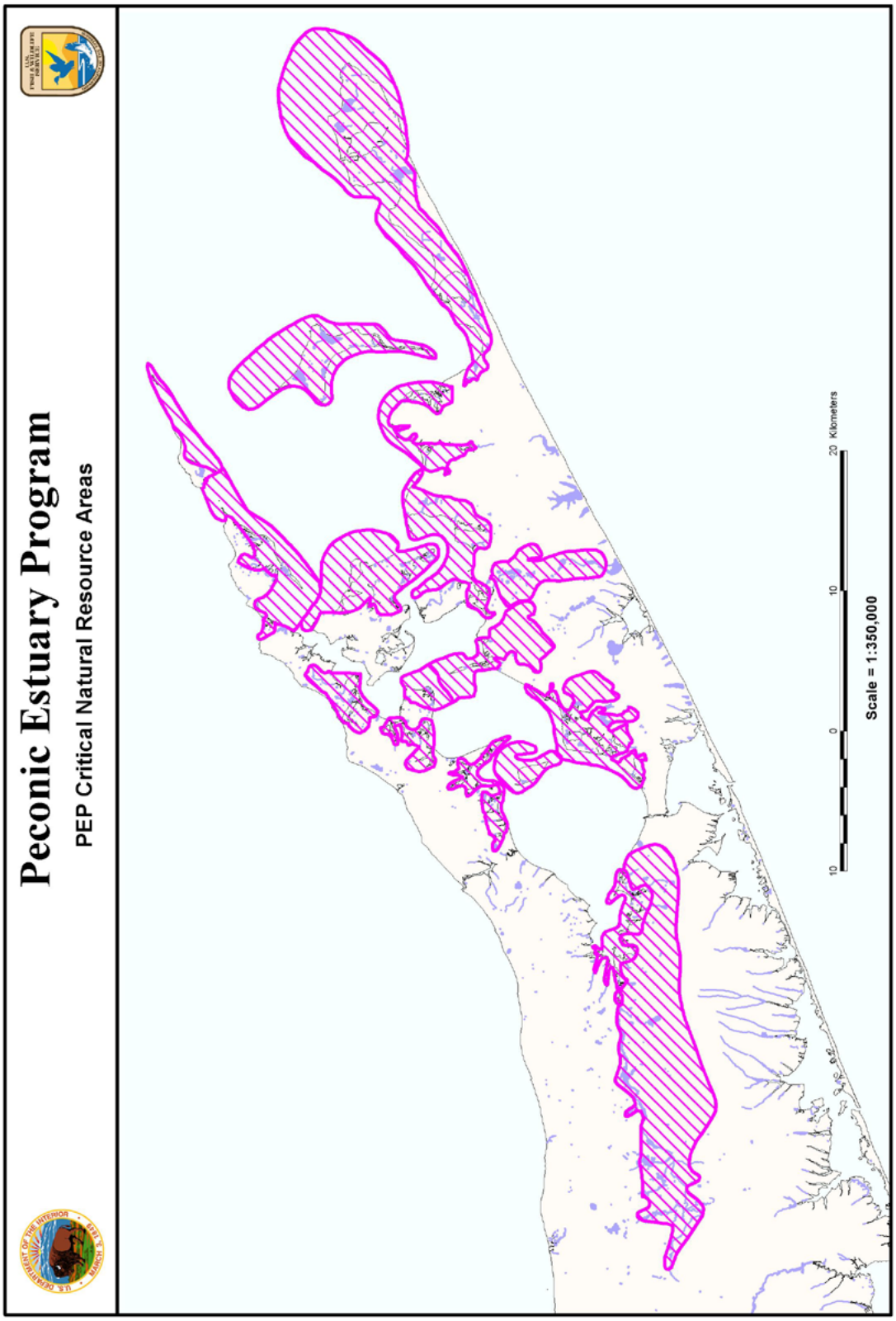


Figure 5. PEP Critical Natural Resource Areas

APPENDIX J

Federal Consistency Report

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Peconic Estuary Program

Comprehensive Conservation and Management Plan

Federal Consistency Report

September 2000

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FEDERAL CONSISTENCY REPORT FOR THE PECONIC ESTUARY PROGRAM

Background

The National Estuary Program (NEP) was established by the Water Quality Act of 1987, which amended the Federal Clean Water Act. The purpose of the NEP is to identify, protect and restore estuaries of national significance. The Peconic Estuary was nominated for the NEP by the Governor of New York in 1991. In 1993, the Management Conference was convened to oversee development of a Comprehensive Conservation and Management Plan (CCMP).

There is a Federal consistency review requirement for the NEP. This is distinct from the Federal consistency requirement of the Federal Coastal Zone Management Act, conducted as part of the State's coastal zone management program.

The Federal consistency review procedure being applied for the Peconic Estuary is explained below. The procedure was originally developed by the Long Island Sound Study and New York–New Jersey Harbor Estuary Program for their CCMPs. The State of New York has decided to apply this procedure to the Peconic Estuary.

Purpose of Review

EPA guidance defines the goal of the Federal consistency review process as to ensure that Federal actions do not adversely affect CCMP goals, and that they support actions proposed in the CCMP where possible. In addition, under an agreement between the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) (see below), CCMPs are submitted for determination that they are consistent with the coastal zone management plans of the affected State or States. The major tasks in the Federal consistency review process are:

- Consistency of Federal actions with the CCMP:
    1. Development of an inventory of Federal programs and projects to be reviewed for consistency with the CCMP, and a one-time assessment of these programs/projects for consistency with the CCMP.
    2. Setting up and implementing a process to continually review individual Federal projects for consistency with the CCMP.
- Consistency of the CCMP with coastal zone management plans:
    3. Determination whether the CCMP is consistent with affected State CZM plans.
    4. Concurrence of the State with the determination.

Consistency of Federal Actions with the CCMP

Activities that affect the quality of the Peconic Estuary are both supported and regulated, both directly and/or indirectly, by Federal, State and local agencies. Because government-sponsored activities have a wide variety of objectives, it is possible that some activities may be inconsistent with the goals of the CCMP for the Peconic Estuary.

The need for coordination among governmental programs and program goals that will affect the Management Conference (and ultimately the CCMP) has been addressed in Section 320(b)(7) of the Clean Water Act, as amended. "Purpose 7" states that:

> "The purpose of a management conference shall be to review all Federal financial assistance programs and Federal development projects in accordance with the requirements of Executive Order 12372, as in effect on September 17, 1983, to determine whether such assistance program or project would be consistent with and further the purposes of the CCMP."

In 1992, EPA and NOAA entered into an agreement designed to avoid conflicts and duplication regarding the NEP and the Coastal Zone Management Program. One provision is that, after concurrence by the State Governor(s) and approval by the EPA Administrator, EPA and NOAA will encourage and/or require, to the extent permitted by law, that the CCMPs be submitted for incorporation into the Coastal Zone Management Program, as appropriate.

Therefore, the consistency review requirement of the NEP can be met by integrating the process into the existing State Coastal Management Plan (CMP) consistency review process in New York. PEP would be available to participate, as appropriate under existing appeal and mediation procedures, in assisting the State in the resolution of consistency determinations.

Note also that potential inconsistencies among coastal activities can be addressed through the Management Conference itself. Under Section 320(b)(7) of the Clean Water Act, as amended, the Management Conference has such authority, as described above. However, the goal of the review process established under purpose 7 is to complement the State's existing review process rather than duplicate them, and PEP would be best served by using the existing process.

The appropriate ongoing review program in the State of New York has the staff and experience necessary to perform Federal consistency reviews, whereas the costs and start-up time in addition to the lack of experienced personnel could make the undertaking of a separate Federal consistency review prohibitive to the PEP. Concerns have also been raised at the Management Conference regarding the review of non-Federal programs for consistency with the CMP. These concerns would be addressed in the existing State review programs, which require the review of certain non-Federal activities and programs[1] and allow the review of activities outside the coastal zone if they affect the coastal zone[2].

[1] These concerns would be addressed in the existing State CMP, which requires the activities of State agencies to be consistent with the State's coastal policies or, in the case of the Villages of Greenport and Sag Harbor, the policies of their State-approved Local Waterfront Revitalization Programs.

[2] In New York State, this applies only to Federal activities.

Consistency of the CCMP with Coastal Management Programs

Under Section 307(c) of the Coastal Zone Management Act (CZMA) of 1972, as amended, and implementing regulations (see 15 CFR 930) consistency with an approved State coastal zone management program is required: (a) for direct Federal activities and development projects; (b) for activities requiring Federal licenses or permits; and (c) for activities receiving Federal financial assistance. In New York, the program and the review of Federal activities consistency with the State's CMP is administered by the New York State Department of State.

The 1988 EPA/NOAA agreement states that:

"CCMPs developed under the NEP will voluntarily, as a matter of policy, be submitted for review under the Federal consistency provisions of Section 307 (c) of the CZMA of 1972, as amended."

The State of New York, pursuant to the Federal and State consistency provision of their existing coastal management program, already has a review process in place. Based on a review of the CCMP and a consistency review submitted by EPA Region II, the State reviews the overall approval and adoption of the CCMP, and each proposal within it, for consistency with policies of their CMP, which is very specific with respect to use and development of coastal resources.

Area to be included for Federal Consistency Review

The study area for the Peconic Estuary Program includes the waters of Peconic Bay to an imaginary line connecting the eastern end of Plum Island and Montauk Point. The land-based area includes the surface water, storm water, and ground water contributing areas.

Federal Consistency Review for the PEP in New York

The Federal consistency review requirement under Section 320(b)(7) for the PEP will be delegated to the State of New York because of the previously mentioned advantages of using the existing process under the State's CMP, rather than establishing a new process under the PEP. Upon acceptance of the final CCMP for the Peconic Estuary Program by the Administrator of EPA, the CMP in New York will take all necessary actions to include the enforceable components of the CCMP in the CMP and its existing Federal consistency process.

To accomplish this incorporation, the New York Department of State (NYDOS) must review the final CCMP and the consistency determination submitted by EPA to determine its consistency with New York's approved CMP. Having New York CMP program staff serve on the CCMP work groups and the Management Committee has helped to ensure that consistency. New York's Federally approved CMP must, if necessary, be amended and approved by NOAA. All steps must be in accordance with NOAA's established regulatory and statutory procedures, including public review and comment. Note that any Federal action that affects New York's coastal zone can be reviewed for consistency with the State's CMP. An "inconsistent" decision, however, must be based on enforceable coastal policies (*i.e.*, those that are based on existing State law and regulation). New York's review of the PEP CCMP indicates that all of the committed actions, and many recommended actions, in the CCMP applicable to New York, are based on existing State law and regulation. New York's review also did not indicate the need for New York to enact new legislation or regulatory authority to help

implement any recommended CCMP actions. Thus, most of the CCMP will be enforceable under New York's CMP.

The PEP Office should be notified of Federal activities that are subject to Federal consistency review with regard to the CCMP. To accomplish this, PEP will request to be added to the NYDOS project review notification list. The PEP Office may comment on the activities and, when the review is complete, shall be notified of the results. If the PEP office comments on any Federal actions, it must do so in timely manner so the State can adhere to the prescribed time frames established by regulation in the *Federal Register* by NOAA for review/approval. As part of the consistency review determination under the CMP, New York will ensure that each action is consistent with the enforceable components of the CMP.

If necessary, New York will amend its CMP to incorporate the enforceable components of the CCMP for the PEP. The review process shall consider all Federal financial assistance and development activities as well as all other Federal actions including the issuance of Federal permits which are listed in the State's CMP. State actions not requiring Federal consistency review are often subject to review under the existing State consistency review process, and a formal or informal agreement should be established between New York and the PEP whereby the PEP Office is notified of the projects that may affect achieving the CCMP goals, strategies and proposed actions for the PEP. The PEP will be best served by utilizing the State's existing CMP for its Federal consistency review requirements.

For the CCMP consistency review with the State CMP under Section 307(c) of the CZMA, EPA will send a formal consistency determination to the NYDOS at the same time that the final CCMP is submitted to the Governor of New York and the EPA Administrator. The NYDOS will determine the consistency of the PEP CCMP with the CMP and implement enforceable PEP actions that are consistent with the CMP.

Federal programs and activities subject to consistency review by New York State are identified in the State's CMP. In some areas, State programs are reviewed under State-approved Waterfront Revitalization Plans. The inventory of Federal programs is provided in Table 1.

Criteria for Consistency

The general criteria for determination of consistency are whether programs encourage or support the objectives listed in the CCMP.

More specific criteria are whether the programs encourage or support the proposed CCMP actions in the following ways. Programs or projects are inconsistent if they inhibit these activities or harm the resources that they seek to protect or restore.

- Complies with existing management plans or supports continued development of management plans for a wide variety of living resources and habitats;
- Encourages development of tools for such compliance, including GIS and community classification systems;

- Encourages or provides for restoration of a variety of valuable habitats, including wetlands, streams, stream corridors, riparian and wetland buffer zones, artificial reefs, oyster reefs, shorelines, and large forested upland tracts;
- Reduces loss of wetlands;
- Protects shorelines;
- Promotes sustainable development;
- Reduces NPS pollution and protects water quality and quantity through watershed-based planning, BMPs, and riparian corridor protection;
- Promotes improved land use planning to protect water quality and reduce sprawl;
- Encourages regional coordination;
- Encourages redevelopment and compact development;
- Encourages water conservation and integrated planning for water supply and wastewater;
- Promotes better coordination and planning for dredging, including dredge material disposal;
- Encourages development and use of pump-out facilities;
- Improves public access to the estuary;
- Encourages wise use of chemicals by residents and businesses;
- Supports development and implementation of toxics water quality criteria;
- Helps to identify sources of contaminated sediments and identify control measures;
- Promotes regional information sharing and development of Geographic Information Systems;
- Supports private sector efforts to achieve all these objectives and activities;
- Supports public education activities, including newsletters, other outreach materials, ecotourism promotion, hands-on activities for volunteers, and curricula development; and,
- Supports existing and expanded monitoring plans, including volunteer monitoring.

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan.

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
10.200	Grants for Agricultural Research, Special Research Grants	USDA-ES	X	–	–
10.069	Conservation Reserve Program	USDA-FSA	X	–	–
10.072	Wetlands Reserve Program	USDA-NRCS	X	–	–
10.901	Resource Conservation and Development	USDA-NRCS	X	X	–
10.902	Soil and Water Conservation	USDA-NRCS	X	–	–
10.903	Soil Survey	USDA-NRCS	X	–	–
10.904	Watershed Protection and Flood Prevention	USDA-NRCS	X	–	–
10.906	Watershed Surveys and Planning	USDA-NRCS	X	–	–
10.912	Environmental Quality Incentives Program	USDA-NRCS	X	–	X
10.913	Farmland Protection Program	USDA-NRCS	X	–	–
10.914	Wildlife Habitat Incentive Program	USDA-NRCS	X	–	X
10.768	Business and Industry Loans	USDA-RB-CS	X	X	–
10.769	Rural Development Grants	USDA-RB-CS	X	X	–
10.854	Rural Development Loans and Grants	USDA-RB-CS	X	X	–
10-410	Very Low to Moderate Income Housing Loans	USDA-RHS	X	X	–
10-411	Rural Housing Site Loans and Self-Help Housing Land Development Loans	USDA-RHS	X	X	–
10-433	Rural Housing Preservation Grants	USDA-RHS	X	–	–
10-766	Community Facilities Loans and Grants	USDA-RHS	X	X	–
10.760	Water and Wastewater Disposal Systems for Rural Communities	USDA-RUS	X	X	–
10.762	Solid Waste Management Grants	USDA-RUS	X	X	–
10.770	Water and Waste Disposal Loans and Grants	USDA-RUS	X	X	–
11.300	Grants for Public Works and Economic Development	DOC-EDA	X	–	–
11.302	Economic Development- Support for Planning Organizations	DOC-EDA	X	–	–
11.307	Economic Adjustment Assistance	DOC-EDA	X	X	–

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan. (continued)

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
11.405	Anadromous Fish Conservation Act Program	NOAA	X	–	–
11.407	Interjurisdictional Fisheries Act of 1986	NOAA	X	–	X
11.417	Sea Grant Support	NOAA	X	–	X
11.419	Coastal Zone Management Administration Awards	NOAA	X	–	X
11.420	Coastal Zone Management Estuarine Research Reserves	NOAA	X	–	–
11.426	Financial Assistance for National Centers for Coastal Ocean Science	NOAA	X	–	–
11.427	Fisheries Development and Utilization Research and Development Grants and Cooperative Agreements Program	NOAA	X	–	–
11.429	Marine Sanctuary Program	NOAA	X	–	–
11.433	Marine Fisheries Initiative	NOAA	X	–	–
11.441	Regional Fishery Management Councils	NOAA	X	–	–
11.444	Aquaculture Program	NOAA	X	X	–
11.463	Habitat Conservation	NOAA	X	–	–
11.473	Coastal Services Center	NOAA	X	–	–
11.474	Atlantic Coastal Fisheries Cooperative Management Act	NOAA	X	–	–
11.477	Fisheries Disaster Relief	NOAA	X	–	–
11.478	Center for Sponsored Coastal Research - Coastal Ocean Program	NOAA	X	–	X
12.100	Aquatic Plant Control	ACOE	X	–	–
12.101	Beach Erosion Control Projects	ACOE	X	X	–
12.102	Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works	ACOE	X	–	–
12.104	Flood Plain Management Services	ACOE	X	–	–
12.105	Protection of Essential Highways, Highway Bridge Approaches and Public Works	ACOE	X	X	–
12.106	Flood Control Projects	ACOE	X	X	–
12.107	Navigation Projects	ACOE	X	X	–

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan. (continued)

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
12.109	Protection, Clearing and Straightening Channels	ACOE	X	X	–
12.110	Planning Assistance to States	ACOE	X	–	–
12.111	Emergency Advance Measures for Flood Protection	ACOE	X	X	–
12.300	Basic and Applied Scientific Research	ONR	X	–	–
12.301	Basic and Applied Scientific Research	ONR	X	–	–
12.600	Community Economic Adjustment	DOD-OEA	X	X	–
12.607	Community Economic Adjustment Planning Assistance	DOD-OEA	X	X	–
12.612	Community Base Reuse Plans	DOD-OEA	X	X	–
12.613	Growth Management Planning Assistance	DOD-OEA	X	X	–
14.218	Community Development Block Grants/Entitlement Grants	HUD-CPD	X	X	–
14.2246	Community Development Block Grants/Economic Development Initiative	HUD-CPD	X	X	–
15.605	Sport Fish Restoration	FWS	X	–	–
15.611	Wildlife Restoration	FWS	X	–	–
15.614	Coastal Wetlands Planning, Protection and Restoration Act	FWS	X	–	–
15.615	Cooperative Endangered Species Conservation Fund	FWS	X	–	–
15.616	Clean Vessel Act	FWS	X	–	X
15.618	Administrative Grants for Federal Aid in Sport Fish and Wildlife Restoration	FWS	X	–	–
15.623	North American Wetlands Conservation Fund	FWS	X	–	–
15.805	Assistance to State Water Resources Research Institutes	USGS	X	–	–
15.976	Migratory Bird Banding and Data Analysis	USGS	X	–	–
15.916	Outdoor Recreation - Acquisition, Development and Planning	NPS	X	X	–
15.918	Disposal of Federal Surplus Real Property for Parks, Recreation, and Historic Monuments	NPS	X	X	–

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan. (continued)

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
15.919	Urban Park and Recreation Recovery Program	NPS	X	–	–
15.925	National Maritime Heritage Grants	NPS	X	–	–
20.005	Boating Safety Financial Assistance	USCG	X	–	–
20.006	State Access to the Oil Spill Liability Trust Fund	USCG	X	–	–
20.007	Bridge Alteration	USCG	X	X	–
20.205	Highway Planning and Construction	FHA	X	X	–
20.219	Recreational Trails Program	FHA	X	X	X
20.312	High Speed Ground Transportation - Next Generation High Speed Rail Program	FRA	X	X	–
20.500	Federal Transit-Capital Investment Grants	FTA	X	X	–
20.505	Federal Transit- Metropolitan Planning Grants	FTA	X	X	–
20.507	Federal Transit-Formula Grants	FTA	X	X	–
20.509	Formula Grants for Other than Urbanized Areas	FTA	X	X	–
20.514	Transit Planning and Research	FTA	X	X	–
20.515	State Planning and Research	FTA	X	X	–
20.801	Development and Promotion of Ports and Intermodal Transportation	DOT-MA	X	X	–
66.419	Water Pollution Control- State and Interstate Program Support	EPA	X	–	X
66.433	State Underground Water Source Protection	EPA	X	–	–
66.454	Water Quality Management Planning	EPA	X	–	X
66.456	National Estuary Program	EPA	X	–	X
66.458	Capitalization Grants for State Revolving Funds	EPA	X	–	X
66.460	Nonpoint Source Implementation Grants	EPA	X	–	X
66.461	Wetlands Protection- Development Grants	EPA	X	–	–
66.463	National Pollutant Discharge Elimination System Related State Program	EPA	X	–	–

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan. (continued)

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
66.500	Environmental Protection-Consolidated Research	EPA	X	v	–
66.600	Environmental Protection Consolidated Grants Program Support	EPA	X	–	–
66.605	Performance Partnership Grants	EPA	X	–	X
66.606	Surveys, Studies, Investigations and Special Purpose Grants	EPA	X	–	X
66.608	One Stop Reporting	EPA	X	–	–
66.609	Children's Health Protection	EPA	X	–	–
66.700	Consolidated Pesticide Enforcement Cooperative Agreements	EPA	X	–	–
66.701	Toxic Substances Compliance Monitoring Cooperative Agreements	EPA	X	–	–
66.604	Environmental Justice Grants to Small Community Groups	EPA	X	–	–
66.710	Environmental Justice Community/University Partnership Grants Program	EPA	X	–	–
66.713	State and Tribal Environmental Justice	EPA	X	–	–
66.801	Hazardous Waste Management State Program Support	EPA	X	–	–
66.802	Superfund State Site-Specific Cooperative Agreements	EPA	X	–	–
66.804	State and Tribal Underground Storage Tanks Program	EPA	X	–	–
66.805	Leaking Underground Storage Tank Trust Fund Program	EPA	X	–	–
66.806	Superfund Technical Assistance Grants for Citizen Groups at Priority Sites	EPA	X	–	–
66.807	Superfund Innovative Technology Evaluation Program	EPA	X	–	–
66.808	Solid Waste Management Assistance	EPA	X	–	–
66.809	Superfund State Core Program Cooperative Agreements	EPA	X	–	–
66.810	CEPP Technical Assistance Grants Program	EPA	X	–	–

Table 1. Inventory of Federal Programs for Consistency with the Peconic Estuary Plan. (continued)

Catalog of Federal Domestic Assistance*	Program Title	Agency**	Potential to support PEP CCMP	Potential to conflict with PEP CCMP	Priority?
66.811	Brownfield Pilots Cooperative Agreements	EPA	X	–	–
66.708	Pollution Prevention Grants Program	EPA	X	–	–
83.536	Flood Mitigation Assistance	FEMA	X	X	–
83.537	Community Disaster Loans	FEMA	X	X	–
83.548	Hazard Mitigation Grant	FEMA	X	X	–
83.551	Project Impact-Building Disaster Resistant Communities	FEMA	X	X	–

* 2000 Catalog of Federal Domestic Assistance, Executive Office of the President, Office of Management and Budget

** Agency Names:

ACOE — Army Corps of Engineers
DOC — Department of Commerce
DOC-EDA — Department of Commerce - Economic Development Administration
DOD-OEA — Department of Defense - Office of Economic Adjustment
DOT-MA — Department of Transportation - Maritime Administration
EPA — Environmental Protection Agency
FEMA — Federal Emergency Management Agency
FHA — Federal Highway Administration
FRA — Federal Railroad Administration
FTA — Federal Transit Administration
FWS — Fish and Wildlife Service
HUD-CPD — Department of Housing and Urban Development — Community Planning and Development
NOAA — National Oceanic and Atmospheric Administration
NPS — National Park Service
ONR — Office of Naval Research
USCG — U.S. Coast Guard
USDA — U.S. Department of Agriculture
USDA-ERS — USDA Economic Research Service
USDA-ES — USDA Cooperative State Research, Education and Extension Service
USDA-FSA — USDA Farm Services Agency
USDA-NRCS — USDA Natural Resources Conservation Service
USDA-RB-CS — USDA Rural Business-Cooperative Service
USDA-RHS — USDA Rural Housing Service
USDA-RUS — USDA Rural Utilities Service
USGS — U.S. Geological Survey

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APPENDIX K

Base Program Analysis

Table of Contents

Introduction

This Base Programs Analysis has been prepared pursuant to Section 320(b)(5) of the Clean Water Act, which requires that each National Estuary Program:

"Develop [action] plans for the coordinated implementation of the [comprehensive conservation and management] plan by the states as well as Federal and local agencies participating in the conference."

EPA's policy further elucidates Base Programs Analysis requirements, stating that:

"The base program analysis assesses the effectiveness of the estuary's management framework. It describes existing mechanisms for addressing priority problems identified by the scientific characterization and recommends options for improving or enhancing the management framework." (See *National Estuary Program Guidance, Comprehensive Conservation and Management Plans: Content and Approval Requirements,* USEPA Office of Water, October 1992; see also *National Estuary Program Guidance, Base Programs Analysis,* USEPA Office of Water, March 1993).

The Peconic Estuary Program (PEP) has structured its Base Programs Analysis in a modular format, corresponding with the chapter structure of the PEP *Comprehensive Conservation and Management Plan* itself. For each module, or chapter, the Base Programs Analysis provides:

- a description of the regulatory/institutional framework;
- an evaluation of effectiveness; and
- recommendations for addressing gaps and expanding strengths ("recommendations for improvements")

Programs and agencies are discussed in greater detail the first time they are mentioned in this document. For example, USEPA and Clean Water Act programs dealing with technology-based and water quality-based discharge limits are described in the nutrients section, but are simply referred to in the pathogens and toxics sections, which also deal with those programs. Thus, the nutrients section has the most extensive description of water quality and pollution control programs.

During the entire PEP CCMP preparation process, agency and institutional frameworks have been identified and evaluated as part of the management plan preparation process. However, this Base Programs Analysis document serves valuable purposes, above and beyond the work already done. For example, it affords the opportunity for inter-chapter evaluation and reflection, to ensure that all opportunities and options have been fully evaluated and addressed. Also, the document brings together, in one place (see Summary below) programmatic recommendations. As such, it provides a cohesive look at all programmatic needs and recommendations. It also offers the genesis of a template, or checklist, which can be used to assess programmatic progress during implementation efforts.

Two major documents have already been developed to address programmatic issues, focusing largely at the local level. The local focus is based on the fact that the bulk of the PEP land use management

and pollution control (mainly nonpoint source) recommendations must be implemented at the local level. They are:

- *PEP Base Programs Analysis, Nonpoint Source Management Plan Inventory*, June 12, 1995.
- *Evaluating Town Capacity and Needs in Protecting the Peconic Estuary*, Columbia University, 1999.

The reports are incorporated by reference in appropriate sections of the Base Programs Analysis.

Finally, acknowledgement must be provided to the following base programs analysis reports:

- *Discussion of Existing Management Programs for the Long Island Sound and its Resources*, January 1993.
- *Barnegat Bay Estuary Program, Base Programs Analysis*, May 2000.
- *Delaware Estuary Program, Base Programs Inventory, Summary, and Analysis*, May 1995.

Information and narrative from these reports were used in the PEP Base Programs Analysis, particularly with respect to the "regulatory/institutional framework" descriptions for Federal and state agencies and programs.

Brown Tide

Description of Regulatory/Institutional Framework

Federal Agencies and Programs

National Oceanic and Atmospheric Administration

NOAA's Coastal Ocean Program (COP) is part of the National Centers for Coastal Ocean Science. The COP provides scientific information to assist decision-makers in managing coastal resources. The Program targets critical issues that exist in the nation's estuaries, coastal waters, and Great Lakes.

The Peconic Estuary Program, NOAA, Sea Grant, and the State University of New York at Stony Brook's Marine Sciences Research Center sponsored a Brown Tide Summit in October 1995 to develop a comprehensive Brown Tide research agenda. Since the Brown Tide Summit in 1995, the Coastal Ocean Program has committed $3 million towards Brown Tide research. New York Sea Grant is in charge of administering these funds. The Brown Tide Research Initiative (BTRI) Committee formed as a result of the COP funding commitments and has been instrumental in preparing Requests for Proposals, reviewing research proposals, and assisting in managing the NOAA COP funding. The BTRI Committee includes: NOAA, NY Sea Grant, NYS Department of Environmental Conservation, the Suffolk County Executive, USEPA/Peconic Estuary Program, a local government representative, a citizen representative, and a South Shore Estuary Reserve (SSER) representative.

The intent of the COP Brown Tide program is to understand and predict the onset of Brown Tide blooms, and determine advance strategies for mitigating its environmental impacts. Current research is focused on identifying the factors that cause, maintain, and dissipate the blooms. Brown tide research and characterizations are routinely reported in the scientific literature and are systematically updated through Sea Grant's BTRI reports.

State Agencies and Programs

New York Sea Grant

New York Sea Grant is a cooperative program between the State University of New York and Cornell University which focuses the talents of university scientists and extension specialists on research and the transfer of scientific information to industry, government, resource managers, and the public. Sea Grant supports more than 20 scientific research projects annually in technology and product development, fisheries, coastal environmental quality and processes, and other areas of special interest, including Brown Tide. As with the NOAA Coastal Ocean Program Brown Tide research funding, Sea Grant administers grants and leverages partnerships with the state and private sector.

Regional Level

Brown Tide Steering Committee

A Brown Tide Steering Committee was formed after the Brown Tide Summit in 1995 to more broadly coordinate and guide Brown Tide research and monitoring efforts through the development of a Brown Tide Workplan. The Committee is made up of BTRI members, as well as several additional

members, including elected officials and representatives from various agencies, citizens groups and estuary programs and coordinated by Suffolk County. The Steering Committee's goals are to:

1) Coordinate research efforts funded and performed by various entities
2) Assist in dissemination of information
3) Develop and continually refine and update research workplans, by systematically organizing and summarizing results of previous and ongoing Brown Tide research efforts and identifying priorities for additional research needs
4) Estimate funding needs to conduct necessary additional research.

Between 1997 and 2000, Suffolk County has appropriated $583,000 to support Brown Tide monitoring and investigation efforts. Much of the funding has gone towards funding projects outlined in the 1998 Brown Tide Workplan. Suffolk County will continue to authorize $150,000 each year for the next three years (2001-2003) from the Capital Budget for additional Brown Tide research and monitoring.

Local Level

Suffolk County

In 1988, the Suffolk County Department of Health Services (SCDHS) Bureau of Marine Resources expanded its surface water monitoring operations to characterize the extent and severity of the Brown Tide blooms. The Bureau of Marine Resources provides this information and needed samples to researchers. Although the cause of Brown Tide is still not known, the study's resulting final report, the Brown Tide Comprehensive Assessment and Management Program (BTCAMP) (SCDHS, 1992), served as the primary basis for the nomination document for acceptance of the Peconic Estuary Program into the National Estuary Program.

Evaluation of Effectiveness

The agencies and programs described above are effective but are underfunded.

Recommendations for Improvements

Continued research and monitoring depends on continued funding. It is recommended in the CCMP that:

- The SCDHS water quality monitoring program continues to provide information needed for analysis and research related to Brown Tide
- Funding for NOAA-funded Brown Tide research and monitoring projects is continued
- Funding sources to implement the Brown Tide Workplan are identified and secured

Nutrients

Description of Regulatory/Institutional Framework

Federal Agencies and Programs

United States Environmental Protection Agency

The principal law governing pollution of the nation's waterways is the Federal Water Pollution Control Act, or Clean Water Act. Originally enacted in 1948, it was totally revised by amendments in 1972 that gave the Act its current shape. The 1972 legislation spelled out ambitious programs for water quality improvement that are still being implemented by industries and municipalities. Congress made fine-tuning amendments in 1977, revised portions of the law in 1981, and enacted further amendments in 1987.

