

2. NATURAL RESOURCES

Provincetown is defined by its natural resources, most conspicuously its dunes, beaches, wetlands, ponds, Harbor, and orientation to the sea. Surrounded on three sides by water, Provincetown has unique and spectacular natural features that contribute considerably to Town character and help drive the local economy. All of Provincetown is, geologically speaking, a barrier beach unlike any other on Cape Cod. This is what makes any rare plants, insect or animal life especially noteworthy. Habitats and natural features occur here that is one of a kind in the entire world. The Town has been listed as number one out of the top ten towns in the Commonwealth with the greatest density of rare species by the Nature Conservancy and the Massachusetts Natural Heritage and Rare Species Program (NHRSP).

Natural resources are Provincetown's greatest attraction and limit and condition the ways it can grow. Even more so than in most coastal communities, natural features are often natural constraints to development. Developable land is limited by the presence of both coastal and inland water, and existing local groundwater supplies are not potable. These local supplies may prove useful in the future with treatment, and must be protected as an important element of the overall ecosystem. The greatest limiting factor, though a tremendous resource, is the National Park Service and the Cape Cod National Seashore, which controls some seventy- percent of Provincetown's land.

This section is divided into three subsections: 2.1, Water Resources, 2.2, Coastal Resources, and 2.3, Wetlands, Wildlife and Plant Habitat, each with its own Goals, Inventory, Analysis, Actions, and Implementation Program. An appendix, section 2.3.6 was added to this section of the LCP to demonstrate the threat that exists to the inhabitants of this barrier beach. It is a listing compiled by NHRSP of plant and animal species which are endangered, threatened and of special concern. Once the rare species go, then the more common ones follow. This is the chain of survival. Homo sapiens are a part of this cycle even though we may easily forget that.

2.1 WATER RESOURCES

2.1.1 INTRODUCTION

This section of the Natural Resources Element is concerned with the health and productivity of Provincetown's groundwater and fresh and marine surface waters. The Pilgrim Lens of the Cape Cod Aquifer serves Provincetown. The Pilgrim Lens has high concentrations of iron

and manganese, making it unsuitable for public water supply use. Most properties suited for well sites are located in neighboring Truro, but the Town has recently undertaken exploration within its own borders. The Town is also exploring technologies for treating this water, both for emergency purposes and to supplement the existing supply. Despite its inadequacy as a public water supply source, protection and management of Provincetown's groundwater remains important because the groundwater lens feeds fresh water to Provincetown's ponds, bogs and wetlands, and ultimately discharges to the surrounding marine waters. The importance of protecting the groundwater, wetlands and ponds is not only a question of whether we drink it or not, but also must be protected as the very lifeline of a fragile and unique ecosystem.

2.1.2 GOALS AND POLICIES

GOAL 1: To preserve and restore the ecological integrity of marine and fresh surface and ground waters using the Classification System below:

POLICY A: Except as otherwise specified in the classification system below, all development and redevelopment shall not exceed a 5 parts per million nitrogen (ppm) loading standard for impact on groundwater based on a methodology contained in Cape Cod Commission Nitrogen Loading Technical Bulletin.

POLICY B: All development and redevelopment shall comply with the Goals and Policies outlined in the following water resources classification system. If a property is located where two classifications overlap, the more stringent standards shall apply. The water resources classification system is illustrated on Cape Cod Water Resources Classification Maps 1 and 2 dated September 5, 1996, as amended and described below:

Fresh Water Recharge Areas: Consist of recharge areas to fresh water ponds as mapped by a method acceptable to the Cape Cod Commission.

1. In order to limit phosphorous inputs, no subsurface disposal systems shall be permitted within 300' of mean high water of fresh water ponds unless the applicant demonstrates by a ground water study that the site is not within the Fresh Water Recharge Area.
2. Developments of Regional Impact that generate over 2000 gallons per day (gpd) of sewage effluent may be required to delineate the ground water recharge areas to potentially affected fresh water ponds and conduct a phosphorous loading assessment in order to identify and mitigate adverse impacts.

3. Public and private sewage treatment facilities may be used within Fresh Water Recharge Areas subject to standards enumerated below.

Impaired Areas: Consist of areas where ground water may have been degraded by point and non-point sources of pollution, including but not limited to areas with unsewered residential developments where lots, on average, are less than 20,000 sq ft; landfills, septage and wastewater treatment plant discharge sites; high density commercial and industrial areas and those downgradient areas where the ground water may have been degraded by these sources. For these standards, certified growth/activity centers shall be classified as Impaired Areas. These areas in Provincetown would include the downtown and the landfill.

1. Development shall meet a 5 ppm nitrogen loading standard for impact on ground water, but may increase to a 10 ppm nitrogen loading standard where it can be demonstrated to the permitting authority the increase will cause no significant adverse impact on ponds, wetlands, marine waters, public or private drinking water supply wells and potential water supply wells.

2. Where existing development exceeds the 10 ppm nitrogen loading standard, development and redevelopment of that property shall not increase existing levels of nitrogen loading.

3. Public and private sewage treatment facilities, as well as other remediation measures such as community systems and DEP-approved alternative systems with enhanced nitrogen removal shall be encouraged in Impaired Areas. Public and private sewage treatment facilities shall be subject to the Goals and Policies below.

Water Quality Improvement Areas: Consist of Impaired Areas located within Fresh Water Recharge Areas. In such areas improvement of water quality is a major goal.

1. Development shall not exceed a 5 ppm nitrogen loading standard or an identified marine water quality standard as applicable. Where existing development exceeds the identified loading standard or where there are documented marine water quality problems, development and redevelopment shall improve existing levels of nitrate-nitrogen loading;

2. Use of public and private sewage treatment facilities shall be as follows: within Water Quality Improvement Areas that are in Fresh Water and/or Marine Water Recharge Areas, public and private sewage treatment facilities may be used in conjunction with any development or redevelopment. All such facilities shall be subject to the Policies below.

Marine Water Recharge Area (MWRA): the area around Provincetown Harbor. Although the Harbor is not considered nitrogen sensitive due to its volume and tide, the protections afforded by an MWRA designation should be established as follows:

1. Nitrogen loading within the MWRA shall not exceed 5 ppm for the lens and 10 ppm standard for impaired areas.

POLICY C: Conversion from seasonal to year-round uses in FEMA A flood zones or within 100 feet of wetlands shall not be permitted unless the proponent installs a DEP-approved alternative system with enhanced nitrogen removal. The proponent must also demonstrate that the project will not have other adverse impacts on ground water or adjacent surface water areas and wetlands.

POLICY D: New direct discharge of untreated stormwater, parking lot runoff and/or wastewater into marine and fresh surface water and wetlands shall not be permitted. Stormwater shall be managed and disposed of on-site. Development and redevelopment should follow the best management practices, such as vegetated swales (if applicable), to minimize runoff and maximize water quality treatment. A maintenance schedule shall be developed for all drainage structures. Stormwater drainage should be based on the projected 25 year-24 hour storm unless more conservative figures are required by local zoning bylaws, Planning Board and Conservation Commission regulations.

POLICY E: Water withdrawals in Truro should be cooperatively managed so that they do not adversely affect surface water resources, wetlands, private wells or the safe yield of the aquifer. Progress has been made with the Boards of Selectmen holding joint meetings.

POLICY F: Development and redevelopment should make use of water conservation technologies.

POLICY G: Development and redevelopment should regulate the use of chemical fertilizers, pesticides, herbicides and non-biodegradable cleaning products.

POLICY H: Cleanup of chemical spill and contamination sites should be expedited, and the Town should maintain equipment and personnel to assist in the cleanup.

POLICY I: Potential Water Supply Areas (PWSA), both inside and outside the Town, should be protected according to the following minimum standards:

1. A five parts per million (ppm) nitrogen load maximum within the PWSA..
2. An undisturbed buffer of 400 feet surrounding the entire PWSA.
3. No sewage treatment plant facilities shall be located within the PWSA.
4. No quantities of hazardous waste beyond those associated with normal household use shall be allowed within the PWSA.
5. Surface water-dependent ecosystems within the PWSA shall be protected from damage, especially any draw down resulting from water withdrawal.

POLICY J: Should sites within Provincetown be developed as water supplies, The Town shall apply minimum performance standards compatible with the Wellhead Protection Area standards in the Cape Cod Commission Regional Policy Plan (RRP).

GOAL 2: To encourage public and private sewage treatment facilities in areas where they will provide environmental or other public benefits and can be adequately managed and maintained.

POLICY A: All public and private sewage treatment facilities shall be designed to achieve tertiary treatment with denitrification that meets a maximum 5 ppm total nitrogen discharge standard in the ground water at the downgradient property line (unless another appropriate standard is identified in the Provincetown Wastewater Facilities Management Plan).

POLICY B: The construction of private sewage treatment facilities (PSTFs) shall not allow development to occur at a higher density than would be allowed by local zoning.

POLICY C: The construction of PSTFs shall be consistent with existing local capital facilities plans. Provincetown shall have the opportunity to assume ownership and maintenance responsibilities for such facilities.

