

Chapter 9. Sustaining the Bay's Biodiversity

Summary of Issues and Recommendations

The extraordinary array of natural resources found in the Pleasant Bay study area make it one of the richest marine eco-systems in the region. While currently healthy, these natural resources are under increasing stress due to impacts from a variety of human uses. As the condition of resources weakens over time, they will lose their ability to remain vital in light of human use impacts. Among the most disturbing trends observed are:

- The tremendous diversity of terrestrial and aquatic animal and plant life is threatened by conflicts with a number of Bay uses, including pollution, turbidity, and noise from power boating, and changes in habitat conditions caused by shoreline structures, among others.
- Water quality, the foundation of resource vitality as well as human use and enjoyment of the Bay, is threatened by nutrients from land uses within the watershed, as well as impacts from marine uses such as power boating.
- Wetlands resources which cleanse groundwater of pollutants and provide critical animal habitats, are being encroached on by surrounding land development, development of shoreline structures, and trampling from public and private uses.

Recommendations to address these issues include:

- Undertake a program to inventory and monitor the ecology of the Bay
- Designate *Areas of Critical Marine Habitat* where uses and activities will be restricted
- Develop and implement a *Species and Habitat Protection Program*
- Develop and implement a *Watershed Management Program* governing waste water management
- Evaluate the need for changes in land use regulations
- Initiate and sustain a Bay-wide *Water Quality Monitoring Program*
- Undertake further study of water quality issues
- Strengthen and coordinate local wetlands regulations and review procedures
- Increase protections for the barrier beach/marsh system
- Provide relief for hydrologically restricted wetlands

9.0 Overview

Pleasant Bay's biodiversity encompasses the health and productivity of its natural resources: its salt water, fresh water, wetlands, vegetation, and animal life. Expressed this way, biodiversity not only reflects the uniqueness of the Bay's natural resources, it also underlies our ability to use and enjoy those resources, whether for shellfishing, finfishing, scenic viewing, swimming, or boating.

The information compiled and analyzed for the resource management plan indicates that the Bay's natural resources are generally in good condition. The relative health of Pleasant Bay has afforded the surrounding communities time to ensure that measures are taken to avert future problems, and to sustain or improve on present resource conditions. However, the analysis also indicates that uses of the Bay and the surrounding land area are intensifying. A number of alarming trends have been identified:

- The tremendous diversity of terrestrial and aquatic animal and plant life is threatened by conflicts with a number of Bay uses, including pollution, turbidity, and noise from boating, changes in habitat conditions caused by shoreline structures, among others.
- Water quality, the foundation of resource vitality as well as human use and enjoyment of the Bay, is threatened by excessive nutrients from land uses within the watershed, as well as impacts from marine uses such as boating.
- Wetlands resources which cleanse groundwater of pollutants and provide critical animal habitats, are being encroached on by surrounding land development, development of shoreline structures, and trampling from public uses.

These trends which threaten the future health and productivity of the Bay's resources are addressed in the following recommendations.

9.1 Management Issue: Understanding and Sustaining the Ecology of Pleasant Bay

It is widely recognized that Pleasant Bay constitutes one of the richest and most diverse eco-systems in the Northeast region. The Bay's extensive natural resources and biological processes have attracted the attention of numerous researchers and scientists. Earlier chapters summarized findings from many of the technical studies that have been undertaken concerning the Bay's water quality, vegetation, and marine life. These studies, while useful, tend to focus on single facets of the Bay's eco-system, and most are several years outdated. And virtually none of the existing studies could have foreseen the variety of human use and environmental factors that influence the ecology of the Bay today.

The ACEC designation inherently recognizes the importance of the ecology of Pleasant Bay. However, there is no current inventory of the vast number of organisms and habitats within the system, nor is there a comprehensive understanding of the interactions of organisms with each other, or with the array of human uses and environmental forces at work in the Bay.

For many years it has been assumed that impacts from uses of the Bay and of the surrounding land area could be absorbed by the system without seriously degrading resource conditions. As land around the Bay is developed, and as uses of the Bay increase both in number and intensity, stresses on the Bay's resources have become more severe and longer lasting. As resources conditions within the system degrade, their resiliency will continue to diminish. For this reason, the resource management plan recommends immediate steps to fortify our understanding of the Bay's ecology, and to develop management strategies to ensure its sustainability in light of dynamic human and

environmental conditions.