The Clean Water Act (CWA) authorizes the U.S. Environmental Protection Agency (EPA) to establish national, uniform technology-based effluent limitation guidelines for point sources of pollution discharging to "waters of the United States," broadly defined to include wetlands. Effluent limitations are enforced through Section 402 of the CWA, the National Pollutant Discharge Elimination System permit program (NPDES; delegated to New York under SPDES). The CWA does not apply to agricultural nonpoint source pollution.

Recently, Phase II Municipal Stormwater Rules have been promulgated under Section 402 by EPA, which will extend regulatory requirements for stormwater effluent limitations to smaller urban areas than have previously been affected. The program will be phased in over 7 years, and will be administered by the New York State Department of Environmental Conservation (NYSDEC) as part of its delegated authority under the CWA. Municipalities, which fell outside of the regulatory purview of the Phase I Rules, will need to meet the compliance requirements of Phase II. Permitted municipalities will be required to implement 6 minimum control measures:

I. public education and outreach
II. public involvement/participation
III. illicit discharge detection and elimination
IV. construction site stormwater runoff control
V. post-construction stormwater management in new development and redevelopment
VI. pollution prevention/good housekeeping for municipal operations

Sections 208 and 303(e) of the CWA of 1972 established the initial framework for addressing nonpoint sources of pollution (NPS). States and local planning agencies analyzed the extent of NPS pollution and developed water quality management programs to control it with funds provided by EPA under Section 208. Best management practices were evaluated, assessment models and methods were developed, and other types of technical assistance were made available to State and local water quality managers. Section 208 provided that States prepare statewide and regional plans, based on watersheds, for the prevention of both point and nonpoint source pollution.

EPA's Total Maximum Daily Load (TMDL) Program comes from Section 303(d). There remain waters in the nation that do not meet the CWA national goal of "fishable, swimmable" quality despite the fact that nationally required levels of pollution control technology have been implemented by many pollution sources. CWA Section 303(d) addresses these waters that are not "fishable,

swimmable" by requiring the state to identify the waters and to develop total maximum daily loads (TMDLs) for them, with oversight from EPA.

Per Section 312 of the CWA, EPA, individual States and the U.S. Coast Guard work together to provide states with the opportunity to protect citizens and aquatic habitats through Vessel Waste No Discharge Area designations and national standards for marine sanitation devices on boat toilets, or heads. Section 312 of the CWA helps protect human health and the aquatic environmental from disease-causing microorganisms that may be present in sewage from vessels and boats. These microorganisms can include bacteria, protozoa, and viruses. For more discussion on No Discharge Areas, see the discussion on the Clean Vessel Act in the Pathogens section.

Section 319 of the Clean Water Act directs each state to develop programs for controlling nonpoint source pollution. New York has an EPA-approved State Assessment Report and Management Program that describes the state's nonpoint source pollution problems and programs.

Section 320 of the CWA of 1987 established the National Estuary Program (NEP), under which authority for this document supporting the Peconic Estuary Program was prepared. Section 320 authorized the EPA Administrator to convene Management Conferences to develop Comprehensive Conservation and Management Plans for estuaries of national significance that are threatened by pollution. The general goals of the NEP are the protection and improvement of water quality and the enhancement of living resources. To achieve these goals, the program calls for activities to help:

- establish working partnerships among Federal, state, and local government;
- transfer scientific and management information, experience, and expertise to program participants;
- increase public awareness of pollution problems and ensure public participation in consensus building;
- promote basin-wide planning to control pollution and manage living resources; and
- oversee development and implementation of pollution abatement and control programs.

Section 320 also specifies members of a Management Conference to ensure representation by a broad range of interests. Membership must include, at a minimum, representatives of Federal, state, regional, and local agencies, affected industries, academia, and the public.

Section 401 of the CWA of 1977 (33 U.S.C. 1251, Section 401) provides that all projects requiring Federal permits for the discharge of dredged or fill material into waters of the United States also require a Water Quality Certification. The purpose of this certification is to insure that all such activities are consistent with national water quality standards and management policies. This program is administered by the State of New York through Federal delegation.

Section 404 of the CWA establishes the Federal permitting program governing discharge of dredged and fill material into wetlands and other waters, administered by EPA and U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (ACOE) is an engineering and water resources development agency authorized to investigate, develop, conserve and improve the nation's water, land and related environmental resources. The ACOE's civil programs primarily manage the country's wetlands and waterways. Program activities include navigation, flood control, flood plain management, shore and

beach restoration and protection, hurricane flood protection, water quality control, wetland protection and enhancement, outdoor recreation and environmental quality.

The ACOE issues permits for the placement of fill material into United States waters or wetlands. This can affect small and large-scale projects such as constructing piers, docks and ramps or dredging and placement activities in navigable waters. The ACOE also issues permits for placement of dredged material into ocean waters.

National Oceanic and Atmospheric Administration

The U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) is the nation's principal marine science agency. NOAA serves the public through a variety of programs designed to manage, assess, and increase our understanding of the marine environment and coastal zone. NOAA's coastal programs are carried out primarily through two line offices, the National Ocean Service and the National Marine Fisheries Service (NMFS), described in greater detail below. NOAA also conducts many studies through its Coastal Ocean Program (COP), a multidisciplinary activity which emphasizes marine environmental quality, fishery productivity, and the physical impact of natural coastal hazards. NOAA's National Sea Grant Program, which supports university research directed at the development and use of marine resources, is implemented in the Peconic Estuary through the New York Sea Grant Institute.

U.S. Department of Agriculture, Natural Resources Conservation Service

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) carries out a broad program of technical assistance, research and education which aims to improve agricultural and land management practices which help protect surface and groundwater from contamination. These management practices focus on proper animal waste handling, erosion and stormwater runoff control and abatement.

U.S. Department of the Interior, Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has the principal Federal responsibility for conserving the nation's fish and wildlife including their related habitats.

Although the Service has no direct regulatory control concerning discharges of pollutants into waters of the U.S. or discharge of dredged or fill material, the Agency plays a direct advisory role in these regulatory practices. Under the Fish and Wildlife Coordination Act, the Service must assess the impacts on biota of all water and water related development projects that are funded by the Federal government or constructed under a Federal permit or license. The Service provides information to Federal construction or regulatory agencies and to permit applicants.

U.S. Department of the Interior, Geological Survey

The primary responsibility of the U.S. Geological Survey (USGS) is to conduct surveys, investigating and researching the topography, geology and mineral and water resources of the nation. The Survey is also involved with quantification of the nation's water resources and the effect of development and utilization on them. It makes statistical data and summary reports available to planners, developers and managers.

The USGS is also responsible for the National Water Quality Assessment Program which aims to describe the status and trends in the quality of the nation's ground and surface water resources and to provide a sound, scientific understanding of the primary natural and human factors affecting the quality of these resources. The information collected under this program provides essential water quality information for policy makers.

State Agencies and Programs

New York State Department of Environmental Conservation

The New York State Department of Environmental Conservation is the lead State agency in planning, developing and managing the state's water resources, and undertakes studies for the protection, conservation, development and use of water resources of the state. Other activities include classification of state waters and establishing standards for quality and purity, permitting of wastewater discharges, flood control and flood plain management, control of dredging and filling in navigable waters, control of construction of dams and docks, tidal and freshwater wetland conservation programs and management of fish, shellfish and wildlife resources.

A listing of individual divisions with responsibility over the water quality of the Peconic Estuary follows:

> Division of Water: charged with maintaining water quality in all of the state's waterbodies and managing water resources. The Division sets water quality standards, regulates wastewater treatment and associated discharges, monitors water quality, oversees the state's nonpoint source pollution program and protects groundwater aquifers, under delegation of Clean Water Act powers described above.
>
> Bureau of Marine Resources: responsible for managing living marine resources in the state. This includes assessing environmental impacts on marine resources, administering the tidal wetlands and excavation and fill regulatory programs, coordinating state participation in National Estuary Programs, recommending standards and classifications for marine waters, certifying shellfish growing waters for harvesting, administering shellfish management programs, assessing principal fishery stocks and developing recommendations for effective management of species.
>
> Division of Environmental Permits: coordinates permit reviews, assesses environmental impacts of proposed projects, reviews regulations, and issues permits. The Division also administers the State Environmental Quality Review Act which requires all levels of state and local government to assess the environmental significance of actions which they have discretion to approve, fund or directly undertake.

New York State Department of State Coastal Management Program

In New York, the Department of State administers the Coastal Management Program (CMP). The CMP provides for the preservation, protection, development and use of the state's coastal and inland waterways. The program has many aspects: policies covering land use planning, development of recreation, commercial and industrial water-dependent properties, maintenance of fish and wildlife habitats, stabilization of beaches and dunes, and waste discharges from vessels and on shore facilities. The CMP's jurisdiction extends from the limit of the state's territorial waters to a line generally 500 to 1000 feet inland.

The CMP reviews projects having some form of Federal involvement in coastal areas for consistency with local, state and Federal environmental statutes and program. The CMP also provides technical and financial assistance to local municipalities to prepare Local Waterfront Revitalization Plans. These plans promote revitalization of coastal areas while protecting their integrity.

Under the Coastal Zone Act Reauthorization Amendments of 1990, each state was required to develop and submit to the EPA and NOAA a coastal nonpoint pollution control program. The purpose of the program is "to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters," working in close conjunction with other state and local authorities.

New York State Department of Health

The Department of Health enforces compliance with the Public Health Law and the State Sanitary Code. In the area of water resources, the Department establishes drinking water quality standards, and establishes regulations for the sanitary control of water supplies. The Health Department sets guidance for seafood consumption to protect public health. The Department also assists DEC in developing water and air human health standards and in overseeing public health interests for the inspection and remediation of inactive hazardous waste sites.

Regional Level

Long Island Regional Planning Board

The Board conducts planning and technical studies targeted to the preparation and update of the Bi-County Comprehensive Development Plan for Nassau and Suffolk Counties. Activities are supported by grants from Federal, state and local government agencies. Technical assessments conducted at both regional and local levels have focused on a wide array of topics including the implications of land use on waste management planning, the quality of groundwater and surface waters and natural resource protection. The Board also provides technical expertise to local municipalities and makes recommendations on development proposals, government operations and open space plans and acquisitions.

Local Level

New York has a long-standing tradition of local self-determination or local home rule. Home rule authority is highly valued and strongly defended. Land use controls in particular are viewed as a local prerogative. At the county level, Suffolk County performs state-assigned functions such as enforcement of state laws, and the conduct of elections, as well as providing a variety of public services to its residents in such areas as public and environmental health, sanitation, highways and public safety.

In New York, municipalities, usually local planning and/or zoning commissions, and zoning boards of appeals are responsible for determining land use and zoning. This authority is delegated to localities by state law and under state guidance. Commissions, in conjunction with other local agencies, exert additional regulatory control over activities in the community. Some examples include conservation, aquifer protection, and wetland and historic commissions.

Municipal Boards or Councils

In New York, the elected Municipal Boards are charged with the responsibility of overseeing all functions of local government. These boards are ultimately charged with the regulation of land use and zoning—the "backbone" of home rule. In most instances, the Board commissions the development of a master plan or other comprehensive land use document which defines the existing development patterns within a given community, articulates a set of objectives or goals, sets forth a plan for guiding future development in conformance with the stated goals or objectives and can grant

zoning incentives. The Board will usually delegate watchdog powers to a planning board that analyzes individual development proposals in the context of the overall master plan to insure compliance. However, if this authority is not delegated, zoning, rezoning and granting special permits is the function of the legislative board.

Boards and Department of Health

The Department of Health has far-reaching authority in exercising their responsibility to protect public health and safety. Its broad regulatory authority places it at the forefront of environmental protection. The Board of Health can adopt regulations for many activities that might endanger public health or the environment. Health Department jurisdictions typically extend into the areas of water supply, sewage disposal and sanitation.

The Suffolk County Department of Health Services implements delegated programs from the NYS Departments of Health and Environmental Conservation, as well as Suffolk County Sanitary Code Articles 4, 6, 7, and 12. These Sanitary Code sections limit nutrient and toxic pollution to groundwater, with attendant benefits to surface waters.

Conservation Commissions and Boards

Municipalities are empowered under state law to establish local environmental advisory agencies. Among their purposes are to inventory natural resources within the community; receive and monitor designated open space/conservation areas as well as conservation easements on behalf of the community; serve as an advisor on conservation matters to other municipal boards, councils and agencies; and prepare and periodically update maps of open space/conservation areas and other important natural resources.

Inland or Freshwater Wetland Commissions

The municipality is empowered under state law to enact legislation providing for the local regulation of inland or freshwater wetlands that is consistent with state statutes. Once wetland regulations are enacted, the municipal board will generally delegate implementation to an Inland Wetland Commission or Conservation Board. These commissions preside over specific development actions in and around wetlands and render regulatory decisions. Other activities may include monitoring approved projects for compliance with the terms and conditions of issued permits, providing enforcement of the local wetland regulations, and keeping maps of wetland areas that are available for review. The regulation of inland wetlands is an important component to the protection of estuarine quality as inland wetlands are often hydrologically connected to estuarine wetlands and waterways.

Environment Departments

Environment Departments are often established by the governing municipal board to oversee and coordinate all activities in the municipality having to do with the environment. These departments are charged with managing natural resources, protecting public health and balancing population growth, resource use and resource health. Environmental departments provide assistance and advice to a wide variety of elected and appointed boards having jurisdictions in environmental matters.

Planning and Zoning Boards or Commissions

Planning boards or commissions are statutorily empowered to carry out a variety of planning related functions, some of which are long-range while others pertain to the review of individual projects, proposals and activities. These authorities are conveyed to municipalities, but not required of them. Accordingly, while these powers are the backbone of local home rule, all procedures must be consistent with the requirements of state planning and zoning enabling statutes and are not universally

in place. These boards or commissions are the primary authorities for local coastal management planning and implementation. All significant development proposals are reviewed for conformance with local and state coastal programs.

Generally, planning or combined planning and zoning commissions prepare, adopt or amend master plans of development for a community; review municipal improvement projects and the subdivision of land.

Zoning Board of Appeals

Boards of Appeals are elected or appointed by the local legislative board and empowered to vary land use regulations where the strict application of such regulations would create unnecessary hardship (i.e., if the applicant is deprived of all economic uses or benefit, the hardship is unique but not self-created). In some municipalities, the boards may also hear and decide on applications for special permits.

Nonpoint Source Implementation

Local programs are discussed more fully in the PEP documents, *PEP Base Programs Analysis, Nonpoint Source Management Plan, Inventory*, June 12, 1995, as well as *Evaluating Town Capacity and Needs in Protecting the Peconic Estuary*, Columbia University, 1999. The nonpoint source document is particularly significant with respect to pollution loading, as it describes applicable 6217(g) management measures, and the extent to which they are implemented by local programs. The report discusses, in detail, issues such as local ordinances and management approaches for stormwater runoff, sanitary systems, and land use management controls (zoning, open space, clearing restrictions, etc.).

Legislative Bodies

NYS Legislative Commission on Water Resource Needs of Long Island

Since 1987, the NYS Legislative Commission on Water Resource Needs of Long Island has worked to prevent degradation of resources and their interdependent ecologies. The Commission's primary responsibilities are to make recommendations that lead to the preservation and protection of water resources, to initiate the enactment of legislation to those same ends, and to participate in ongoing dialogues to ensure the health of those waters.

Evaluation of Effectiveness

In general, most of the agencies and programs described above provide adequate capacity (statutory and regulatory authority, agency functionality, etc.) to support PEP management objectives. A few needs/deficiencies, potentially warranting "new" programs, are recommended, including:

- Optimizing farmer involvement in AEM initiatives by providing comfort levels, possibly via insurance programs.

- Promoting more progressive nonpoint source control measures, especially in sensitive nearshore areas and subwatersheds of embayments, dealing with sanitary system upgrades, innovative and alternative sanitary systems, septage management districts, and harbor protection overlay district ordinances.

While a few needs for "new" programs have been recommended, most of the programmatic analysis contained in this document, and in the CCMP, has resulted in identification of recommendations for improvements in existing programs. These improvements generally fall in the classes of:

- Needs to apply/tailor existing programs and mechanisms to further PEP recommendations (e.g., use mechanisms such as nitrogen guidelines to guide regional nitrogen load allocations).

- Needs to expand pre-existing programs to meet Peconic Estuary needs (e.g., tailor an agricultural environmental management program for nitrogen management needs to the conditions in Suffolk County, where nitrogen from fertilizers leaches readily from soil to groundwater, eventually reaching surface waters).

- Needs for additional financial and/or staff resources for implementation (e.g., additional staff at Suffolk County Soil and Water Conservation District and USDA Natural Resources Conservation Service to implement agricultural environmental management).

Recommendations for Improvements

Based on its programmatic inventory and evaluation, in terms of new programs, the PEP has recommended:

- Investigating the creation of a farm insurance program to optimize involvement in AEM initiatives.

- Evaluating the feasibility of progressive nonpoint source control measures.
  - Tax credits for sanitary system upgrades.
  - Innovative and alternative sanitary systems, and septage management districts.
  - Harbor protection overlay district ordinances.

Since these new programs are in the early stages of investigation, commitments have not been procured, and costs and responsibilities are unknown. The PEP Management Conference is the lead entity in evaluating feasibility of these programs.

Based on program needs, recommendations for improvements (or programmatic follow-up) include:

- Refine Water Quality Standards and Guidelines.
  - Integrate monitoring and modeling data, studies, and reports to evaluate the application of nitrogen guidelines for attaining and maintaining DO standards, optimizing eelgrass habitats, and for use in developing regional load allocation strategies and TMDLs.
  - Review and revise as appropriate the marine DO standards based on Long Island Sound Study efforts to develop area-specific DO targets and USEPA efforts to develop DO criteria for marine waters.

- Preserve Water Quality East of Flanders Bay
  - Develop and implement water quality preservation plans to protect existing water quality for waters east of Flanders Bay where water quality meets or exceeds established standards, criteria, or guidelines. This may be accomplished, in part, by land use and nonpoint source pollution control measures noted above and below.

- Implement a Quantitative Nitrogen Load Allocation Strategy for Entire Estuary
  - Initiate the development of load allocation targets and implementation strategies for nitrogen loading to the entire estuary, identify water segments to be included in New York State's 2002 303(d) list, and establish schedule for development of a TMDL, as needed.

- Control Point Source Discharges from STPs and Other Dischargers
  - Evaluate the appropriateness of applying for a "Discharge Restriction Category" to prevent new nitrogen discharges from point sources in the Peconic River and the western portion of the Peconic Estuary.
  - Consider a groundwater application of the point source nitrogen freeze in the Peconic River/Flanders Bay watershed (currently applied only to surface water discharges), based upon Nitrogen Management Work Group recommendations and TMDL work.

- Implement Nonpoint Source Control Plans
  - Ensure that the Section 6217(g) management measures of CZARA are appropriately implemented, in support of the overall nitrogen management plan.
  - Develop a regional implementation plan for agricultural nitrogen load reductions which would include promoting agricultural best management practices, expanding agricultural environmental management (AEM) strategies, and promoting organic farming among other initiatives. Four staff persons per year over the next 10 years are needed for implementation (estimate).
  - Develop a Long Island component to the New York State Agricultural Environmental Management (AEM) program. ($1 million for program development).
  - Provide funding for increased local AEM development and implementation ($1 million for implementation start up, from NYS Bond Act, Suffolk County ¼% Sales Tax, and other funding sources; long-term to be determined).

- Use Land Use Planning to Control Nitrogen Loading Associated with New Development

- Continue and expand aggressive open space preservation programs
- Review the Pine Barrens Land Use Plan "guidelines" (non-binding) for development in the Compatible Growth Area and develop proposals for additional "standards" (binding) for development based on Peconic River water quality protection goals.
- Evaluate nitrogen-loading impacts when reviewing Core Preservation Area hardship applications.
- Ensure that the public acquisition of private, vacant lands in Core Preservation Areas within the Peconic River ground watershed are given high priority.
- Utilize the strictest practicable standards when reviewing Peconic River development plans (e.g., require open space dedications, maximum practicable setbacks from the river, and natural landscaping to minimize fertilizer use).

Habitat and Living Resources

Description of Regulatory/Institutional Framework

Federal Agencies and Programs

National Environmental Policy Act

This Act established a national environmental policy and goals for the protection, maintenance, and enhancement of the environment, provided a process for implementing these goals within the Federal agencies, and established the Council on Environmental Quality to oversee Federal implementation of the Act. Under the Act, all Federal agencies must incorporate environmental considerations into their planning, decision-making, and actions through the preparation of environmental impact statements.

Coastal Zone Management Act

The Coastal Zone Management Act is administered by the National Oceanic and Atmospheric Administration (NOAA); however, the objectives of the law are to be achieved through state coastal management programs. The State of New York has such a program, and the actions of Federal agencies must be consistent with the states' programs. The Act established a national policy to preserve, protect, develop, and where possible, to restore or enhance coastal zones.

Magnuson-Stevens Fishery Conservation and Management Act

This Act was designed to conserve and manage all fishery resources within the U.S. Exclusive Economic Zone, with the exception of some species on the continental shelf outside of the U.S. Exclusive Economic Zone. This Act also established eight regional fishery management councils, which prepare Fishery Management Plans for the fisheries in their region. These plans must include measures for conservation and management that prevent overfishing while achieving optimum yield for each fishery. Amendments to the Act require the National Marine Fisheries Service describe, identify, conserve, and enhance "essential fish habitat", defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

Atlantic States Marine Fisheries Commission

The Atlantic States Marine Fisheries Commission has an Interstate Fisheries Management Program that was established by a state/Federal cooperative agreement with the National Marine Fisheries Service. This program was designed to establish priorities for Territorial Sea Fisheries Management, develop, monitor, and review management plans for high priority fisheries, recommend to states, Regional Fishery Management Councils, and the Federal Government, management measures that will benefit these fisheries, and conduct short-term research to assist in the preparation or revision of fishery management plans. Fishery management plans are now required to include essential fish habitat provisions.

Endangered Species Act

The Endangered Species Act is administered by the U.S. Fish and Wildlife Service (FWS) and NOAA's National Marine Fisheries Service (NMFS). This program is designed to protect and conserve all types of wildlife and plants -- both marine and terrestrial -- that are threatened or endangered with extinction. All Federal agencies must consult with the FWS and NMFS on activities that they authorize, fund, or carry out, which may impact any threatened or endangered species or its habitat. This is to ensure that actions will not jeopardize the species either directly or through adverse modification of its habitat.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) is administered by NMFS. This Act serves to protect and conserve marine mammals and their designated critical habitat. In addition, it establishes a moratorium on the taking and importation of marine mammals. This Act also provides for scientific, legal, and policy research to determine the best methods for protecting and conserving marine mammals. The porpoises and pinnipeds found in the Peconics are all covered under this law.

North American Waterfowl Management Plan

This Plan is administered cooperatively by the states and the FWS. It was established to address the serious decline of waterfowl populations throughout North America. The Plan identifies habitat conservation needs in specific regions, sets goals for restoration of waterfowl populations, and provides a framework for accomplishing local, regional, and international goals.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934 authorizes the FWS to "provide assistance to and cooperate with Federal and state agencies to protect, rear, stock and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife." Amendments passed in 1958 further allow the FWS to review proposed Federal actions that may affect stream, wetlands or other bodies of water and recommend ways to conserve fish and wildlife. It also allows the FWS to determine standards for water quality maintaining fish and wildlife, study methods of abating and preventing pollution and recovering useful products, and collect and distribute data on the results of the investigations.

Migratory Bird Conservation Act and Migratory Bird Treaty Act

The Migratory Bird Conservation Act of 1929 and the Migratory Bird Treaty Act of 1919 serve to protect migratory birds through prohibiting their takings, development of hunting seasons, restriction on weapons, numbers taken and acquiring areas to manage and protect migratory birds. These laws protect many of the waterfowl and migratory birds found within the Peconics.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act is administered jointly by the Army Corps of Engineers (ACOE) and the U.S. Environmental Protection Agency (EPA). Section 404 requires and regulates permits for the discharge of dredged or fill material into surface waters, their tributaries, and adjacent wetlands. Through environmental impact statements, a permit applicant must demonstrate that 1) there are no practicable alternatives; 2) that threatened or endangered species will not be eliminated or water quality standards violated; 3) that no significant degradation of waters will result; and 4) that the impacts of any necessary discharge are minimized.

Section 103 of the Marine Protection, Research, and Sanctuaries Act

Section 103 of the Marine Protection, Research, and Sanctuaries Act is administered by the ACOE, in conjunction with the EPA, NMFS, and FWS. Section 103 is the only part of the Act that affects the Peconic Estuary. The purpose of Section 103 is to regulate the transportation and placement of dredged materials. Non-Federal projects in which dredged materials are transported or placed must be evaluated and permitted by the ACOE, and Federal projects must be evaluated. The EPA is responsible for development of environmental impact criteria upon which these evaluations are based, and for the identification of placement sites. Both the NMFS and FWS assist in the environmental review of activities covered by Section 103 of this Act.

Anadromous Fish Conservation Act

The Anadromous Fish Conservation Act of 1965 is administered by the U.S. Department of the Interior and the U.S. Fish and Wildlife Service. The Act is intended to conserve, develop and enhance anadromous fishery resources.

Rivers and Harbors Act

The Rivers and Harbors Act is administered by the ACOE. This Act was designed to prevent the deposition of obstructive and/or injurious materials within harbors or adjacent and tributary waters. This Act requires permitting for the movement or deposition of dredged, excavated, or other refuse material in harbors and their tributaries.

Coastal Wetlands Planning, Protection, and Restoration Act

The Coastal Wetlands Planning, Protection, and Restoration Act is administered by the FWS. Under this Act, coastal states can receive matching grants to establish programs for the conservation of wetlands. Projects funded include those in which wetlands are acquired, restored, and enhanced.

Federal Agriculture Improvement and Reform Act

The Federal Agriculture Improvement and Reform Act (FAIRA) of 1996 consolidated and simplified some of the existing conservation programs established under the Food, Agriculture, Conservation, and Trade Act of 1990. Implemented primarily by the U.S. Department of Agriculture (USDA), both acts encourage reducing soil erosion, retaining wetlands, and protecting other environmentally sensitive croplands.

Environmental Monitoring and Assessment Program

The Environmental Monitoring and Assessment Program is administered by EPA. The purpose of this program is to confirm the effectiveness of pollution control strategies. It does this through assessing and documenting the status and trends of various habitats in marine and non-marine systems. The monitoring and assessment of these habitats is standardized throughout the country, so as to ensure comparable spatial and temporal measurements.

National Wildlife Refuge System

Wildlife refuges are managed by the USFWS. The mission of this program is "to provide, preserve, restore, and manage a national network of lands and waters sufficient in size, diversity, and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wild lands is enhanced and made available." Goals of this program include preservation, restoration, and enhancement of plant and animal species in danger of extinction, perpetuation of migratory birds, preservation of natural diversity and abundance of plants and animals in refuges, and provision of recreational experiences to the public.

Coastal Barrier Resources Act

The Coastal Barrier Resources Act is administered by the FWS. The purpose of this Act is to protect ecologically sensitive coastal barriers through reduction or prevention of development. This Act designated specific barrier islands and spits as ineligible for either direct or indirect Federal financial assistance that would support development (including Federal flood insurance). Thus, private interests or state and local governments can only finance development.

Protection of Wetlands (Executive Order 11990)
Actions implemented within freshwater or coastal wetlands may be subject to the completion of a wetlands assessment and mitigation plan.

Floodplain Management (Executive Order 11988)
Any construction within the 100-year flood plain necessary to implement actions of the CCMP may necessitate the preparation of a flood plain assessment.

Land and Water Conservation Fund
The Land and Water Conservation Fund is administered by the U.S. Department of the Interior. It is designed so that there are sufficient outdoor recreation resources that are conserved, developed, and utilized for present and future generations. The Fund derives revenue from various sources such as Outer Continental Shelf oil and gas monies and motorboat fuel taxes, and appropriates this money to 1) states in the form of matching grants for outdoor recreation projects; and 2) Federal agencies for land acquisitions.

National Sea Grant College Program
The National Sea Grant College Program is a partnership between the nation's universities and NOAA chartered in 1966 by the National Sea Grant College Program Act. The program encourages the wise stewardship of marine resources through research, education, outreach, and technology transfer. The NOAA Office of Sea Grant administers the program and provides financial support to colleges, universities, and other research institutions through a matching fund program.

Fish and Wildlife Service's Coastal Ecosystem Program
The USFWS's Coastal Ecosystem Program aims to conserve fish and wildlife and their habitats and to support healthy coastal ecosystems. The Program's approach is to work in partnership with Federal, state, international, Native American, and local agencies; non-governmental organizations; and the private sector to develop and implement ecosystem-based policies and programs that protect and enhance coastal living resources. The emphasis of the Coastal Ecosystem Program is to have natural laboratories for long-term research and monitoring projects, as well as public education, so that comparative work can be accomplished through these sites.

Coastal America
Coastal America is an interagency partnership of 12 Federal agencies working together to protect, preserve, and restore coastal ecosystems that was established in 1992. It also includes state, local and tribal governments and non-governmental organizations. Coastal America also collaborates and cooperates in the stewardship of coastal living resources by working in partnership with other Federal programs and by integrating Federal actions with state, local and tribal efforts.

National Estuarine Research Reserve
The National Estuarine Research Reserve (NERR) was created in 1972 with the passage of the Coastal Zone Management Act. The NERR systems protect representative estuarine areas through a partnership between NOAA and state governments. Each estuarine reserve has research, education, and monitoring functions that include researching reserve environments, and tracking the status and trends in ecosystem health.

State Agencies and Programs

Environmental Quality Review Act

The Environmental Quality Review Act is administered by NYS DEC Division of Environmental Permits. This Act requires consideration of environmental impacts along with social and economic factors in all state and local agency decision making. Through this Act, all state and local government agencies must assess the environmental significance of actions that they have discretion to approve, fund or directly undertake. In cases in which an action may potentially have significant environmental impacts, an environmental impact statement must be prepared. This statement examines ways to reduce or avoid adverse environmental impacts related to a proposed action, and it includes analysis of reasonable alternatives.

Coastal Management Program

The Coastal Management Program is administered by NYS Department of State, Division of Coastal Resources and Waterfront Revitalization. This Program is responsible for coordinated and comprehensive planning for the use, protection, and development of coastal resources, and the exercise of full governmental authority over land and water uses in the coastal area. The Coastal Management Program is implemented through three components: 1) local Waterfront Revitalization Programs, which address coastal development; 2) review of Federal and state government actions to determine consistency with coastal management policies; and 3) support and involvement in coastal programs, projects, and activities, which implement coastal policies. A fourth component, the Coastal Nonpoint Pollution Control Program, has recently been added to develop and implement management measures for nonpoint source pollution. In addition, the Coastal Management Program contains the Significant Coastal Fish and Wildlife Habitats Program, which maps designated areas for their protection, preservation, and maintenance.

Marine Fisheries Management Programs

There are various fisheries management programs administered by NYS DEC Division of Fish, Wildlife and Marine Resources. It is the mission of these programs to manage and maintain the state's living marine, estuarine, and anadromous resources, and to protect and enhance the habitat upon which these resources depend, in order to assure that diverse and self-sustaining populations of these resources are available for future generations. Specific programs include investigation and management of shellfish, anadromous finfish, marine finfish, and crustaceans, the Peconic finfish and macroinvertebrate trawl survey, development of artificial reefs, and enhancement of access to these resources.