POLICY D: PSTFs shall not be constructed in FEMA V zones and floodways, Areas of Critical Environmental Concern (ACECs), protected wetlands and buffer zones, barrier beaches, coastal dunes, or critical wildlife habitat. PSTFs may be constructed in FEMA A zones only to mitigate water quality problems from existing development within such A zones and consistent with the Goals and Policies in the Coastal Resources Section of this LCP element.

POLICY E: The long-term ownership, operation, maintenance, and replacement of PSTFs shall be secured as a condition of approval in accordance with Cape Cod Commission, state and local guidelines.

POLICY F: Applications shall include a plan for sludge disposal.

POLICY G: When allowing additional development in areas where existing high density development or large numbers of failing septic systems have led to public health or water quality problems, the Commission and/or the Town may require PSTFs or DEP-approved alternative systems with enhanced nitrogen removal to be installed as a remedial measure.

2.1.3 INVENTORY

A. Aquifers and Groundwater Systems / Water Supply

The freshwater lens in Provincetown, the Pilgrim Lens, was long ago abandoned as a source of public water supply due to high levels of sodium and iron. With the increasing importance of identifying additional sources of water, and because of the DEP requirement for 100% redundancy, this freshwater lens is being investigated again.

With treatment, the lens might also provide water for an emergency situation.

The best sites for withdrawing drinking water are located in Truro in the National Seashore, within which the National Park Service is mandated to protect all resources that feed surface waters, including groundwater.

In recognition of the region's complete reliance on groundwater for potable water, all of Barnstable County was designated a Sole Source Aquifer by the U.S. Environmental Protection Agency in 1982. All of Provincetown's drinking water is drawn from the Pamet Lens in Truro. The primary supply sites are the Knowles Crossing and Paul Daley wellfields, with additional wells for summer use at the former North Truro Air Force Station, through an annual emergency agreement with the National Seashore. Provincetown recently participated in the Lower Cape Water Management Task Force, which resulted in a report that identified potential well sites, their preliminary withdrawal limits and potential procedures for distribution of aquifer resources for the towns of Eastham, Wellfleet, Truro, and Provincetown.

As the population has grown (primarily in the summer), pumping has increased. For five months of the year, the existing system is pumping 24 hours a day. Provincetown is currently limited to a withdrawal rate of .85 million gallons per day (MGD) or 311.62 million gallons per year (MGY) under the DEP Water Management Act.

The task force report calls for regional solutions and collaborative efforts among Lower Cape towns and identifies a number of "potential" and "hypothetical" well sites in the Cape Cod National Seashore, some of which have less potential impact on surface water than those existing outside of the Seashore. The sites in proximity to Provincetown are located within the Pamet Lens in Truro and receive good ratings with respect to their impacts on "surface water natural resources."

In 1995, the Air Force Station wells successfully provided 64 million gallons of good quality water in addition to pumpage from the Knowles and Daley wellfields. (Provincetown Annual Report, 1995) Total metered and estimated water pumpage steadily increased from 305 million gallons in 1990 to 1995's total of 406 million gallons. However, recorded water consumption in 1995 in Provincetown and Truro was 210 and 27 million gallons respectively, for a total of 237 million gallons, well within the limits of the water withdrawal permit. The discrepancy between reported pumpage and consumption is thought to be the result of faulty flow meters at well pump stations, leakage and unmetered usage in the distribution system. (Final Needs Assessment Report for Wastewater Management Facilities Planning Study, 1997). Recorded pumpage for 1996 was up to 419 million gallons; factoring in at least a 15% flow meter error (as determined for the previous year by the Needs Assessment) and minor leakage, the Town is still within the limits of its water withdrawal permit, but the margin has grown slimmer.

Hoping to see a decrease in water consumption rates, the Water Department initiated its Water Conservation Project in 1995, distributing water-saving devices for toilets and faucets. Dramatic progress has also been made in accounting for previously unaccounted for water by repairing leaks and replacing mains and other parts of the system. The Water Department has also assumed the leadership in the Town's renewed interest in discovering and tapping groundwater sources within its own borders. Toward this end, the Town has commissioned EIS and EIR studies of potential sites, and has participated in the USGS regional groundwater modeling study of the Outer Cape.

B. Septage Disposal/Wastewater Management

Provincetown currently has no municipal sewage collection system. Types of on-site septic systems include cesspools, "improved" cesspools, Title 5 systems, holding tanks (tight tanks), and tight tanks with limited leaching capacity. A survey conducted as part of the Final Needs Assessment Report for Wastewater Management Facilities Planning Study indicated that cesspools are still the predominant type of system--particularly in older, densely developed areas.

All systems are on-site and must meet federal, state, regional, and local requirements. Title 5 regulations of the State Environmental Code, enforced by the local Board of Health and the state Department of Environmental Protection (DEP), represent the major regulatory standards for Provincetown. Design standards for on-site septic systems include requirements for setbacks, maximum design flows, restrictions for flood zones, and variance procedures.

Provincetown has many existing subsurface systems in V Zone flood areas that would not be permitted under current Title 5 requirements. Enforcement of Title 5 (through upgrading) occurs when repairs are necessary or when structures are altered or sold (unless the system is operating efficiently and passes inspection).

Upgrades to systems in low elevation areas where groundwater is close to the surface require elevation to allow a minimum of five feet of separation between the bottom of soil absorption systems and the top of maximum high groundwater elevation. The resulting raised septic systems often conflict with the historic character of the downtown area. Additionally, many require electric-powered pumps, since they have reverse gravity flow; this is a potentially serious problem in a Town subject to a high risk of power outages. Article 17, a resolution opposing raised systems passed at a 1994 Special Town Meeting and initiated the wastewater facilities management planning process.

The largest single project the Town might ever undertake is a centralized wastewater facility, or sewer project. The Town continues to gather information for wastewater facilities planning under the direction of the Board of Selectmen. The concept of privatization is also being explored. This continued planning and information gathering is to ensure that the facility is built at the lowest possible cost, but also that the firm which designs it can then be accountable to the Town for its construction and operation.

What is unusual about Provincetown's approach is the amount of choice and flexibility that would be provided to property owners. Those properties that can comply with Title 5 can choose to hook-up if they wish. Those that cannot comply would be allowed to delay connecting if their on-site system is not in failure. Assessments would only be levied upon those properties that do connect. Any property's sewer connection would be limited to its Title 5 design flow capacity or actual flow resulting from its current legal use of the property, whichever is greater. This could allow for greater use than strict Title 5 compliance would allow.

Special State legislation required allowing this approach was passed at Annual Town Meeting in 1999, along with authority for the Board of Selectmen to explore the option of a privatized design/build/operate wastewater facility. As of this writing, the Board of Selectmen have not made a final determination on either the size of the facility or its location.

One of the results of Provincetown's renewed interest in sources of water within the Town's borders could be that the number of sites available for wastewater discharge will be reduced. For example, the Town's engineering consultants have recently suggested the Route 6 median strip as both a site for wastewater discharge and for groundwater withdrawal.

C. Water Bodies and Wetlands

Ponds:

Provincetown's primary freshwater resources are its ponds, nine of which are state-recognized, covering a combined area of 94 acres. All of the freshwater ponds are Class B, the highest ranking for ponds not used for public drinking water supply. The ponds in Provincetown are not kettlehole ponds as are found on other parts of Cape Cod. Rather, the ponds are the result of dune blowouts. The ponds are isolated, and do not drain to the sea. Their surface level depends on fluctuations in the aquifer's water table and their shorelines provide a sensitive habitat and are primary sites for rare plants and animals.

Three ponds, Clapps, Shank Painter and Great, are classified as Great Ponds of the Commonwealth, on the basis of being larger than 10

acres in size, entitling public ownership and access (smaller ponds can be privately owned and public access prohibited).

"Clapps Pond is the only pond with a practical shallow-draft boat access point, the dirt landing provided by the Massachusetts Division of Fisheries and Wildlife off Route 6." (Open Space and Recreation Plan, p. 29, 1995) Provincetown's ponds and their environs are used for birdwatching, fishing, ice skating, hiking and as outdoor studio by artists and are important habitat for rare plant and animal species. Encroaching development and nitrogen loading from septic systems and storm water and runoff from Route 6 threaten the ponds.

Salt Water Bodies:

Provincetown's twenty-one mile coastline represent the basis of the tourist economy, providing opportunities for swimming, fishing, boating, shell fishing and other activities. Within the National Seashore, Race Point Beach and New Beach at Herring Cove are attractive public beaches, while other marine activities occur mainly in Provincetown Harbor and Cape Cod Bay.

The Town has eight designated landings and three non-designated landings on the shoreline, only one of which has a paved ramp for boat launching at high tide. Use of all of the landings is restricted by the lack of parking and tidal range. The potential for the creation of new landings is made difficult by the intensity of waterfront development.

Harbor:

Provincetown Harbor is used for a variety of activities including transportation, fishing, shell fishing, commercial uses such as sport fishing and whale watching, recreation, education, excursions, and a wide range of local activities. Though declining, Provincetown's fishing port remains one of the largest on Cape Cod. The Harbor and related planning issues are discussed in greater detail in the Coastal Resources section. At Annual Town Meeting in 1997, the Town adopted a Harbor Plan.