9.2 Recommendations to Sustain the Bay's Ecology

9.2.1 Undertake a Program to Inventory and Monitor the Ecology of the Bay

Summary: The inventorying and monitoring program would generate baseline and updated information about the status of natural resources and habitats within the Bay. The program would encompass: water quality, physical characteristics, vegetation, salt marsh, macroalgae, shellfish, fin fish, and birds. Information generated by the program would be applied directly in making management decisions, including the number and location of moorings, regulation of docks and piers, steps to protect water quality, and the extent and location of aquaculture in the Bay. It would also be used to assess and monitor long-term impacts from these and other uses.

The program would be designed in three phases to be completed as funding becomes available:

- Phase I: initial mapping of habitat types in the study area, description of physical characteristics of habitats types, selection of reference sites representing habitat types, and development of sampling protocols for each reference site.
- Phase II: development of detailed parameters for sampling, data collection at sampling sites, development of initial design for long-term monitoring plan.
- Phase III: development of the long term monitoring plan outlining specific issues and concerns for each habitat type, and time intervals for data collection.

Implementation: The Alliance Steering and Technical Resource Committees would work with local Natural Resources Officers, the National Park Service, and regional scientific institutions to develop the scope of the program. The need for consultant services for all phases of the program is anticipated.

Funding: The rough costs of the study, to be refined pending the scope of the project, are estimated at \$50,000 per phase, and thereafter, \$10,000 per year for monitoring. A variety of potential funding sources will be pursued, including Massachusetts Coastal Zone Management, the National Park Service, SeaGrant, and private foundations.

Time Frame: The scope and work plan of the inventory and monitoring program will be developed within twelve months of the adoption of the resource management plan by the towns and the state. Phase I will commence within twenty-four month's of the plan's adoption, and Phases II and III within thirty-six months.

9.2.2 Designate and Enforce Areas of Critical Marine Habitat

Summary: Areas that are now known to be critical habitat areas have been identified as *Areas of Critical Marine Habitat*. The designated areas encompass several distinct types including sandy tidal flats, muddy tidal flats, eelgrass beds, fringe marsh, and areas of freshwater up-welling, among other areas of relatively unaltered shoreline. Many Areas of Critical Marine Habitat have been selected because they are located adjacent to undisturbed uplands that are inhabited by species that rely on both land and water access for survival. The Areas of Critical Marine Habitat serve as habitats, feeding areas, nesting areas, spawning areas and nursery areas for hundreds of species of marine invertebrates and vegetation that are food sources for other species, as well as amphibians, shellfish, fin fish, migratory shorebirds, and some species of upland fauna. Pending the completion of the ecological inventory and monitoring program, protection of these areas is necessary for the sustainability of these species. The protection of such areas and may even lead to the re-introduction of some lost or endangered species, such as the diamond-backed terrapin.

Areas of Critical Marine Habitat, as indicated on the following figure, are listed below.

1. The intertidal zone and flats north of Tern Island, south of Minister's Point, and west of the channel.
2. The intertidal zone and flats south, east, and west of Strong Island.
3. The intertidal zone of Nickerson's Neck from the Strong Island Town Landing to the southeastern tip of Fox Hill.
4. The intertidal zone of Nickerson's Neck from the Chatham Yacht Club north to the 7th tee of Eastward Ho! Country Club.
5. The intertidal zone of Pleasant Bay from the southwest entrance of the Narrows westward to the eastern end of the Winslow revetment.
6. The intertidal zone of Little Pleasant Bay from Namequoit Point west to the entrance to Paw Wah Pond.
7. The intertidal zone and flats west and south of Little Sipson's Island.
8. The intertidal zone and flats west of Nauset Beach from the Chatham breakthrough northward to the southern entrance of Broad Creek, and including Hog Island Creek, the south side of Hog Island, and the west side of Sampson Island to its northern tip.
9. The intertidal zone along Barley Neck.
10. The intertidal zone along the conservation property on the south side of Kent's Point, and along both sides of The River from Kent's Point to the entrance of Meetinghouse Pond (east of Lucy Snow's Point), including Frost Fish Cove.