Shellfish Sanitation Program

The Shellfish Sanitation Program is administered by NYS DEC Bureau of Marine Resources. This program assures that shellfish harvested and sold in the state meet public health guidelines. This goal is achieved by testing the waters where shellfish are harvested and closing those waters that exceed levels of pathogen indicators that would be unsafe for human consumption. In addition, NYS DEC monitors and inspects all wholesalers to make sure that all shellfish are handled, processed, and shipped under sanitary conditions.

Freshwater Fish and Wildlife Management Programs

There are various wildlife management programs administered by NYS DEC Division of Fish, Wildlife and Marine Resources. These programs are designed to manage and maintain the state's freshwater fisheries and wildlife resources for the use and enjoyment of the public, and to protect and enhance the habitat upon which these resources depend. Some of these programs include: management of the waterfowl resource, including habitat restoration under the North American Waterfowl Management Plan,

monitoring and protection of endangered species and significant habitats, regulation of use of species through the process of setting hunting regulations, and biological surveys of wildlife species.

Endangered Species Program

The Endangered Species Program is administered by NYS DEC Division of Fish, Wildlife and Marine Resources. This Program studies species with declining population sizes and classifies them as "endangered," "threatened," or "of special concern." Overall, there are 52 endangered or threatened species in New York State. The Program identifies and acts to preserve habitats vital to the existence of these species. In addition, this program actively participates in efforts to restore populations of endangered species.

Water Quality Certification ("401 certification") Program

The Water Quality Certification Program is administered by NYS DEC Division of Environmental Permits, under program authority of the Division of Water. Under section 401 of the Federal Clean Water Act, any "discharge" to U.S. waters that requires a Federal permit must first obtain a 401 certification from the state. Therefore, this Program regulates water quality to insure that actions by Federal agencies do not compromise the water quality standards adopted by New York State. This objective is accomplished by requiring Federal agencies issuing permits or carrying out direct actions to first obtain a water quality certification from the state.

Nonpoint Source Water Pollution Program

The Nonpoint Source (NPS) Water Pollution Program is administered by NYS DEC Division of Water. Under section 319 of the Federal Clean Water Act, the U.S. EPA oversees this Program through grant administration, program approval, and periodic program evaluation. This Program is responsible for an Assessment Report, which reflects the current level of understanding of NPS problems in New York State, and a Nonpoint Source Management Program. The management program is designed to: identify approved management practices, establish watershed planning processes, recommend control measures needed to address each category of NPS pollution, identify potential sources of funding available to implement NPS control programs, and establish a procedure to ensure that Federal, state, and local programs are consistent with the state's NPS program. This Program was initiated in 1989, and is implemented through other existing programs and agencies, which incorporate management recommendations into their plans.

Point Source Control Program

The Point Source Control Program is administered by NYS DEC Division of Water. Under section 402 of the Federal Clean Water Act and New York State law, this Program regulates discharges from all point sources. This includes ensuring water quality standards are achieved. This Program is responsible for granting state pollutant discharge elimination system (SPDES) discharge permits. SPDES is the primary mechanism for controlling the discharge of conventional, non-conventional and toxic pollutants from point sources, and it is the mechanism through which sanitary, commercial, and industrial discharges of wastewater to surface and ground waters are regulated.

Tidal Wetlands Program

The Tidal Wetlands Program is administered by the NYS DEC Division of Fish, Wildlife and Marine Resources, and it consists of three parts (NYS Environmental Conservation Law, Article 25). The Tidal Wetlands Regulatory Program is designed, through the use of permits, to preserve and protect tidal wetlands and adjacent areas, and to prevent their despoliation and destruction. The Tidal Wetlands Acquisition Program purchases or otherwise obtains (e.g., easement, donation) tidal wetland areas that are deemed valuable. The state acquires these wetlands for the purpose of conservation, preservation, and

public use. The NYS DEC also has a program for restoring and enhancing tidal wetlands. In addition, all tidal wetlands in the state are mapped, inventoried, and their status is assessed.

Freshwater Wetlands Program

The Freshwater Wetlands Program is administered by NYS DEC Division of Fish, Wildlife and Marine Resources (NYS Environmental Conservation Law, Article 24). This Program protects and regulates activities in freshwater wetlands 12.4 acres or larger and their adjacent areas, and smaller wetlands if they are deemed locally important. Permits are required for activities such as construction, modification, expansion and restoration of structures, placement of fill, excavation, grading, drainage, and application of pesticides.

Protection of Waters Program

The Protection of Waters Program is administered by the NYS DEC Division of Fish, Wildlife and Marine Resources (NYS Environmental Conservation Law, Article 15). This Program regulates the following three categories of activities: 1) disturbance of the bed or banks of a "protected stream" or other watercourse; 2) construction and maintenance of dams; and 3) excavation and/or filling in "navigable waters" or the wetlands and estuaries adjacent and contiguous to any navigable waters.

Coastal Erosion Hazard Program

The Coastal Erosion Program is administered by the NYS DEC (NYS Environmental Conservation Law, Article 34). This Program identifies and maps coastal erosion hazard areas, establishes standards for the issuance of coastal erosion management permits, and regulates activities within these areas. Procedural requirements are also set up for local governments that wish to implement a local program.

Toxic Substances Assessment Program

The Toxic Substances Assessment Program is administered by NYS Department of Health Division of Environmental Health Assessment. After the NYS DEC tests finfish and shellfish for toxic substances, this Program interprets the results from a human health risk perspective. In the case that levels of toxic substances are above those which present a risk to human health, this Program issues consumption advisories.

New York State Marine Mammals; Harbor Seals

In addition to the Marine Mammal Protection Act (See Federal section above), the State of New York specifically protects harbor seals in New York water under NYS Environmental Conservation Law, Article 11, section 0107, by prohibiting the wounding or killing of harbor seals except as permitted. These animals are also protected under this law from being possessed, transported, bought, or sold, except as permitted.

Natural Heritage Program

The Natural Heritage Program is administered by NYS DEC Division of Fish, Wildlife and Marine Resources and the Division of Lands and Forests, with support from The Nature Conservancy. This Program was developed to gather information and store data on rare species and significant natural communities in New York State. Information and data collected includes distribution and abundance of species and habitats, as well as classification of communities.

Wild, Scenic, and Recreational Rivers Program

The Wild, Scenic, and Recreational Rivers Program is administered by NYS DEC Division of Lands and Forests (NYS Environmental Conservation Law, Article 15). This Program was developed to protect and preserve, in a free-flowing condition, those rivers of the state that possess outstanding natural, scenic, historical, ecological, and recreational values identified as being important to present and future

generations. Rivers that meet specific criteria are categorized as either wild, scenic, or recreational based on the appearance and amount of nearby development. After designation, construction of many structures in the river or adjacent areas requires a permit.

Open Space Conservation Plan

The Open Space Conservation Plan is administered by NYS DEC Division of Lands and Forests and the NYS Office of Parks, Recreation, and Historic Preservation. The purpose of this plan is to provide for the conservation, protection, and preservation of open space, natural, historic, and cultural resources, and the enhancement of recreational opportunities. Such open space and resources includes fields, forests, waters, and wetlands. The Open Space Conservation Plan strives towards this objective by purchasing or otherwise acquiring undeveloped open space and developing management strategies for these acquisitions.

New York State Pine Barrens Act

The New York State Pine Barrens Act delineates large, undeveloped parcels containing unique plant and animal communities around the Peconic River which are to be protected. This law provides for the protection of several communities exclusively associated with the barrens, such as the pitch pine/scrub oak forests and coastal plain ponds.

New York State Clean Water/Clean Air Bond Act

The New York State Clean Water/Clean Air Bond Act was approved by NYS voters in 1996 and provides $1.75 billion for improving and restoring water bodies across the State. Open spaces of lands are also conserved with Bond Act money, as well as the closing of aging landfills, upgrading of sewage treatment plants, reduction of stormwater runoff, restoration of degraded habitats, and the clean up of contaminated properties.

Local Level

There are a wide variety of local programs in place to protect, preserve and enhance the habitats and living resources of the Peconic watershed. These were discussed in detail in Columbia University's report entitled "Evaluating Town Capacity and Needs in Protecting the Peconic Estuary ". This report evaluated the existing programs enlisted to protect habitat and living resources for all six east-end towns (Brookhaven, East Hampton, Riverhead, Shelter Island, Southampton and Southold) and determined their ability to monitor and evaluate threats to the estuary. Each Town has developed their own laws, zoning regulations and environmental programs to address habitat and living resources protection that often go beyond those of the New York State. For example, Southampton adopted a wetlands law in 1993 that intends to achieve a "no net loss" of wetlands, and to encourage a net gain. A more detailed description of each Town's programs and ability to meet the needs of the PEP CCMP actions are found in the report by Columbia University.

Evaluation of Effectiveness

In general, the agencies and programs described above provide excellent mechanisms to protect many of the habitats and living resources in the Peconic Estuary. Many of these programs also provide a means to monitor habitats, water quality and living resources, as well as allowing for the enhancement and restorations. However, the Peconic Estuary Program Natural Resources Subcommittee and the PEP Management Conference have identified several areas where existing laws and programs do not sufficiently protect the natural resources or require strengthening for protection into the future. The PEP makes the following recommendations:

Recommendations for Improvements

- Although many of the habitats in the Peconic Estuary are offered some level of protection through existing regulations by the Federal, state and local governments, there are assemblages of aquatic and terrestrial habitats and living resources that are increasingly threatened by human activities because the regulations do not adequately protect them. For example a continued loss of inter-tidal and beach habitats from shoreline hardening is expected since NYSDEC regulations classify bulkheads as "generally compatible with the environment" above mean high water, provided that there are no tidal wetlands in the vicinity. While these regulations may sufficiently protect wetlands, they offer only limited, or no, protection of the beach habitats which are of great importance to many nesting shorebirds (e.g., piping plovers) and horseshoe crabs which lay their eggs in these areas. Similar examples are found in other aquatic and terrestrial environments. While it is generally recommended that NYS strengthen its tidal wetland regulations, an alternative is proposed. It is recommended that the areas within the Peconics that are of very high ecological quality (e.g., providing important spawning, breeding, nursery and feeding habitats for a diversity of rare, keystone and commercially important species) be identified and mapped as Critical Natural Resource Areas. Once these Critical Natural Resource Areas are identified and adopted, they should be given an extra level of protection through increased coordination and rigorous implementation of existing regulations; and new protection mechanisms should be developed where needed. A full implementation strategy to protect Critical Natural Resource Areas should be developed and implemented by the Peconic Estuary Program and all regulatory authorities.

- Eelgrass has been identified as a critical underwater habitat for bay scallops and finfish. Eelgrass beds, however, are only loosely protected under the NYSDEC tidal wetlands regulations, to a depth of only 6 ft. and by Protection of Waters (NYS ECL; Article 15). No other regulations exist to protect this important habitat from the increasing threats of propeller scarring, dredging and shading from docks and piers. It is recommended that a full review of current policies that protect eelgrass beds be undertaken and that the PEP develop recommendations for their increased protection, possibly through inclusion as a Critical Natural Resources Area.

- There is an increasing need for dredging in the Peconics for both commercial and recreational purposes, which can result in negative impacts to the habitat and living resources in the estuary. Dredging is regulated at the Federal and state levels, but the existing regulations may not always offer the best protection of habitats due to conflicting programmatic concerns. It is recommended that a "dredge summit" be convened for the Peconic Estuary that addresses specific concerns such as: impacts to shorebird nesting, demersal fish spawning and benthic communities. The "dredge summit" should develop regional management recommendations to minimize impacts to the critical habitat and living resources of the estuary.

- As mentioned above in the example for Critical Natural Resource Areas, shoreline hardening structures such as bulkheads and rock revetments are considered "generally compatible with the environment" above mean high water, provided that there is no tidal wetland vegetation in that location. While State regulations are protective of wetlands, they offer only limited protection of beach habitats and when bulkheads are installed above mean high water, they may not allow for the landward migrations of tidal wetlands with sea-level rise. Additionally, docks and piers are also listed as "generally compatible with the environment", which leads to a fragmentation of tidal marsh and aquatic habitats, as well as a shading of eelgrass beds. It is recommended that the PEP adopt a policy of "no net increase" in shoreline hardening structures for the Peconic Estuary, develop recommendations to reduce impacts from shoreline hardening structures, encourage the strengthening of existing policies and regulations to reduce impacts from bulkheads at all levels of government, and promote "softer" vegetated alternative shoreline protection solutions as well as incentives to remove existing bulkheads.

- There are a number of aquatic and terrestrial habitat restoration opportunities in the Peconic Estuary that have been identified by the Towns and local agencies. These include: coastal grasslands, beaches, dunes, fish and wildlife migratory corridors, tidal wetlands, freshwater wetlands, submerged aquatic vegetation, coastal forest communities and intertidal flats. There are also various sources of funding available at the Federal, state and local levels to implement restoration efforts. However, there is no single agency that identifies or coordinates restoration projects in the Peconics. It is recommended that the PEP convene a Habitat Restoration Workgroup to develop and implement an estuary-wide habitat restoration plan. This plan should identify and list priority habitats to be restored, develop restoration criteria for selection of restoration sites and identify sources of funding to implement and monitor all restoration efforts in the Peconics.

- Tidal wetlands have been extensively ditched in the past for mosquito control. Ditching fragments tidal marshes and can impact their ecological functions. While no new ditching is currently allowed in the Peconic Estuary, tidal wetland regulations do allow for the maintenance of existing ditches through rotary-ditcher machines. Advances in alternatives to ditching for mosquito control management such as Open Marsh Water Management (OMWM) have proven effective. There have been some efforts to restore and control mosquitoes in tidal marshes in the Peconics with OMWM, but they are often limited in scope and not well coordinated. It is recommended that the PEP work cooperatively with Suffolk County Vector Control and other agencies, towns and groups to encourage and develop priority areas for OMWM in the Peconics.

- Aquaculture and transplanting of shellfish have the potential to be beneficial or harmful to the water quality and living resources in the Peconic Estuary depending on the type, scale and location of culturing/transplanting activities. The NYSDEC is responsible for the permitting of aquaculture activities in the Peconics, but Suffolk County is responsible for developing an aquaculture plan. No comprehensive plan exists for aquaculture in the Peconic Estuary and this has resulted in uncoordinated management and planning of these activities. It is recommended that the PEP assist in the development of a Regional Aquaculture Plan for the Peconic Estuary that is mutually beneficial to the estuary and the culturing/transplanting facilities and does not impact natural stocks of shellfish or finfish.

- Artificial reefs can also be beneficial or harmful to the habitats and living resources in the Peconic Estuary depending on their type, scale and locations. The State has an Artificial Reef Plan that was developed in the 1980s, but it is limited in its overall considerations of potential impacts to marine mammals, benthic communities or changes to the species compositions in the area. It is

recommended that PEP evaluate the use of artificial reefs and develop recommendations to minimize the impact on resources by these structures, particularly in Critical Natural Resource Areas.

- There has been increasing usage of the Peconic Estuary by sea turtles and marine mammals. Current activities that may harm them include boating, dredging, large-scale aquaculture projects, or poorly designed artificial reefs. Under NYS ECL Article 11, Section 0107, it is illegal to injure or cause the death of harbor seals. It is also illegal to buy, sell, transport, or have possession of these animals. The law was implemented a number of years ago when the harbor seal was the only pinniped found in NY waters. Currently, there are five species of seals that are found in these waters, of which three have become fairly common. In order to protect these species as well as other marine mammals, this law would need to be expanded. PEP should work with the Towns, County, and State to review uses of areas which have been identified as sea turtle and marine mammal feeding areas and consider what restrictions may be necessary to be more protective of these species and their food resources.

- Measures are needed to counteract the effects of increasing human populations and development of the lands and waters of the watershed surrounding the estuary. Although the East End Towns are developing Local Waterfront Revitalization Plans, which can enhance public access and protect habitats and living resources, proper planning is needed to ensure that access points are coupled with the right kind of space to accommodate different uses. PEP should support maintaining a balance between the needs and opportunities for public access and requirements for sustaining living resources. One local plan that has been used successfully in the estuary is the Harbor Protection Overlay District (HPOD). The Town of East Hampton created the HPOD to address development on waterfront property and imposes restrictions on newly developed or redeveloped waterfront property. A number of these restrictions are particularly useful in the protection of living resources, such as requirements that the shoreline be maintained with a natural buffer made up of native vegetation. The PEP should encourage and assist other Towns in adopting similar planning measures.

- Monitoring involves the multi-year collection of data on living resources and water quality to understand the natural variability of populations over time as well as changes in those populations that result from human influences. While there are several different on-going monitoring programs in the Peconics (e.g., SCDHS Water Quality Program, NYSDEC Juvenile Finfish Trawl Survey, Cornell Cooperative Extension eelgrass monitoring, NYSDEC Endangered Species Program, etc.), there is a need to coordinate these programs to fully evaluate the health of the Peconic ecosystem and manage it based on sound data collection and analysis. There is also a significant need for basic ecological research in the Peconic Estuary, to help understand and guide the management of the natural resources that exist. It is therefore, recommended that the PEP develop and seek funding to implement a research and monitoring plan for the habitats and living resources of the Peconic Estuary.

Pathogens

Description of Regulatory/Institutional Framework

Federal Agencies and Programs

National Pollution Discharge Elimination System (NPDES)

On November 16, 1990, EPA issued National Pollution Discharge Elimination System (NPDES) permit application regulations for stormwater discharges. The National Pollutant Discharge Elimination System (NPDES) program requires certain activities obtain authorization (via a permit) to discharge pollutants via stormwater runoff to surface waterways. In New York, this requirement is covered under two General Stormwater Permits through the State Pollutant Discharge Elimination System (SPDES) program. One permit covers activities associated with construction activities (>five acres in size) and the second covers the remaining activities listed in the NPDES regulations. Unless covered by a separate individual SPDES permit, the only other alternative for dischargers that need a permit is one of the general permits. The general permit requires the development and implementation of a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in use of pesticides or street salt, or frequent catch-basin cleaning). The plan need not be submitted to the NYSDEC unless asked, but must be kept on-site and continually updated. The NYSDEC may request to see these plans and may require changes in practices if adverse impacts on receiving waters have, or may have occurred).

Phase II of the USEPA Storm water regulations were finalized in October 1999. This set of regulations contains important changes and requirements for construction activities and certain municipal separate storm sewer systems serving populations less than 100,000 and construction activities that disturb areas between one and five acres. These regulations will potentially have a significant impact on stormwater management in the Peconic Estuary. NYSDEC is currently evaluating the program changes necessary to comply with the new regulations.

Clean Water Act Section 319 Nonpoint Source Programs

New York State has developed a program for the control of sources of pathogen indicators to the Peconic Estuary. The Clean Water Act (CWA) Section 319 Nonpoint Sources Management Program, forms the basis for this management program. The 1987 amendments to the CWA established a national program to control nonpoint sources of water pollution. Under Section 319, States address this pollution by: 1) developing nonpoint source assessment reports and 2) adopting and implementing nonpoint source management programs. Section 319 also provides for the issuance by EPA of grants to states to assist them in implementing the management programs that have been approved by the EPA. New York has an approved Nonpoint Source Management Program that, among other objectives, attempts to address diverse sources of pathogen indicators.

The NYSDEC Nonpoint Source Management Program was finalized and approved by EPA in January 1990. The plan addressed specific requirements of the Clean Water Act, Section 319. NY developed a process of ongoing assessment of waters impacted by nonpoint source pollution and identifies BMPs to be used to reduce their effects. Programs for the control of general sources of nonpoint source pollution were also presented.

NYSDEC has developed several nonpoint source documents. Statewide guidelines for stormwater management for new development and for erosion and sediment control have been developed by NYSDEC for use by local planning officials, building inspectors, and developers. Municipalities have been encouraged to use these guidelines in the review of local development projects. In addition, NYSDEC has developed Management Practices Catalogues for: 1) agriculture; 2) silviculture; 3) urban/stormwater runoff; 4) road/right-of-way maintenance; 5) leaks, spills, and accidents; 6) resource extraction; 7) onsite waste disposal; 8) construction; and 9) hydrologic/habitat modification.

Coastal Management Plan Nonpoint Source Control Program

The reauthorization of the Federal Coastal Zone Management Act (CZMA) was passed on November 5, 1990. A major provision of the Act (Section 6217) is the requirement for a new Coastal Zone Nonpoint Source Management Program in each state. These programs were to be developed over the 30 months following EPA publication of final technical guidance in May 1992. These programs are applicable in the entire coastal zone exclusive of the areas subject to the new stormwater regulations.

The new nonpoint source programs are jointly approved by NOAA and EPA, and must be incorporated into states' Clean Water Act Section 319 programs. The coastal zone nonpoint source programs are based on nonpoint source pollution management measures, which are essentially systems of best management practices (BMPs). EPA published draft management measures guidance in May of 1991, and published final guidance in May 1992. The management measures are keyed to different land uses (sources) and specify practices to be carried out to reduce and/or prevent nonpoint source pollution. Demonstration of water quality impairment is not required for implementation of the management measures; rather, the approach is technology-based (like effluent guidelines).

The issues addressed by the Management Measures Guidance include 1) agriculture, 2) forestry (silviculture), 3) urban runoff, 4) wetlands, 5) boats and marinas, and 7) hydromodification. Pathogens from confined animal feeding operations (CAFO), onsite sewage disposal systems, urban runoff, and boats and marinas are addressed in the guidance. Management practices suggested to control pathogens in urban runoff include detention/retention ponds, biofiltration and infiltration devices. Management practices identified to remove pathogens from onsite sewage disposal systems include periodic septic tank pumping, septic system inspections, and installation of intermittent sand filters with a leaching fields for existing developments. For new developments, wastewater separation with a holding tank for blackwater and conventional system for grey water has been recommended. Marina siting, design and operation, and maintenance and management measures are also presented in the guidance. Wastewater collection to prevent pathogen contamination of marina waters can be performed with marina-wide collection (pump-out) systems implemented as portable/mobile systems or dedicated slipside systems.

The State’s modified Coastal Management Plan (CMP) must contain "enforceable" policies based on local ordinances, state laws or regulations. Section 6217(b) of the CZMA Reauthorization also provides for the identification of critical areas immediately adjacent to coastal areas where land uses may contribute to future impairment. In these areas, the law provides for additional management measures that are land use oriented, such as siting and density requirements. The focus of this section of the law is on land use controls.

In New York State, the development of the Coastal Zone Nonpoint Management Plan falls under the joint jurisdiction of the Department of State (DOS) and the NYSDEC which together have the authority for implementing section 6217(b) of the Coastal Zone Act Reauthorization Amendments of

1990. NYSDOS submitted the New York State Plan to NOAA in July 1995 and has been approved and has been incorporated it into the State's Nonpoint Program (Clean Water Act section 319).

Total Maximum Daily Load Program

EPA's Total Maximum Daily Load (TMDL) Program comes from Section 303(d) of the Clean Water Act (See: Nutrients Section of Base Programs Analysis). There remain waters in the nation that do not meet the CWA national goal of "fishable, swimmable" despite the fact that nationally required levels of pollution control technology have been implemented by many pollution sources. CWA Section 303(d) addresses these waters that are not "fishable, swimmable" by requiring the state to identify the waters and to develop total maximum daily loads (TMDLs) for them, with oversight from EPA.

Clean Vessel Act

Congress passed the Clean Vessel Act (CVA) in 1992 to help reduce pollution from vessel sewage discharges. The Act established a five-year Federal grant program administered by the U.S. Fish and Wildlife Service (FWS) and authorized $40 million from the Sport Fish Restoration Account for use by the states. Federal funds may constitute up to 75% of all approved projects with the remaining funds provided by the states or marinas. Grants are available to the states on a competitive basis for the construction and/or renovation, operation and maintenance of pumpout and portable toilet dump stations. Currently, states submit grant proposals, by May 1 of each year, to one of seven Fish and Wildlife Service regional offices for review. The Service's Division of Federal Aid then convenes a panel including representatives from the Service's Washington Office of the Division of Federal Aid, the National Oceanic and Atmospheric Administration (NOAA), EPA, and the U.S. Coast Guard. The panel reviews, ranks and makes funding recommendations to the Director of the Fish and Wildlife Service. The Director gives priority consideration to grant proposals that provide installation and/or operation of pumpout and dump stations under Federally approved state plans.

Pursuant to the CVA, the Sport Fish Restoration Program sets aside money for pump out units for marinas; money comes from an excise tax built into sales of certain fishing or boating gear (money is administered by FWS and sent back to the state agencies for projects that would benefit recreational fishing and boating).

As noted above under Clean Water Programs, Section 312 of the Clean Water Act authorizes the EPA, individual states and the U.S. Coast Guard to work together to provide states with the opportunity to protect its citizens and its aquatic habitats through Vessel Waste No Discharge Area designations and national standards for marine sanitation devices on boat toilets or heads. The availability of pumpout stations and/or the importance of the waterbody for human health and recreation or the aquatic ecosystem bring to bear on a state's request for a Vessel Waste No Discharge Area designation. A graphic pumpout symbol is placed at docks and marinas to show boaters where a pumpout facility is located. In some cases, small boats may be modified to receive these wastes and can visit boats to provide this service. Enforcement of Vessel Waste No Discharge Areas is the responsibility of the U.S. Coast Guard; the Coast Guard may delegate this responsibility to the state.

There are three distinct kinds of Vessel Waste No Discharge Area designations that may be available to an interested state. These are: to protect aquatic habitats where pumpout facilities are available, to protect special habitats or species, and to protect human drinking water intake zones.

State Agencies and Programs

Surface Water and Groundwater Classifications and Standards

The NYSDEC Division of Water classifies water quality standards for coliforms through the NYS Water Quality Regulations (Title 6, Chapter X, Part 703 of Water Quality Regulations). These standards have been established for total and fecal coliform counts, and are applied throughout the NYS waters, including the Peconic Estuary.

Transportation Efficiency Act

The Transportation Efficiency Act is implemented by New York State Department of Transportation (NYSDOT) and funded by NYSDOT capital budget. These funds can be used to improve water quality by preventing or remediating road runoff.

Vessel Waste No Discharge Area Designations

Per Section 312 of the CWA, EPA, individual States and the U.S. Coast Guard work together to provide states with the opportunity to protect citizens and aquatic habitats through Vessel Waste No Discharge Area designations and national standards for marine sanitation devices on boat toilets, or heads. Section 312 of the CWA helps protect human health and aquatic environment from disease-causing microorganisms that may be present in sewage from vessels and boats. These microorganisms can include bacteria, protozoans and viruses.

Bathing Beach Monitoring Programs

NY's coliform standards for beach water quality are specified in Sub Part 6-2 of the New York State Sanitary Code (NYSSC). The NYSSC, as revised on March 30, 1988, allows local health departments the option of utilizing either total or fecal coliform as a water quality indicator. The New York State monitoring guidelines are described in the NYSSC Subpart 6-2.15. No state requirements have been made for the sampling frequency and it is up to the local health department in each county to design a monitoring plan. As a result, each county has a slightly different sampling strategy.

Since sources of pathogens may be different during rainfall, samples are specified as either taken in "wet" or "dry" periods. A sample is considered "wet" if (1) it has rained 48 hours prior to sampling, or if (2) more than 0.4 inches of rain has accumulated within a 24 hour time span, or if (3) more than 0.2 inches of rain has fallen in a two-hour period.

In addition to closures caused by regularly monitored indicator levels, some areas are automatically closed following rainfall events or as a result of sewage treatment plant malfunction. These closures are made as a precaution against predicted elevated coliform levels and pathogen-related human health risks. This type of automatic closure is referred to as an administrative closure, and does not require indicator sampling. In the case of emergency closures, sampling is necessary after the closure to determine if the water quality has rebounded to certified criteria.

The Suffolk County Department of Health Services has recommended suspension of swimming at enclosed bay beaches after significant rainfall events. The definition of a significant rainfall varies based on the local hydrology, soil type, topography, and land use. Therefore, the threshold amount required to trigger a closure varies for each area.

Shellfish Monitoring Programs

The New York State Shellfish Sanitation Program monitors shellfish harvesting areas and the shellfish industry to protect public health. New York State is a participating member of the Interstate Shellfish Sanitation Conference (ISSC) which uses the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish (1997).

The National Shellfish Sanitation Program (NSSP) was established by the U.S. Public Health Service in 1925 to protect the public health from contaminated shellfish. In 1968, the U.S. Food and Drug Administration began administering the NSSP. The NSSP carries out its mandate by providing states with detailed procedures and protocols as highlighted in the Guide for the Control of Molluscan Shellfish. These are implemented by the New York State Department of Environmental Conservation (NYSDEC) Shellfish Sanitation Program. The New York State Shellfish Sanitation Program conducts the following activities in shellfish harvesting areas: water quality monitoring for bacteria indicative of potential pathogenic contamination; conducting detailed pollution source surveys to identify potential sources of pathogens; restricting shellfish harvesting consistent with the results of such monitoring and surveys, and enforcing such restrictions.

The New York State Shellfish Sanitation Unit classifies all shellfish growing areas for harvesting in the New York State Marine District. New York State defines shellfish as oysters, scallops, mussels and clams. There are seventy-five individual shellfish growing areas in New York State. Approximately thirty shellfish growing areas are located within the Peconic Estuary.

The Shellfish Sanitation Unit classifies all growing areas using the guidelines established in the National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish. These guidelines require the establishment of water sampling stations to effectively evaluate all potential pollution sources that may affect a growing area. On average, the NYSDEC Shellfish Sanitation Program collects and analyzes from 10,000 to 15,000 bacteriological water quality samples each year. All certified and selected uncertified areas (used for transplant and conditional harvest) are sampled and evaluated.

New York State uses the NSSP Systematic Random Sampling (SRS) Method of water sample collection and the Total Coliform Standard to evaluate shellfish growing areas. SRS requires that water sample collection be scheduled sufficiently far in advance to support random collection with respect to environmental conditions. Samples are collected under wet and dry weather conditions in warm and cold weather months. Surface and bottom temperature and salinity measurements are also collected at selected stations in each Peconic growing area. SRS samples are collected at each station a minimum of six times per year on an ebbing tide. Following the collection of thirty SRS water samples the area is evaluated to determine proper classification for shellfish harvesting.

The Shellfish Sanitation Unit has a policy to temporarily close harvesting shellfish growing areas that are affected by greater than 3.0 inches of rainfall within a continuous 36-hour period. The affected growing areas will remain closed until water sampling documents an improvement in water quality supporting the reopening.

NYSDEC Shellfish Sanitation, in cooperation with the NYS Department of Health and the NYS Department of Agriculture and Markets, has been very effective at controlling outbreaks of shellfish-related, food-borne disease. Controls on the quality of the shellfish consumed are achieved not only through proper management of harvesting areas but also through sanitary inspection of facilities and review of records and tags from shellfish wholesalers and shippers throughout the State. The NYSDEC Shellfish Inspection Unit carries out the latter activities. Sanitary inspection of food service establishments is carried out by the Department of Health and inspection and review of shellfish retailers is done by the Department of Agriculture and Markets.
New York's Shellfish Transplant Program is administered by the NYSDEC Bureau of Marine Resources, Shellfish Management Unit. The primary goal of the Transplant Program is to provide the opportunity for utilization of shellfish resources that are presently unusable. Shellfish harvested in the transplant program are relayed from uncertified to certified waters and may be reharvested from

the cleansing area after 21 days under specified conditions. Following adequate cleansing the clams can be marketed.

Some of these transplants are carried out within the estuary but a large segment of the New York Transplant Program involves the transfer of hard clams from Raritan Bay in New York Harbor to near shore waters in the Peconics. Transplanted clams from this area have accounted for an increased percentage of the total hard clam harvest from the Peconics in the last decade.

Shellfish regulations are enforced by NYSDEC Environmental Conservation Officers as well as County Marine Police, Town Bay Constables and Harbor Masters. Towns also assist in collection of water samples and in obtaining information for shoreline surveys. For a full description of all local-level pathogens reduction programs and shellfish management programs see Columbia University's report, "Analysis of Town Capacity and Needs in the Peconic Estuary ".