Wetlands:

Provincetown has diverse wetlands, both salt and fresh water, totaling over 600 acres. In addition to their aesthetic attributes, these wetlands are important as habitat and food sources for a variety of flora and fauna. Types of wetlands located in Provincetown include quaking bogs, upland forested wetlands such as cedar swamps, ponds, vernal pools, salt marsh, inter-tidal areas and tidal flats. Freshwater wetlands comprise some 271 acres. Nearly all of the salt water wetlands are located in the National Seashore.

2.1.4 ANALYSIS

A. Existing Water Quality Problems, Threats and Priorities for Protection

Because there is no public sewer system in Provincetown, non-point discharges from septic systems are a significant source of contamination of water resources. Other pollution sources include street runoff, discharge from boats, and marine-related debris. The Town has made great strides in minimizing marine discharges through its pump-out program and through Article 5 of the Provincetown Harbor Regulations which prohibits the discharge of "oil, sewage, gray water, holding tank wastes, spirits, flammable liquids, contaminated bilge wastes, kitchen wastes, garbage, litter, or other refuse into Town waters." (PHR, Article 5, pp. 13-14).

Since the public water supply does not rely on local ground resources, the effects of local groundwater contamination on the Pilgrim Lens do not present an immediate public health problem. However, it is important to protect Provincetown's groundwater to protect its fragile ecosystem. Provincetown is one of a kind in the barrier beach habitat it provides, and the Pilgrim lens plays an important role in balancing this fragile and unique system.

Provincetown's high water table, concentrated development pattern and vulnerable location magnify the potential impacts of groundwater contamination on surface water bodies and human health.

Provincetown's Water Resource District, adopted in 1991, protects land owned by the Town and the state between Route 6 and the railroad bed, east of Howland Street. In order to protect groundwater, the District designation prohibits storage of hazardous materials. However, the chances of establishing a safe, functional wellfield here, even as an emergency back-up source, are highly unlikely.

Potential non-point threats to the public drinking water well sites in Truro include salt water intrusion from over-pumping (the Knowles Crossing well field has already experienced salt contamination), underground storage tanks, landfill leaching, and chemical spills from trucks on nearby Route 6. Truro recently changed a bylaw increasing the Zones of Contribution to the well sites and restricting certain types of business from those zones. However, the greatest threat remains vehicles and uses along Route 6. Current zoning is not restrictive in the general business zones and uses just outside the current water protection district may present hazards in the future. (Truro LCP, WR-15) To their mutual benefit, Provincetown and Truro must work cooperatively to protect existing and potential water sources and to initiate coordinated water conservation efforts.

Continued total reliance on on-site individual septic systems and cesspools may result in effluent contamination of ground and surface water. The highly permeable soils readily transmit nitrates to ponds and the Harbor and, in some cases, coliform bacteria.

With septic failure in the downtown area a constant concern, some commercial establishments have converted to "tight tank" systems that eliminate on-site effluent except in the case of overflow. The

tanks' contents are pumped out and disposed of at the Tri-Town facility. While state authorities do not encourage such systems because of the large quantity of waste generated for disposal, there is no specific limit or policy in place at the state level.

To offset insufficient depth to groundwater, in recent years some home and business owners developed "raised" or "mounded" septic systems. Many Provincetown residents find these systems unsightly and the Town has passed a non-binding resolution in support of a moratorium on mounded systems. Such systems are also vulnerable to the high risk of power failure.

Though the Town has been successful "in encouraging and requiring low-flow solutions to wastewater problems, the potential for continued degradation of Provincetown's most important open space asset, its broad Harbor and open tidal flats, will remain." (OSRP, p. 49). The Wastewater Facilities Management Plan scope called for analysis of the Town's wastewater problems and needs on a section-by-section basis, assessing the viability of different technologies for different areas of Town. Evaluation of options for Provincetown's wastewater management must take into account a wide range of local issues, such as water consumption and community character, that overlap with several other Elements of this LCP. For example, consideration given to installing sewers in the downtown area must address the potential impacts on landowners' behavior vis-a-vis probable increased water use and renewed interest in infill development and expansion.

The Cape Cod Commission water resources classification system, detailed under Goal 1 at the beginning of this section, enumerates prohibited uses, maximum allowable loading standards for nitrogen, required contamination mitigation measures and technologies, and other Goals and Policies. This system governs development and redevelopment in fresh water recharge areas, impaired areas, and water quality improvement areas. The Town must document how these standards will be applied locally.

The "Final Needs Assessment Report for Wastewater Management Facilities Planning Study" (February, 1997) highlights the major issues to be addressed by the project overall as follows:

Provincetown's sandy soils are generally appropriate for on-site septic systems, but areas at lower elevations and close to beaches often cannot meet standards without construction of raised systems. In the downtown area, such raised systems have faced strong opposition on aesthetic grounds.

Due to limited space, high groundwater and sandy soils, construction costs for Title 5 systems are extremely high in some areas. Physical constraints such as storm sewers, water lines and other underground utilities, as well as the narrow streets, increase the costs of any

potential sewer collection system in the downtown areas. Potential disruption of summer trade downtown for any proposed sewage collection system construction poses important considerations. Many of Provincetown's residential on-site systems are cesspools. In the August 2, 1995 changes to Title 5, Section 15.03 (1)(b), existing cesspools only fail automatically by being within 50 feet of surface water bodies, wetlands, or salt marshes. Some Provincetown residents believe that their cesspools are not adversely affecting the environment, and the concerns of these residents are addressed as part of the facilities plan. All variances available within the existing Title 5 regulations and their impacts are explored.

B. Public Water Supply and Regional Coordination Issues

Water pumpage has increased dramatically over the last decade. This increase needs to be evaluated and managed in order to maintain compliance with the Permit, both in 1997, 1999 and in 2020.

Some existing and all potential sites for drawing public water are located in Truro and, more importantly, within the National Seashore. The National Park Service (NPS) is mandated to protect all resources that feed surface waters, including groundwater, within the National Seashore. The NPS is not mandated to provide long-term water supplies. Therefore, for other well fields to be considered, not only must the Town demonstrate need, but it must be clear that use of potential well sites would have no negative impact on natural resources.

The Lower Cape Water Management Task Force (LCWMTF) report indicates that use of all the existing sites supplying Provincetown have potential "moderate" impacts on "identified natural resources at a 0.5 MGD [million gallons per day] pumping rate" (Peak summer water consumption in the summer of 1995 exceeded 2.0 MGD). The North Truro Air Force Station wells and a hypothetical Truro "Coast Guard" site are identified as having less impact on natural resources than the present use of Knowles Crossing and Paul Daley wellfields.

Given the physical and political barriers to mainland water acquisition, desalinization has been studied as an alternative solution to the looming water supply crisis and found unfeasible. While use of a desalinization facility could potentially offset the demands of the ever-increasing peak summer population, drawbacks include the high cost of desalinization technology, insufficient available land for the siting of such a facility, and the lack of places to dispose of brine byproducts. Desalinization has been effectively eliminated as a viable option. Peak water demand is difficult to control because tourism is heavily concentrated in the summer months and the influx of day-trippers cannot be directly controlled by regulations governing the issuance of building permits. However, the Town can minimize the potential for water supply shortages by limiting growth, including business activity,

that puts additional strain on the water supply, reviewing the effectiveness of the Growth Management By-law, vigilantly enforcing building regulations, and encouraging a greater commitment to water conservation

Clearly, growth controls must be stronger, as supported by the Community Vision Project Survey, in order to ensure adequate water supply in the future. Provincetown must also continue to seek regional solutions involving neighboring towns and the National Seashore to address long-term water supply needs. Finally, the Town should compare its water rates with other towns and evaluate their impact on usage.

2.1.5 ACTIONS / IMPLEMENTATION PROGRAM

ACTION 1: Continue to actively seek new sources of water within the Town's own borders, and to conduct Environmental Impact Studies and Environmental Impact Review of potential sites.

ACTION 2: Develop a detailed water conservation plan, ensuring compliance with the DEP Permit. The plan should encourage the installation and use of water saving devices and use of non-potable and "gray water" systems for garden irrigation and other uses whenever possible.

ACTION 3: Develop a coordinated water conservation plan for users within the Water District.

ACTION 4: Identify and locate cesspools and leaching systems that are constructed within the groundwater table, especially those serving properties in densely developed areas, and implement inspection and improvement programs (in coordination with the Wastewater Management Facilities Planning Study).

ACTION 5: Develop regulations requiring and establishing procedures for regular maintenance and pump-out of septic systems in accordance with the Cape Cod Regional Policy Plan.

ACTION 6: Implement the recommendations of the final Wastewater Management Facilities Planning Study.

ACTION 7: Minimize the total application of salt and other harmful de-icing chemicals in the removal of snow from roadways.

ACTION 8: Compare local water rates with those of other towns and evaluate the impact on usage. Develop incentives for conservation and educate the public regarding the limited resource and its value.

ACTION 9: Encourage the use of water saving devices such as non-water toilets and low-flush toilets through cooperation with the Board of Health and Department of Regulatory Management and with financial incentives to homeowners and businesses.

ACTION 10: Protect groundwater quality by limiting and regulating the use of pesticides, herbicides and toxic cleaning products.