It is recommended that Areas of Critical Marine Habitat be in effect while the inventory and monitoring program is being designed and implemented. This is to ensure that areas now known to be sensitive habitats are protected from adverse impacts while further scientific data is collected and assessed. Based on the results of the inventory and monitoring program, the designation of such areas could be amended. The following activities would be prohibited within Areas of Critical Marine Habitat:

- placing a shoreline structure (no effect for existing structures);
- placing a mooring (no effect for existing moorings);
- aquaculture (no effect for existing aquaculture grant areas);
- shellfishing in areas other than those permitted by the local shellfish official in cooperation with the Pleasant Bay Management Alliance.

Implementation: The Alliance Steering and Technical Resource Committees would work with conservation commissions, harbor masters and shellfish officials to monitor the designated areas. Prohibitions of activities within designated areas would be enforced by the applicable local agencies.

Funding: Funding for enforcement will be incorporated in harbor masters' and shellfish officials' FY 1999 budgets.

Time Frame: Prohibitions would be in force within one year of the adoption of the resource management plan by the towns and the state, unless further changes in regulations are required. The designation of areas would be reviewed every five years based on results of the inventory and monitoring program (see 9.2.1).

9.2.3 Develop and Implement a Species and Habitat Protection Program

Summary: A program of regulations and policy measures would be developed to restore the natural estuarine conditions and hydrology needed to sustain habitats within the study area. Specific issues and management strategies that should be addressed in the program include:

- Restoring salt water and fresh water habitats, including anadromous fish runs, that have deteriorated due to changes in water quality, vegetation, or other factors.
- Creating *Wildlife Corridor Overlay Districts* to protect upland habitats from adverse impacts, even in areas where development has taken place.
- Reviewing and coordinating local habitat protection regulations, specifically predator control regulations.
- Identifying areas where habitats are in conflict with other uses.

- Undertaking special studies of species, such as horseshoe crabs, that may be undergoing unique pressures due to harvesting, or loss of habitat.
- Increasing public education concerning habitats and wildlife in the study area.

Implementation: The Alliance Steering and Technical Resource Committees would work with local natural resources officers, shellfish officials, and planners to develop a work plan for evaluating and recommending regulatory changes and policy measures. Technical assistance would be requested from the Massachusetts Audubon Society, Massachusetts Heritage Program, Cape Cod Commission, and other public and private wildlife protection resources.

Funding: Development of the work plan for the *Habitat and Species Protection Program* is included in the budget for the Pleasant Bay Management Alliance. Personnel time would be required of the involved town departments. Additional funding may be needed for studies recommended by the program.

Time Frame: The work plan for the *Habitat and Species Protection Program* will be developed within twenty-four months of adoption of the resource management plan by the towns and the state. Initial recommendations may be forthcoming within thirty-six months, and subsequent recommendations will follow the results of the inventory and monitoring program.

9.3 Management Issue: Sustaining the Bay's Water Quality

All available data indicates that Pleasant Bay's water quality is good, but faces threats. The land area which contributes groundwater and surface water to the Bay, known as the watershed, extends miles from the shoreline of the Bay and encompasses 14,013 acres in Orleans, Chatham, Harwich and Brewster. Leachate and surface run-off from septic systems, lawns and gardens, storm drains, and other activities within this area can contribute nutrients, toxic substances, and bacterial contaminants that pose a threat to water quality in Pleasant Bay.

9.3.1 Nutrient Loading

The increased level of nutrients, mainly nitrogen, in the Bay is considered to be one of the greatest threats to water quality in Pleasant Bay. Nitrogen from septic systems, fertilizers, boat discharge, road run-off, and other sources travels to the Bay through groundwater, streams, springs, and over-land run-off. Nitrogen levels can also be influenced by different circulation patterns within water bodies. Nitrogen levels in Round Cove, for example, were found to be exacerbated by poor flushing and circulation in that water body. Nitrogen is anticipated to be a continuing concern for water quality in the Bay because of the enclosed nature of several water bodies and because of the high rate of residential land use within the Bay's watershed.

The Cape Cod Commission has completed a nitrogen loading study for Pleasant Bay and its watershed. This study has identified three sub-embayments with excess nitrogen loads coming from existing land uses within their watersheds: Muddy Creek, Arey's Pond, and Round Cove. Two other sub-embayments (Pah Wah Pond and Ryder's Cove) are identified as having the potential to exceed their nitrogen loading limits once all land is developed within their watershed. The remaining sub-embayments and the Bay as a whole were below critical nitrogen loads.