New York State Clean Water/Clean Air Bond Act

The New York State Clean Water/Clean Air Bond Act was approved by NYS voters in 1996 and provides $1.75 billion for projects including improving and restoring water bodies across the State. Open spaces of lands are also conserved with Bond Act money, as well as the closing of aging landfills, the clean up of contaminated properties, the reduction of stormwater runoff, and the upgrading of sewage treatment plants.

Regional Level

SCDHS Bathing Beaches and Swimming Pools Program

In order to protect beach goers from the human health risks associated with pathogens, the Suffolk County Department of Health Services (SCDHS) Bureau of Marine Resources monitors for pathogen indicators at public beaches. When water quality parameters fail to meet the established human health criteria, beaches are closed.

Pfiesteria piscicida and *Alexandrium tamarense* Monitoring Programs

The unusual dinoflagellate, *Pfiesteria piscicida*, has been implicated in major fish kills in the brackish coastal waters of North Carolina and several areas within the Chesapeake Bay. It has also been implicated in human health effects, the severity of which are apparently dependent on the length of contact with the organism, or an airborne toxin released by the organism. *Pfiesteria* normally occurs in non-toxic forms unless triggered to develop into a toxic form; the exact conditions triggering toxin production are poorly understood.

Preliminary studies by SCDHS in 1998 showed the organism to be present at seven of the sixteen sites sampled within Suffolk County and at two of the three sites sampled within the Peconic Estuary. In the summer of 1999, the NYSDEC and the Nassau and Suffolk County Health Departments (SCDHS) and the Town of Hempstead undertook a comprehensive monitoring effort to assess the marine waters of the state for the presence of *Pfiesteria* cells. Water samples were tested for *Pfiesteria* along with a suite of other parameters, including dissolved oxygen, water temperature, and salinity. The test, using a molecular probe in the laboratory, detects the presence of *Pfiesteria* but not the toxicity. Water samples are shipped to Dr. Parke Rublee of the University of North Carolina where they are analyzed for *Pfiesteria*.

The SCDHS is currently testing for the presence of *Pfiesteria* at fifteen sites, three of which are located in the Peconic Estuary. This project is meant to provide a comprehensive temporal analysis

as samples are being collected from each of the fifteen stations on a biweekly basis from April to October, 2000. Differential phytoplankton counts and water quality analysis will be conducted in the lab. This monitoring is a cooperative effort with the NYSDEC and is being coordinated with funds from the U.S. EPA.

Paralytic shellfish poisoning (PSP) red tides caused by the organism *Alexandrium tamarense* have been a problem mainly in the northern New England states. The organism produces a neurotoxin that can be concentrated by shellfish which when consumed by humans can result in PSP. In a four year monitoring study, from 1986 to 1989, SCDHS found that a spring bloom of *A. tamarense* consistently occurred in Reeves Bay and also noted blooms in Terry's and East Creeks in 1989, the one year in which they were investigated. No other stations in the Peconic Estuary were sampled. The SCDHS Bureau of Marine Resources is currently estimating the concentration of *Alexandrium* at seven sites in the Peconic Estuary. The investigation entails the placement of mussels (*Mytilis edulis*) at the study sites, and their collection at specified intervals for PSP toxin analysis. The present study is limited to the Peconic Estuary.

Local Level

Harbor Protection Overlay Districts

One local plan that has been used successfully in the estuary to protect water quality and habitats, and reduce pathogens, is the Harbor Protection Overlay District (HPOD). The Town of East Hampton created the HPOD to address development on waterfront property and imposes restriction on newly developed or redeveloped waterfront property. A number of these restrictions are particularly useful in the protection of living resources, such as requirements that the shoreline be maintained with a natural buffer made up of native vegetation. Such restrictions can potentially reduce pathogen loadings into the estuary, particularly within poorly flushed areas as tidal creeks. For additional information on local government pathogens reduction programs see Columbia University's report, "Analysis of Town Capacity and Needs in the Peconic Estuary".

Evaluation of Effectiveness

In general, the agencies and programs described above provide an excellent ability to protect humans from pathogen contamination of shellfish or bathing waters in the Peconic Estuary. Many of these programs also provide a means to monitor and reduce pathogens through stormwater improvements, sewage treatment plant upgrades and restorations of degraded habitats that help to filter these pathogens. In addition, new regulations may prove helpful at reducing nonpoint sources of pathogens into the estuary, however, these are currently being evaluated and have not yet been fully implemented. The Peconic Estuary Program has identified several areas where existing laws and programs do not adequately address the reduction and management of pathogens in the estuary and thus, make the following recommendations.

Recommendations for Improvements

- It is recommended that existing stormwater management regulations continue to be used to control pathogen loadings and other forms of nonpoint source pollution. It is also recommended that an evaluation of the ability of general stormwater permits to regulate pollution from activities

in the national stormwater regulations be performed for the Peconics. The development of new regulations may be necessary for further reductions in pathogen loadings.

- Controlling stormwater runoff from non-waterfront property and vacant lands can be accomplished through a variety of land use regulations, such as protective zoning, transfer of development rights to limit density, and standards for stormwater discharges from lands developed or redeveloped in the future. Local legislation that is highly protective of the coastal zone, such as the East Hampton Harbor Protection Overlay District, has proven very effective on a relatively discrete, enclosed body of water entirely within local jurisdiction. However, in order for such a measure to be protective of a regional body of water such as the entire Peconic Estuary, this type of legislation must be enacted on a system-wide basis. Therefore, it is recommended that an evaluation of existing model land use regulations that eliminate or minimize new sources of stormwater runoff in to the estuary be performed. For example, a review of the East Hampton Harbor Protection Overlay District (HPOD) legislation and the results of its implementation would be a good starting point. If effective, the PEP should encourage the adoption of similar regulations in other East End towns and villages to eliminate or minimize new sources of stormwater runoff. The PEP should also recommend controlling the impacts of waterfront development through a prohibition on all new non-water-dependent commercial development.

- Construction sites of all types and sizes can be significant sources of pollutants to stormwater runoff because the natural vegetation and land forms which would normally slow and absorb runoff have been removed. The Clean Water Act requires stormwater permits for construction activities on sites over 5 acres. These permits contain a requirement for the permittee to develop a sediment and erosion control plan for the project. Developing official guidelines for sediment and erosion control plans would ensure that construction sites of all sizes would have access to information about appropriate BMPs for controlling runoff into the Peconic Estuary. These guidelines should be incorporated into recommendations for stormwater plans required for general stormwater permits or they could be required by town planning boards for incorporation into site plans. State Building Codes should also be expanded to include provisions for sediment and erosion control measures.

- One way to reduce pathogen loadings to the estuary system is to remediate stormwater runoff. A number of projects aimed at minimizing or treating stormwater runoff have been implemented throughout the Peconics, but their overall effectiveness needs to be evaluated before the technologies are fully endorsed for other locations in the estuary. It is also recommended that information on ongoing, successful stormwater remediation projects is shared among the NYSDOT, Suffolk County Department of Public Works, and towns and villages in a timely fashion. Monitoring support following the implementation of management actions, providing ambient coliform loading data, helping to evaluate sources of coliform bacteria, and assessing localized impacts of runoff, particularly on shellfish beds and bathing beaches, is also recommended.

- Develop a “Regional Stormwater Management Plan” to evaluate and recommend technologies to remediate stormwater runoff in the Peconic Estuary.

- Wastewater treatment for most of the residences, businesses, and institutions in the watershed of the Peconics is serviced by onsite disposal systems (OSDS), e.g., septic tanks or cesspools. In some areas, these systems are decades old and have not been properly maintained. Systems that have not had the solids pumped regularly and whose leaching fields have been compromised by

clogging may eventually release inadequately filtered fluids that contain high concentrations of pathogens. Once released to the surface, these fluids can be carried into the estuary via stormwater. Since identifying these failing systems requires cooperation of individual homeowners (e.g., dye testing), it is recommended that inspection and repair/replacement of OSDS under certain circumstances be mandated. PEP recommends that we follow the State of Massachusetts approach to managing OSDS for inspections. PEP should also provide a means to obtain funding for repairing and upgrading OSDS for failing systems. Another potential alternative is to investigate the need for and feasibility of establishing an OSDS (septic system) district(s) to provide homeowners access to low-interest loans available through the State Revolving Fund to repair and upgrade malfunctioning OSDS.

- One of the ways to reduce the potential for pathogen loadings in marina and mooring areas from human sewage is to minimize boater discharges. Boats on which people stay for extended periods of time represent a particular concern because of the amount of waste generated on these vessels. There is currently legislation that requires that marinas that dock houseboats/barges have a functioning pumpout station. This law needs to be rigorously enforced. The use of shoreside restrooms and the use of Type III marine sanitation devices (MSD) on boats (which have holding tanks), combined with pumpout facilities at marinas, would minimize the potential for release of pathogens into the water through untreated wastes and wastes from boats with Types I and II marine sanitation devices. The Federal Clean Vessel Act (CVA) provides money to the states to develop a plan for siting and constructing pumpout facilities at docks and marinas in an effort to reduce the potential contamination of coastal waters with human sewage from boats. The Act also provides grant money to be administered by the states for subsidizing the construction of these facilities once the need has been identified at specific sites. All funds from the CVA have currently been obligated; it is not anticipated that additional funding will be available through this legislation. Therefore, PEP recommends that other sources of funds be identified and allocated to provide boaters with more pumpout facilities. It is also recommended that in general, PEP promote the use of shore-based toilets, holding tanks on boats, and pumpout stations, especially in areas of heavy boat traffic or environmentally sensitive areas. Marinas should encourage their patrons to use shore toilet facilities when berthed at a dock, particularly if they remain overnight.

- Through the Clean Water Act, water bodies may be designated as "Vessel Waste No Discharge Areas." The discharge of untreated vessel waste is prohibited within the three-mile jurisdiction of State coastal waters and navigably connected waters. However, treated waste from approved Marine Sanitation Devices (MSDs) can be discharged in these waters. Within No Discharge Areas, vessels are prohibited from discharging both treated and untreated waste into surface waters. Since such a program may lead to localized reductions in pathogens it is recommended that the Peconic Estuary Program develop an agreement on the Peconics for a No Discharge Area.

- PEP recommends using administrative and regulatory measures to control pollution from boaters and marinas and promote the use of best management practices to control pathogen loadings from marinas and boatyards.

- Disinfection of effluent from sewage treatment plants is essential to prevent the spread of disease. Disinfection can be accomplished by a variety of methods, all of which have been proven effective under specific conditions. There are concerns about the use of chlorine as a disinfectant because chlorine may not effectively eliminate certain viruses from effluent. In addition, chlorine may have toxic effects on living organisms when it becomes complexed in seawater with organic compounds. Therefore, PEP should ensure adequate disinfection at sewage treatment plants and encourage all sewage treatment plants to use ultraviolet disinfection.

- An important step in reducing pathogens in the estuary is to identify their sources. Therefore, it is recommended that PEP identify and assess the major nonpoint source and stormwater inputs and quantify loadings of pathogens to local harbors in the Peconic Estuary System. Since high coliform counts have also been observed in relatively undeveloped embayments, it is further recommended that PEP seek funds to develop a DNA "library" of coliform bacteria isolated from feces of animals, including humans. This knowledge can potentially be used to identify loading pathways and, thus, the means by which to remediate those loadings. Additionally, PEP should perform land cover analyses for the study area that can be used to determine stormwater runoff loadings. This analysis should include tabulation and mapping of existing land cover types and analysis of land cover changes over time. Finally, nonpoint source control plans for specific embayments for each nonpoint source category associated with potential pathogen contamination (such as stormwater runoff, onsite disposal systems, and marinas/boating) through the "Regional Stormwater Management Plan" and sub-watershed management pilot projects for each Town should be developed.

- PEP should identify projects in the Peconic Estuary watershed that are fundable under the Transportation Efficiency Act and NYSDOT capital budget that will improve water quality by preventing or remediating road runoff, as well as those that may be fundable under New York Clean Water/Clean Air Bond Act.

- It is recommended that the water quality sampling programs run by the NYSDEC Shellfish Sanitation Program and the SCDHS Bureau of Marine Resources for monitoring pathogens in shellfish beds and public beaches be fully maintained and expanded where necessary. In addition to sampling for coliforms, monitoring for *Pfiesteria piscicida* and paralytic shellfish poisoning organisms should be funded for the Peconic Estuary.

Critical Lands Protection Strategy

Description of Regulatory/Institutional Framework

Federal Agencies and Programs

United States Fish and Wildlife Service

Through the Division of Habitat Conservation, the U.S. Fish and Wildlife Service (USFWS) works to conserve coastal resources. The Division's Coastal Program works in partnership with Federal, state, and local governments, and private organizations and individuals to conserve fish, wildlife, and their habitats in the coastal areas. The Coastal Program implements on-the-ground restoration in high-priority estuarine and coastal watersheds around the country.

The USFWS National Coastal Wetlands Conservation Grant Program was established in 1990 by the Coastal Wetlands Planning, Protection, and Restoration Act. Through this program, which complements the Service's other coastal conservation efforts, matching grants are provided to coastal states for the acquisition, restoration, or enhancement of coastal wetlands. Grant funds for the program are derived from excise taxes on motorboat and small engine fuels and certain fishing equipment. About $10 million in grants are awarded annually through a nationwide competitive process based on ranking factors developed by the Service. The program's emphasis on encouraging partnerships, supporting watershed planning, and leveraging ongoing projects ensures that the use of limited funds results in maximum benefits.

National Park Service

There are many programs within the National Park Service which protect critical lands. The Land and Water Conservation Fund, one such program, provides a system for funding Federal, state and local parks and conservation areas. It gives states and localities incentives to plan and invest in their own park systems.

Farmland Protection Policy Act

This act was created to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to ensure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with state and local governments as well as private programs and policies, to protect farmland. If any projects in the CCMP would convert significant agricultural land to non-agricultural uses, consultation with the USDA – Natural Resources Conservation Service may be necessary.

State Agencies and Programs

New York State Open Space Conservation Plan

Released in 1998 by the New York State's Department of Environmental Conservation and the Office of State Parks, Recreation, and Historic Preservation, this is the current State-wide plan for open space acquisition and protection. The plan identifies sites that are priorities for protection and preservation of farmland, historic and archaeological resources, water quality, natural and scenic environments, and open space/recreational opportunities. This plan was updated in the summer of 2000.

New York's Clean Water State Revolving Fund (CWSRF)

This fund provides low-interest rate loans to municipalities to carry out projects that reduce or prevent water pollution. As the loans are repaid, money is available to be used again for new loans. The CWSRF program, in existence since 1990, has made over $4.3 billion in loans. The CWSRF program funds projects involving construction of wastewater treatment facilities that reduce or prevent point source water pollution. Projects that reduce nonpoint source pollution are also eligible for CWSRF financing. Such projects include restoration of riparian vegetation, wetlands and other water bodies; land purchase or conservation easements for water quality protection such as for wellheads or watersheds; and certain USEPA designated estuaries projects, such as aquatic habitat restoration and protection.

New York State Environmental Protection Fund

This fund provides approximately $30 million per year for open space preservation. It is funded primarily through real estate transfer taxes. Decisions regarding the use of these funds are made according to the New York State Open Space Conservation Plan.

New York State Clean Water/Clean Air Bond Act

This Bond Act provides $150 million for State Open Space conservation projects undertaken by either the NYS Department of Environmental Conservation or Office of Parks, Recreation, and Historic Preservation and farmland preservation projects administered by the Department of Agriculture and Markets. An additional $50 million is dedicated to municipal parks and historic preservation projects administered through Office of Parks, Recreation, and Historic Preservation; this also includes funds for land acquisition.

Regional Level

Peconic Land Trust

The Peconic Land Trust works with landowners to protect eastern Long Island's scenic vistas, water quality and productive farmland. The Trust assists landowners with the available options for land conservation, including an outright donation of land to a blend of conservation measures including the sale of appropriate portions or the development rights on the property.

The Nature Conservancy

The mission of The Nature Conservancy is to preserve plants, animals and natural communities by protecting the lands and waters they need to survive. The Conservancy has protected more than 11 million acres of habitat in the United States and nearly 60 million acres in Canada, Latin America, the Caribbean, Asia and the Pacific.

Local Level

Suffolk County Farmland Preservation Program

This program, the first of its kind in the United States, was created in 1977 for the purpose of acquiring development rights to working farms. The easement acquired eliminates all development rights other than those necessary for agricultural production, and establishes oversight and approval of new farm structures with the County Farmland Committee. Since the inception of the program, approximately $40 million in general obligation bonds have been spent by Suffolk County to preserve 7,000 acres of farmland.

Suffolk County Open Space Program

This program was created in 1986 and funded through general obligation bonds initially at $60 million. Subsequent appropriations have raised expenditures to $84 million. Approximately 5,000 acres have been acquired by the County to date. It is designed to acquire lands under development pressure that cannot be clustered, rezoned, or partially developed. Lands acquired are managed generally as passive open space.

Suffolk County Drinking Water Protection Program

This program is funded with one-quarter cent of the sales tax, which has been generating approximately $35 million annually depending on the economy. The County has acquired 12,000 acres, mostly in the Pine Barrens. Since the inception of the program in 1987, over $220 million has been spent on acquisitions. The program expires in 2001. The program has three components:

12.5.A requires that acquisitions must relate directly to drinking water supply anywhere in Suffolk County, generally in one of the Special Groundwater Protection Areas (SGPAs). There are seven designated SGPAs within the deep aquifer recharge areas of Suffolk County. The bulk of the money continues to pay for debt service on acquisitions made in the 1989-91 time frame.

12.5.D is a revenue sharing component based on population and is set aside by each town. The towns can elect to spend all or a portion on landfill costs, but Brookhaven and the five eastern towns are still requesting their yearly shares be spent on land acquisition.

12.5.E is the residuary or leftover, which voters in 1996 mandated be spent totally for land acquisition. It is divided into two segments: one-third goes to the four western towns and Shelter Island on a population basis and can be spent to acquire any properties which are authorized by the County Legislature; two-thirds goes to the other, or so-called Pine Barrens towns, on an undifferentiated basis to be spent on Drinking Water-related parcels.

Suffolk County Community Greenways Program

Authorized by referendum in 1998, this program is funded at $62 million. In 1999, the County Legislature authorized the Open Space component ($20 million) principally for drinking water protection parcels, stream tributaries, greenbelt, and habitat enhancement, which comprises about 1000 acres scattered throughout Suffolk County. Parcels have been targeted for acquisition and negotiations are proceeding. Individual authorizations are also proceeding for lands to be used for Active Recreation ($20 million available), where the County buys the land and a town, village or community group is required to design, build and maintain the recreation improvements. Golf courses are specifically excluded. In early 2000, the Legislature will authorize the Farmland component ($20 million), for the purchase of development rights to active farms anywhere in the County, provided another level of government commits to 30% of the cost of acquisition. This program should be able to preserve another 2000 acres of farms. Two million dollars are set aside for the construction of a natural history interpretive center.

Suffolk County Land Preservation Partnership

This funding program from general obligation bonds calls for the acquisition of land for various purposes, not including active recreation, in partnership with a town or village primarily. All associated costs are split 50-50, and the land can be divided or held in common ownership as the partners choose. Development rights and conservation easements can also be acquired under this program, funded thus far at approximately $9 million in County dollars.

Suffolk County Sales Tax Extension Program

This program, authorized by referendum in 1999, will extend the sales tax starting in 2001 and ending in 2013. The program will be funded annually depending on the economy and sales tax revenues. It is broken into the following five separate and dedicated accounts:

- **Sewer rate relief** (projected total $300 million)
- **Tax relief** (projected total $270 million)
- **Farmland** for the continued purchase of development rights (projected total $62 million)
- **Drinking Water and Open Space** for land acquisitions, including the Peconic Estuary and the South Shore Estuary Reserve (projected total $114 million)
- **Water Quality** to fund wetland cleanups and rehabilitation, stormwater runoff cleanups, demonstration projects, and other environmental improvements (projected total $95 million)

Review of Tax Lien Properties for Environmental Value

The Suffolk County Planning Department reviews all tax lien parcels for environmental evaluation after the redemption period has expired to determine if the County should retain these parcels for open space/park/municipal purposes or sell them at auction. This procedure was first initiated by Suffolk County nearly 15 years ago. In 1999 alone, Suffolk County transferred over 350 acres into its Department of Parks, Recreation and Conservation.

Additional information on Suffolk County's open space programs can be obtained over the Internet on the Suffolk County Planning Department homepage at http://www.co.suffolk.ny.us/planning/acq_progs.html.

Town Community Preservation Fund Project Plans

In November 1998, the voters of the five East End Towns approved a referendum that added a 2 % tax to certain real estate transfers in their communities. Revenues generated by the tax go into a Community Preservation Fund in the Town in which the transaction occurred for the purpose of protection and acquisition of open space and historic properties. In each of the Town's Community Preservation Fund Project Plans, parcels have been identified for protection through fee simple acquisition or other means such as conservation easements.

When the program was conceived, it was estimated the transfer tax would generate approximately $10 million annually until the year 2010 when the program either expires or is renewed. After the first several months of tax receipts, it appears that $10 million may be an underestimate of the potential in this program. For instance, transfer taxes in the Town of Southampton in January, 2000 were close to $2 million.

Evaluation of Effectiveness

Although there are many agencies and organizations acting on behalf of land protection and, at a quick glance, there seems to be enough money for land protection available, land values are high and escalating, the population of eastern Suffolk County continues to grow and the demands for the existing funds are great. Land protection measures would be more effective with increased funding and a focused list of land protection priorities.

Recommendations for Improvements

The PEP recommends that a Critical Lands Protection Plan be developed which will prioritize the land available for development in the Peconic Study Area "through the lens" of habitat and water quality protection. This Plan will also estimate the funds and funding sources needed for this protection.

Toxics

Description of the Regulatory/Institutional Framework

Federal Laws, Agencies and Programs

Clean Water Act
Please see Clean Water Act description in the Nutrients section.

Clean Vessel Act
Please see Clean Vessel Act description in the Pathogens section.

Clean Air Act
The Federal Clean Air Act's primary mechanism for achieving clean air is through State Air Quality Implementation Plans. These plans encompass many different elements, including regulations limiting emissions from small and large stationary sources, both new and existing, and strategies dealing with emissions from mobile sources such as vehicle inspection programs. EPA's primary responsibilities are to assist and oversee the development of these plans, and once in place, to ensure their implementation. Because of the large number of responsibilities delegated to the states, Section 105 of the Act established a mechanism to fund a portion of these activities. These resources are used to fund both the base programs run by the states and special outputs which are specified by EPA. The special outputs are negotiated with the states and are in accordance with national objectives. The use of these funds and the accomplishment of specific objectives contained in the grants are closely tracked by EPA.

A special category of air emissions is made up of airborne toxic compounds. EPA is developing a national program to implement the air toxics portion of the Clean Air Act and emissions are expected to be reduced over the course of a 10-year period as controls for various categories of sources are developed. In addition, the Clean Air Act establishes National Emission Standards for Hazardous Air Pollutants (NESHAPs) under Section 112 of the Act, and EPA provides technical and financial support to state agencies for the development and implementation of air toxics programs. EPA has established emissions standards for 7 pollutants, including mercury, and another 189 hazardous air pollutants will be regulated under the 1990 Clean Air Act Amendments.

Resource Conservation and Recovery Act (RCRA)
This Federal statute was enacted in 1976 to ensure the proper management and disposal of hazardous and non-hazardous solid wastes and treatment, storage, and disposal facilities. In 1984, the Hazardous and Solid Waste Amendments (HSWA) were authorized by Congress to strengthen RCRA. The 1984 Amendments require an applicant to:

I. construct land disposal facilities in accordance with Minimum Technology Requirements, such as double liners and leachate collection and detection systems;
II. construct and operate treatment and storage tanks in accordance with the Federal regulation promulgated July 14, 1986 which mandated secondary containment;
III. identify and address any contamination at all solid waste management units; and
IV. certify to waste minimization.

The HSWA permit also requires the applicant to initiate a corrective action program to address any environmental releases of hazardous waste or constituents at solid waste management units. A corrective action program consists of:

I. RCRA Facility Assessments to identify releases or potential releases requiring further investigation;
II. Interim Corrective Measures to take immediate action in response to releases;
III. RCRA Facility Investigations to fully characterize the extent of releases;
IV. Corrective Measure Studies to determine the need for and extent of remedial measures. This step includes the selection and implementation of appropriate remedies for all problems identified.

These 4 activities ensure that a facility will adequately identify all contamination and provide corrective action as necessary to protect human health and the environment.

The current Federal Solid Waste Management Program is an outgrowth of the Resource Conservation and Recovery Act of 1976. The Hazardous and Solid Waste Amendments of 1984 and the Municipal Solid Waste Task Force within EPA have guided Federal solid waste program development. In February 1989 a final report of the Task Force, entitled "The Solid Waste Dilemma: An Agenda for Action," set forth the current Federal initiatives in solid waste management.

Comprehensive Environmental Response, Compensation and Liability Act ("Superfund")

"Superfund" was established in December 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 1901 et seq.). The purpose of this program is to provide funding for the cleanup of sites contaminated with hazardous wastes. The Act authorized EPA to provide long-term remedies at hazardous waste sites, and established a $1.6 billion fund, raised over 5 years from special industry taxes and general revenues, to finance remedial activities. In 1986, Congress reauthorized Superfund by enacting the Superfund Amendments and Reauthorization Act (SARA), increasing the fund to $8.5 billion and strengthening the remedial process.

The sites eligible for receiving Superfund monies are listed on the National Priorities List (NPL), which is used by EPA to set priorities for cleanup of the sites. A priority site can be remediated in several ways:

I. The responsible parties, i.e., site owners and operators as well as generators and transporters, can remediate it voluntarily;
II. The responsible parties can be forced to remediate it by legal and administrative actions; or
III. Superfund monies can be used to finance the remedial action. If there is difficulty in getting the responsible parties to act, EPA will proceed under Superfund and will seek recovery of costs through legal action at a later date.

National Oil and Hazardous Substance Pollution Contingency Plan

Prevention and cleanup of oil and hazardous substance spills are the focus of Federal programs administered by the U.S. Coast Guard and EPA. The National Oil and Hazardous Substance Pollution Contingency Plan was developed pursuant to the provisions of Section 311(c)(2) of the Clean Water Act of 1972 as amended. The National Plan is also required by Section 105 of the Superfund Act.

The National Plan calls for the establishment of a nationwide network of regional contingency plans. The purpose of these local contingency plans is to provide for a coordinated and integrated response by the concerned Federal, state, and local agencies in the event of a spill. The plans provide for the standardization of procedure and policy among agencies, and encourage the development of capabilities by both local governments and private interests to handle and prevent pollution discharges.
Additionally, Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires state and local level emergency planning efforts. SARA requires industries to notify local governments of potential chemical hazards present in the community.

Pollution Prevention

Pollution prevention has become a key notion for environmental progress in the last decade. Pollution prevention is a multi-media approach with its primary goal being the avoidance of waste and pollution generation, followed by source reduction and environmentally sound recycling. The ultimate goal is to avoid shifting pollutants from one media to another by reducing the need for treatment. EPA has 4 strategic objectives by which the pollution prevention goal can be met:

- Develop a multi-media approach;
- Support regional, state, and local multi-media prevention programs;
- Build consensus for a National Agenda on Prevention; and,
- Establish data strategy to develop indicators, evaluate progress, and target opportunities.

The Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act (CZMA) of 1972 established a national policy to preserve, protect, develop, and where possible, to restore or enhance, the nation's coastal zone. The Act also encouraged the states to exercise their responsibilities in the coastal zone through the development and implementation of management programs, the preparation of special area management plans, and the participation and cooperation of the public, local and state governments, interstate and regional agencies, and Federal agencies in programs affecting the coastal zone. The U.S. Department of Commerce is the Federal lead agency charged with the responsibility of implementing the Act; however, the Act provides that the objectives of the law are to be achieved through the development and administration of approved state coastal management programs. The Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) augmented the original Act by authorizing Federal matching grants for assisting coastal states in developing management programs for the land and water resources of their coastal zones, particularly for nonpoint source pollution control.

Like their state counterparts, Federal agencies operate a number of programs that affect the wise use and protection of coastal resources. The CZMA, as amended, requires the actions of Federal agencies to be consistent with the policies of a state's Coastal Management Plan (CMP). Federally conducted or supported activities (including development projects), activities requiring Federal licenses or permits, Federal financial assistance to state and local governments, and exploration, development, and production activities on the Outer Continental Shelf which require a Federal license or permit are all subject to CZMA requirements and must be consistent with the New York CMP.

To ensure that Federal agencies comply with the CZMA provisions, the U.S. Department of Commerce adopted regulations (15 CFR Part 930) which established procedures for the Federal consistency process. These regulations set up separate review procedures for each of the above-mentioned items.

Coastal Zone Act Reauthorization Amendments of 1990

The 1990 amendments to the Coastal Zone Management Act (CZMA) require that each state develop a nonpoint source pollution control program. Please refer to the Pathogens section for more information on the Coastal Zone Act Reauthorization Amendments of 1990.

Pesticides are a primary agricultural nonpoint source pollutant. The NPS Management Measure for states to follow under CZARA is:

- To reduce the contamination of surface water and ground water due to the application of pesticides;
- Evaluate pest problems, previous pest control measures, and cropping history;
- Evaluate the leaching potential at the site. Take steps to prevent further contamination if needed;
- Use integrated pest management (IPM) strategies (apply pesticides only when an economic benefit to the producer will be achieved and apply pesticides efficiently and at times when runoff losses are unlikely);
- When pesticide applications are necessary and a choice of registered materials exists, consider the persistence, toxicity, runoff potential, and leaching potential of products in making a selection;
- Calibrate pesticide spray equipment; and
- Use anti-backflow devices.

The practices and concepts that can be used to implement this measure on a given site are those commonly used by states and the U.S. Department of Agriculture (USDA) for general use on agricultural lands. When this measure is implemented by using the necessary mix of practices for a given site, there should be a relatively small negative economic impact on the operator's net costs and farm income, and in some cases the impact will be positive. Many of the practices that can be used to implement this measure may already be required by Federal, State, or local rules, or may otherwise be in use on agricultural fields. Since many producers may already be using systems that satisfy or partly satisfy the intent of this management measure, the only action that may be necessary will be to determine the effectiveness of the existing practices and implement additional practices, if needed. Use of existing practices will reduce the time, effort, and cost of implementing this measure.

Other nonpoint sources of toxics addressed under CZARA include: road, highway and bridge construction sites, operation and maintenance, and runoff systems; general construction sites, onsite disposal systems; pesticide and toxic substance uses in developed areas; and marinas and recreational boating.

Toxic Substances Control Act

The Toxic Substances Control Act institutes comprehensive procedures for the testing and control of chemicals believed to present unreasonable risks and injuries to human health and the environment. This includes: assisting states in developing and maintaining toxic substances enforcement programs; sponsoring cooperative surveillance, monitoring and analytical procedures; encouraging regulatory activities within the states; and supporting and promoting the coordination of research projects relating to the effects, extent, prevention and control of toxic chemical substances or mixtures. Under the Toxic Substances Control Act and FIFRA (see Federal Insecticide, Fungicide, and Rodenticide Act, below), the sale, use or distribution of certain toxic substances has been banned or reduced.

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act supports and promotes the coordination of research projects relating to human and ecological effects from pesticides, pesticide degradation products and alternatives to pesticides. FIFRA authorizes EPA to control pesticides that may threaten ground water and surface water. FIFRA provides for registration of pesticides and enforceable label requirements, which may include maximum rates of application, restrictions on use practices, and classification of pesticides as "restricted use" pesticides (which limits use to certified applicators trained to handle toxic chemicals). This Act also provides for assisting states in developing and maintaining comprehensive pesticide enforcement programs; sponsoring cooperative surveillance monitoring and analytical procedures; and encouraging regulatory activities within the states. Under FIFRA and TSCA (see Toxic Substances Control Act, above) the sale, use or distribution of certain toxic substances has been banned or reduced.