ACTION 11: Protect ponds as sensitive habitats for rare plants and animal species by

discouraging use of their shorelines for recreational purposes and ensuring that damage does not occur from excessive water table drawdowns from any new water supply pumping.

ACTION 12: Encourage and support Town, citizen and nonprofit monitoring efforts for Provincetown Harbor.

2.2 COASTAL RESOURCES

2.2.1 INTRODUCTION

This part of the Natural Resources section addresses issues relating to coastal resources including the Harbor, beaches, flood hazard areas, dunes, coastal banks, and tidal flats. Specific issues include protection and enhancement of public access rights, coastal water quality, shell fishing, swimming and other recreational pursuits, marine-related activities and coastal ecosystems

2.2.2 GOALS AND POLICIES

GOAL 1: To protect public interests in the coast and rights for fishing, fowling and navigation; to preserve and manage coastal areas so as to safeguard and perpetuate their biological, economic, historic, maritime, and aesthetic values; and to preserve, enhance and where appropriate, expand public access to the shoreline.

POLICY A: Development and redevelopment along the coastline shall not interfere with existing public access, water-dependent uses, traditional rights-of-way and environmentally appropriate use of the shoreline.

POLICY B: Public access shall be provided at publicly funded beach nourishment sites where such access will not impair or damage natural resources.

POLICY C: Development and redevelopment should reflect the traditional maritime character and architecture typical of the area and should be designed to maintain and enhance views of the shoreline from public ways, access points and existing development.

POLICY D: The walkways, where environmentally acceptable and consistent with public safety, should be encouraged to enhance shoreline access for the public, including people with disabilities.

POLICY E: If an existing water dependent facility is within 250 feet of the historic mean high water line or shoreward of the first public way, whichever is less, such use should not be changed to a non-water-dependent facility. Replacement of a water-dependent use shall not be permitted unless an overriding public benefit is provided to accommodate for the loss of the water-dependent use.

POLICY F: Development or redevelopment of water-dependent facilities should provide coastal access benefits to the general public.

Such access should minimize interference with the water-dependent use.

POLICY G: Coastal engineering structures should be designed so as to allow the public to pass along the shore (either above or below the structure) in the exercise of its public trust rights to fishing, fowling and navigation.

GOAL 2: To limit development in areas subject to coastal storm flowage, particularly high hazard areas, in order to minimize the loss of life and structures and environmental damage resulting from storms, flooding, erosion, and relative sea level rise.

POLICY A: Except as specified in Policy E, below, no development or redevelopment shall be permitted within FEMA V flood zones. Existing structures may be reconstructed or renovated, provided there is no increase in floor area or intensity of use. As an exception, where there is no feasible alternative, water-dependent structures and uses may be permitted subject to the approval of all permitting authorities.

POLICY B: In order to ensure human health and safety, and protect the integrity of coastal landforms and natural resources, all new buildings, including replacements or substantial improvements to existing structures, within FEMA A zones shall be designed to accommodate the documented relative sea level rise rate. That rate in Massachusetts is of at least one foot per 100 years, except as provided in Policy K, below, and in V zones shall be designed to accommodate a relative sea level rise rate of two feet per 100 years.

POLICY C: Except as specified in Policy E, no new development or redevelopment shall be permitted on barrier beaches and coastal dunes as defined by the Wetlands Protection Act and associated regulations and policies. Existing structures may be reconstructed or renovated, provided there is no increase in floor area or intensity of use, or conversion from seasonal use.

In accordance with FEMA standards, if the reconstruction/renovation is greater than 50% of the assessed value of a structure, and is located within a V zone, the lowest horizontal structural member shall be elevated at least two feet above the 100 year flood elevation. If the structure is located in the A zone, the lowest floor shall be elevated at least one foot above the 100 year flood elevation, except as provided in Policy K. On a barrier beach or coastal dune, and in either the V or A zone, the structure shall be on open pilings, to allow for storm flowage and beach and dune migration.

If the structure is on a barrier beach or dune and is outside the 100 year coastal floodplain, and is proposed to be reconstructed or renovated to greater than 50% of its assessed value before reconstruction or renovation, it shall be elevated at least two feet above grade on open pilings to allow dune migration.

Water-dependent public recreational facilities in these locations may be developed, providing that it can be demonstrated that the proposed development will not compromise the integrity of coastal resources, and are appropriately elevated on pilings, or flood-proofed.

POLICY D: Development and redevelopment on or within 100 feet landward of a coastal bank or dune shall be designed to have no adverse effect on the height, stability or the use of the bank or dune as a natural sediment source. In areas where banks or dunes are eroding, the setback for all new buildings and septic systems to the top of the coastal bank or dune crest shall be at least 30 times the average annual erosion rate of the bank or dune. This rate shall be determined by averaging the erosion over the previous 30-year period at a minimum. In instances where shoreline erosion rates are indicative of bank/dune erosion rates, MCZM shoreline change maps may be used in determining the setback.

POLICY E: Where fire, storm or similar disaster has caused damage to or loss of buildings in FEMA A and V zones, on barrier beaches, coastal banks or coastal dunes of greater than 50 percent of their assessed value, all reconstruction shall be in compliance with current applicable regulations. Reconstruction shall be designed in accordance with Water Resources Section, Goal 2, Policy C; Coastal Resources Section, Goal 2, Policies B and D; and Coastal Resources Section Goal 3, Policies A and B. Reconstruction shall not enlarge or expand the use of an existing structure.

POLICY F: Except as provided in Minimum Performance Standard K, below, no new public infrastructure or expansion of existing infrastructure shall be made in flood hazard zones (FEMA A and V zones) unless it is shown that there is an overriding public benefit provided, and provided that such infrastructure will not promote new growth and development in flood hazard areas.

POLICY G: Where land subject to coastal storm flowage is significant to the interests of flood control and storm damage prevention, no activity shall increase the elevation or velocity of flood waters or increase flows due to a change in drainage or flowage characteristics on the subject site, adjacent properties, or any public or private way.

POLICY H: Within the 10 year floodplain no activity shall impede the landward migration of other resources areas within this area of the floodplain. Relative sea level rise and the landward migration of resource areas in response to relative sea level rise shall be incorporated into the design, construction, and location of structures and other activities proposed.

POLICY I: New structures, additions, to existing structures, solid foundations, new or proposed expansions of roads, driveways or parking lots, or impermeable paving of existing ways, new or proposed

expansions of coastal engineering structures, and new septic systems shall be prohibited within the V zone of a beach, dune, barrier beach, or coastal bank where they will result in alterations to vegetative cover, interruptions in the supply of sediment to other wetland resources, and/or changes to the form or volume of a dune or beach.

POLICY J: Notwithstanding the above Policies, the following activities may be permitted provided the applicant demonstrates that best available measures are utilized to minimize adverse impacts on all critical characteristics of land subject to coastal storm flowage. The applicant must also demonstrate that all other performance standards for underlying resource areas are met.

Beach, dune and bank nourishment and restoration projects, including fencing and other devices to increase dune development and plantings compatible with natural vegetative cover.

Elevated pedestrian walkways and elevated decks with appropriate height and spacing between planks to allow sufficient sunlight penetration

Boat launching facilities, navigational aids, piers, docks, wharves and moorings

Improvements necessary to maintain the structural integrity and stability of existing coastal engineering structures

Projects that will restore, rehabilitate or create a salt marsh or freshwater wetlands

Projects that are approved, in writing, or conducted by the Division of Marine Fisheries that are specifically intended to increase the productivity of land containing shellfish, including aquaculture, or to maintain or enhance marine fisheries

Projects that are approved, in writing, or conducted by the Division of Fisheries and Wildlife that are specifically intended to enhance or increase wildlife habitat.

POLICY K: In order to allow alternative means of reducing flood hazard risks in areas where there are serious concerns about protecting the character of historic villages, the following shall apply in certified Village Growth/Activity centers located in FEMA A zones for which a Flood Hazard Mitigation Plan has been prepared and adopted by the Town and has been found by the Cape Cod Commission to be consistent with state coastal policies and regulations. Notwithstanding other Goals and Policies herein, the following standards shall apply to such certified Village Growth/Activity centers located within FEMA A zones:

1. Development and redevelopment shall be subject to the requirements of the adopted Flood Hazard Mitigation Plan and any related policies and regulations.

2. Public infrastructure and private sewage treatment facilities (PSTFs) may be constructed in FEMA A zones (but not within V or AO zones) provided that these facilities are consistent with the Flood Hazard Mitigation Plan and the certified Local Comprehensive Plan; further provided that the infrastructure is itself flood-resistant; and provided that such infrastructure will not promote new growth and development outside such certified Growth/Activity center.

3. All new buildings or substantial improvements to existing structures in the FEMA A zone shall comply with FEMA and State Building Code regulations for elevation and flood-proofing.

POLICY L: Vehicle, boat and pedestrian traffic in critical wildlife and plant habitat areas should be regulated to minimize and mitigate any adverse affects. The Open Space Committee, Conservation Trust and Conservation Commission should develop regulations that control and minimize access to these areas. These areas are identified in the classification system described under Goal 2 of the Wetlands, Wildlife and Plant Habitat section of this Plan Element as follows: wetlands, dunes, shallow estuarine areas, and shorebird breeding habitats.