To be effective, efforts to limit the levels of nitrogen flowing into Pleasant Bay should be addressed from a watershed perspective. Currently, each Bay town has some form of nitrogen loading by-law which restricts the amount of nitrogen that may be generated by new land uses. The main purpose of these by-laws is to protect groundwater used as a drinking water source from contamination with excessive nitrogen. However, levels of nitrogen that may be safe for groundwater are still significantly higher than can be tolerated in the marine environment. Additional nitrogen loading protection on a watershed basis is needed to protect the Bay's water quality.

9.3.2 Toxic Pollutants

Metals, chemicals and other toxic pollutants enter the Bay directly and through groundwater, springs and run-off. Some toxic pollutants may remain suspended in the water column, or settle into the substrate where they may be re-suspended. In high enough concentrations, certain toxic substances can be extremely harmful to marine organisms. Boats can be a source of toxic pollutants from anti-fouling paint, hydrocarbons, and other petroleum-based products. Chemicals used to treat wood used for docks and piers, pesticides and fertilizers, household cleaning products, and metals and other chemicals found in road runoff are additional sources of toxic pollutants. Despite the severity of impacts from toxic pollutants, very little testing has been done to provide data on the presence or trends of toxic pollutants in the Bay. The potential threat of toxic pollutants will increase as boating activity and surrounding land uses continue to increase.

9.3.3 Micro-biological and Biological Pollutants

Bacterial contamination, while now a relatively small occurrence, could increase from septic systems, wild and domestic animal waste, road run -off, boat waste, and other sources. Additional testing of impacts on the Bay's water quality from these pollution sources is needed.

Recommendations to Sustain the Bay's Water Quality

9.4.1 Develop and Implement a Watershed Management Program

Summary: The *Watershed Management Program* would constitute a comprehensive set of regulations to be adopted by the towns of Orleans, Chatham, Harwich and Brewster and applied to areas within the watershed of the Bay. The Watershed Management Program would encompass:

- *Implement a Nitrogen Management Program.* Using the results of the Cape Cod Commission nitrogen loading study, the program would work to implement specific nitrogen management options for the sub-embayments identified in the plan as having or potentially having excessive nitrogen loading (Muddy Creek, Pah Wah Pond, Arey's Pond, Ryder's Cove and Round Cove). The sub-embayment plans should address wastewater disposal practices (i.e., the role of on-site denitrifying septic systems, centralized technology, etc.), open space acquisition, and the impact of lawn care and agricultural practices.
- *Storm water management.* The program would coordinate the detailed inventories of storm water management conditions undertaken by the towns, Massachusetts Department of Environmental Protection, as well as local water quality task forces, to develop comprehensive and coordinated storm water management policies and practices within the watershed.
- *Fertilizer and pesticide use.* The program would work to ensure that commercial land-care operations including agriculture, cranberry bogs, lawncare/landscaping, and golf courses, operate according to Best Management Practices recommended for their respective activities by various agencies and associations (i.e. Natural Resource Conservation Service, Cranberry Growers Association, Massachusetts Turf and Lawngrass Association) . Agricultural operations, including cranberry bogs, would be encouraged to develop and implement "conservation farm plans". Agricultural operations and golf courses would be encouraged to practice Integrated Pest Management (IPM) recommended for their activity. Best Management Practices for landscaping and pesticide use by individual homeowners also should be addressed in the program.
- *Public education.* The program would include a public education component to explain how activities within the watershed affect the Bay's water quality, how changes in water quality affect the marine environment, and how specific watershed management initiatives address critical concerns.

Implementation: The Alliance Steering and Technical Resource Committees would work with local conservation commissions, boards of health, planning boards, and storm water management committees to determine the scope of the program, develop specific regulatory and policy measures, and implement the measures. Agricultural, land-care, and golf course representatives would be asked to participate in the identification and promotion of Best Management Practices. Technical assistance would be requested from Massachusetts Department of Environmental Protection Division of Wetlands and Waterways, Massachusetts Executive Office of Environmental Affairs Cape Cod Basin Team, Cape Cod Commission, and projects such as the Waquoit Bay National Estuarine Research Reserve which have already initiated watershed management programs.

Funding: Developing the scope and work plan for the program is incorporated in the FY 1999 budget for the Pleasant Bay Management Alliance. Personnel time would also be required from the involved town departments. Funding for developing

recommendations would be included in subsequent Alliance budgets. Funding requirements for program implementation would be included in the recommendations.