Organotin Antifouling Paint Control Act of 1988

The Organotin Antifouling Paint Control Act of 1988 prohibits the use of bottom paint containing tributyltin on vessels less than 82 feet long in order to control toxic substances in the water to help protect fish and other aquatic life.

Environmental Quality Incentives Program (EQIP) under the 1995 Federal Farm Bill

Financial incentives for voluntary compliance by private growers with the CZARA pesticide management measure and for Integrated Pest Management (IPM) strategies may be available through the 1995 Federal Farm Bill's Environmental Quality Incentives Program (EQIP). The Suffolk County Office of the United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS) would need to be involved in the preparation of any EQIP proposal.

Safe Drinking Water Act

The Safe Drinking Water Act, as amended, in addition to establishing tap water criteria and ensuring the safety of public water supplies, contains other provisions to protect groundwater and sets controls on the injection of fluids into underground sources of drinking water. This Act also includes the wellhead protection program, Sole Source Aquifer Program, and source water protection program.

The National Environmental Policy Act

The National Environmental Policy Act (NEPA), (42 U.S.C. 4321 et seq.), was signed into law on January 1, 1970. The Act established national environmental policy and goals for the protection, maintenance, and enhancement of the environment, provided a process for implementing these goals within the Federal agencies, and established the Council on Environmental Quality (CEQ) to oversee Federal implementation of NEPA.

NEPA contains a Declaration of National Environmental Policy which requires the Federal government to use all practicable means to create and maintain conditions under which people and nature can exist in productive harmony. NEPA also requires Federal agencies to incorporate environmental considerations into their planning and decision-making through a systematic interdisciplinary approach. Specifically, all Federal agencies are to prepare detailed statements assessing the environmental impact of, and alternatives to, major Federal actions significantly affecting the environment. These statements are commonly referred to as Environmental Impact Statements (EISs). Federal agencies are also required to lend appropriate support to initiatives and programs designed to anticipate and prevent a decline in the quality of human living and the world environment.

National Oceanic and Atmospheric Administration (NOAA)

The U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) has specified "Effects Range" values for toxics in sediments to indicate contaminant concentrations at which bottom dwelling organisms may be adversely affected, and as an indicator of overall ecosystem health. While these NOAA Effects Range values are not sediment quality criteria for regulatory purposes, they provide a benchmark for evaluating sediment contaminant measurements.

The two NOAA guideline values, ER-L (effects range-low) and ER-M (effects range-median) delineate three concentration ranges for a particular chemical. The concentrations below the ER-L value represent a minimal effects range, a range intended to estimate conditions in which effects would be rarely observed. Concentrations equal to and above the ER-L, but below the ER-M, represent a possible effects range within which effects would frequently occur. At concentrations equal to and above the ER-M, contaminant-induced effects are likely. (See Long, et al, 1996)

NOAA Mussel Watch Program

NOAA created the National Status and Trends (NS&T) Program in 1984 to address national concerns over the quality of the coastal marine environment, including chemical contamination. The Mussel Watch portion of the NS&T program was formed in 1986 to measure concentrations of a broad suite of trace metals and organic chemicals in surface sediments and the whole soft parts of mussels and oysters.

The U.S. Food and Drug Administration

The U.S. Food and Drug Administration (FDA), the lead Federal agency responsible for risk management of foods in interstate commerce, has set levels for contaminants which, when exceeded in fish and shellfish tissues, can prevent these products from entering the marketplace. (State and local agencies are responsible for protecting consumers of local fisheries products. State-issued consumption advisories for chemicals in sportfish and game are based on FDA levels and other factors.)

Presidential Memorandum on "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds"

A Presidential Memorandum of April 26, 1996 addresses "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds" which is to be followed by all executive departments and agencies.

State Laws, Agencies and Programs

Among the state agencies having authority and directly involved in coastal affairs and toxic substance management are the New York State Department of Environmental Conservation, the New York State Department of State, and the New York State Department of Health. The DEC has the principal responsibilities for the management and protection of environmental quality and the natural resources of the coastal zone. The DOS is the lead agency in New York for coastal zone management activities and also conducts a program of planning assistance to local communities. The DOH has responsibilities including protecting humans from toxic substances in drinking water and sportfish.

New York State Department of Environmental Conservation (DEC)

The DEC, in planning, developing and managing the state's water resources undertakes studies for the protection, conservation and development of state waters and establishing standards for quality and uses, permitting of wastewater discharges, and the control of dredging and filling of navigable waters.

The Division of Solid and Hazardous Materials regulates and monitors hazardous waste facilities and transporters, encourages waste reduction and proper disposal of household hazardous waste and regulates the use of pesticides. The Division requires hazardous waste generators and facilities treating the waste to submit waste reduction plans that must be approved by the Department.

State Pesticide Use Program

Under the Pesticide Use Program, NYSDEC regulates the sale and use of restricted and general use pesticides in order to prevent the unsafe or excessive application of pesticides. This program is implemented through certification of pesticide applicators and backed up by examinations to ensure that only knowledgeable, qualified people are permitted to handle and apply these chemicals. A certification required by commercial applicators if they handle and apply restricted or general use pesticides, and by private applicators (e.g., farmers) if they plan to use a restricted use pesticide. It has been estimated that 50% of the commercial pesticide applicators on Long Island may be operating without the required approvals. While pesticides have not been identified as impairing water quality or living resources, the potential for misuse or unintended off-site impacts exists, particularly from uncertified applicators.

Freshwater Wetlands Law

The State's Freshwater Protection Law prohibits the use of pesticides and herbicides on or in the vicinity of wetlands and associated waterbodies. However, many residents may be unaware of this law.

The Division of Hazardous Waste Remediation is responsible for the superfund program that involves regulation of inactive hazardous waste sites.

The Division of Water is charged with maintaining water quality in all of the state's waterbodies and managing water resources.

The Division is the lead for establishing water quality standards, regulates wastewater treatment and associated discharges, monitors water quality, oversees the state's nonpoint source management program, and protects groundwater aquifers.

The New York State Water Quality Standards classify waters in the state according to their best usage and specify chemical specific numeric criteria. In addition to specific chemicals in the State Water Quality Standards, a NYSDEC Technical and Operational Guidance Series document establishes guidance values for additional substances.

The New York State Pollutant Discharge Elimination System (SPDES) was established by the New York Environmental Conservation Law and regulates discharges to the land, groundwater, and surface waters of the state. Such discharges include effluent from: public and private sewage treatment plants; industrial discharges; land application of sludge, septage, and industrial wastes; discharges into municipal wastewater treatment plants which are regulated under the industrial pretreatment program; and underground injection. This program was delegated to New York under the CWA, through which the state assumed the permitting functions of the National Pollutant Discharge Elimination System.

State Pollutant Discharge Elimination System program permits are written to ensure that these discharges do not cause or contribute to the violation of ambient water quality standards. Under Phase I of the SPDES stormwater program, permits are required to be issued for municipal separate

storm sewer systems serving large or medium-sized populations (greater than 250,000 or 100,000 people, respectively), and for stormwater discharges to surface waters associated with industrial activity, including certain types of marinas. At the present time, nine establishments in the Peconic Estuary Program Study Area have been issued SPDES stormwater general permits.

Permits also are issued on a case-by-case basis if the U.S. Environmental Protection Agency (USEPA) or the State determines that a stormwater discharge to surface water contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States. No permits of this type have been issued, to date, in the Peconic Estuary Study Area.

Discharges to ground waters include sanitary wastes from residences and commercial establishments and non-contact cooling waters. There are no permitted discharges of wastewater from industrial activities to groundwater in the Peconic Estuary Study Area (aside from a permit at Brookhaven National Laboratory [BNL]). Businesses, which generate wastewater containing toxic substances, dispose of such wastewater by containing the limited volumes on-site, and then removing them by approved hazardous waste handlers/transporters for treatment off-site. This method is often referred to as "hold and haul".

A marina is required to obtain a SPDES stormwater discharge permit if vehicle maintenance activities, such as vehicle (boat) rehabilitation, mechanical repairs, painting, fueling, and lubrication or equipment cleaning operations are conducted at the marina. SPDES permits apply only to the point source discharges of stormwater from maintenance areas at the marinas.

Marinas not involved in equipment cleaning or vehicle maintenance activities are not covered under the SPDES stormwater program. Likewise, a marina that has no point source discharges of stormwater is not regulated under the SPDES stormwater program, regardless of its classification and the types of activities conducted. In addition, some marinas are marine service stations that are not regulated under the SPDES stormwater program. These types of marinas are primarily in the business of selling fuel without vehicle maintenance or equipment cleaning operations.

Sewage treatment plant (STP) effluents are subject to disinfection to limit the discharge of pathogens. The most common method of disinfection is chlorination. Chlorinated discharges to surface waters are of concern because, in systems like the Peconics which contain high levels of organic matter, chlorinated compounds can be formed which, although short lived, can be quite toxic to aquatic organisms. The complexity of the reactions of chlorine in the environment increases the difficulty of assessing its impact. Increased attention is being given to addressing the possible need to limit all uses of chlorine as a means of reducing the input of chlorinated compounds into the environment.

The water quality certification program is authorized by the New York Environmental Conservation Law and the CWA Amendments of 1977 (33 U.S.C.1251, Section 401). All projects requiring Federal permits for the discharge of dredged or fill material into state waters or wetlands also require a State Water Quality Certification. The purpose of this certification is to insure that all such activities are consistent with New York State water quality standards and management policies.

The **Division of Fish, Wildlife and Marine Resources** protects promotes and provides for the use of fish and wildlife resources by maintaining and protecting the resources and their habitats, including managing the living marine resources of the state. This includes assessing environmental impacts on marine resources, administering the tidal wetlands and excavation and fill regulatory programs, coordinating state participation in the National Estuary Programs, recommending standards and classifications for marine waters, certifying shellfish waters for harvesting, administering

shellfish management programs, assessing principal fishery stocks and developing recommendations for effective management of species.

The **Division of Air** controls air pollution by regulating, permitting, and monitoring sources, and developing and implementing strategies to meet the requirements of the Federal Clean Air Act.

The **Division of Regulatory Affairs** coordinates permit reviews, assesses environmental impacts of proposed projects, reviews regulations and issues permits. The Division also administers the State Environmental Quality Review Act which requires all levels of government (state and local) to assess the environmental significance of actions which they have discretion to approve, fund, or directly undertake.

The **Division of Construction Management** approves and manages engineering plans and construction activities for sewage treatment plants in the state.

The **Bureau of Spill Response** controls petroleum and chemical bulk storage and responds to spills.
New York State law includes provisions for preventing spills of petroleum. These provisions require all facilities with a minimum capacity of 1,100 gallons to be registered, set forth standards for the handling and storage of petroleum, and set forth standards for new and substantially modified underground and aboveground storage facilities. Owners and operators must notify NYSDEC of any spills. Another State program addresses the requirements for the bulk storage of other hazardous substances, including the registration of storage tanks, spill reporting procedures and specifications for the sale and delivery of such substances.

New York State Department of State Coastal Management Program

In New York State the Department of State administers the Coastal Management Program (CMP). The CMP provides for the preservation, protection, development and use of the state's coastal and inland waterways. The program has many aspects: policies covering land use planning, development of recreation, commercial, and industrial water dependent properties, maintenance of fish and wildlife habitats, stabilization of beaches and dunes, and waste discharge from vessels and on-shore facilities. The CMP's jurisdiction extends from the limit of the state's territorial waters to a line generally 500 to 1000 feet inland.

The CMP requires reviews of projects having some form of Federal involvement in coastal areas for consistency with local, state, and Federal environmental statutes and programs. The CMP provides technical and financial assistance to local municipalities to prepare Local Waterfront Revitalization Plans. These plans promote revitalization of coastal areas while protecting their integrity.

Existing state programs and requirements (including those under the State Navigation Law) are in place to address: pollution from boat cleaning at marinas; liquid material disposal at marinas; solid waste disposal at marinas; and petroleum control at marinas.

New York State Department of Health

The Department of Health enforces compliance with the Public Health Law and the State Sanitary Code. In the area of water resources, the Department establishes drinking water quality standards and establishes regulations for the sanitary control of water supplies. The Health Department sets guidance for seafood and wildlife consumption to protect human health. The Department also assists DEC in developing water and air human health standards and in overseeing public health interests for the inspection and remediation of inactive hazardous waste sites.

Fish, Shellfish and Wildlife Consumption Advisories

The State routinely monitors contaminant levels in fish and game and issues advisories on eating sportfish and game because some of these foods contain chemicals at levels that may be harmful to human health. These advisories are updated yearly, and provide information on how to minimize exposure to contaminants and reduce whatever health risks are associated with exposure.

Local Programs and Laws

Suffolk County Sanitary Code

Suffolk County sanitary code requirements (Article 12) are more stringent than state requirements. The County law went into effect in 1980 and addresses all underground and aboveground tanks storing fuels, solvents, and chemicals, virtually anything that could contaminate groundwater or surface water. New underground tanks are required to have secondary containment and be constructed of non-corrodible materials, and must have leak detection and overflow protection systems. All existing facilities had to be brought up to new construction standards by 1990.

The County law exempted existing tanks from the replacement requirement that were under 1100 gallons and used for the storage of heating oil for on-premises use. However, new tanks of this type must be made of non-corrodible materials. The Financing chapter of this CCMP includes several recommendation regarding incentives for private homeowners to address this potential threat to groundwater and surface water.

Organic solvents used as septic system cleaners may hinder effective septic system operation by destroying useful bacteria that aid in the degradation of waste, resulting in disrupted treatment activity and the discharge of contaminants. In addition, since the organic chemicals in the solvents are highly mobile in the soils and toxic (some are suspected carcinogens), they can easily contaminate ground water and surface waters and threaten public health. State and County laws restrict/prohibit the sale and distribution of illegal disposal system products in Nassau and Suffolk counties. This includes deodorizers and drain cleaners as well as cesspool additives. However, sewage system cleaners may still be used by unsuspecting residents.

East Hampton Harbor Protection Overlay District

The Town of East Hampton, recognized that those who own property bordering on the Town's harbors (including flag lots, flag strips, and flag access strips) derive many benefits from proximity to these waters and therefore have a special responsibility to help protect them. The Town has established a Harbor Protection Overlay District (HPOD) whereby all lots in this district are subject to special requirements for maintaining or protecting wildlife habitats, and surface water quality to protect aquatic life. This includes:

- Requiring new parking lots and driveways to have “unimproved” surfaces or be constructed of one or more of the following: poured concrete, hot plant asphalt, rapid curing cut-back asphalt or quartz gravel;
- Requiring that runoff from new paved roads, parking lots and driveways be managed on-site;
- Requiring that fuel tanks be double walled fiberglass if installed below ground or include specified containment provisions if installed elsewhere;
- Requiring that swimming pools: be constructed or installed with a system to reduce the use of chlorine, such as an ozonator, ionizer, or ultra violet disinfectant system; have drywells constructed for evacuation of water from the pool; not be drained anywhere but

to the dry well; and not be cleaned by means of an acid wash unless the acids used are neutralized prior to discharge from the swimming pool, and

- Allowing the use of wood treated with copper chromated arsenate (CCA), ammoniacal copper quat (ACQ), or creosote in tidal waters only when it can be shown that no reasonable alternatives to using these treated woods exists.

Suffolk County Vector Control
The Suffolk County Department of Public Works maintains vector control ditches (mosquito ditches), and typically applies sprays for larval control of mosquitoes. Problem areas are monitored to determine effective treatments. The primary insecticide used is Bti (bacillus thuringiensis var. israelensis); in some areas, methoprene is used.

Local "Stop Throwing Out Pollutants" (STOP) Programs
Each of the towns have STOP ("Stop Throwing Out Pollutants") or HAZMAT (HAZardous MATerial) Programs, or which include collections for proper disposal of oil, paints, solvents, boat and auto products (antifreeze, polishes, etc.), cleaning chemicals, and lawn and garden chemicals. Some programs have specified collection dates and locations (East Hampton); others collect materials on specific days (Shelter Island (Saturdays), Southold (Tuesdays and Thursdays)).

Construction Site Chemical Waste Disposal
All of the towns have some program or ordinance to address the disposal of chemical waste from construction sites, although they are quite varied. Although Brookhaven and Riverhead require contractors to submit plans for waste disposal at the construction site, they lack sufficient enforcement strength to ensure these plans are being followed. East Hampton has indirect ordinances for this action, but regulations are not uniform and disposal is handled on a case by case basis.

Road, Highway and Bridge Construction and Operation and Maintenance
All towns except Shelter Island have programs or ordinances to address both road construction and maintenance chemical storage and disposal, although they are quite varied. East Hampton and Riverhead have reported success in allocating staff and resources to addressing this potential source of toxics.

Evaluation of Effectiveness

General: In general, most of the agencies and programs described above provide adequate capacity (statutory and regulatory authority, agency functionality, etc.) to support PEP management objectives. A few needs/deficiencies, potentially warranting "new" programs, initiatives, or efforts are recommended.

Monitoring: Many agency programs and resources, when available, are effective and useful. There is a significant amount of data that has been collected since the initiation of the PEP that still needs evaluation.

Regulatory Sites of Concern: Existing Federal/State/local programs are effective at addressing toxic contamination at Superfund sites, other hazardous waste sites, and permitted facilities, including those that discharge to groundwater and surface water. Remedial investigations, feasibility studies, and clean up, in particular are complex and often take significant time to complete. Adequate monitoring and evaluation needs to take place following remedial actions to ensure the remedy is effective. Attention needs to be

paid to permitted facilities that use or discharge toxic substances and enforcement action used when necessary.

Chlorine: Alternatives to chlorine for disinfection at Sewage treatment Plants (STPs) are effective, but not all effluents are suitable for all alternatives. Where chlorine is used, ambient water quality standards for the protection of aquatic life for chlorine need to be attained.

Pesticides: FIFRA is an effective means of banning or restricting the use of pesticides of concern, as is the state mechanism. The state has an effective pesticide certification program for commercial applicators, as well as provisions to eliminate or reduce pesticide use near wetlands. The development/establishment of a Long Island Pesticide Management Plan should be pursued, as should enforceable programs under CZARA. The County's IPM pesticide free golf course initiative is worthwhile, as is the Federal Presidential Memorandum regarding landscaping at Federal installations. Additional demonstrations and cooperative efforts with the agricultural community to reduce or eliminate pesticide use should be pursued. Overall IPM programs need to be developed and implemented, and opportunities to expand markets for organic produce investigated.

Construction Sites, Roads: At present, on State funded projects, there are programs to effectively manage toxic chemical use at construction sites, including road construction, and roadway operation and maintenance. There are also existing statewide pesticide management, spill management, and solid and hazardous waste disposal requirements. In the absence of statewide requirements addressing remaining toxic concerns at these sites, there is a need to pursue local requirements applicable at these sites. Requirements also need to be enforced, and education/outreach efforts with industry/trade groups pursued.

Developed Areas: Public facilities should set the example in terms of conducting and implementing pollution prevention opportunity assessments and environmental management reviews. Stormwater runoff at marinas and boatyards may need further evaluation and management. The Town of East Hampton's Harbor Protection Overlay district is effective at addressing a number of potential sources of toxic substances, including: materials for roads, driveways and parking lot surfaces and management of runoff from these surfaces; fuel storage tanks; swimming pools; treated woods; and other activities. Certain onsite disposal system products are banned, but retail establishments may still sell them to unsuspecting customers. Additional research and investigations are needed regarding the placement of treated lumber in the marine environment. Natural shoreline and non-toxic structures should be encouraged, consistent with PEP's overall policy no net increase of shoreline hardening structures. Guidelines should be developed to address the disposal of treated lumber following demolition. The Federal government's efforts to eliminate the use of the gasoline octane booster, MTBE, should continue. Structurally sound home heating oil tanks currently exempted from current replacement requirements still present a potential threat to groundwater and ultimately surface water resources. Voluntary and incentive based programs should be developed to encourage replacements and upgrades of these tanks.

Pollution Prevention: More aggressive pollution prevention programs should be established and implemented, particularly for industries/establishments that use, generate or discharge toxic substances. Existing town "Stop Throwing Out Pollutant" type programs are necessary and should continue. Mosquito control programs should first encourage good housekeeping methods of control. The use of pesticides should be reduced to the maximum extent practicable that still adequately protects human health.

Dredged Materials: Existing programs at the Federal and state level are adequate for ensuring that applications and permits for dredged material are evaluated with respect to toxics.

Recommendations for Improvements

Monitoring: Many existing programs and resources at the Federal (especially USEPA, NOAA, USGS), state (especially NYSDEC, NYSDOH) and local agency (SCDHS) should be accessed to the maximum extent possible and supplemented with specially funded projects. Monitoring should include not only chemical specific analyses but also evaluations of overall toxicity. In particular, sediments, biota and groundwater should be evaluated, as well as surface waters, dredged materials and soils. New and emerging topics, issues and concerns need to be addressed, including potential endocrine disruptors, historic and present marinas and boatyards as possible areas of contamination and any locally identified areas of concern.

Regulatory Sites of Concern: Federal and state regulatory agencies need to focus on meeting deadlines associated with cleanups and permitting actions under hazardous waste laws. Facilities that use or discharge toxic substances need to be inspected and monitored, as should sites being remediated under hazardous waste laws. Enforcement should be used as necessary.

Chlorine: Consistent with human health protection needs and based on the suitability of the effluent, the use of chlorine for disinfection at Sewage Treatment Plants (STPs) should be eliminated. Where alternatives to chlorine are not effective and chlorine continues to be used, discharge permits must ensure that the ambient water quality standards for the protection of aquatic life for chlorine be attained.

Pesticides: EPA and the State should restrict or ban all pesticides that are detected at levels of public health or environmental concern in groundwater or in the estuary. The State should continue to ensure the proper certification of commercial pesticide applicators; the public should be educated about using commercial applicators that are properly certified. The state should enforce the provisions of the State Freshwater Wetlands Law to reduce or eliminate the use of pesticides in the vicinity of wetlands. The Long Island Pesticide Management Plan should be developed/established, as should enforceable programs under CZARA. The concepts behind Suffolk County's integrated pest management/pesticide free golf courses should be applied to all public lands and golf courses. The Federal Presidential Memorandum regarding landscaping at Federal installations should be adhered to and a similar policy enacted for other owners of public lands. Additional work is needed with the agricultural community to demonstrate/identify opportunities for reducing pesticide applications. Integrated pest management programs need to be developed and implemented to reduce or eliminate overall pesticide use. Opportunities for expanding markets for and production of organic produce should be investigated. Collection of unneeded and unwanted pesticides, particularly from agribusinesses and commercial landscapers, should be carried out on a regular basis.

Construction Sites, Roads: For state funded construction projects, including road, highway and bridge construction, and road, highway and bridge operation and maintenance, existing programs are adequate to control toxics. While there are other existing Statewide pesticide management, spill management, and solid and hazardous waste disposal requirements, other toxics may not be addressed on private projects or projects funded at the local level. Requirements applicable on state funded projects should be applicable at all project sites. Until such time as statewide requirements are adopted, uniform programs equivalent to those applicable at state funded projects should be enacted at the local level. Requirements also need to be enforced, and education/outreach efforts with local government/industry/trade groups pursued. Similarly, adequate management programs are in place at the state level for runoff management systems for roads, highways and bridges. Similar program

requirements need to be adopted for application at the local level, and until such time as they are adopted, local programs should be enacted or voluntary cooperation pursued. The desired and enforceable measures to be implemented are as follows:

Road, Highway and Bridge Construction Site Chemical Control: Limit the application, generation and migration of toxic substances, and ensure the proper storage and disposal of toxic materials.

Road, Highway and Bridge Operation and Maintenance: Incorporate pollution prevention procedures into the operation and maintenance of roads, highways and bridges to reduce pollutant loadings.

Road, Highway and Bridge Runoff Systems: Develop and implement runoff management systems for roads, highways and bridges to reduce runoff pollutant concentrations and volumes; identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures); and establish schedules for implementing appropriate controls.

Developed Areas: Public facilities should set the example in terms of conducting and implementing pollution prevention opportunity assessments (PPOAs) and environmental management reviews (EMRs). PPOAs and EMRs should be conducted and implemented at all public facilities, beginning with Federal installations. Priorities should include facilities handling toxic materials. Stormwater runoff at marinas and boatyards may need further evaluation and management, due to materials used and disposed of at these facilities and their proximity to estuarine waters. The Town of East Hampton's Harbor Protection Overlay District is effective at addressing a number of potential sources of toxic substances, including: materials for roads, driveways and parking lot surfaces and management of runoff from these surfaces; fuel storage tanks; swimming pools; treated woods; and other activities. In Suffolk County, certain onsite disposal system products are banned, but retail establishments may still sell them. Retail establishments should be regularly inspected to enforce the ban on the sail of these illegal OSDS products and an education/outreach effort initiated for these establishments and consumers. Additional research and investigations are needed regarding the placement of treated lumber in the marine environment. Natural shoreline and non-toxic structures should be encouraged, consistent with PEP's overall policy no net increase of shoreline hardening structures. Guidelines should be developed to address the disposal of treated lumber following demolition. The Federal government's efforts to eliminate the use of the gasoline octane booster, MTBE, should continue. Structurally sound home heating oil tanks currently exempted from current replacement requirements still present a potential threat to groundwater and ultimately surface water resources. Voluntary and incentive based programs should be developed to encourage replacements and upgrades of these tanks.

Pollution Prevention: More aggressive pollution prevention programs should be established and implemented, particularly for industries/establishments that use, generate or discharge toxic substances. Existing town "Stop Throwing Out Pollutant" type programs are necessary and should continue. Mosquito Control programs should first encourage good housekeeping methods of control. The use of pesticides for mosquito control should be reduced to the maximum extent practicable that still adequately protects human health.

Dredged Materials: Existing programs at the Federal and state level are adequate for ensuring that applications and permits for dredged material are evaluated with respect to toxics. Permits and applications should be critically evaluated with respect to their potential to cause adverse toxic effects to the Peconic Ecosystem, and particularly to pelagic and benthic organisms and their food chains, including humans. The EPA and the U.S. Army Corps of Engineers have identified the likely need to continue

marine placement of dredged material in the Long Island Sound area. In 1999, the EPA in cooperation with U.S. Army Corps of Engineers issued a notice of intent to prepare an environmental impact statement to consider the potential identification of one or more placement sites for Long Island Sound dredged material. The EPA and the Corps have decided to consider the use of four existing sites and their identification as dredged material placement sites under Section 102(c) of the Marine Protection, Research and Sanctuaries Act. Other alternatives will also be evaluated, including other open water placement sites and other placement and management options. Identification of a site does not itself result in placement of any particular material, it serves only to make the identified site a placement option available for consideration in the alternatives analysis for each individual dredging project in the area. The PEP participants consider it unlikely a placement site will be proposed within the PEP study area, but the PEP should continue to participate in the EPA/Corps efforts to identify potential placement sites for Long Island Sound dredged material.

Post-CCMP

Description of Regulatory/Institutional Framework

Three alternative frameworks were considered for post-CCMP management:

- Continuation of Existing Management Conference Structure (*Policy Committee; Management Committee; Citizens, Technical and Local Government Advisory Committees; and Program Office*);
- Formation of a Regional Advisory Commission (*formal, non-regulatory commission of East End town and village representatives*);
- Modification of the Pine Barrens Maritime Reserve Commission (*Modification of the Pine Barrens Maritime Reserve Act as a mechanism to involve State, County, and local governments in a regional implementation process*)

State Agencies and Programs

Pine Barrens Maritime Reserve Act

Through the Pine Barrens Maritime Reserve Act, the New York State Legislature declared that the Long Island Pine Barrens should be protected in a comprehensive plan adopted by the state and individual local governments. The Long Island Pine Barrens encompasses over one hundred thousand acres in the county of Suffolk and overlies the largest source of pure groundwater in New York. The Pine Barrens are interconnected to the Peconic Bay system by the Peconic River, the longest groundwater river in New York.

The Act calls for a state supported regional comprehensive land use plan providing for the preservation of the core preservation area, protection of the Central Pine Barrens area and for the designation of compatible growth areas to accommodate appropriate patterns of development and regional growth. The legislature intended that the comprehensive regional land use plan would include provisions for private landowners whose property is located within the Central Pine Barrens area. The landowners will be afforded an opportunity to receive benefits from the plan such as transferable development rights, conservation easements, rights and values transfers, purchase of development rights and/or fee acquisition with monetary compensation.

A Long Island Pine Barrens Maritime Reserve Council was established to help local governments and the state coordinate the efforts of all municipal, county, state and Federal agencies involved in the management of the preserve. The Council was also charged with overseeing and preparing a comprehensive intergovernmental management plan for the Long Island Pine Barrens maritime reserve for state and local governments to adopt.

Evaluation of Effectiveness

The existing Management Conference Structure has been successful in integrating concerns and building consensus in an often complex and contentious process. For the foreseeable future, the Management Conference has recommended continuation of the existing management structure, at least until a different approach is sanctioned by the Policy Committee.

APPENDIX L

Response to Public Comments

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I. Introduction

The public comment period for the draft Comprehensive Conservation and Management Plan (CCMP) began September 16, 1999 and ended November 16, 1999. Afternoon and night public hearings in each of the six East End towns took place in October. Over 160 people attended these meetings. In addition, The Bay Show, a live television call-in show on channel 27, dedicated a show to the draft CCMP; a few people called in with questions. The Citizens Advisory Committee met near the beginning and end of the comment period to offer suggestions. Other comments from citizens have come in the mail to the PEP Program Office.

Three new sections of the CCMP (the Base Programs Analysis, Environmental Monitoring Plan, and Federal Consistency Report) were presented for public comment from August 10, 2000 to September 9, 2000. An afternoon and an evening public comment meeting were held at the County Center in Riverhead.

Summaries of the public comments and the resulting PEP responses are located in Section II. Section III lists all the correspondence that was sent during the public comment periods. All letters received during the comment periods are on file at the Program Office.

II. Public Comment Summaries and Resulting PEP Responses

Several comments and questions were raised at the public hearings and by letters sent in during the public comment period. These issues are summarized and satisfied below.

Brown Tide

Radionuclides/ Brookhaven National Laboratory

Comment: At several sessions, commentators from Fish Unlimited, Standing for Truth About Radiation, and the South Fork Groundwater Task Force raised questions about the possible relationship between radionuclides, toxics, and brown tide. These issues are of concern to these groups, particularly with respect to contamination associated with Brookhaven National Laboratory (BNL). For example:

* A 1994 release of tritium was cited as a potential causal factor for the brown tide.
* A conflict of interest is suspected, in that BNL is conducting brown tide research.

Response: The detail in which radionuclide and toxic contamination, and BNL are discussed in the Toxics chapter of the CCMP has been expanded. The CCMP Toxics module now includes more discussion about the extensive programs dealing with the characterization and management efforts related to BNL and the Peconic River (see discussion below, in "Toxics"). A report released by the Peconic Estuary Program since the public hearings entitled *A Characterization of the Resources in the Peconic Estuary with Respect to Toxics* further addresses these issues.

To the knowledge of the PEP, the scientific community, to date, has not produced a credible theory that links radionuclide contamination and brown tide. This is based on several factors, including the appearance of the brown tide in several locations (not just the Peconic Estuary) dating back to 1985. Also, there has been a recent global increase in harmful algal blooms. Moreover, there does not appear to be a hypothesis that offers a mechanism by which relatively low-level radioactive contamination can result in onset or persistence of brown tide.