POLICY M: The Town should develop a beach nourishment program with input from the Conservation Commission and Harbor Committee. Wherever feasible, dredge material should be used for beach nourishment in areas subject to erosion.

GOAL 3: To maintain and improve coastal water quality to allow shell fishing and swimming in all coastal waters as appropriate, and to protect coastal ecosystems which support shellfish and finfish habitat.

POLICY A: Within FEMA V zones new mounded septic systems shall be prohibited except to upgrade existing substandard septic systems where such systems pose a demonstrated threat to public health, water quality or natural resources. If feasible, solid components of the septic system shall be elevated above the 100 year flood level.

POLICY B: No new direct, untreated storm water discharges shall be permitted into any coastal waters or wetlands including discharges above or below the mean high water level.

POLICY C: The design and construction of storm water management systems proposed in V zones shall incorporate the historic rate of relative sea level rise in Massachusetts of two feet per 100 years. For systems proposed in A zones, the historic rate of relative sea level rise in Massachusetts of one foot per 100 years shall be incorporated into the project design and construction.

POLICY D: In order to avoid loss of shellfish habitat and minimize impacts on wetlands, construction of community docks and piers, rather than separate structures serving individual lots, shall be required wherever possible (some properties under Chapter 91 jurisdiction may be required to have dinghy docks). In significant

shellfish habitat areas, as identified and documented by the Division of Marine Fisheries and/or local shellfish officials, the construction of docks and piers shall not be permitted. Docks and piers that are more than 50% damaged or destroyed by storms may be replaced in accordance with federal, state and local regulations, except in areas identified and documented as significant shellfish habitat.

POLICY E: New marinas of 10 or more slips, moorings or active landward storage berths, and expansions of existing marinas by 10 or more slips, moorings or berths shall provide or contribute to the provision of adequate boat sewage pump-out facilities in the Harbor and shall provide restrooms for their patrons. Such marinas shall also provide or contribute to the provision of adequate collection facilities for solid waste and waste oil for their patrons.

POLICY F: New dredging projects or expansion of existing dredging projects shall not occur unless a substantial public benefit can be demonstrated including but not limited to enhancement of fish or shellfish habitat, improvements to the flushing capacity of nitrogen sensitive embayments, or necessary improvements to navigational safety. Establish a waste oil collection tank at MacMillan Wharf.

POLICY G: Undisturbed buffer areas of at least 100' width surrounding coastal wetlands and/or landward of the mean high water of coastal water bodies shall be protected as specified in Wetlands Section, Goal 1, Policy B.

POLICY H: Waterfront fueling facilities should be upgraded to ensure that best management practices are used to avoid adverse impacts to water quality

2.2.3 INVENTORY

A. Provincetown Harbor

The Harbor Plan for the Town of Provincetown (Adopted by the Town in 1997 and by the State in 1998) serves as the primary source of inventory and analysis of Harbor-related resources.

Harbor Definition and Use:

Provincetown Harbor is defined in its entirety as the area contained within an imaginary line extending from Long Point to the Truro/Provincetown boundary. The mean tidal range is 9 feet and prevailing winds come from the south/southwest. Over the course of hundreds of years the Harbor has provided a deep natural anchorage and attractive setting for fishermen, tourists and residents.

In recent years the Harbor has seen declining use as a commercial and fishing port and a rise in tourist-related uses. Where once there were numerous piers and wharves, now just three piers remain: MacMillan Wharf, Fisherman's Wharf, and the Coast Guard Pier. Only MacMillan Wharf, constructed in 1957, is owned and operated by the Town. Its

uses include fishing berths, some fish off-loading facilities, the Marine Superintendent's office and facilities for whale watching, sailing excursions, Harbor tours, charter fishing, and drop-off points for cruise boats.

A breakwater built by the Army Corps of Engineers protects MacMillan and Fisherman's wharves and Harbor moorings from the southeast. Records show that the Harbor shoreline was located just seaward of Commercial Street before fill extended the shore to its present configuration. Shoaling occurs around piers and the Federal Breakwater. Shoaling at the east end of the breakwater is such that only boats drawing less than four feet can pass through (shoaling also occurs in other locations, notably at the west end of the Harbor).

Additional marine structures in the Harbor include the following: Federal rubblestone dike running from the West End Rotary to Wood End, used for fishing and recreation;

Eight designated Town Landings: Pearl Street Extension, Freeman Street Extension, Gosnold Street Extension, Court Street Extension, Atlantic Street Extension, Good Templar Place, the Coast Guard Station alley on the west side, and Captain Jack's Wharf.

Three non-designated landings owned by the Town: Kendall Lane, Johnson Street and the West End parking lot. The Town-owned West End Boat Ramp, which is limited in its usefulness by tidal constraints, the lack of support floats and limited parking.

The Town issues approximately 470 moorings, renewable each year for a fee. These include individual moorings and rental moorings (for marinas, clubs, hotels, etc.). Marina facilities include a total of some 160 moorings and approximately 65 slips. Water-based transportation is dominated by seasonal ferry excursion lines running to and from Boston, Plymouth and Gloucester. Freight service is non-existent.

Water Quality:

Administered by the Harbormaster or Marine Superintendent, a 300 gallon pumpout boat services the Harbor. A 1993 Town General By-law prohibits discharge of septic or other waste from any vessel.

According to a 1994 study undertaken by the Woods Hole Oceanographic Institute's Sea Grant New Initiative Program, Massachusetts Coastal Zone Management (CZM), and local citizens, major water quality concerns center on land-generated marine debris, discharge from street drains, septic discharge from waterfront systems and boats, boat-generated marine debris, and nets and lines lost at sea. Public awareness was lacking with respect to the impacts of debris, the existence of disposal facilities and appropriate means of handling garbage in a marine setting.

B. Flood Hazard Areas

Under terms of participation in the Federal Flood Insurance Program, new shorefront development must meet flood-proofing standards. Provincetown has an estimated 24 dwellings along Commercial Street located in a flood velocity zone or V Zone. These are high risk areas where storm surge or direct wave action occurs. According to the Open Space and Recreation Plan, "State and local wetlands protection legislation should help prevent future development in the high hazard Harbor area." (OSRP, p. 30)

A Zones are located landward of V Zones; these are areas where flooding can be expected when 100-year storm events occur, primarily salt marshes and shore areas up to 15 feet above sea level. The municipal parking lot and Town Hall Square are located in an A Zone. Past hurricanes and major storms have caused considerable structural damage and erosion.

C. Dunes, Beaches, Coastline

Provincetown is a barrier beach created by deposition and accretion, sea level rise and shifting sands some 5,000 years ago. Geologically much younger than the rest of the Cape, steep dunes were created by sand built up by wind on the wave-driven landform.

"The dunes exhibit the same essential features as the classic ones in the National Seashore, but they are "older, relatively stabilized by vegetation and retaining walls and more manipulated by development." They pose "significant development obstacles due to erosion and aesthetic issues, while at the same time being very attractive for residential development owing to the magnificent water views they afford." (OSRP, p. 23)

Twenty of Provincetown's dune hills reach close to 100 feet in height. In 1991, a High Elevation Protection District was established, protecting particularly scenic and vulnerable dunes.

Provincetown's 21.3-mile shoreline is actively used for swimming, fishing, shell fishing, boating and other recreational pursuits, especially during the summer months. Most of this activity is concentrated in the major marine areas: Provincetown Harbor, Herring Cove (New Beach), Hatches Harbor, and at sea.

D. Shellfish Habitats

Provincetown has some 480 acres of Harbor shellfish beds. They include sea clams, soft-shell clams, quahogs, blue mussels, and occasionally bay scallops. All are harvested recreationally, except for sea clams, for which commercial licenses are issued. The popularity of shell fishing (over 200 recreational permits are issued annually) means that the shellfish population is constantly challenged. Hatches Harbor is seasonally off-limits to shell fishing due to the presence of parasites.

Over two million quahog seeds were planted on the West End flats in 1992. Other aquaculture projects include a 30,000 seed quahog bed in the West End and an experimental spat collection for oysters and steamers. (OSRP, p. 42)

E. Coastal Access

Public facilities providing access to the coast include the eight designated Town landings, MacMillan Wharf, and numerous right-of-ways in the Harbor area, some of which are generally not recognized as such by the public.

F. Federal, State, Local Regulations

Local, state and federal authorities regulate the Harbor. The State regulates construction, dredging, filling, changes in use, and other activities in filled and flowed tidelands and other waterways under Chapter 91 of the Massachusetts General Laws. Dating from 1866, with several major amendments and regulatory revisions between 1979 and 1990, Chapter 91 is based on the time-honored public trust doctrine, which regards as common property the air, running water, sea, and seashore. Amendments and revisions stress water-dependency of uses and provision of public access to the water and water-dependent facilities, and encourage local involvement in Chapter 91 licensing through municipal Harbor plans. Chapter 91 is applicable to tidelands and great ponds, as well as along some rivers and streams. "Tidelands" include all land currently or formerly underwater, including land that is always submerged and inter-tidal areas (below the historic mean high water mark).