Time Frame: The scope and work plan for the program would be developed within twelve months of the plan's adoption by the towns and the state. Regulatory and policy measures would be identified and implemented in within thirty-six months of the plan's adoption.

9.4.2 Evaluate the Need for Changes in Land Use Regulations

Summary: Land uses within the watershed can greatly influence water quality conditions in the Bay. However, current zoning may not provide adequate protection of the Bay's water quality. Current zoning of undeveloped land within the watershed allows for substantial residential development, and provides minimal protection of open space. Also, recommendations generated by a comparative zoning analysis sponsored by the Friends of Pleasant Bay, designed to protect water quality in the Bay, have not been implemented. There is concern that nutrient contributions into the Bay will increase substantially if available land within the watershed is developed, particularly for residential use. An evaluation of existing land use regulations is needed to ensure that regulations adequately protect water quality in the Bay, as well as groundwater quality.

Implementation: The Alliance Steering and Technical Resource Committees would work with planning boards and boards of health to identify areas where land use regulations could be strengthened to protect resources. Consultant studies may be required to develop new regulatory language.

Funding: Funding to identify land use regulatory issues for evaluation is included in the Alliance's FY 1999 budget.

Time Frame: Land use regulatory issues needing further evaluation would be identified, and evaluation of issues would begin, within one year of the plan's adoption by the towns and the state.

9.4.3 Initiate a Bay-wide Water Quality Monitoring Program

Summary: A Bay-wide water quality monitoring program would be designed and implemented on a sustained basis. The program would generate baseline information on water quality conditions throughout the Bay, identify water quality trends, and monitor trends over time. Specifically the program would:

- identify indicators and threshold concentrations for nutrient, toxic, biological and micro-biological pollutants in the Bay;
- prioritize areas within the Bay for testing and remediation;
- encompass periodic sediment testing;
- encompass periodic updating of the Bay-wide flushing and circulation, and nitrogen loading studies recently completed for the resource management plan.

Implementation: The Alliance Steering and Technical Resource Committees would work with boards of health, and local water quality committees to design and implement the program. Technical assistance would be requested from the Massachusetts Executive Office of Environmental Affairs Cape Cod Basin Team, U.S. Environmental Protection Agency, regional institutions, and successful water quality monitoring programs in the region.

Funding: Funding for the program would be requested from the U.S. EPA through the Massachusetts Coastal Zone Management Water Quality Program.

Time Frame: The scope of the water quality monitoring program would be developed within twelve months of the adoption of the plan by the four towns and the state. A funding proposal for the program would be developed as soon as the program scope has been determined.

9.4.4 Undertake Further Study of Water Quality Issues

Summary: There are many influences on the Bay's water quality that are not adequately understood, and may not be addressed in the resource management plan. Some issues have been raised that deserve further study to determine whether management actions are necessary. The resource management plan recognizes the need to continue the study of additional water quality topics, including impacts from chemically-treated lumber; and environmental impacts of mosquito control on wetlands and water quality. Other topics may be identified through the water quality monitoring program.

Implementation: Water quality study topics would be identified by the participants in the water quality monitoring program (see 9.4.2)

Funding: No funding is required at this time.

Time Frame: Further study of water quality issues would follow the preliminary findings of the water quality monitoring program (see 9.4.2).

9.5 Management Issue: Preserving and Restoring Wetlands Resources

Not long ago, wetland resources were commonly filled or altered to make way for alternative land uses. As a result, millions of acres of wetlands have been lost nationwide. Today, with greater recognition of the many important ecological functions they serve, wetlands are protected by state, regional, and local regulations.

The Massachusetts Wetlands Protection Act (WPA) requires that any activity that is proposed for within 100 feet of a wetland or wetland resource area must obtain the approval of the local Conservation Commission. However, the WPA does not establish buffers requirements or other restrictions on activities within 100 feet of a wetland

resource. Such restrictions may be in place through the state-administered *Coastal and Inland Wetlands Restrictions Orders* which exist for all four towns in the Pleasant Bay ACEC. The Order of Restriction regulates, restricts, or prohibits certain activities or uses in wetland resource areas.¹ Additional requirements and restrictions concerning wetland resources may be established at the local level through ordinance and regulation.