The Peconic Estuary has aggressively pursued this question, however. Brown Tide Research Initiative researchers were asked at the March 2000 brown tide work session hosted by the New York Sea Grant whether the onset and/or persistence of the brown tide may be related to, or caused by, radioactive and/or toxic chemical contamination associated with BNL, such as the 1984 release of tritium. The researchers, who are closest to the latest findings about brown tide, did not seem to think this hypothesis was viable based on personal knowledge of relevant studies, personal expert opinion based on well-established scientific principles, and discussions with third parties.

Researchers are already actively analyzing water column and sediment samples for metals and other trace contaminants. The research will determine level of presence, and possibly offer clues to potential impacts.

A PEP priority for the year 2001, the Brown Tide Workplan will be revisited, and will be amended to reflect the results of latest research, and to indicate priority research and monitoring needs. The revised Workplan will consider radionuclides, toxics, and other issues.

Regarding the suspected conflict of interest (i.e., that Brookhaven National Lab is hypothesized to be a cause of the Brown Tide, but it is conducting brown tide research, as well), BNL is performing an extremely small portion of ongoing Brown Tide research and monitoring. In recent years, they have received approximately $250,000, as compared with a Brown Tide pool of research funding which totals well over $3 million dollars. Also, the BNL researchers are widely acknowledged and respected as world-class biologists and oceanographers. Finally, BNL is not in a position to direct research efforts. The BTRI (the source of most Brown Tide research funds) is administered by NOAA and N.Y. Sea Grant, and includes a steering committee with representatives from government, academia, and citizenry (not BNL). Modest funding is also provided by Suffolk County, with no control by BNL.

Nutrients

Wastewater Treatment Plants

Comment: Continue controlling loads from sewage treatment plants (STPs) and discourage new plants.

Response: As a long-range management goal, the PEP will continue to evaluate additional upgrades to the STPs in the Peconic watershed. Action N-4 in the CCMP states that new or incremental point source increases to the surface waters of the tidal Peconic River and western Flanders Bay should be prohibited and should be limited elsewhere in the Peconic watershed. The surface water point source nitrogen freeze applies to all facilities, including the sewage treatment plants at Brookhaven National Laboratory and the former Grumman plant. Point sources that cause substantial groundwater degradation that adversely affects surface waters should also be limited.

Comment: Modify the SPDES permits for STPs to meet nitrogen-loading goals.

Response: The PEP has an action in the CCMP to consider modifying the State Pollutant Discharge Elimination System (SPDES) permits for STPs and other point sources in the Peconic watershed in order to meet the PEP's proposed surface water quality nitrogen guideline of 0.45 mg/l.

Comment: Evaluate and consider a beneficial reuse program for reclaimed STP water and sludge for possible use on golf courses, playing fields, and farms.

Response: The Program added a step to Action N-4 to evaluate and consider a possible beneficial reuse program in the Peconic watershed. Water reuse is beginning to gain acceptance in New York State. The NYSDEC has permitted four upstate STPs to use treated wastewater to irrigate nearby golf courses and a study group formed to assess the feasibility of water reuse on the Pt. Washington peninsula in Nassau County.

Comment: The trend to ultraviolet light disinfection is important.

Response: The use of ultraviolet light, an alternative to the traditional method of chlorination, to disinfect effluent from Sewage Treatment Plants, safeguards the public from pathogens and eliminates the negative environmental impacts to our surface waters. Ultraviolet light is an effective germicide because it mutates the DNA of the pathogenic organisms, resulting in death. The PEP funded a successful on-site pilot study at the Shelter Island Heights Sewage Treatment Plant to determine the effectiveness disinfecting the effluent using UV sterilization. The Brookhaven National Lab and the Plum Island Sewage Treatment Plants use an ultraviolet disinfection process. Switching from chlorination to ultraviolet light disinfection is planned for the Riverhead and Sag Harbor STP upgrades.

Septic Systems

Comment: Emphasize financial incentives for on-site disposal system improvements.

Response: A step included in Action N-5 calls for investigating feasible implementation

mechanisms and developing a plan to prevent increases and encourage decreases in nitrogen in groundwater underflow due to on-site disposal systems (sanitary systems). One of the many mechanisms for sanitary system management already recommended in the CCMP is tax credits and other incentive programs.

Comment: Promote innovative and alternative sanitary systems.

Response: The PEP agrees that promoting innovative and alternative sanitary systems, like Clivus Multrums, is another good way to prevent increases and even encourage decreases in groundwater underflow due to sanitary systems. This mechanism is already mentioned in the CCMP.

Comment: Evaluate use and effectiveness of septage management districts.

Response: The use of wastewater management districts or utilities was added as another possible mechanism for sanitary system management in Action N-5.

Fertilizers

Comment: Create financial incentives to reduce fertilizer use.

Response: The PEP already included tax credits and other incentives programs as a mechanism for fertilizer management.

Comment: Evaluate restrictions on the sale and/or use of some products (e.g., liquid fertilizers).

Response: The PEP agrees that market-based measures coupled with a regulatory approach would accomplish a significant reduction in fertilizer use. Restricting the sale and/or use of some fertilizer products has been added to the possible mechanisms for fertilizer management listed in the CCMP.

Comment: Promote organic and/or slow-release fertilizers (tax on inorganic fertilizers; public relations such as endorsements of good products; education of retailers and consumers, etc.).

Response: The PEP agrees that advocating organic and/or slow-release fertilizers may help control the degradation of our watershed's groundwater quality. This recommendation has been added to CCMP's list of possible mechanisms for fertilizer management. Promoting certain fertilizers could be done with a tax on inorganic fertilizers, public relation endorsements of "good" products, and educational campaigns for retailers and consumers.

Agriculture

Comment: Promote organic farming.

Response: The Program agrees that promoting organic farming should be included in the implementation plan for regional nitrogen load reductions. The final CCMP will incorporate this addition.

Comment: Agriculture preservation goals need clarification (e.g., balance of agriculture vs. residential growth).

Response: There is an overwhelming public desire to preserve the East End's farmland and agricultural traditions, as evidenced by the recent voter-approved farmland preservation programs. Also, the PEP Economic Value Assessment study found that the public was willing to pay more for farmland preservation than several other environmental programs. Thus, the PEP operates under the presumption that farmland preservation goals will be met, and deals with nitrogen loading issues associated with farmland through the Agricultural Nitrogen Management Work Group.

Golf Courses

Comment: Discuss golf courses specifically, including impacts and investigations.

Response: A recent SCDHS study investigating groundwater impacts entitled *Water Quality Monitoring Program to Detect Pesticide Contamination in Groundwaters of Nassau and Suffolk Counties, NY* (1999) has found that the golf courses examined were not having major, adverse environmental impacts with respect to nutrient loading, particularly as compared with traditional row crop farms. The 1999 report documented the testing of 31 wells at 18 Long Island golf courses and found that the average nitrate concentration was 4.3 mg/L (the median nitrate concentration was 2.6 mg/L), which is the equivalent of a housing density of less than one residence per acre. At agricultural sites, the 1999 study found an average nitrate concentration of 11.7 mg/L and the SCDHS 1996 study entitled *Nitrate and Pesticide Impacts of Agriculture on Groundwater Quality Suffolk County, NY* found a 20 year nitrate average of 11.3 mg/L. Turf management practices at golf courses do effectively limit nitrogen inputs, however, monitoring should continue, as should aggressive golf course BMP implementation.

The SCDHS conducted a follow-up study in 2000 with an expanded list of analytes and with new monitoring wells at five more courses in the county, including Shinnecock, National, and Maidstone. Preliminary data suggests that nitrogen is well controlled. The NYSDEC has been funding the monitoring program for three years at about $100,000 per year. The NYSDEC recently agreed to a three-year one million-dollar commitment with the SCDHS to expand the monitoring program.

Nitrogen Model and Nutrient Criteria

Comment: Emphasize specific nutrient standards for which the plan will propose to manage, and include strategies proposed for implementing such objectives, including permitting requirements.

Response: The appropriate Nitrogen Management Work Groups and the Management

Committee will consider specific nutrient standards for groundwater inputs, along with strategies for attaining these standards.

Comment: Evaluate reversal of Shinnecock Locks to allow better flushing of Flanders Bay.

Response: The three-dimensional hydrodynamic and water quality model of the Peconic Estuary includes a connection between Great Peconic Bay and Shinnecock Bay through the Shinnecock Canal. Preliminary runs of the model indicated that improved flushing of the Peconic Estuary would occur if changes were made to the operating characteristics of the tide gate at Shinnecock Canal. Preliminary analysis by the Suffolk County Department of Public Works indicates that changes to the Shinnecock Canal tide gate system are feasible (e.g., flow can be reversed to improve Peconic Estuary flushing), but the costs would be on the order of several million dollars. More detailed engineering and environmental impact studies would be required prior to supporting such a major expenditure. The PEP has recently contracted Tetra-Tech, Inc., to address the primary threshold questions of environmental impacts: the degree of improvement in Peconic Estuary water quality that could be attained by management alternatives, coupled with associated impacts that would result in Shinnecock Bay.

Comment: Focus on tailoring nitrogen-loading targets to subwatersheds in the estuary.

Response: The PEP recently contracted Tetra-Tech, Inc., to upgrade the existing three-dimensional hydrodynamic and water quality model of the Peconic Estuary to include new information on nonpoint source and groundwater flows and nutrient loads with a focus on smaller watersheds. The contractor will use the model to address concerns regarding nutrient impacts on Flanders Bay, and several peripheral creeks and embayments, including Meetinghouse Creek, West Neck Bay, and Sag Harbor.

Comment: The PEP should spend more money on developing and implementing management initiatives, rather than on modeling/assessment.

Response: The PEP believes that the modeling and assessment are necessary prerequisites to establishing effective regional planning and management strategies, and that these efforts have already reaped rewards in terms of policy changes (e.g., point source nitrogen freeze) and early implementation. The PEP recognizes the need for early implementation, as evidenced by the 55 early demonstration and implementation projects using $11 million in federal and state funds. Moreover, tens of millions more have been committed by the County and Towns, as discussed in the CCMP. These implementation funding sources are orders of magnitude higher than the moneys used for characterization and modeling. As the program matures, yet additional resources will be placed on developing and implementing tangible management initiatives at the subwatershed level, through programs such as the Subwatershed Management Plans.

Comment: Solicit and use peer review in refining and using monitoring data and nitrogen management tools.

Response: The PEP will continue to incorporate the PEP Technical Advisory Committee and external peer review in the modeling development and application process, which includes dependent analyses of water quality and pollution input studies. As the model process is completed, the PEP will continue to solicit and use the TAC and external peer review in developing programs and interpreting and applying data.

Living Resources

Comment: Better discuss the impacts of nutrients on eelgrass.

Response: Text was added to the introduction of the Nutrients Module to explain that increased nutrient enrichment causes increased microscopic algae production that decreases water clarity and diminishes the amount of light received by rooted aquatic plants. Submerged aquatic vegetation that are at a species' depth limit for clear water conditions would be expected to decline due to the lack of sufficient light energy in turbid waters. Eutrophication will also increase the growth of epiphytes on eelgrass blades, again shading the plant itself and hindering production. Furthermore, species such as red or green macroalgae, which adsorb nutrients more quickly than eelgrass, may competitively exclude eelgrass plants.

Comment: Focus on nutrient levels with respect to bay productivity. Is there too little nitrogen in the system?

Response: To the knowledge of the Peconic Estuary Program, the scientific community and environmental managers, to date, do not believe that there is too little nitrogen reaching the waters of the Peconic Estuary. Nitrogen is critical for sustaining the marine ecosystem, but can be harmful to the estuary at excessive levels. The process by which a water body becomes over enriched with nutrients and associated organic carbon, called eutrophication, may result in dissolved oxygen stresses that are harmful to marine life. Ecological stresses are already prevalent in the estuary due to nitrogen, including extensive macroalgae blooms (e.g., Ulva), areas of high sediment oxygen demand rates, and areas of dissolved oxygen depression.

Given the concerns of some citizens, the Peconic Estuary Program has posed this question to Brown Tide Research Initiative (BTRI) researchers for consideration with respect to brown tide. At this point, there does not appear to be a hypothesis that offers a mechanism by which low levels of nutrients could result in the onset or persistence of brown tide.

Comment: The plan may focus too much on nitrogen and dissolved oxygen.

Response: Long-term shifts in an ecosystem are likely due to subtle changes in the environment over an extended period of time. Nitrogen and dissolved oxygen measurements are immediate tools with which resource managers can identify differences in water quality. Nitrogen and dissolved oxygen measurements are also "integrators" of pollutant inputs, reflecting organic carbon overenrichment and other contaminants. The Peconic Estuary

Program is involved in other ways to monitor water quality, including monitoring eelgrass beds and coordinating brown tide research efforts with respect to nutrients. Ultimately, the Living Resources Research and Monitoring Plan will develop long-term monitoring and assessment techniques for evaluating nitrogen impacts on food web dynamics.

Comment: Participate actively in the Pine Barrens process.

Response: The Peconic Estuary Program closely coordinates its activities with the Central Pine Barrens Planning Commission. In addition, the same agencies and levels of government serve on the Central Pine Barrens Planning Commission and Peconic Estuary Program committees, including the NYSDEC, the Suffolk County Executive's Office, and town representatives.

Habitat and Living Resources

The Natural Resources Subcommittee (NRSC) of the PEP reviewed all public comments pertaining to habitat and living resources. While the comments were numerous, the NRSC identified several key topics that were repeatedly raised both at the public meetings and in letters. Since there was considerable overlap among these comments, they were reduced into sub-categories within the following main sections of the Habitat Chapter: 1) critical natural resource areas; 2) shoreline hardening; 3) dredging; 4) aquaculture; 5) finfish/shellfish; 6) habitat restoration; and 7) research and monitoring.

Critical Natural Resource Areas

Question: What was the scientific basis and criteria used to select the CNRA boundaries?

Response: The CCMP has been revised to better reflect the CNRA process and sources of information used to form the CNRA boundaries (see: HLR-1). However, the NRSC recognizes that improvements to the existing data for underwater lands are needed, and has recommended that additional bottom mapping using state-of-the-art techniques be employed. Once the data is analyzed, modifications to the underwater boundaries should then be made. Some examples of data that were used for the CNRAs are: the NYS Heritage maps, Federal endangered species lists, NYS Coastal Significant Fish and Wildlife maps and local input from the towns. Reference will also be made to the Living Resources Characterization report, which contains a detailed description of the natural resources of the estuary.

Question: How will the CNRAs be implemented and coordinated?

Response: The NRSC recommended that the PEP host a Critical Natural Resource Area Workshop. The aim of the workshop is to bring the various levels of government together to clarify the intent of the CNRA designation, develop an implementation strategy and update/revise the current language in the CCMP. At a minimum we will include the following workshop objectives within the CCMP chapter as a **new** step.

Workshop objectives:

a) Provide the background & ecological information for the CNRA boundaries (including new surveys such as underwater mapping).
b) Review existing regulations for natural resource protection at all governmental levels.
c) Determine how protection of CNRAs are related to the existing regulatory framework.
d) Determine what level of designation is necessary/appropriate for CNRAs.
e) Discuss commonalities that the towns share with respect to their needs and interests.
f) Determine uses of this designation and whether it should be on the State, County, Town level or some combination of them.
g) Determine implementation strategies
h) Plan the next steps

Shoreline Hardening

Comment: The CCMP did not provide adequate evidence that shoreline hardening structures (e.g., bulkheads, docks) have a negative impact on habitat and living resources. Shoreline hardening should, in some instances, be encouraged because they don't always have a negative impact to the resources.

Response: The PEP maintains that shoreline hardening structures can negatively impact marine habitats and biota. A recent example of negative impacts from such structures in the Peconics was demonstrated in a study on eelgrass beds by the National Marine Fisheries Service (a critical habitat for shellfish and finfish in the estuary) in Lake Montauk, where a dock structure was built over them. This study showed evidence that the eelgrass beds that were shaded by the dock died back. Although there are few studies specific to the Peconic Estuary, there is ample evidence from investigations in other areas that demonstrate the negative impacts of structures such as: bulkheads, seawalls and docks to the natural resources (e.g., loss of beach and shallow-water habitats, disrupting connectivity of land and sea, habitat fragmentation). Reference to such studies will be listed in an unbiased review of the literature that is currently underway (i.e. studies that show no effects of such structures to natural resources will also be included).

Comment: Regulations should be reviewed and revised to make shoreline-hardening structures more difficult to obtain.

Response: The CCMP has been modified and now calls for a comprehensive review of State, County and Town regulations as well as an update/review of the NYS Coastal Policies has been included in the Habitat chapter. It is hoped that strategies will be developed to strengthen current policies (particularly within CNRAs). A recent example of a shoreline hardening management plan that the PEP supports is the Town of East Hampton's proposed Coastal Legislation. A description of this proposal has been included in the Habitat Chapter.

Comment: The policy of "no-net increase" of shoreline hardening structures is unrealistic. Basic inventories of existing structures and their location in the estuary are needed to properly develop management strategies.

Response: The PEP maintains its support of the Citizens Advisory Committee's

recommendation for a policy of "no-net increase" of shoreline hardening structures. Known impacts from shoreline hardening structures to the natural resources warrant such a strategy. However, the PEP also realizes that the current environmental regulations actually allow for an increase in much of the watershed. The PEP also acknowledges that data for existing structures is necessary to properly develop and implement such a plan, and incentives to remove existing bulkheads are also necessary for such a policy to actually succeed. A shoreline hardening inventory was performed for the entire estuary in the spring/summer 2000; all existing structures will be digitally mapped. This data will be used to further refine the recommendation of "no-net" increase of bulkheads in the estuary. The Habitat Chapter has also been modified accordingly to reflect this (section: HLR-2).

HLR-2.4 has been modified as follows:

> Develop a variety of financial incentives and programs to encourage property owners to remove or modify hardened shoreline structures and replace them with natural vegetation and other vegetated (bioengineered) alternatives to restore the natural shoreline of the Estuary.

A new step for shoreline hardening structures was also included in the CCMP under (HLR-2):

HLR-2.2 Review existing regulations for shoreline hardening structures at all levels of government, encourage consistent policies and strengthen regulations where appropriate.

Dredging

Comment: There is concern that the Peconic Estuary is being proposed as a dredge material disposal site. The EPA and the Army Corp of Engineers have a commitment to the public to tell them if the contaminated dredge material is going to be dumped in Montauk or the Peconics. Management policies should be set in the Peconics so that contaminated dredge materials cannot be dumped there.

Response: There is a Draft Environmental Impact Statement being developed by the United States Army Corps of Engineers for designation of dredge material disposal areas for the Long Island Sound. This will include the Peconic Estuary and Block Island Sound. Site selection criteria are currently being developed (e.g., water depth, habitat, etc.) and will be presented to the public to comment on as well as to comment on the scope of the potential dredge areas and upland disposal areas. It is expected that most shallow waters will be eliminated from this list, including those of the Peconics. The PEP will provide information (e.g., habitat data, endangered species, etc.) to the Corps during the site selection review process to ensure that the importance and significance of the Peconic Estuary is clearly demonstrated and that the maximum levels of protection are sought.

Comment: Will the dredge summit include all appropriate parties involved with dredging?

Response: While the exact format of the summit remains to be determined, the PEP is a

consensus building program and will, therefore, include all interested parties (regulatory and non-regulatory) to the workshop. It is hoped that the forum will lead to the development of a comprehensive dredging plan for the estuary the minimizes impacts to important resources, while considering the needs of businesses that depend on dredging, and the concerns of others.

Aquaculture

Comment: Finfish and shellfish culture are associated with different types of impacts and the CCMP should reflect this. Additionally, the aquaculture activities that are currently undertaken in the estuary are primarily small-scale (shellfish). The Habitat chapter gives the impression that it is primarily large-scale (finfish) culture that occurs in the Peconics, which is not the case.

Response: The Habitat chapter has been revised to better reflect these concerns in the text. Further discussions through workgroups that deal with the regional planning of aquaculture in the Peconic Estuary should be encouraged to discuss the different impacts of all types of aquaculture activities and how best to manage them in the estuary (See Action HLR-10). In addition the following actions have been added to the chapter:

HRL-10 The text has been revised to reflect the two main types of aquaculture; shellfish and finfish aquaculture that take place within the estuary and the different impacts associated with each. The text has been revised to emphasize the smaller-scale shellfish culture that occurs within the estuary, rather than on the single large-scale finfish culture facility located in Gardiner's Bay.

HLR-10.2 Calls for identifying areas where intensive aquaculture should be avoided. This has been reworded to identify areas where shellfish and/or finfish aquaculture are appropriate/suitable.

Comment: Under action HLR 10.2 a $500,000 survey is proposed. What type of survey would this be?

Response: This is a rough estimate for the costs of an acoustic benthic mapping survey of the entire estuary, including tidal creeks. As stated below in the Habitat Restoration Workgroups comments, the benthic habitats/communities/resources in the Peconic Estuary are poorly documented, and such mapping would not only help PEP best determine where aquaculture activities are most compatible with the water quality and habitat objectives in the CCMP, but also be useful for critical natural resource mapping and watershed management.

Habitat Restoration

Question: Why were an overwhelming majority of habitat restoration sites from the South Fork?

Response: The Habitat Restoration Workgroup did not select habitat restoration sites internally. The Workgroup conducted a public nomination process and disseminated information on the process through a variety of outreach mechanisms, including: a mass

mailing, interviews on The Bay Show, a presentation to the PEP Citizens' Advisory Committee and a press release published in a variety of regional and local newspapers. The majority of nominations received by the Workgroup during Round One of this process were sites located on the South Fork. The Workgroup attempted to rectify the under-representation of North Fork sites during Round Two by conducting additional outreach in North Fork municipalities and groups, and by providing assistance to potential site nominators. As a result, during Round Two, 24 North Fork sites were nominated, out of a total of 26 new nominations. These nominations can be found in the report entitled *Habitat Restoration Plan for the Peconic Estuary*.

Comment: There are osprey nesting platforms in East Hampton that need to be straightened or replaced. Specifically, there is one at the end of Breeze Hill Road in East Hampton that needs to be looked at.

Response: In East Hampton, most osprey platform construction and maintenance is conducted by Larry Penny, Director of the East Hampton Natural Resources Department. The Habitat Restoration Workgroup recommends that inquiries regarding osprey platforms in East Hampton be directed to the Natural Resources Department. Inquiries regarding osprey platforms located on county or state properties should be directed to the appropriate Suffolk County or New York State agency.

Comment: There should be a wetlands restoration summit/technical workshop to talk about techniques, applications and monitoring. Restoration can be done cheaper than people think.

Response: The Habitat Restoration Workgroup agrees that information sharing is valuable and will consider setting up a workshop for municipalities. The Workgroup will also provide technical assistance through components of the PEP Habitat Restoration Plan, including a compilation of completed restoration projects throughout the estuary, descriptive narratives for particularly instructive projects, and profiles of restoration techniques used in different habitat types. The Workgroup will also participate in the Environmental Protection Agency's Restoration Project Database (see http://www.epa.gov/owow/wetlands/restore/) to increase the accessibility of information about Peconic Estuary Program projects. For more focused training, the Workgroup suggests that municipal staff research the wide variety of existing technical workshops and courses offered regularly through organizations such as Environmental Concern, Inc. We also will encourage workshops on native plantings that are beneficial to the Peconic watershed.

Comment: For reef restoration, people seem more concerned with the turtles and marine mammals than with fish. The focus needs to be more on the fish.

Response: The Habitat Restoration Workgroup does not consider artificial reef construction in the Peconic Estuary to be "restoration". This type of habitat does not naturally occur in this area and therefore, would be considered habitat creation. The impacts of artificial reef construction in areas where they do not naturally occur need to be carefully considered for all aquatic species because they will potentially result in significant alterations to the existing

system. Sea turtles and marine mammals are given particular attention because most of these species are listed as federally endangered or threatened. This does not preclude the PEP's concerns regarding other marine species.

Comment: The CCMP should cover deepwater habitat restoration for fish. The CCMP needs to go beyond shallow reefs.

Response: Knowledge of the characteristics of deepwater benthic habitats in the Peconic Estuary, as well as knowledge of historical conditions in these environments, is extremely limited. The Habitat Restoration Workgroup feels that these limitations currently preclude efforts to conduct habitat restoration in deepwater areas. However, it is hoped that benthic mapping of the entire estuary will someday lead to a better understanding of these deeper areas and possibly result in such restorations. Benthic mapping efforts are currently in the planning stages and are expected to be implemented in 2001.

Comment: A new trend in wetlands protection is the concept of offsetting the loss of wetlands at particular building sites through wetland banking. The wetland banks are mechanisms by which damaged or degraded wetlands can be restored or enhanced and then credits can be sold to property owners whose building projects will impact wetlands. Wetland banking should be encouraged as a source of funding for wetland restoration work.

Response: The Habitat Restoration Workgroup does not feel comfortable recommending the use of wetland banking in the Peconic Estuary. Some people believe wetland banking encourages destruction of wetlands and leads to a decline in overall quality of wetland ecosystems. Wetland banking works best for extremely large projects, the impacts of which are unavoidable for logistical reasons, *e.g.*, construction of transportation corridors. This technique has not been employed in the Peconic Estuary region to date and is probably not appropriate given the types of development most common in our area.

Comment: Setting a wetland restoration goal (acres of wetlands and SAV to be restored) for the Peconics would be an important tool for the program.

Response: The information (primarily historical) needed to accurately set an acreage-based goal for restoration of either wetlands or submerged aquatic vegetation is currently not available for the Peconics. However, PEP has set some preliminary restoration objectives in the measurable goals section of the Habitat Chapter. These are: 1) Maintain current eelgrass acreage (approximately 2,100 acres) and increase acreage by 10% over ten years, and 2) Maintain a policy of no new mosquito ditches and not re-opening ditches that have filled in by natural process, and restore 10-15% of mosquito ditched marshes through Open Marsh Water Management. The Habitat Restoration Workgroup will attempt to refine quantifiable goals for these habitat types as additional information is acquired.
Comment: Something else is killing eelgrass, other than brown tide.

Response: While there are many factors that are suspected to have contributed to the decline of eelgrass beds, one of the most prominent is decreased water clarity from algal blooms

such as brown tide or other light decreasing factors (e.g, increased turbidity from suspended solids). When light levels are inadequate, eelgrass (a rooted vascular plant) is no longer able to photosynthesize and eventually dies off (see: Nutrients Chapter). While PEP does not have definitive proof of what has caused these die-backs of eelgrass in the Peconic Estuary, evidence from studies done in other estuaries indicate that increased nutrients and runoff from land-based activities has negatively impacted their eelgrass beds. The PEP & NRSC are constantly searching for other pathways as identified in the literature, and continues to seek funding to study and monitor the eelgrass beds in the estuary. One suggested mechanism is the linking of groundwater influxes to eelgrass viability, since groundwater is a major contributor of freshwater inputs into the Peconic ecosystem. We have also included the following new action to reduce impacts to eelgrass beds:

Added **New** Step: HLR-6.3 Evaluate anchor dragging and propeller scaring and other known impacts to extant eelgrass beds in the Peconic Estuary and develop recommendations to reduce them.

Comment: Some facts about *Phragmites* are misstated in the CCMP.

Response: Recent evidence from research on wetland plants suggests that *Phragmites* sp. has positive habitat values. While typically considered a nuisance species (see Habitat Chapter for discussion) management plans should also consider the value of *Phragmites* such as sequestering of nutrients, bird and fish habitat, waterfowl screening, etc.. Such values have been added to the text in the Habitat Chapter, but in cases where *Phragmites* is outcompeting other valued wetland species, we will consider removal of it as restoration of wetlands (e.g., restricted tidal flow areas, dyked channels, etc.).

Marine Fish

Question: How does the CCMP address the Magnuson-Stevens Fishery Conservation and Management Act's essential fish habitat designations?

Response: The National Marine Fisheries Service (NMFS) has designated the Peconic Estuary as Essential Fish Habitat. The NMFS handles these designations and coordinates with other Federal agencies regarding project/activities that are proposed within these areas to avoid or minimize impacts associated with them to fish habitat. The PEP is fully aware of this designation and we support its use on regulating activities that can cause impacts to the marine fish populations in the estuary. However, as mentioned above, review of proposed projects are primarily coordinated at the Federal level. The CCMP's overall consistency with this designation will be included in our base programs analysis. We have included the following **new** action in support of these designations in the CCMP:

HLR-12.6- Support NMFS Essential Fish Habitat Designations within the Peconic Estuary.

Comment*:* The effect of blocking tributaries is detrimental to anadromous fish reproduction and various food chain species. Tributaries should be cleared of blockages.

Response: The Natural Resources Subcommittee and the Habitat Restoration Workgroup have identified blockage of tributaries as primary targets for restoration efforts. These have been noted in the CCMP and also in the Habitat Restoration Plan for the estuary. A recent example of such restorations in the estuary was the creation of a fish-ladder for the headwaters of the Peconic River in Riverhead. This effort has restored spawning grounds for alewife, which they had lost access to due to the installation of dams in the past.

Comment: The CCMP needs to discuss striped bass, lobsters, squid and dogfish for their management.

Response: While the PEP and Natural Resources Subcommittee are concerned with the quality/abundance of marine finfish species within the Peconic Estuary, it is not the role of the PEP to manage fisheries. There are other programs that focus on fisheries management that the PEP supports. New York State is one of 23 partners of the Atlantic Coastal Cooperative Statistics Program, that cooperatively collect, manage and disseminate fishery statistical data that is compiled by the National Marine Fisheries Service. Furthermore, many of the species that are mentioned above are transient species in the estuary and therefore, are subjected to fishing pressures and impacts in other coastal and offshore waters. The PEP's CCMP recommendation is to foster sustainable recreational and commercial finfish and shellfish uses of the Peconic Estuary that are compatible with biodiversity protection (HLR-12).

Shellfish

Comments: In the 1960's there was a steady and incremental decline of fish and shellfish in the Peconics. Oysters should be in the CCMP. In the 70's and 80's there was a marked decline in scallops on the western side of Shelter Island before brown tide hit. Oysters are the most sensitive barometers of the bays.

Response: Oysters are discussed in the CCMP in the Habitat and Pathogens Chapters. While oysters were primarily introduced to the Peconic Ecosystem for culturing purposes the PEP and Natural Resources Subcommittee recognize the significance of shellfish in general within the Peconic Estuary. While many of the Actions throughout the CCMP are aimed at improving water quality and habitats for shellfisheries, the NRSC has also decided to include the following **new** action within the CCMP:

NEW ACTION: HLR-17 Establish a working group to examine the role of grazers and filter feeding organisms in influencing water quality and productivity, and to better understand the food web dynamics and to develop management applications.

Shellfish (i.e., hard clams, soft clams, bay scallops, and slipper shells) are vital to the Peconic estuary both ecologically and commercially. Shellfish can filter large volumes of bay water over relatively short time periods. They have the potential to affect water quality and exert significant influence on the size, type and abundance of phytoplankton. Conversely, changes in phytoplankton species composition have the potential to affect shellfish diversity and abundance. With the advent of brown tide, reduction of duck farms, changes in habitat (e.g.,

invasive species) and harvesting; shifts can occur in shellfish diversity, temporal and spatial distribution and abundance. Preliminary brown tide research findings by Caron and Lonsdale have resulted in a working hypothesis that the rapid decline in the shellfish population prior to the first brown tide in the Peconics may have led to significant reduction in grazing pressure on phytoplankton, thereby allowing the onset of brown tide. A shellfish working group is necessary to examine these issues more closely and develop recommendations to improve shellfish resources in the estuary and promote sustainable harvesting of these species.

Issues for examination by the Shellfish Working Group could include: 1) understanding the relationship of grazer and filter-feeder diversity and abundance with phytoplankton diversity and abundance, 2) how to enhance shellfish and finfish stocks to accommodate harvesting while also maintaining sufficient populations that are adequate to fulfill ecological functions, and 3) need for collaboration between related Peconic Estuary efforts such as BTRI, water quality modeling, aquaculture regional plan work group, and finfish monitoring.