There are two types of tidelands: 1) Commonwealth tidelands which are, for most of the Massachusetts coastline, all lands below the low water mark extending out three miles to the limit of state jurisdiction. This area is owned by the Commonwealth or held by private persons in accordance with the public trust. 2) Private tidelands are those areas between mean high and mean low water which are usually privately owned but on which the Commonwealth reserves and protects public rights of fishing, fowling and navigation.

In Provincetown there are three jurisdictional distinctions as follows:

1) Lands east of Howland Street, outside the former Provincelands, which were formerly part of Truro. These "private tidelands," were owned by adjacent upland landowners, but were subject to easements granting public rights of fishing, fowling and navigation. As such, they are governed by the same rules as land titles in any other coastal Town in Massachusetts.

2) The coast west of Howland Street, or "Town" lands in the former Provincelands where "private ownership of property is limited to the area landward of the (historic) mean high water mark," with land on the waterward side designated Commonwealth tidelands.

3) "Wild lands" in the former Provincelands, located northeast of Howland Street. This land is owned by the Commonwealth and managed by DEM, except where the National Seashore has assumed control. No private ownership is possible without explicit grant of the Commonwealth.

Through the Army Corps of Engineers (ACOE), the federal government regulates dredging, filling and other activities below the mean high water mark. Local zoning regulates the uses, density and dimensions of waterfront development, and additional local rules and regulations apply to the management and operation of MacMillan Wharf. The National Park Service regulates and otherwise controls all activity within the Cape Cod National Seashore.

Other coastal activities are regulated through various laws as follows: Section 404 of the Federal Clean Water Act and Section 401 of the State Clean Water Act regulates the effects of Harbor activities on water quality.

Chapter 131, Section 40 of the State Wetlands Protection Act regulates the Harbor and its wetlands through the local Conservation Commission.

The State Division of Marine Fisheries through the Natural Heritage Program regulates shellfish and conservation areas, as well as the Endangered Species Act.

Coastal waters are regulated by the State CZM, and the ACOE conducts federal consistency review.

Annual private mooring permits are issued under the jurisdiction of the Marine Superintendent.

2.2.4 ANALYSIS

A. Environmentally Sensitive Resources

Provincetown Harbor:

Harbor-related issues include overcrowding, access problems, commercial/recreational conflicts, and water quality concerns. The Harbor Plan for the Town of Provincetown addresses these and other issues. Key themes expressed in the goals and objectives outlined in the Harbor Plan are the following:

- prioritizing water-dependent uses
- balancing multiple (compatible) uses
- protecting and enhancing tourism and recreation
- reorganizing responsibilities for the effective management of public facilities and interests

- enhancing and protecting public access
- supporting the fishing industry
- improving launching ramps
- improving moorage and berthing for small boats.

Beaches:

Having no dedicated beach of its own, the Town only has jurisdiction over the Harbor beach areas that are used de facto by the public. Continued and improved access to these areas as well as attention to water quality and maintenance concerns should be a Town priority.

Tidal flats:

Expansive tidal flat are among Provincetown's defining features and support a variety of shellfish. Because of the popularity of shell fishing, both commercially and recreationally, there is always pressure on the shellfish supply. The Town should ensure the protection of its tidal flats from road runoff contamination and other degradation. Efforts to protect and restore shellfish beds should be continued and supported.

B. Coastal Land Use and Water-Dependent Uses

Revised Chapter 91 regulations call for a renewed commitment to water-dependent uses on the waterfront. This comes at a time when Provincetown's large vessel fishing industry is in decline, though pleasure boating and other recreational use of the Harbor and shoreline is very popular, and some small boat fishing remains active. The Community Vision Project Survey clearly indicates that public access to the waterfront is very important to the people of Provincetown. Clearly, established rights-of-way should be identifiable and usable but respect must be paid to the rights of shorefront property owners.

C. Water Quality and Impacts on Use of the Harbor and Shoreline

To ensure that a high level of water quality is maintained, steps should be taken to minimize septic discharges, manage road runoff, control marine-related debris (both land- and boat-generated), eliminate discarding of marine nets and lines at sea and eliminate petrochemical discharge. Public education relating to the impacts of debris, proper use of disposal facilities, and appropriate procedures for handling garbage in a coastal setting should be an essential component of such efforts.

D. Shorefront Use Conflicts and Adequacy of Facilities

In the not-so-distant past, commercial fishing dominated use of the Harbor and piers. Today, conflicts exist between a wide variety of recreational and commercial marine activities vying for space in the Harbor and on MacMillan Pier. Though recreational use is ever-increasing and diversifying, Provincetown Harbor has a reputation as an unfriendly port, lacking adequate signage and information,

convenient provisions, sufficient launch service, and laundry and shower facilities for boaters. The Harbor Plan stresses the need for careful management of uses and delineation of responsibilities to ensure compatibility of uses on the waterfront.

E. Dredging and Maintenance Needs

Navigation in the Harbor has become increasingly difficult in recent years due to shoaling along both ends of the Federal Breakwater (particularly along the East End) and around the piers. In addition, certain areas of the Harbor lack sufficient depth and have resulted in the grounding of vessels. Periodic dredging is necessary to ensure the viability of the Harbor. In accordance with Goal 2, Policy M., dredge material should be used for beach nourishment in areas subject to erosion wherever feasible.

The Town should develop a beach nourishment program involving the Conservation Commission and Harbor Committee. The Municipal Harbor Plan recommends establishment of a regular maintenance program for areas outside of the Federal channel, not under the responsibility of the Coast Guard. The Plan also recommends removal of mooring floats within the Harbor navigation fairways and channels.

F. Public/Private Shore Access Issues

The Commonwealth tidelands that make up most of Provincetown's waterfront have been ignored and encroached upon by abutting property owners for years, reducing public access to the waterfront and potentially affecting shellfish populations. Enforcement of revised Chapter 91 regulations by the state is entering a new, more stringent phase and should ultimately result in clarification of public and private use and access rights along the waterfront.

In August of 1996 a Waterfront Access Gift Fund was established by the Board of Selectmen "to receive Chapter 91 public benefit mitigation funds and other donations, the proceeds of which shall be used without further appropriation to enhance the public's access and use and enjoyment of the shoreline and waters of Provincetown Harbor, including but not limited to maintenance and improvements of Town landings and other public properties for water dependent use."

The Harbor Plan recommends development of an administrative process for "collecting, expending and accounting for the Harbor Access Fund." (p. VI-2)

The Harbor Plan also recommends the establishment of a volunteer committee to research historic rights-of-way to the Harbor in the hopes of re-establishing important accessways.

2.2.5 ACTIONS/IMPLEMENTATION PROGRAM

ACTION 1: Designate a "working waterfront" overlay zone to ensure the preservation and expansion of traditional maritime uses. All new

buildings or accessory uses constructed within such zone should directly benefit maritime-related uses and should complement the Town's historic character.

ACTION 2: Establish a committee to research and document public access areas to and along the shoreline and, where possible, reestablish and/or designate traditional rights-of-way to the shore through appropriate legal means. This should be coordinated with the Chapter 91 licensing process.

ACTION 3: Identify sensitive coastal areas where public access and development should be restricted in order to maintain the integrity of coastal features, and take measures to protect these areas and maintain the historic waterfront.

ACTION 4: In accordance with the Cape Cod Regional Policy Plan, strengthen local regulations, including those governing development, health, the Harbor, and wetlands, beyond minimum state and federal standards to reduce the potential impacts of coastal storms on public health and safety, wetlands shellfish populations and the economy. (Refer to Goal 2 and the Policies following at the beginning of this section).

ACTION 5: Develop a list of projects that provide or enhance coastal access and use of the shoreline to be used in conditioning Chapter 91 licenses, including maintenance and upgrading of Town landings to enable legal public access to coastal waters.

ACTION 6: Develop an administrative process for "collecting, expending and accounting for the Harbor Access Fund as established by the Waterfront Access Gift Fund.

ACTION 7: Evaluate long-term dredging and dredge disposal needs and alternatives.

ACTION 8: Evaluate areas appropriate for aquaculture in coordination with local planning efforts. In so doing, minimize conflicts with other users of coastal and marine waters (considering mooring areas, recreational boating, natural resource habitats, and tidelands ownership issues).

ACTION 9: Encourage "soft" solutions to coastal erosion, such as beach nourishment, planting of beach grass, and related measures, as an alternative to "hard" coastal engineering structures, and amend local regulations to address this issue.

ACTION 10: Adopt a "No Discharge" designation for Provincetown Harbor to protect the eelgrass and shellfish resources located just off shore. The intensity of recreational and commercial use of the area, the existence of pump-out facilities and the fact that residents use the entire shoreline as a public beach make this designation critical to protect the health and well being of the Town's residents.

2.3 WETLANDS, WILDLIFE AND PLANT HABITAT

2.3.1 INTRODUCTION

Although Provincetown has the smallest land area of any Cape Cod Town (excluding National Seashore holdings), it is unusually rich in natural resources. Dunes, wetlands, forested areas, rare plant and wildlife species, and a variety of uncommon habitats, such as white cedar swamps, quaking bogs, sphagnum bogs, and coastal plain pond shores, are located within Town.