Orleans, Chatham and Brewster, respectively, have adopted local wetlands protection regulations. These regulations, in some ways, are more restrictive than state regulations. Harwich has not adopted local wetlands regulations, and applies the state regulations. The local regulations, and the towns' respective enforcement resources, vary in a number of areas that are pertinent to the Pleasant Bay study area.

Additional Interests and Resources Protected. Additional interests are those community values not addressed in the WPA that must be protected in the administration of local regulations. Several resources pertinent to the study area are not covered in all towns' regulations: *erosion and sediment control* (not covered in Harwich), *aesthetics, agriculture and aquaculture*. (not covered in Harwich, Chatham), *water quality in ponds* (not covered in Harwich, Orleans), *historic values, all inland land subject to flooding, and rare plants* (not covered in Orleans, Harwich, Chatham).

Buffers and Setbacks. Each communities' regulations differ on buffers and setbacks. For example, Orleans' regulations specify no alteration from zero to twenty-five feet from a wetlands resource area; and within twenty-five to fifty feet, only projects that will enhance wetlands resources will be allowed. Brewster's regulations specify that no activity is allowed within fifty feet of a wetlands resource area. Consistency of enhanced buffer and setback requirements is desirable to protect resources.

Docks and Piers. Docks and piers require conservation commission approval in all four Bay towns, however specifications for the structures may be found in zoning or other town regulation. Within the regulations there are numerous differences in design specifications, materials, and other conditions necessary to receive approvals.

ACEC Standards. The standard that an activity may be allowed as long as it has no adverse effect on wetlands resources within an ACEC is incorporated in local regulations. However, there are no specific criteria for conservation commissions to rely on in applying the *no adverse effect* standard.

These are among the major discrepancies found in a comparison of local regulations that could result in uneven protection of wetlands resources within the Pleasant Bay study area. These discrepancies have become more pronounced as land use development within the study area has intensified. The current volume of activity required for permitting reviews, field verification and testing, and enforcement of

¹ The wetlands restrictions were put in place for 42 coastal communities across the state between 1966 and 1987 via 302 CMR 4.00: *Rules for Adopting Coastal Wetlands Orders* and 302 CMR 6.00: *Rules for Adopting Inland Wetlands Orders*. Monitoring of the wetlands restrictions orders is conducted by the DEP regional office in Lakeville, MA.

regulations generally exceeds personnel resources in all four towns. These issues concerning wetlands protection regulations and resources need to be addressed to preserve the Bay's wetlands resources, and ultimately its water quality.

Recommendations to Preserve and Restore Wetlands Resources

9.6.1 Strengthen Specific Provision of Local Wetlands Regulations and Review Procedures

Summary: A process for strengthening local wetlands protection regulations and review procedures should be undertaken. To ensure consistency among the four towns, specific language should be developed and adopted into wetlands protection regulations in each town. Issues to be addressed include:

- Establishing a goal of *no loss of wetlands* within the study area.
- Ensuring that replication of wetlands is not an allowed mitigation action.
- Developing specific criteria for applying the ACEC standard of “no adverse impact”.
- Developing uniform procedures for the delineation of wetland resource boundaries, allowing for periodic review and revisions to boundaries as needed.
- Strengthening buffer zone requirements to adequately protect salt and fresh water fringe marsh areas and allow for their upland migration due to sea level rise.
- Requiring that all projects within the watershed be subject to an assessment of impacts on wetlands resources.
- Reviewing and assessing the status of *Coastal and Inland Wetlands Restrictions* in terms of their consistency for protection of wetlands in the four towns, and their use during local and state wetlands reviews.
- Ensuring that Conservation Commissions have adequate professional staff support for regulatory reviews and enforcement.
- Increasing resources devoted to local monitoring and enforcement of wetlands regulations.
- Increasing penalties and fines for violations of orders of condition.
- Coordinating wetlands reviews and regulatory decisions with decisions made by other local boards such as zoning, appeals, and public works.

Implementation: The Alliance Steering and Technical Resource Committees would work with local conservation commissions to identify and prioritize the wetlands regulations and review procedures to evaluate. Professional assistance by consultants may be necessary. Technical assistance may be requested from the Cape Cod Commission and Massachusetts Department of Environmental Protection, Division of Wetlands and Waterways.

Funding: Funding to develop the scope of wetlands regulations and review procedures to be evaluated is included in the FY 1999 budget for the Pleasant Bay Management Alliance. Personnel time will be required of the involved town departments. Funding needs for the evaluation and development of recommendations will be determined by the scope.