New Steps include:

HLR-17.1 Review appropriate scientific literature, identify information gaps, and develop research recommendations regarding how shellfish, finfish and other "top-down" predators influence water quality and the planktonic community.

HLR-17.2 Develop research, monitoring and assessment needs for quantifying food-web dynamics.

HLR-17.3 Develop food-web sub-models to be included in the nutrient model to evaluate the sensitivity of productivity to anthropogenic changes in nutrient supply.

HLR-17.4 Consult with the Brown Tide Research Initiative (BTRI) and Aquaculture work group to develop management recommendations for "top-down" regulation of water quality and brown tide in the Peconic Estuary.

HLR-17.4 Facilitate communication among BTRI, water quality managers and aquaculture work group.

Research and Monitoring

Comments: The development and implementation of a robust research and monitoring program, particularly for the living resources is critical. A resource-based research and monitoring program should be developed and implemented. The food-web of the estuary needs to be characterized. Also, how the food-web has been impaired by man-made chemicals entering our waters needs to be researched. Research should look at how harmful chemicals impact life in the water column (e.g., fish larvae).

Response: The Marine Resources Conservation Planner for the PEP has developed (jointly with the Natural Resources Subcommittee) a Living Resources Research and Monitoring Plan for the Peconic Estuary. Topics already identified by the PEP Natural Resources Subcommittee for inclusion in the plan address questions about finfish spawning, larval development, and recruitment to the fishery; population dynamics of the benthic communities of the system; distribution, abundance, and growth, including habitat use and preference, by juvenile and forage fish; and the links among these different components of

the food web.

One of the monitoring needs identified by the PEP includes monitoring eelgrass by aerial photographic interpretation, appropriate groundtruthing, periodic mapping, and other surveillance techniques to adequately assess trends in eelgrass distribution, abundance and overall health. Given the recent decline in eelgrass beds over the last decade, a long-term commitment to eelgrass monitoring is essential to provide adequate management, preservation, and restoration measures. Additional assessment, research and monitoring needs identified by the PEP include the following: 1) impacts of macroalgae and toxic contaminants on eelgrass distribution and abundance 2) distribution, abundance, habitat preferences, and life stage requirements of forage fish species, horseshoe crabs, slipper shells, bay scallops and hard clams, 3) critical spawning habitats for local populations of winter founder, 4) benthic habitat mapping, 5) assessing and monitoring the impacts of shoreline hardening on habitat and living resources and 6) effects of sea level rise on saltmarshes.

The research and monitoring plan is currently being released for external peer review. Once this process is completed and the document revised, it will be formally adopted by the Management Committee and released.

Other Comments

Comment: Step HLR-1.9 should be rewritten. Better wording may be "help marinas with more creative storage areas so they do not have to expand into tidal areas".

Response: This is a useful recommendation and wording has been included to consider such recommendations as part of the more comprehensive strategy dealing with shoreline hardening, marinas, docks and public access.

Question: What are the mosquito control recommendations in the CCMP for Open Marsh Water Management? Should ditches in marshes be filled in or kept open? How should we balance ditching marshes, pesticides, and mosquitoes?

Response: The PEP recognizes that mosquito control is important to public health and safety. Ditching was employed in the past to drain the marshes of standing water, to reduce mosquito-breeding habitat, and is primarily handled by Suffolk County Vector Control (as well as insecticide spraying). However, in many areas these ditches caused excessive drainage of tidal wetlands at low tide, disturbing the natural functioning of the marsh. Although diminution of standing water was thought to reduce the populations of mosquitoes, it is now thought that the pools actually provide habitat for small finfish (killifish) which eat mosquito larvae. Over the past few years, Suffolk County Vector Control (SCVC) has discontinued its practice of creating new ditches and switched to implementing Open Mash Water Management (OMWM) to restore marshes to their former state and control mosquito populations. The PEP supports this policy (HLR-5 and HLR-8). Furthermore, the PEP encourages better coordination between SCVC and all other agencies and Towns for maintenance of existing ditches and planning of mosquito control practices in wetlands. The

PEP would like to see a region-wide plan developed for mosquito control practices in the Peconics that are effective at reducing mosquito populations and environmentally compatible. We have modified HLR-5.3 and added HLR-5.4 as follows:

HLR-5.3 Maintain and enforce the policy of creating no new mosquito ditches in tidal wetlands and establish a policy for not re-opening ditches that have filled-in by natural processes.

HLR-5.4 Ensure that SCVC works cooperatively with all government agencies, East End towns and local conservation organizations in the planning of wetland mosquito ditch maintenance and pesticide spraying.

Final Note: Minor editorial changes were made throughout the text to improve the overall flow and content of the document, as well as to reflect recent projects that have occurred in the estuary since the initial draft. Additionally, some figures have been modified as suggested by the comments received.

Pathogens

Question: Is there a Difference between Human and Avian Coliforms?

Response: Yes, there is a difference between the coliform bacteria generated by birds and humans. A study conducted by the Suffolk County Soil and Water Conservation District pursuant to Section 208 of the Federal Water Pollution Control Act Amendments of 1972 contained a comparison of coliforms produced by humans, ducks and chickens. The following information was excerpted from the *Animal Waste Characteristics* section of this report:

ESTIMATED PER CAPITA CONTRIBUTION OF INDICATOR MICROORGANISM

Animal	Fecal Coliform [FC] (millions)	Fecal Streptococcus [FS] (millions)
Humans	2,000	450
Ducks	11,000	18,000
Chickens	240	620

(Note: The ducks used in this study were semi-wild White Pekin. The report noted that the amount and characteristics of waste produced by semi-wild ducks is similar to that produced by White Pekin ducks.)

The Peconic Estuary Program supports efforts that are geared toward distinguishing wildlife from human coliform sources (See DNA library Action P-12) since they will assist in defining loading pathways into the estuary, and therefore, improve management strategies to reduce these loadings. However, it is not necessary to separate human and animal coliforms

for shellfish sanitation management. Shellfish sanitation is concerned with monitoring the total concentrations of coliforms (i.e., both wildlife and human coliforms) in the environment.

Question: Do Pathogens affect Wildlife other than Shellfish?

Response: Yes, pathogens can affect wildlife. Pathogens are described in the CCMP as "viruses bacteria, algae and protozoans that cause disease in humans, plants and other animals". Some examples of pathogens other than coliforms that affect wildlife in the marine environment are "gray crab disease" *(Paramobea perniciosa)* associated with crab mortalities and the dinoflagellates *Alexandrium tamarensis* and *Gymnodinium breve* which are known to be responsible for fish kills. *Alexandrium tamarensis,* commonly referred to as "red tide" produces a toxin (*saxitoxin)* which has been linked to mass mortalities in a variety of marine organisms from finfish to marine mammals such as whales.

The Peconic Estuary Program recognizes that pathogens can affect wildlife other than shellfish, but since shellfish have the greatest potential to transmit these pathogens to humans our management actions are focused on these organisms. Furthermore, the PEP management strategies aimed at reducing pathogen loadings throughout the estuary may be beneficial to all forms of wildlife and not just limited to shellfish.

Comment: The report should recommend the monitoring of not only *Alexandrium tamarense* (a toxic dinoflagellate known to cause shellfish poisoning), but also *Pfiesteria piscicida*.

Response: Alexandrium tamarense and other harmful algae such as *Pfiesteria piscicida* have been found in the Peconic Estuary. While these organisms have not caused any problems to date, the PEP recognizes their (potential) risks to human health and safety and encourages increased monitoring throughout the estuary (See Action P-15). The Pathogens Chapter has also been updated to include the following information about existing and planned monitoring programs:

The NYSDEC Shellfish Sanitation Unit has a *Marine Biotoxin Contingency Plan* in place for monitoring *Alexandrium tamarensis,* but does not routinely test for this organism or any other organism responsible for a Harmful Algal Bloom (HAB). The state of Connecticut actively tests for HAB's from April through November. The Suffolk County Department of Health Services currently monitors for the presence of *Pfiesteria* at fifteen sites, three of which are located in the Peconic Estuary. This monitoring is a cooperative effort with the NYSDEC and is being conducted with funds from a Federal program. The PEP supports that monitoring for the presence of *Pfiesteria* in the Peconic Estuary be continued and expanded (See Action P-15).

Additional changes to the Pathogens Chapter
Note: Editing changes that were minor in scope are not included here.

1) The box on Page 5-4 ("Shellfish Bed Closures") has been revised substantially under the heading "Administrative Closure" to more accurately reflect current DEC management classifications.

2) Page 5-11: "Point Sources of Pathogen Contamination". We have included the following statement: "The Corwin Duck Farm's NYSDEC SPDES permit allows the facility to discharge to surface waters only in the event of an extraordinary rainfall (e.g., a ten year storm)".

3) Table 5.2 has been updated to include the Calverton (former Grumman facility) sewage treatment plant.

4) Plum Island sewage treatment plant also employs UV sterilization.

5) A section describing the potential harm to human and wildlife from *Alexandrium* (red tide) and *Pfiesteria* has been included in the text prior to the section on "Management Actions".

6) Action P-1 has been substantially revised to better reflect the new stormwater regulations for New York State.

7) Action P-7 has been updated to reflect the most recent agreements that have been reached for the Vessel Waste No Discharge Zone.

8) Action P-15 has been revised to include increased monitoring for the red-tide organism *Alexandrium* and other harmful algal blooms.

9) All tables have been updated to reflect recent commitments, time-frames, costs and status.

Toxics

Treated Lumber

There were many comments regarding treated lumber. These included comments to:

- include a discussion of treated lumber in the CCMP;
- study the effects of the wood in the marine environment;
- monitor waters for chemicals used in treated lumber;
- identify if there are areas where sediments have been contaminated by treated lumber;
- review existing studies on treated lumber and potential impacts and share this information with stakeholders;
- Investigate alternatives to treated lumber;
- promote natural materials as alternatives (i.e., locust or cypress lumber);
- address potential problems with using vinyl or plastic as alternatives;
- provide financial incentives (i.e., via taxes) for using alternatives;
- develop regulations to require the complete removal and proper disposal when treated lumber structures are demolished; and

- ban or restrict the use of treated lumber

Based on these comments, the final CCMP includes a discussion of treated lumber and contaminants associated with its use. Chemicals associated with treated lumber will continue to be included in monitoring efforts and the effects of treated lumber and associated chemicals (as well as other toxics) is included as an element in the PEP research and monitoring plan. The CCMP includes a step to develop model guidelines regarding the placement of treated lumber in the marine environment and supporting non-toxic structures, based on existing studies and potential impacts, and consistent with the PEP's overall policy of no net increase in shoreline hardening structures. These guidelines will address natural materials as alternatives, potential problems with using vinyl or plastic as alternatives, and the disposal of treated lumber following demolition. This information will be shared with stakeholders. Based upon the available information, at the present time, the PEP is not recommending an outright ban on the use of treated lumber, but does support restoration to natural shoreline features, natural alternatives and products, and providing incentives for removing treated lumber (and other shoreline hardening structures). Financial incentives for the removal of or alternatives to shoreline hardening structures are discussed on the Finance Chapter of the Plan.

Stormwater

There were numerous comments regarding storm water with respect to toxics. These included comments to:

- Stop road runoff from all contributing points and address needs for storm drain management and catchment maintenance, including some specific named sites and to prevent the expansion of a particular business enterprise where contaminated runoff was suspected of being an issue;
- Fast-track stormwater management projects and the likely high costs of doing so;
- Encourage the use of permeable surfaces for driveways instead of blacktop;
- The need to review past stormwater abatement projects; and
- The need to reevaluate standards and guidelines for construction projects to ensure that future projects work properly.

One commentor suggested postponing all stormwater remediation work until the PEP Regional Stormwater Management Plan was prepared.

In general, the Peconic Estuary Program management conference members and the CCMP recognize that stormwater needs to be managed and that remediation will be an expensive proposition. A Regional Stormwater Management Plan is being prepared and will address issues such as the identification of contributing sites, the need for storm drain and catchment maintenance, coordination of efforts at all levels of government, as well as review past abatement projects, and standards and guidelines for construction projects. The CCMP also recognizes the need to address land uses and activities that contribute contaminants to runoff, including paving materials as well as the need to identify, develop and implement programs to reduce pollutant loadings. In general, the PEP believes that stormwater remediation projects currently underway do not need to be put on "hold" until the Regional Stormwater

Management Plan is prepared as they are likely to involve appropriate remedial technologies; any significant concerns would likely be addressed through the permitting process.

Radionuclides/Brookhaven National Laboratory

Several commentaries addressed the issue of radionuclides and operations at Brookhaven National Laboratory (BNL). Comments included the need for: an expanded discussion of Peconic Estuary related issues regarding BNL; monitoring of the river and estuary for radionuclides, including sampling sediment, fish, and fish bones; investigating the bioaccumulation of radionuclides and other contaminants from BNL in humans; describing the results of sampling that has already taken place, particularly for plutonium; and considering the synergistic human health effects of multiple radioactive contaminants, particularly for impacts on pregnant women and children.

The CCMP now has a greatly expanded discussion of the historic contamination at BNL and downstream impacts, and discusses activities that have taken place to characterize the contamination and risks. Once the results of EPA's1999 fish sampling has been evaluated, additional sampling may be conducted, potentially including fish bones and sediments. Finfish and shellfish sampled by EPA in 1999 are being analyzed for radionuclides. This analysis will be completed on the edible portion (according the NYSDOH guidelines), which does not include the whole fish or fish bones. Contaminants in whole fish or fish bones are a concern for certain sub-populations, including certain ethnic groups and subsistence anglers. For this reason, the CCMP includes a step in the Education and Outreach Chapter for the continuation and expansion of dissemination of fish and wildlife consumption advisory information, which includes suggestions on how to reduce exposure to contaminants through certain preparation and cooking methods. Remedial investigations that are conducted under Superfund characterize the potential for radionuclides to bioaccumulate in humans and clean-ups are proposed where contamination results in risks above acceptable levels. Results of sampling and risk assessments that have been completed (including sampling for plutonium) are presented in the CCMP and the companion document, *A Characterization of Toxic Substances in the Peconic Estuary and its Watershed* (PEP, January 2001). The results of some sampling efforts, including sampling that EPA has completed for the PEP, are not yet available. The results are expected in 2001. The Superfund risk assessments that have been completed consider the cumulative risk for exposure to multiple contaminants, including radionuclides, under various future use scenarios. No specific procedure exists at the present time to consider any special risks imposed on pregnant women an children, beyond the conservation risk and toxicity assumptions incorporated in existing criteria formulation methodologies.

Other commentaries suggested: the PEP have a position on the operation of the high flux beam reactor at BNL, a relationship between operations at BNL and Brown Tide, and that BNL pay for citizens' financial losses due to contamination of the Peconic River. A decision has been made to permanently shut down the high flux beam reactor at BNL. At present, there is no plausible hypothesis relating Brown Tide and operations at BNL; this is discussed further in the Brown Tide section of this response document. The contamination of the Peconic River is being addressed under the Federal Superfund program, which is the

appropriate venue to address the issue of citizens financial losses, rather than the National Estuary Program.

One commentor suggested that two additional sources of radionuclides be listed in table 6.1: naturally occurring radionuclides and fall-out from atmospheric nuclear weapon tests. These sources are now noted in the CCMP. This commentor also noted that the reference to the NYSDEC remedial action threshold for tritium provides guidance only for evaluating radioactively contaminated soil clean-up plans, and not to the radioactive contamination of water or fish. This has been corrected in the final CCMP.

One commentor recommended that the CCMP include a recommendation that there be a full investigation and report concerning the radioactive contamination in the Peconic Estuary, and what the investigation should entail. The PEP will continue to monitor actions under Superfund at BNL through its member agencies (principally the USEPA, NYSDEC, and SCDHS) and will participate in oversight of the eventual remedy for the site. The PEP will also fully evaluate the results of all sampling, including fish tissue sampling that EPA completed for the PEP. Based on an evaluation of the results of all these efforts, PEP will determine if any additional efforts regarding the radioactive contamination of the Peconic Estuary is warranted.

A commentor asked for the final CCMP to indicate that the BNL sewage treatment plant utilizes ultraviolet disinfection for its sewage treatment plant effluent; this has been done. Another commentor suggested that research being completed at BNL is important and the contamination is small. The PEP is concerned with all releases of toxic substances to the environment and therefore supports continuing efforts at BNL to clean-up historical contamination and take all appropriate steps to eliminate or significantly reduce ongoing discharges to the environment.

Pesticides and Herbicides

Comments regarding pesticides included suggestions to:

- Include additional information on the presence of pesticides in the estuary;
- Include information on pesticide investigations, including a map depicting pesticide contamination of groundwater, if possible;
- Ban (especially at the state level) the use of destructive chemicals, most artificial pesticides - including at a minimum the 30 detected in Suffolk County wells which are not banned already, and Malathion which is used for mosquito control;
- Include in the table of “toxics of concern in the Peconic Estuary System” pesticides impacting groundwater, and include the name of every pesticide and pesticide metabolite identified as contaminating groundwater in cited reports;
- Investigate connections between pesticides and eelgrass decline, and discuss the potential effects on pesticides in groundwater may be having on shellfish larvae;
- Investigate if DDT (now banned) is still impacting resources;
- Increase the annual estimated cost of conducting pesticide clean sweeps to $150,000;
- Implement measures to reduce mosquito populations that do not involve spraying, especially the pesticides Malathion and Anvil, and for the PEP to take a position on

the issue of spraying for mosquito control; also NYSDEC and NYSDOH should be added as responsible entities for the action regarding mosquito control;
- Identify golf courses as contributors to pesticide (and nitrate) contamination; forcefully address herbicide use on golf courses;
- Reduce toxic loadings (including pesticides) from private homes; identify residences as contributors to pesticide (and nitrate) contamination;
- Encourage organic pest control;
- Add a new step to develop and implement IPM programs that manage pests with minimal impact on human health and the environment; the appropriate entities were also identified;
- Reduce agricultural pesticide use;
- Recognize and reconcile possible conflicts between applying more restrictions to agricultural operations and public support for farmland preservation, public desire to preserve rural character, and the importance of agriculture to local quality of life and economy, including tourism;
- Support lawsuits against pesticide companies;
- Impose a "sin tax" or "fee" on pesticides; and
- Have manufacturers of toxic substances fund research projects in the Peconics;

The final CCMP includes an expanded discussion of pesticides, includes sources, impacts, and recent data on levels in groundwaters and surface waters. Revisions/clarifications to the table of "Toxics of Concern in the Peconic Estuary System" have been made. The PEP has not added any additional pesticides to the list of toxics of concern, but the final CCMP does list 47 pesticides detected in Suffolk County wells in two recent groundwater studies. The final CCMP provides summaries of these two studies, but does not include maps associated with those studies, as the studies themselves should be consulted by those interested in that level of information. The CCMP now includes a new step for the state to "restrict or ban pesticides whose residues are frequently detected at levels of environmental or public health concern in groundwater or the estuary." The PEP is not calling for any additional substances to be banned at this time, though this may occur in the future. The CCMP also includes language recognizing a potential connection between pesticides and eelgrass decline, and discusses the potential effects pesticides in groundwater may be having on fish larvae. As described in a step in the Habitat and Living Resource Chapter, the PEP supports further investigations of these two areas of concern through inclusion in the Long Term Research and Monitoring Plan. The CCMP also describes some recent investigations suggesting that DDT and its breakdown products, through historical and possibly current sources, may be impacting resources and that further investigations are perhaps warranted. If continuing sources of DDT to the environment are documented, this supports the continuation of "Clean Sweep" programs for the proper collection and disposal of pesticide products. As suggested, the annual estimated cost of conducting pesticide clean sweeps has been increased to $150,000.

The PEP is also not recommending against the use of Malathion or Anvil for mosquito control at this time. In a CCMP step, the PEP supports a reduction in the use of insecticides for mosquito control to the maximum extent practicable that still adequately protects human

health, and considers limiting adverse impact on the environment in pesticide selection. The CCMP also recommends good housekeeping methods of control, such as eliminating/reducing standing water that functions as breeding sites. The NYSDEC and NYSDOH have been added to the list of responsible entities for this step. The PEP is also pursuing "open marsh water management" (OMWM) as a potential means of mosquito control (in addition to habitat restoration and possibly stormwater control) that does not involve the use of pesticides but rather natural systems, in locations where it is appropriate. OMWM is described in the Habitat and Living Resources Chapter of the Plan.

Additional information is now provided identifying golf courses and residences as contributors to pesticide (and nitrate) contamination. The CCMP includes language calling for the implementation of integrated pest management programs and specifically highlights Suffolk County's IPM pesticide-free golf course initiative. The Public Education and Outreach Chapter contains a step calling for endorsement, adoption and implementation of "environmental Principles for Golf Courses in the United States" by all golf courses in the study area. The CCMP also discusses how the implementation of BMPs on golf courses can reduce groundwater contamination. Similarly, the Public Education and Outreach Chapter contains a step calling for the implementation of program aimed at eliminating or reducing domestic pesticide use.

The final CCMP includes a new step to develop and implement IPM programs that manage pests with minimal impact on human health and the environment; the appropriate entities were also identified for this step. This is intended as a means of encouraging organic pest control. Other steps in the Toxic and Public Education and Outreach Chapter are intended to support "organic" pesticide operations, such as supporting organic agricultural operations, pesticide free golf courses, implementing IPM program on public lands, and eliminating or reducing pesticide use at residences.

In addition to the steps in the draft CCMP regarding reducing agricultural pesticide use, the final CCMP includes an additional step calling for the USDA to develop and implement a comprehensive agricultural pesticide management proposal. This step, in addition to others regarding reducing overall pesticide use seek to lessen the potential impacts. These steps include development of the Long Island Pesticide Management Plan, comply with the Federal Coastal Zone Act Reauthorization Amendments section 6717(g) requirements regarding agricultural pesticides in the coastal zone, carrying out regular "Clean Sweep" programs to properly collect and dispose of unwanted pesticides, developing and implementing IPM programs, and banning or restricting pesticides under certain circumstances. Also, the Critical Lands Protection Plan of the final CCMP addresses the need to establish a connection between the agricultural operations and pesticide use, including pesticide usage when development rights are being purchased. It is likely this will continue to be a topic of discussion during the development and Implementation of the Agricultural Environmental Management Strategy (see also Appendix H of the CCMP).

The Finance Chapter of the final CCMP includes a step proposing the investigation of establishing selective sales fees for pesticides (and fertilizers). Fees collected would fund

environmental management programs. The PEP is not recommending that manufacturers of toxic substances fund research projects in the Peconics, though the Program is interested in any potential connections between pesticide use and eel grass declines or impact on fin fish and shellfish and their larvae. The PEP is not recommending lawsuits against pesticide companies.

Boat Engines/Personal Water Craft ("Jet Skis")

Comments regarding boat engines and personal water craft (i.e., "jet skis") were to:

- Address the problem of 2 stroke marine engines;
- Identify fuel from motor boats as a direct and local source of PAHs;
- study the pollution potential of exhaust from motor boats; and
- Curtail the use of "jet skis" in the estuary.

The final CCMP includes a detailed discussion of the pollution impacts of marine engines, including how impacts are lessened with cleaner burning 4 stroke (vs. 2 stroke) engines. The Finance and Public Education and Outreach chapters discuss incentives for switching to 4 stroke engines. In the CCMP table of "Pollutants of Concern" boat wet exhaust is identified as a source of PAHs. Poor fueling practices is also identified as a potential source of pollutants (PAHs) in both the Toxics and Education and Outreach Chapters. While the CCMP does not include a specific recommendation for the PEP to study exhausts from boats, discussion is included on studies and findings at the national level. Local studies, if determined to be warranted, could be included in the research plan being prepared. The Toxics Chapter does not specifically address the issue of personal water craft ("jet ski") engines, but marine engines generally, which includes personal water craft. The Habitat and Living Resources chapter includes some anecdotal information regarding the adverse impact of personal water craft (on marshes and other otherwise generally inaccessible habitats), though the PEP is not making recommendations to curtail their use in the estuary at this time, the issue of personal water craft use is being reviewed under authorities beyond the Peconic Estuary Program.

Underground Storage Tanks

Comments regarding underground storage tanks were to:

- Discuss Article 12 of the Suffolk County Sanitary Code, which addresses toxic and hazardous material storage (including underground storage tanks) in the CCMP;
- Describe the potential problem of home heating oil tanks and financial incentives to replace older tanks;
- Include an action in the final CCMP regarding oil tanks, and that steel storage tanks are
- not desirable; and
- Include information on evidence of petroleum leaking into the estuary from old storage tanks.

The final CCMP now includes a discussion of Article 12 of the Suffolk County Sanitary Code, which addresses toxic and hazardous material storage (including underground storage tanks). The CCMP also includes a discussion of the potential problems associated with

home heating oil tanks not meeting code requirements for new installations in the Toxics Chapter. This includes a discussion of the current county requirements regarding these tanks, including the requirement that tanks be constructed of non-corrodible materials. Limited information is also included on tank leaks. A step establishing a voluntary replacement program of underground oil tanks is included in the Public Education and Outreach Chapter, and financial incentives for replacement/removal are discussed in the Financing Chapter. The Toxics Chapter includes a step to determine the adequacy of the voluntary program and make a determination as to whether a regulatory program should be instituted watershed wide or in particular areas.

"Superfund" Sites

Comments regarding the former Naval Weapons Industrial Reserve Plant (NWIRP) site, also known as the Grumman Calverton facility, were to:

- Identify the NWIRP site as a toxic concern, and expand the discussion of this site due to the existing contamination and potential to effect the Peconic River and Estuary;
- Clarify the status of this site with respect to Superfund's National Priorities List;
- Participate and provide input to the clean up effort, and participate in meetings of the Navy's Restoration Advisory Board; and
- Describe the status of the facility's RCRA permit.

Other Superfund related comments addressed: the status of the Long Island Fisherman Building (the former power generating plant by Baron's Cove); and the EPA decision that "no further action is necessary" at the North Sea Landfill Superfund Site in light of the continued presence of hazardous substances in Fish Cove.

The final CCMP includes an updated and expanded discussion of the former Naval Weapons Industrial Reserve Plant (NWIRP) site, due to its potential to contribute pollutant loadings to the Peconic River and Estuary. However, this site is not presently on the Federal government's National Priorities List under Superfund; clean-up and investigations are being conducted under the corrective action program of the Federal Resource Conservation and Recovery Act (RCRA). The PEP will continue to monitor actions at the NWIRP through its member agencies (principally the USEPA, NYSDEC, and SCDHS) and participate in oversight of the eventual cleanup of the site. At the present time there are no plans for the PEP to participate directly except through its member agencies. The status of the facility's RCRA permit is described in detail in the final CCMP. The most recent RCRA permit for this facility was issued on April 24, 2000 and will expire on April 30, 2010.

Specific information regarding the Long Island Fisherman Building (the former power generating plant by Barron's Cove) in Sag Harbor has not been included in the final CCMP. This site is not a federal Superfund site on the National Priorities list; the PEP will, however, address any concerns regarding this site in the future. Regarding the North Sea Landfill, the final CCMP contains updated information, now stating that EPA is requiring the Town of Southampton to conduct additional benthic community and sediment toxicity testing, and that based on the results of that sampling, the current Superfund remedy may be evaluated. This is also reflected in the revised step addressing the North Sea Landfill site in the Toxic

Chapter.

MTBE

Comments regarding the gasoline additive MTBE were to: ban MTBE from gasoline, immediately; seek alternatives to MTBE remediation; and notify residents in the event of an MTBE spill.

The final CCMP now discusses MTBE in detail, including actions underway to reduce or eliminate its use; this information is also reflected in a step supporting regulatory actions to reduce/eliminate the use of MTBE in gasoline. The final CCMP does not specifically address the issues of alternatives to MTBE remediation or notifications of residents in the event of an MTBE spill; the PEP believes these issues are adequately addressed though ongoing and existing programs, though the PEP may become involved in this in the future.

Boating

Comments regarding boating included the need to address the issue of boat bottom paint, as any area where boats were traditionally stored and maintained is likely to have soil contamination.

The final CCMP includes a discussion of the issue of boat bottom paint, and a step to identify past and present boatyards as potential sources of heavy metal contamination to the estuary.

There was also a comment regarding the use of gasoline motors on Peconic Lake (also called Forge Pond), concerns regarding parking in the area, and enforcement of local laws regarding gasoline engine use on the lake. The Peconic Estuary Program is not aware of any state or local laws in effect prohibiting the use of gasoline engines on this waterbody. Neither the Program nor the CCMP is recommending any restrictions on gasoline engine use at this location at this time

Monitoring and Testing

Comments regarding monitoring included suggestions to: Describe current and recent sampling efforts;

- Test fish in the Peconic River for bioaccumulation of organochlorine substances, as well as test fish bones in addition to fish muscle when analyzing freshwater and saltwater fish;
- Test Peconic Estuary sediments for toxics and radionuclides, especially near the Riverhead Sewage treatment Plant outfall;
- Study pollution from the aviation industry;
- Study toxics that might be coming into the estuary from the shellfish depuration program;
- Study the effects of pollutants, even trace doses, on larval stages of aquatic life; and
- Look into the high rates of breast cancer on Long Island.

The final CCMP includes an expanded discussion of current and recent sampling efforts for toxic contaminants. As discussed under the heading “Radionuclides/Brookhaven National

Laboratory" in this response document, once the results of EPA's 1999 fish sampling analysis have been evaluated, additional sampling may be conducted, potentially including fish bones and sediments. The 1999 EPA fin and shellfish sampling for the PEP was of marine and estuarine species rather than freshwater species. As described in the CCMP, analyses are being performed for a full suite of chemical and radiological parameters. Finfish and shellfish sampled by EPA in 1999 will be analyzed for radionuclides, though analysis will be on what the NYSDOH considers the edible portion, which does not include the whole fish or fish bones. Freshwater fish were sampled and analyzed for a full suite of chemical and radiological parameters as part of the remedial investigation under Superfund for Operable Unit V at Brookhaven National Laboratory. As indicated in the final CCMP, EPA has committed to ongoing support in the form of sediment sampling, testing and analysis for chemical specific analyses as well as overall toxicity. The 2001 sampling effort will likely include analyses for radiological parameters for a subset of the samples collected as part of an initial characterization; candidate sampling locations for 2001 included the area around the Riverhead sewage treatment plant outfall in the tidal Peconic River.

Potential pollution from aviation industry sites is not currently described in the CCMP, however the PEP will keep this sector in mind under various steps contained in the CCMP, including those addressing RCRA inspections, environmental sampling and the development of pollution prevention strategies for particular areas or industry sectors. Any new or emerging concerns can also be identified through key regulatory agencies participating in the PEP management conference. The PEP does not believe that toxics that might be coming into the estuary from shellfish depuration program are a significant concern at this time and no specific steps addressing this potential source have been included in the CCMP. Studying the effects of pollutants, even trace doses, on larval stages of aquatic life has been identified as a concern and this has been addressed in the Habitat and Living Resources Chapter of the Plan; there is a specific step calling for research of lethal, sub-lethal and synergistic effects of toxic contaminants. The CCMP does not specifically address the issue of breast cancer or breast cancer rates. The PEP, through its member agencies, will continue to participate efforts to investigate breast and other cancers, and will take appropriate action based on findings. The CCMP does include numerous steps which can serve to reduce loadings of toxic substances and support clean-ups of contaminated areas.

Toxics: Miscellaneous Sources

Comments regarding other sources included:

- Toxics in paving materials are a concern; alternatives to current materials should be sought;
- Resources should be provided for regular inspections of retail stores to enforce the ban on the sale of illegal on-site disposal system products (deodorizers, drain cleaners, and cesspool additives); and
- The Plum Island sewage treatment plant should be included in the list of point source discharges to the study area.