Because of its location, Provincetown is an important stopover for migrating birds, and many species exist here at or near the northernmost or southernmost limits of their range. Recent public attention has focused on a number of significant areas including the Shank Painter Pond/Bog ecosystem, Clapps Pond, Foss Woods, and Hatches Harbor, bringing natural resource issues to the fore locally. Many of the most important natural resource areas are located in the National Seashore, while the two largest ponds in Provincetown (Clapps and Shank Painter) are in divided ownership, with portions in the National Seashore. Cooperative efforts between Town and National Seashore authorities will continue to be necessary to protect these resources from degradation resulting from inappropriate use, new development and overuse.

Provincetown's 1995 Open Space and Recreation Plan (OSRP) provides additional natural resource inventory, supplementing this and other sections of the Natural Resource Element.

2.3.2 GOALS AND POLICIES

GOAL 1: To preserve and restore the quality of inland and coastal wetlands in Provincetown.

POLICY A: Wetland alteration shall not be permitted except as provided in these Goals and Policies. As an exception, where there is no feasible alternative, water-dependent projects involving wetland alteration and appropriate mitigation may be permitted subject to the approval of all permitting authorities. Such permission may be granted subject to a finding that there is no feasible alternative location for the project and that any necessary alteration is the minimum necessary to accomplish the goals of the project. Appropriate mitigation shall not include wetland creation or replication.

POLICY B: Vegetated, undisturbed buffer areas of at least 100' width shall be maintained and/or provided from the edge of coastal and inland wetlands including isolated wetlands, to protect their natural functions. This policy shall not be construed to preclude pedestrian access paths or construction and maintenance of water-dependent structures within the buffer area, which may be permitted at the discretion of permitting authorities where there is no feasible

alternative to their location. The Cape Cod Commission and the Town Conservation Commission shall require a larger buffer area where necessary to protect sensitive areas or where site conditions such as slopes or soils suggest that a larger buffer area is necessary to prevent any adverse impact to wetlands and associated wildlife habitat. In making this determination, the Commission shall use the Wetland Buffer methodology, Technical Bulletin 96-00x as guidance.

Where a buffer area is already altered such that the required buffer cannot be provided without removal of structures and/or pavement, this requirement may be modified by the permitting authority, provided it makes the following findings: 1) that the proposed alteration will not increase adverse impacts on that specific portion of the buffer area or associated wetland and 2) that there is no technically demonstrated feasible construction alternative.

POLICY C: Disturbance of wetlands and buffer areas for operation and maintenance of underground and overhead utility lines (electrical, communication, sewer, water, and gas lines) may occur. Installation of new utility lines through these areas may occur where the permitting authority finds that the proposed route is the best environmental alternative for locating such facilities. In all instances, disturbance of wetland and buffer areas shall be minimized and surface vegetation, topography and water flow shall be restored substantially to the original condition.

POLICY D: Storm water management plans for new development shall preclude direct discharge of untreated storm water into natural wetlands and water bodies. New storm water discharges shall be located a minimum of 100' from wetlands and water bodies.

POLICY E: Measures to restore altered or degraded inland and coastal wetlands, including nonstructural bank stabilization, re-vegetation and restoration of tidal flushing, should be encouraged. However, such areas should not be used as mitigation for wetland alteration projects (mitigation banking).

POLICY F: Construction of artificial wetlands for stormwater and wastewater management may be permitted in appropriate areas where there will be no adverse impact on natural wetlands, waterways, and groundwater.

GOAL 2: To prevent the loss or degradation of critical plant and wildlife habitat, to minimize the impact of development on plant and wildlife habitat, and to maintain existing populations and species diversity.

POLICY A: Developments of Regional Impact (DRI) that propose to alter undeveloped areas shall contain a natural resources inventory. Such inventory shall identify the presence and location of wildlife and plant habitat, including vernal pools, and serves as a guide for the layout. Developments shall be planned to minimize the impacts to

wildlife and plant habitat. In sensitive areas, Natural resources inventories shall be prepared in accordance with Cape Cod Commission Plant and Wildlife Habitat Assessment Guidelines Technical Bulletin 92-002.

POLICY B: Clearing of vegetation and alteration of natural topography shall be minimized, with native vegetation planted as needed to enhance or restore wildlife habitat. Standing specimen trees shall be protected. The permitting authority may require designation of building envelopes (for structures, driveways, lawns, etc.), where appropriate, to limit removal of vegetation.

POLICY C: Fragmentation of wildlife and plant habitat shall be minimized by the establishment of greenways and wildlife corridors of sufficient width to protect not only edge species, but species that inhabit the interior forest, as well as by the protection of large unfragmented areas, and the use of open space or cluster development. Wildlife shall be provided with opportunities for passage under or across roads and through developments where such opportunities will maintain the integrity of wildlife corridors. Fencing shall not be constructed so as to interfere with identified wildlife migration corridors.

POLICY D: Development should only be permitted where the proponent can demonstrate that such development will not adversely affect critical plant and wildlife habitat areas as identified in this plan. A wildlife and plant habitat management plan may be required when development or redevelopment is permitted in critical wildlife and plant habitat areas.

POLICY E: Development shall be prohibited in vernal pools and within a minimum 100' buffer around these areas. This buffer area may be increased up to 350' based on the guidelines contained in Cape Cod Commission Wetland Buffer Methodology, Technical Bulletin 96-00x. These areas shall not be used for storm water management.

F. Measures to restore altered or degraded upland habitat areas should be encouraged where ecologically appropriate.

2.3.3 INVENTORY

A. Wetlands in Need of Special Protection

Wetlands are areas of land which are inundated or saturated for a portion of each year. These areas tend to exhibit hydric soil conditions, and contain greater than fifty- percent wetland vegetation. Wetlands serve a variety of functions including aquifer recharge, flood control, pollution prevention, and fish and wildlife habitat. Provincetown's location, geological makeup, high water table, and vulnerability to the forces of wind and water make its wetlands extremely fragile and

susceptible to degradation from development and accompanying septic waste.

Provincetown has many different types of wetlands in need of special protection including sphagnum bogs, quaking bogs, cedar swamps, and salt marshes. The White Cedar Swamp is the only one on a barrier beach in New England, on the East coast and possibly in the world. All such wetlands are identified as critical habitat areas (listed below). The Shank Painter quaking bog system is especially vulnerable due to its size, habitat diversity and evidence of previous degradation. These bogs exist in other places, but no where else are they part of a barrier beach system. It is the largest quaking bog in the world, and serves as a food factory and habitat for most of our wild animals.

B. Local Wetlands Protection

The Town's Zoning By-laws contain several provisions for the protection of wetlands and habitat areas. A setback of 35 feet is required from the mean high water mark of any salt water body for structures other than piers, wharves and other facilities requiring waterfront contact. In addition, the definition of lot area excludes wetlands from calculations, requiring that the minimum lot area be comprised entirely of upland. The Zoning By-law (Section 3700) prohibits development in "Inland Wetland Areas" 200 square feet or greater. Following a contour line two feet above the outer (upland) boundary of the wetland delineates such areas.

Finally, Section 4331 of the By-laws enables the use of a Development Impact Statement as a planning tool for any project requiring site plan or special permit approval. The purpose of the Impact Statement is to assess project impacts with regard to runoff, water quality, clearing, grading, septic systems, wetlands, and the ecology of the area.

C. Wetlands Restoration

Planning and research efforts have been ongoing since 1986 concerning salt marsh restoration efforts at Hatches Harbor. A Memorandum of Understanding (MOU) has been completed between the Cape Cod National Seashore and the Town on the restoration of some 90 acres of salt marsh. Other involved parties include the Federal Aviation Authority (FAA), Army Corps of Engineers (ACOE), and the U.S. Environmental Protection Agency (EPA). It has been determined that restoration involving reintroduction of tidal flow through a redesigned culvert system may be carried out in a manner consistent with current and future operations at Provincetown Airport. The project will proceed incrementally to ensure that it does not cause environmental harm or negatively affect the airport or navigation aids. A runway extension and the addition of runway safety areas are also proposed for the airport. Under the latest proposal this would call for the filling of four acres of wetlands. The airport project is under review

by federal, state and regional agencies. By agreement in the MOU, the Hatches Harbor restoration can be used as wetlands mitigation for the airport safety project.

D. Wetlands Land Use Changes

Due to the small amount of remaining developable land and the high water table in Provincetown, development and subsequent septic system use is a constant threat to wetlands throughout Town. Shank Painter Pond, bisected by Route 6 in the 1950s, has since seen filling, pollution from substandard campground waste facilities and illegal dumping, as well as intense development pressure. Illegal dumping is also evident at Clapps Pond, as is erosion caused by dirt bike use.