Time Frame: Within twelve months of adoption of the plan by the four towns and the state, the scope of wetland regulations and review procedures to be amended would be identified. Changes in regulations and review procedures would be identified within twenty-four months of the adoption of the plan by the towns and the state. Recommended changes will be implemented within thirty-six months of the plan's adoption.

9.6.2 Ensure Consistency of Local and State Wetlands Reviews with the Pleasant Bay Resource Management Plan

Summary: Future decisions by local and state wetlands regulators concerning applications within the ACEC, both individually and collectively, will have significant impacts on wetland resources within the ACEC. A procedure is needed to ensure that local conservation commissions and the state Division of Wetlands and Waterways can verify that an application is consistent with the provisions of the resource management plan. Accordingly it is recommended that:

- Local conservation commissions require applicants requesting regulatory decisions concerning wetland resources within the ACEC boundary submit a copy of the application and all requisite plans and submission materials to the Pleasant Bay Management Alliance simultaneous with submission to the conservation commission.
- The state Department of Environmental Protection, Division of Wetlands and Waterways, require applicants for Chapter 91 licenses or other regulatory decisions concerning wetland resources within the ACEC boundary to submit a copy of the application and all requisite plans and submission materials to the Pleasant Bay Management Alliance. Submission to the Alliance should be made simultaneous with submission to the Division of Wetlands and Waterways.
- The Pleasant Bay Management Alliance will be the body responsible for providing comments to conservation commissions and state Division of Wetlands and Waterways on the consistency of an application with the current provisions of the resource management plan.

Implementation: The conservation commissions and Division of Wetlands and Waterways would need to require applicants to submit application materials to the Pleasant Bay Management Alliance. The Alliance would provide a list the local and state regulatory bodies with a list of areas covered by the ACEC to which the submission requirements would apply. The Alliance would review application materials and prepare comments for submission to the applicable regulatory bodies.

Funding: Review of application materials is incorporated in the FY1999 administrative budget for the Pleasant Bay Management Alliance.

Time Frame: To be effective upon adoption of the plan by the towns and the state.

9.6.3 Increase Protections for the Barrier Beach/Marsh System

Summary: A study of marsh-barrier beach sedimentation should be undertaken. The study would look at changes in marsh areas, beach profiles, and the impacts of existing and proposed erosion control structures on the marsh-barrier beach sedimentation process. The study results would be used to:

- Recommend shoreline and near shore parcels that should be protected from development to sustain the natural beach re-nourishment processes and allow for marsh migration.
- Develop beach re-nourishment regulations to protect beach profiles and water quality.
- Recommend guidelines to be enforced by local conservation commissions in the review and permitting of projects or structures proposed for erosion control, or to upgrade public or private access, in marsh areas.
- Develop guidelines for public access in sensitive areas.

Implementation: The scope of the study would be developed by the Alliance Steering and Technical Resource Committees with local conservation commissions. Technical assistance would be requested from the National Park Service, and Massachusetts Coastal Zone Management.

Funding: Funding to develop the scope of the study would be included subsequent budgets for the Pleasant Bay Management Alliance. Funding for undertaking the study would be requested from public and private grant sources.

Time Frame: The study scope would be generated within thirty-six months of the adoption of the plan by the towns and the state.

9.6.4 Provide Relief for Hydrologically Restricted Wetlands

Summary: Both the Bay-wide flushing study and the nitrogen loading study conducted for the resource management plan identified under-sized culverts at Muddy Creek and Frost Fish Creek, where crossed by Route 28, as significant impediments to good water quality. Funding should be sought to enlarge culverts at Muddy Creek and Frost Fish Creek, both on Route 28 in Chatham. Larger culverts are needed to provide adequate flushing and circulation of sea water. Other wetland resource areas will be assessed to identify opportunities to prevent degradation of wetlands resources.

Implementation: The Alliance Technical Resource Committee will provide input to local departments of public works, conservation commissions, and the Massachusetts Highway Department concerning the need for specific projects, and subsequent design and environmental impact issues. *Coastal and Inland Wetlands Restriction Orders* should be reviewed in the process of designing and planning culvert projects.

Funding: Funding for culvert improvements at Muddy Creek and Frost Fish Creek will be requested through the Massachusetts Highway Department, and any local contributions that may be a condition of funding.

Time Frame: Efforts are on-going.