Though not recognized as a significant source of toxics, the PEP sees the potential for impacts from paving materials and the CCMP includes steps to reduce the potential for toxic loading from road construction and operation/maintenance. The CCMP also highlights

provisions of the Town of East Hampton's Harbor Protection Overlay District requiring parking lots and driveways have unimproved surfaces or be constructed with certain specified materials and recommending these measures be adopted in other parts of the study area. The PEP would also entertain other or more specific management recommendations regarding paving materials. The CCMP now includes a step recommending that there be regular inspections of retail stores to enforce the ban on the sale of illegal on-site disposal system products (deodorizers, drain cleaners, and cesspool additives). The CCMP has also been revised to include the Plum Island sewage treatment plant in the list of point source discharges to the study area.

Placement of Long Island Sound Dredged Material

Comments regarding dredged material placement focused on the potential for dredged material from the Long Island Sound to be placed in the Peconics, and the recommendation that such placement should not occur, as well as the need for adequate testing of and stringent criteria for the placement of dredged material.

The CCMP now describes how EPA and the U.S. Army Corps of Engineers have identified the likely need to continue marine placement of dredged material in the Long Island Sound Area. In 1999, the EPA in cooperation with U.S. Army Corps of Engineers issued a notice of intent to prepare an environmental impact statement to consider the potential identification of one or more placement sites for Long Island Sound dredged material. EPA and the Corps have decided to consider the use of four existing sites and their identification as dredged material placement sites under Section 102(c) of the Marine Protection, Research and Sanctuaries Act. Other alternatives will also be evaluated, including other open water placement sites and other placement and management options. Identification of a site does not itself result in placement of any particular material, it serves only to make the site a placement option available for consideration in the alternatives analysis for each individual dredging project in the area. The PEP participants consider it unlikely a placement site will be proposed within the PEP study area. The final CCMP includes a step calling for the PEP to participate in the EPA/Corps efforts to identify potential placement sites for Long Island sound dredged material. The final CCMP also continues to stress the need for critical evaluation of applications and permits for dredging and dredged material placement.

Toxics: General Comments

Other comments regarding toxics included:

- Toxics were not adequately addressed in the draft CCMP;
- A request for a description of the standards that were used for the characterization of toxic substances in the Peconic System;
- The section of the draft CCMP on risk based criteria should be rewritten in a clearer manner or taken out;
- Stop the introduction of toxics into the Peconic Estuary; and
- Controls on toxics should include education/outreach, bans in sensitive areas, and taxes;

Overall, the Toxics Chapter has been greatly expanded, including the description of the standards that were used for the characterization of toxic substances in the Peconic System. A separate Characterization Report and expanded bibliography are also available. Additional steps for reducing toxics are also included in the Public Education and Outreach Chapter of the CCMP. The section of the draft CCMP on risk based criteria has been rewritten in a clearer manner. The final CCMP includes many steps to eliminate or reduce the introduction of toxics into the Peconic system, requiring efforts by government agencies, organizations, businesses, and the public. Methods for implementing these steps include education and outreach efforts, regulatory means (including bans), and providing financial incentives through tax programs and the use of selective sales fees.

Other Revisions

In addition to the changes described above, additional objectives have been specified in the Toxics chapter, including: measuring the levels of toxics in the environment to discern trends in environmental quality and to determine the effectiveness of management programs; eliminating where possible, and minimizing where practicable, the introduction of toxic substances to the environment, through regulatory and non-regulatory means; and where toxic contamination has occurred, ensuring that clean-ups occur quickly, and according to the most appropriate and stringent environmental standards. Improving the quality of drinking water and sediments is also now included in the objectives. Measurable goals have also been developed and included for the Toxics Chapter.

Further:

- Copper has been added as a "Toxic of Concern" in the Peconic Estuary System due its presence in Peconic River sediments from historic discharges at BNL;
- Descriptions of previous pesticide "clean sweep" programs have been included;
- There is an expanded discussion of nonpoint sources of pollution, particularly for urban and suburban areas, and of the Town of East Hampton's Harbor Protection Overlay District;
- There is new language regarded dredging and dredged material placement;
- The current memorandum of understanding between EPA and the Department of Energy regarding the facility-wide environmental management systems at BNL is described;
- A description of operations at the Plum Island Animal Disease Center is now included.
- Groundwater quality criteria are discussed;
- Two recent studies discussing ambient water quality in the Peconic River and Estuary are described; and
- EPA's recent sampling efforts of sediments and fin fish and shellfish tissues are described.

Land Protection

Comments regarding establishing a focus in the final CCMP for land protection included:

- that a land protection and development chapter should be created in the CCMP, and that the CCMP should be clear in outlining its objectives for the amount of land that should be protected throughout the basin;
- that a separate land use/management chapter should be created; topics could include Critical Natural Resource Areas, developmental trends, an analysis of current land use and the build out potential; and
- that a new chapter entitled "Critical Lands Protection Plan" should be created in the CCMP. The proposed chapter should include a land acquisition plan, zoning, land use planning, environmental review, and a regulatory framework.

The final CCMP includes a separate chapter addressing the protection of critical lands. The final Plan does not establish a numeric objective in acres for land to be preserved, but rather describes a process for identifying and prioritizing land to be protected, and the steps necessary to ensure that critical lands are protected. This chapter in the final CCMP also discusses integration with the Critical Natural Resource Areas discussed in the Habitat and Living Resources Chapter and other efforts/studies that have taken place under the Peconic Estuary Program, including identification of current land uses, development trends and build out potential, and the development of land management tools (other than outright acquisition), including but not limited to zoning, land use planning, environmental review, and regulatory processes.

Specific suggestions were made to:

- produce land use overlays for vacant, preserved, agriculture, wetland, residential, suburban, and urban areas;
- include in the CCMP an assessment of land use trends occurring in the region with additional attention to the way in which such trends (i.e., developmental pressure and nitrogen application) may be expected to impact water quality and public usage;
- Create a watershed management plan for the five East End towns;
- Produce a watershed management plan for the North Fork and Shelter Island, similar to the South Fork's;
- Require, through the CCMP, all the East End Towns to complete a Local Waterfront Revitilization Plan (LWRP);
- Pay particular attention to shoreline development. Undeveloped shoreline should have priority in open space acquisition programs;
- Place restrictions on heavy land uses near delicate waterways and curtail asphalt paving near delicate waterways;
- Include a discussion of setbacks in the CCMP and have homeowners and officials in government consider setbacks in site planning (zoning) because of sea level rise and other factors; and
- Coordinate the findings and actions of the CCMP with SCPD reviews, particularly with respect to zoning, building, and wetland matters on Shelter Island.

The land use overlays suggested by the commentor have been prepared. Unfortunately, it was not possible to include them in the final CCMP. The program hopes to make this information available in the public summary; it is available in various Peconic Estuary

Program Reports and in large map form in the Program Office. The Critical Lands Chapter of the final CCMP and various supporting reports includes information on land use trends. This information together with the water quality/hydrodynamic model will be used to predict how the estuary will react in response to various development and land use scenarios. The final CCMP is a form of watershed management plan for the five East End towns, however it is possible and desirable for specific watershed plans on a smaller scale to be developed and the program would support any such effort. The development and implementation of subwatershed plans for embayments, tidal creeks and other waterbodies is included as an action in the Post-CCMP Management Chapter of the final CCMP. The south fork watershed management plan primarily addresses drinking water issues. The National Estuary Program does not focus on drinking water issues, though many actions in the CCMP would likely be compatible with drinking water source protection and management plans. The final CCMP does not require towns to develop local waterfront revitalization plans, though the Peconic Estuary Program encourages the development and implementation of such plans, and recognizes the incentives that are available to do so. The CCMP recognizes the importance of activities, particularly development, that take place on the shoreline. Many actions throughout the final CCMP address shoreline protection concerns. The Town of East Hampton's Harbor Protection Overlay District is presented as a model for managing waterfront properties, including certain land uses and asphalt paving. Proximity to the waterbodies is discussed in the final CCMP as a criterion in setting acquisition priorities. The use of setbacks as a tool for protecting lands is discussed in both the Critical Lands Protection and Habitat and Living Resources Chapters of the final CCMP to address sea level rise and other factors. The Peconic Estuary Program, through the CCMP envisions the coordination of findings and actions with existing review processes, such as those of the Suffolk County Planning Department, with respect to zoning, building, and wetland matters on Shelter Island and throughout the watershed and study area.

More generally, there were comments that: land acquisition is important; open space needs to be preserved; and also that the Peconic Estuary Program is treating the Peconic Watershed as sacred land.

The Peconic Estuary Program agrees that land acquisition is an important tool in protecting the estuary, and that open space needs to be preserved in order to support the environmental, cultural, and economic features that make the estuary and its watershed significant. The basis for this is provided in the final CCMP. The Program and the final CCMP recognizes that humans are part of the estuary system. The Program and CCMP also recognizes that sustainable development in the watershed is both possible and necessary.

Public Education and Outreach

Comment: Public education and outreach is important. The Internet web site should be used to disseminate information, scientific findings should be publicized more often and there should be a newsletter to communicate information about the Estuary Program.

Response: These ideas were included in actions such as Establish and Promote an Information Resource Center (including a web site) and Convene an Annual State-of-the-Bays Conference. The Program Administration description in the Implementation Chapter now also specifically includes the preparation and distribution of a periodic newsletter/status report that will include information on scientific findings. It was also suggested that the public be educated through media advertising. The CCMP recommends using a variety of approaches and media for education and outreach campaigns, including print, radio and television. (PE-1, PE-6, PE-18, PE-10, PE-15)

Comment: Some of the actions in this chapter are written too broadly. Realistic, specific education goals should be set that can be attained in designated time frames. Should the purpose of public outreach be to cause or create support for the CCMP and its recommendations?

Response: In the final CCMP, we have identified priority actions and have provided additional specificity to actions that were too broad. The Management Conference also believes that actions, once in the final plan and agreed to by the Management Conference have been sufficiently subjected to review to be appropriate for public support. (PE-11, PE-12, PE-13)

Comment: Well-established and successful public environmental education programs exist and should be expanded to include more estuarine-related subjects.

Response: The CCMP now recognizes the existence of such programs and includes and action stating that such existing effective programs should continue. (PE-5)

Student Involvement

Comment: Students should be involved (monitoring, replanting, educating the public, etc.) in carrying out the Plan.

Response: Several actions in the draft and final Plan are aimed at the involvement of students. These include d-POE-1.1, Continue/expand the Annual Peconic Children's Conference, and d-POE-6.4, Continue/expand the PEP Youth Advisory Committee. In the final CCMP, students and school groups are now also encouraged to participate in habitat restoration projects. The final CCMP also has a new action in the Public Education and Outreach Chapter regarding volunteer monitoring. The Accabonac Protection Committee offered to provide a project leader to start water quality testing with local high school students in the East Hampton area. The Final CCMP identifies the Accabonac Protection Committee as a responsible entity in this new action. (PE-9, PE-16)

Fertilizers

Comment: Create an aggressive consumer-based education campaign for reducing fertilizer use.

Response: While Action N-5.3 in the nutrient chapter of the draft CCMP addressed the need

to improve the quality of groundwater with respect to nitrogen to prevent increases and encourage decreases due to domestic fertilizer use, a specific public education and outreach action addressing residential fertilizer use reduction was not in the draft CCMP. The Public Education and Outreach Chapter in the final CCMP now includes such an action. (PE-2, PE-17b)

Waterfowl

Comment: The education program identified in the draft CCMP discouraging feeding of waterfowl should also identify the problem of feeding gulls, and that scraps of bread left for gulls also attract crows. Gulls and crows are predators of endangered colonial nesting birds.
Response: Two actions in the Public Education and Outreach Chapter now specifically address this issue, the action regarding the feeding of waterfowl and the education program for terns and plovers now more generally address the more general problem of feeding wildlife. (PE-7)

Toxics Management

Comment: Make launching an aggressive consumer based pesticide use reduction campaign a priority.

Response: While several actions in the draft plan were intended to include education and outreach activities to eliminate or reduce pesticide use, a specific public education and outreach action addressing residential pesticide use reduction was not in the draft CCMP. The Public Education and Outreach Chapter in the final CCMP now includes such an action.

Comment: The program should identify environmentally safe products (soap, food, and pesticides) on the market today.

Response: The CCMP now reflects the need to identify such products in various education and outreach efforts, such as the Ultimate Users Guide and other pollution prevention materials. (PE-17a, PE-4)

Comment: Information regarding finfish, shellfish and wildlife consumption advisories should be in both Spanish and Greek.

Response: The CCMP now identifies these two target non-English speaking groups as well as the need to identify other potential audiences. (PE-8)

Comment: Better inform the public of the serious an irreparable damage that occurs when people are exposed to even low level radiation from the ingestion of food and water contaminated with radionuclides.

Response: The final CCMP also includes a commitment to discuss the issue of radioactivity in any materials specifically developed for the Peconic Estuary Program regarding fish and water consumption. (PE-14)

Pollution Prevention

Comment: The North Fork Environmental Council stated it would be launching an education campaign called “Go Organic 2000".

Response: This type of effort was envisioned by the action in the CCMP regarding pollution prevention education and outreach activities. (PE-3)

The CCMP now includes a description of the public participation process that was followed for soliciting input on the draft CCMP, a well as the Public Participation Strategy to be employed during the implementation of the CCMP. New actions have been added as follows: recommending the continuation of existing effective environmental education efforts (other than those carried out by the PEP); developing and implementing comprehensive education programs to reduce residential fertilizer and pesticide use in the watershed; encouraging conversions to cleaner burning marine engines; encouraging alternatives to treated lumber and shoreline hardening structures; encouraging voluntary replacement of underground oil storage tanks exempt from current replacement requirements; promoting the establishment of local watershed associations; and recommending the establishment of citizens monitoring programs.

Financing

Comments regarding financing addressed the need to provide funding for public education projects, especially pesticide reduction efforts; the need for Federal agencies to provide funding, including NOAA; and the need to fund: projects researching the impacts of treated lumber, the monitoring and research of habitats, and a dredging summit. The final CCMP describes the need to fund a variety of actions, including public education and outreach, obtaining funding from all sources, including the Federal government, and to address the specific issues mentioned.

One commentor suggested that Brown Tide research funding be re-directed to address toxic management issues. Because the Brown Tide funding has been appropriated at the Federal level for the purpose of addressing the Brown Tide issue, this is not possible. The CCMP does recognize the need to address toxic issues and identifies many actions of numerous toxic management actions. Another commentor suggested using available funding for small scale wetland restoration projects rather than more studies. The CCMP includes many actions, including those involving research, monitoring and implementation, of varying scales, addressing both preservation and restoration.

The need for funding for land acquisition was also noted, including the Federal government as a source. The discussion of land protection and funding for land protection has been expanded in the Financing Chapter and the new Critical Lands Protection Chapter. Establishing a citizen’s budget oversight committee was recommended as was citizens allocating funding rather than governmental entities. Citizens presently provide input to the allocation of funding through the participation of the chair of the Citizens Advisory

Committee on the Management Committee. This process will continue in the implementation phase, where both governmental and non-governmental entities can provide input in the budgetary process. One commentor stated that $15 million seemed inadequate for stormwater abatement projects. While a final figure has not yet been determined, the PEP CAC has suggested a figure of $50 million is a better estimate of stormwater management needs.

One commentor questioned the source of funding for a particular action. In general, where funding for a particular action has been secured, it has been noted in the plan. The funding needs for most recommended actions has estimated but has not yet been secured; in these cases a particular source for the funding is not identified. Tax credits were suggested to help homeowners and businesses make improvements to help improve the region's environment. The CCMP now includes a revised discussion of tax credits and similar incentives. Two commentaries identified the need to better specify the funding necessary to carry out each action and step in the plan. Nearly all actions and steps in the Plan now includes a cost estimate (expressed in work years or in direct dollar figures.

The Financing Chapter has also been revised to recognize the recently enacted Suffolk County 1/4% sales tax program that will provide funding for CCMP implementation and County and local programs for land protection and acquisition. The CCMP now includes an action recommending a selective sales tax be established (on products such as fertilizers and pesticides) to fund environmental management programs. The CCMP also recommends that SRF funding be made available to private entities, and that 0% loans be available for land acquisition.

Post-CCMP Management

One commentor suggested the PEP should have a citizens advisory committee with a budget. The final Plan describes a post-CCMP committee structure that includes a citizens advisory committee. The Management Conference intends to continue to fund CAC activities, consistent with available resources.

Several comments addressed the issue of post-CCMP management structure, suggesting the regional management alternative be considered, that the existing structure be legislatively created, and that the selected structure foster systemwide collaboration and accountability. While one commentor suggested a protected land-type structure, another questioned the advantage to the North Fork of incorporating the Peconic Estuary Program into the Pine Barrens Maritime Reserve Commission as the North Fork does not have pine barrens. The PEP Management Conference considered all these issues and will be continuing the existing management structure. This decision will be revisited during biennial reviews and changed if an alternative structure is determined to be appropriate.

Other comments asked about the final form of the CCMP and how public input in the draft would be shared. The final plan follows a similar format as the draft plan though additional

detail has been added. This document is being prepared to respond to public comments.

This chapter now includes a revised discussion of the PEP Environmental Monitoring Plan and Living Resources Research Plan. The current management structure will be continued during the implementation phase; this decision will be revisited during biennial reviews or as necessary. The chapter also describes the necessary coordination with the Federal Endangered Species Act and national and state historic preservation efforts.

General Comments

Many general comments were submitted on the draft CCMP. These included comments that the draft CCMP was "great" and "something is actually being done." One commentor expressed gratitude for the coherent presentation on the plan, and another stated that it was satisfying to see how much progress the program had made. The draft Plan was not without its detractors, however, with comments that the recommendations of the draft Plan were impractical to implement and without revision the plan could easily delay protection of the estuary because of legal battles and a lack of cooperation among stakeholders. One commentor found the draft CCMP too vague and noncommittal.

The Peconic Estuary Program management conference participants were pleased with draft CCMP document. Both the draft and final CCMPs document that a great deal of work has been accomplished, in terms of studying the estuary and its problems and threats and also taking steps to preserve, protect and enhance the estuary and watershed. In preparing the final CCMP, the PEP has attempted to develop specific and practical actions that are implementable, and in particular working with the responsible entities to garner support and commitments so that actions will be carried out. The Peconic Estuary Program expects to move ahead with implementing the CCMP, working cooperatively with all responsible entities and stakeholders. The PEP also recognizes that some mid-course corrections may be necessary during the implementation phase.

Commentors suggested: that the plan needs to be implemented quickly and that there wasn't time to waste, as the bays were being degraded; and that a common sense approach was needed, and that we shouldn't be putting things in the bay that don't belong there. It was also suggested that the CCMP needs to emphasize that protection of the Peconic Estuary in its high quality state is a better option (economically, ecologically, philosophically, etc.) than allowing it to degrade and then cleaning it up. One commentor observed that pollution is the biggest problem in the estuary; another, that finfish and shellfish need to be restored to the bay, and another, how flushing is important to the estuary. Environmental awareness was identified as being very important by one commentor; another stated that adequate financing and education would be cornerstones for enabling the program to succeed, and yet another, that public education and outreach should be worked on right away and that the Citizens Advisory Committee perspective is important.

The PEP and the final CCMP recognizes that the plan needs to be implemented quickly. In

fact, many of the actions are ongoing, meaning that implementation is already taking place to some degree. A common sense approach was taken in crafting many of the actions, which included seeking stakeholder input, and using that information in formulating actions. The CCMP relies heavily on a pollution prevention approach, trying to prevent problems from occurring and maintaining high quality environments where they exist and restoring those that have been degraded. The final Plan recognizes that water quality, habitats, and living resources are inextricably linked and that human impacts ("pollution") are the greatest problem affecting and threatening the estuary system. The importance of the tidal flushing of the bay is recognized in the Nutrient and Habitat and Living Resources Chapters of the final Plan, in particular, but flushing should not be used as an alternative to reasonable treatment and management of pollutant sources. An effective public education and outreach program is clearly an important part of the plan, and awareness and action by residents, workers and visitors to the estuary is necessary for the success of the program. The Citizens Advisory Committee will continue to play an important role in the implementation phase.

It was suggested that an overall summary should be provided, tying together conclusions and recommendations with respect to water quality issues from all of the chapters so the reader can see the emergence of a coherent theory. It was also noted that some of the graphics were unreadable and many were unlabeled or did not include a key. One commentor provided numerous stylistic recommendations to improve the message that was being conveyed.

The introduction chapter of the Plan has been revised and expanded to provide a better overall summary of the Plan. A separate Public Summary Document will be prepared. Graphics in the Plan have been improved, including readability, labeling, and keys. The overall document was also edited and many stylistic improvements were made throughout the Plan.

One commentor questioned why the draft CCMP stated that expenditures should be split 50/50 between remediation and preservation, as preservation costs are often significantly lower than remediation costs (a significant exception being the purchase of lands or development rights).

The concept that both remediation and preservation initiatives are equally important is introduced in the Nitrogen Chapter, but applies throughout the plan. If restoring degraded resources always takes precedence over preventing problems or conversely, if only preservation efforts are pursued without regard for correcting existing problems, the Plan will not be successful. Clearly, both restoration and protection actions need to be taken in the estuary and its watershed. The presumption is to attempt to split expenditures 50/50 between remediation and protection, recognizing that eligibility requirements of certain programs may limit activities to one or the other.

Other commentors noted that there needs to be more local government activity in the implementation efforts of the Plan and that CCMP implementation should be made a standing agenda item for the East End Supervisors and Mayors Association meetings. Another commentor noted that it seemed that there were instances where the Towns of

Riverhead and Brookhaven need to be included or listed as responsible entities under the management actions, particularly if the Peconic River and its watershed are truly part of the Plan. The important role and responsibility that shoreline property owners have in carrying out the Plan was noted. It was suggested that two committees be created: an Environmental Oversight Committee, comprised of the various concerned environmental organizations, and a Financial Oversight Committee, to examine how public money is spent. One commentor asked about the total list of stakeholders, another suggested that a more diverse group of people should be on the CAC.

The Peconic Estuary Program recognizes the critically important role of local governments in implementing the Plan. The Program has periodically participated in End Supervisors and Mayors Association meetings and expects that this will continue in the future. A key part of the CCMP implementation phase will be involving, engaging, and supporting local government in their role in the CCMP process. The Towns of Riverhead and Brookhaven are important stakeholders, particularly in actions affecting the Peconic River and its watershed. The final Plan better reflects their role. There are numerous sections and actions in the final Plan that note the important role and responsibility that shoreline property owners have carrying out the Plan, for example, in the Plan's strong support for the establishment of Harbor Protection Overlay Districts based on the Town of East Hampton's model. The final Plan does not recommend the establishment of an Environmental Oversight Committee, but rather supports the continuance of the existing structure which includes a Citizens Advisory Committee and Technical Advisory Committee, both of which include representatives from various concerned environmental organizations. The final Plan does not recommend the establishment of a Financial Oversight Committee, both rather continues to rely on the existing Policy and Management Committees to ensure public funding is spent wisely and consistent with applicable laws, regulations and guidelines, with input from the three advisory committees. The final CCMP includes a corrected list of stakeholders as an appendix, including the membership of the Citizens Advisory Committee. The Citizens Advisory Committee remains interested in the participation of new members; interested individuals can get involved by contacting the committee chair or the Program Office.

The need to prioritize the actions, including prioritization by the agencies responsible for their further development and implementation was noted. It was also suggested that a timetable and budgetary analysis be created for the planning and implementation of each action.

The Final Plan includes a total of 79 priority actions. Tracking progress in carrying out these priority actions is an important part of the implementation process, along with making recommendations to the agencies responsible for carrying out those actions. The action plans and tables of the final Plan includes information on timetables for each actions as well as resource needs (both staff and funding) for carrying out each action. A complete accounting of progress in implementing the Plan will occur every three years consistent with EPA National Estuary Program guidance.

Concerns with enforcement and staffing were also expressed, including comments regarding:

how enforcement was incorporated into the plan, as enforcement can be a problem in environmental initiatives; the shortage of staff in enforcing current laws and who and how actions will be enforced; the general need for additional staff to implement the CCMP; and how the CCMP proposes little in the way of new legislation to help with implementation and enforcement mechanisms, without which too little of the CCMP goals and objectives will be accomplished.

The Peconic Estuary Program sees the importance of enforcement and staffing. The final CCMP provides better estimates of these resource needs for each action, both in terms continuing existing staffing levels as well as increasing staffing and enforcement resources as needed. The naming of responsible entities for each action was reviewed and updated in the final Plan. Many actions in the final CCMP rely on existing authorities, but where new authorities are needed, this is explicitly stated. In other instances, further study may be required before new or expanded authorities are called for to assist with implementation and enforcement.

Comments regarding goal setting included the comment that deadlines should be added to the establishment of goals. Another commentor noted that the goals, objectives and actions all be reviewed with an eye on coordination and more appropriate expression. Other comments suggested that the goals and benchmarks for measuring success be clearly identified throughout the CCMP. One commentor suggested that goals be based on optimal conditions for the Peconic Estuary and not to other polluted areas outside of the study area.

The final CCMP now includes measurable goals in each chapter. All goals, objectives and actions in the draft Plan were reviewed and improvements were made that are incorporated into the final Plan. The Environmental Monitoring Plan reflects monitoring efforts necessary to assess progress in achieving the Plan's measurable goals. The measurable goals for each chapter were developed based on the objectives included in each chapter, which were specifically developed for the Peconic Estuary and its watershed.

One commentor noted that bad journalism should be exposed and that the program should set the record straight, when needed, via editorials, and that bad press can be detrimental to the whole program.

The Peconic Estuary Program, including the Citizens Advisory Committee and Public Education and Outreach Coordinator strive to keep in touch with and be accessible to the local media, as described in the final CCMP. They will provide input when requested and will seek to provide corrected information as needed.

One commentor stated that a baseline for the estuary must be established before any water quality measures are taken; another that trends that exist regarding improvements in water quality should be examined, and further that a characterization of positive trends and negative trends would properly orient the reader to the state of the bays. It was also recommended that there should be a systematic survey of the PEP bathymetry by the USCOE's helicopter LIDAR system as well as intensive interviews with long-term local

residents. A hyperspectral imaging spectrometer was also suggested as a potentially useful tool for ecosystem management in the Peconics.

The information collected and assembled for the characterization elements of the CCMP serves as the baseline condition for water quality, habitats, and living resources in the system. Some of these data sets are substantial, other provide some basic but useful information. Information on trends will be presented and shared with the public on a regular basis as described in the Post-CCMP Management Chapter of the final CCMP. Additional work regarding the estuary's bathymetry is planned in 2001 through a cooperative effort between the Peconic Estuary Program and The Nature Conservancy, with the Marine Sciences Research Center at the State University at Stony Brook. Additional data gathering using remote sensing data is planned in the future, for efforts including land cover and determining eelgrass coverages, for example. The Peconic Estuary Program has in the past and will continue in the future to use information from user groups to fill data gaps and improve technical studies.

One commentor was concerned that the County proposition regarding the quarter percent sales tax, had not been well publicized. Other comments of a general technical nature included the observations that

- Water use overlays should be provided for fishing, dragging, shellfish, sailing, high speed boating, aquaculture, mooring, major harbor, and minor harbor areas; and
- There should be septic and point source outfalls and municipal treatment discharge overlays.

The County proposition regarding the extension of the quarter percent sales tax (a portion of the proceeds will be targeted towards the Peconic Estuary) has since passed. A discussion of this revenue source is discussed in the Financing Chapter of the final CCMP. The Peconic Estuary Program has impressive geographic information system (GIS) data layer coverages of the estuary and watershed. The Program hopes to expand the list of existing data layer coverages in the future to include many of the ones suggested by the commentor, to assist in studying and managing the estuary and communicating with the public. Data layer coverages are discussed throughout the final CCMP and in the Post-CCMP Chapter and in the Environmental Monitoring Plan.

While not comments on the draft Plan itself, the Audubon Society expressed interest in any estimates of the economic impact of bird and wildlife viewing. Another commentor expressed appreciation for receiving copies of some graphs that would be used in an elementary school classroom setting.

The Audubon Society and other groups, including teachers, are welcome to the wealth of information that has been gathered by and through the Estuary Program. A list of references is available in the Final CCMP, as is a list of Peconic Estuary Program Library Reports.

III. Correspondence Sent During the Public Comment Period

Government and Universities

D. Brown, USEPA, January 3, 2000, letter
J. Heisler, USEPA, December 10, 1999, letter
S. Hammond, NYSDEC, November 12, 1999, letter
R. Draper, NYSDEC, November 22, 1999, letter
V. Palmer, NYSDEC, November 16, 1999, letter
C. LaPorta, NYSDEC, November 19, 1999, letter
D. Barnes, NYSDEC, November 18, 1999, letter
J. Pavacic, NYSDEC, November 12, 1999, letter
J. Turner, NYS Legislative Commission on Water Resource Needs of New York State and Long Island, December 8, 1999, letter
F. Thiele, State of NY Assembly, December 13, 1999, letter
D. Kost, NYSDOT, November 2, 1999, letter
C. McCaffrey, DOS, August 9, 1999, letter
J. Pim, SCDHS, October 20, 1999, letter
E. Cademartori, Town of Brookhaven, November 16, 1999, letter
J. Weiss, Rutgers University, letter

Public Interest Groups/Organizations

B. Smith, FISH Unlimited, August 9, 1999, e-mail; October 1, 1999, e-mail; October 18, 1999, letter; October 22, 1999, letter
S. Cullen, STAR Foundation, October 20, 1999, letter
J. Penny, South Fork Groundwater Task Force, November 17,1999, letter
R. Schiano, South Fork Groundwater Task Force, November 15, 1999, letter
N. Kelley, P. Rabinovitch, The Nature Conservancy, November 10, 1999, letter
R. DeLuca, Group for the South Fork, November 17, 1999, letter
K. McAllister, Peconic Baykeeper, November 12, 1999, letter; *Suffolk Life Newspaper* December 1, 1999, article
J. Evans-Brumm, Friends of Long Island Sound, November 15, 1999, letter
B. Prentice, North Fork Audubon Society, October 26, 1999, letter
Accabonac Protection Committee, November 4, 1999, letter
G. Rivara, Cornell Cooperative Extension, November 15, 1999, letter

Commercial

D. Bavaro, Shellfish Construction and Culture Co., November 15, 1999, letter
J. Pillus, Aqua Culture Technologies, November 15, 1999, letter
K. Rivara, Aeros Cultured Oyster Co., November 15, 1999, comment form
R. Mendelman, Harbor Marina, August 10, 1999, letter

Citizens

R. Tollefsen, *The Southampton Press*, November 11, 1999, article; November 7,1999, letter
B. McAlevy, letter
A. Jones, October 16, 1999, December 2, 1999, letter

T. Sullivan, August 9, 1999, e-mail; November 12, 1999, e-mail;
November 21, 1999, e-mail
R. Smith, November 16, 1999, comment form
P. Stoutenburgh, letter
J. Murphy, letter
S. Johnson, November 16, 1999, letter
C. Garvey, December 1, 1999, letter
J. Seeman, October 26, 1999, letter
J. Kelly, November 5, 1999, letter
B. Hajek, October 24, 1999, letter
D. Heckman, comment form
S. Donovan, October 13, 1999, letter
J. Hellerbach, comment form
W. Freese, October 8, 1999, letter
P. Dickerson, comment form
D. Berson, comment form
C. Schubert, August 3, 1999, e-mail
M. Rewinski, November 3, 1999, e-mail; November 11, 1999, comment form;
November 19, 1999, e-mail
M. Sanford, December 8, 1999, letter
T. Rozakis, October 13, 1999, letter
C. Black, November 15, 1999, letter
J. Edler, November 3, 1999, letter
F. Conant, November 12, 1999, letter
L. Tuthill, November 12, 1999, letter

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