E. Critical Habitat Areas

The Outer Cape has a wide range of coastal habitats supporting a diversity of organisms. The following are identified by the Association for the Preservation of Cape Cod's "Critical Habitat Atlas" and the Cape Cod Commission's "Cape Cod Significant Natural Resource Areas" map of 1996 identifies the following as critical habitat areas:

Sphagnum Bogs	Vernal Pools/Amphibian Breeding Habitats
Southern Shank Painter Pond System	Three identified pools
Quaking Bogs	Coastal Plain Pond Shores
Northern Shank Painter Pond System	All ponds, including Shank Painter, Clapps, Clapps Round, Pasture, Bennett, Great, Grassy
North of Harry Kemp Way	Salt Marshes
Two bogs west of Duck Pond	Along Town shoreline
In Pond to east of Pasture Pond	Shellfish Habitats
East of Grassy Pond	Throughout Town salt waters
Northwest of Telegraph Hill	Barrier Beaches
North of Route 6 near Atkins Mayo Road	Two State-designated beaches
Two bogs north of Clapps Pond	Critical Woodland Communities
Cedar Swamps	Southwest of Provincelands Visitor Center (American Beech)
Four swamp system northeast of Provincetown	near Atkins Mayo Road

Shank Painter Pond is the largest known quaking bog on a barrier beach system in the world and home to a number of rare and interesting plants and animals. Species including dragon's mouth orchid, adder's tongue fern, pitcher plant, nodding ladies' tresses, spadefoot toad, and eastern box turtle have been identified at the pond and associated bogs. "Although the state has not designated any Areas of Critical Environmental Concern...in Provincetown, the Shank Painter ecosystem would be the most obvious site and in 1979 state agencies suggested that the Town pursue such a designation." (OSRP, p. 43)

Mammals living in Provincetown include red squirrel, gray squirrel, white-tailed deer, raccoon, red fox, rabbit, skunk, opossum, shrew, muskrat, bat, weasel, mouse, vole, and coyote. In addition to the more common species, birdlife includes songbirds such as prairie warbler, pine warbler, northern parula warbler, red-eyed vireo, cedar waxwing, red-breasted nuthatch, horned lark, black-billed cuckoo and eastern phoebe. (OSRP, p. 40) Other notable bird species include northern harrier (marsh hawk), osprey, bald eagle, red-tailed hawk, black duck, and wood duck. Numerous frog, turtle, salamander, snake, and other amphibian and reptile species also make Provincetown their home.

Protection of rare piping plover nesting sites on the shore has caused sections of the National Seashore to be closed to off-road vehicles in recent years. The number of nesting pairs increased from three in 1988 to 29 in 1993 at Race Point alone, while 11 more pairs were officially counted in 1994 at Wood End by the State Division of Fisheries and Wildlife. A total of 109 nesting pairs of rare least terns were reported in 1994. In addition, numerous pelagic (or open sea) birds are supported by Stellwagen Bank and the waters off Provincetown, including fulmars, gannets and shearwaters, and the diversity of fresh and salt water wetlands provide habitat for a variety of waterfowl and wading birds. The ever-popular Harbor seal makes frequent appearances in Hatches Harbor and whales are seen in Provincetown Harbor. And, lower in profile but significant nonetheless, a rare invertebrate, the water-willow borer moth, nests in the hollow stems of water willows at Jimmy's Pond.

The Outer Cape Capacity Study points out that, in addition to the impacts of development and subsurface waste disposal on environmental resources, intense recreational use can also take its toll. The Capacity Study is an excellent resource for detailed information about habitat impacts and priorities for "open space considerations."

F. Rare Species

The Natural Heritage and Endangered Species Program has recorded occurrences in Provincetown of seven endangered species, ten threatened species and seventeen species of special concern. The end of this section provides descriptions of all these rare species.

G. Vernal Pools

Vernal pools, seasonal fresh water bodies in isolated depressions, are important amphibian and invertebrate habitat areas. Not every little spring pool of standing water is a "vernal pool" but those that are have a rich diversity of life and provide significant quantities of food to large populations of animal life. Even though much of this activity seems

invisible, it is going on around us and is critical to maintaining the overall ecosystem.

In order to be protected under state law, they must be mapped and certified by the Massachusetts Natural Heritage and Endangered Species Program. Three identified vernal pools in Provincetown are located within the Cape Cod National Seashore. Another pool was certified in 1999 by the MNHESP at 35 Conwell Street. Other pools may exist but have not been mapped and certified.

H. Wildlife Habitat and Migration Corridors

A recent report by Sabatia, Inc. noted a stretch of almost unbroken woodland area, or a greenbelt, that extends from the Foss Woods parcel near the Truro line, straddles Route 6 and continues to the Clapps Pond and Shank Painter Pond areas. This area functions as a wildlife migration and dispersal corridor that stretches across Town to Clapps Pond. The report cites the importance of these wooded areas as refuges from the heat and openness of the dunes and the built-up environment along Commercial Street. The acquisition of the Foss Woods parcel has protected a significant patch of forestland for migration and one that contains extremely rare species such as the checkered rattlesnake orchid, found in only one other location on Cape Cod.

While Provincetown lost a smaller percentage of forestland over the past quarter century than did the Cape as a whole, the importance of any loss of this crucial wildlife and plant habitat is underscored by the scarcity of forestland overall in Provincetown. By way of comparison, as of 1990, Truro had 7330 acres of remaining forestland, Wellfleet 6441 acres and Provincetown only 1572 acres, despite the fact that growth rates were higher in Truro and Wellfleet than in Provincetown. It is important to keep enough forest, wetlands and other open space in large continuous areas for birds and animals to move from one area to another.

Some 480 acres of shellfish beds are protected along the harborfront and, as noted above, in the Coastal Resources section, quahog seeds have been planted on the West End flats. Hatches Harbor is seasonally off limits to shell fishing.

Designation of the Stellwagen Bank National Marine Sanctuary in 1993, stands to benefit Provincetown marine life. The widespread emergence of eco-tourism adds to the economic viability of such environmental protection efforts. While the local fishing industry has fallen off significantly in recent years, whale-watching cruises from MacMillan Wharf have become an important aspect of the tourist economy over the last fifteen years or so. The Stellwagen/Cape Cod Bay area has been proposed as a critical habitat area for the endangered North American right whale by the National Marine

Fisheries Service. Other marine mammals include finback whales, humpback whales, dolphins, and Harbor seals. (OSRP, p. 39)

2.3.4 ANALYSIS

A. Addressing Potential Conflicts with Wetlands Protection

The Regional Policy Plan for Barnstable County recommends that Cape Cod towns adopt local wetlands by-laws or ordinances that include measures to specifically protect vernal pools and isolated wetlands, enact policies of "no alteration/replication of wetlands for both public and private applicants," expand jurisdiction beyond 100 feet where appropriate, and improve enforcement. (p. 38)

The RPP also recommends improved wetlands mapping and development of a definition of wetlands that is acceptable to all involved parties. The RPP suggests that the local Conservation Commission work closely with the Board of Health in implementing these measures. In developing a local by-law that is consistent with RPP standards, the Town can work with the Cape Cod Commission to ensure that the by-law is simple and easy to apply, in recognition of the lack of Town staff. The Conservation Commission had its first Conservation Agent appointed in 1999 as part of the re-organization of the Department of Regulatory Management.

One of the primary problems facing Provincetown is wastewater disposal and related environmental and public health issues. Though densely developed, the Town still relies entirely on on-site subsurface disposal systems and, though soils are generally permeable, system failure does occur due to overloading, especially in the summer months. High permeability allows nitrogen to be transmitted to surface waters. As recommended in the RPP, consistent standards for the siting of new subsurface disposal systems should be developed to help minimize impacts.

A public education program would be helpful in better familiarizing the public with the uniqueness and sensitivity of Provincetown's natural resources, the types, locations and functions of local wetlands, and the threats that they face.

B. Critical Habitat Areas in Need of Special Protection

Much of undeveloped Provincetown is critical habitat area. Specific identifiable areas that may require special protection include Shank Painter Pond, the Clapps Pond/Duck Pond ecosystem and Jimmy's Pond.

Protection of habitat and endangered species should be made more explicit in the Development Impact Statement section of the Zoning Bylaw and consideration should be given to increasing the required lot

area in proximity to sensitive resources. Other potential measures include the institution of provisions for open space set-asides and dedications and mandatory clustering.

C. Wildlife Corridors and Strategies for Their Protection

As listed in the Goals and Policies at the beginning of this section: "Fragmentation of wildlife and plant habitat should be minimized by the establishment of greenways and wildlife corridors of sufficient width to protect not only edge species, but species that inhabit the interior forest, as well as by the protection of large unfragmented areas, and the use of open space or cluster development. Wildlife should be provided with opportunities for passage under or across roads and through developments where such opportunities will maintain the integrity of wildlife corridors." Foss Woods is a vital parcel of land already protected, but the Town should continue to protect the greenbelt corridors as they extend to Clapp's Pond, to the Truro line and Shank Painter Road.

2.3.5 ACTIONS & IMPLEMENTATION PROGRAM

ACTION 1: Maintain accurate, appropriately scaled and accessible wetlands maps for use in local regulatory programs. Maps should include isolated inland wetlands and vernal pools.

ACTION 2: Develop a clear and acceptable definition of the boundaries of wetlands and set a consistent standard for siting new subsurface disposal systems in proximity to these areas; Improve and retro-fit areas with failing systems.

ACTION 3: Continue improving the mitigation plan to address existing storm water management problems involving runoff and drainage systems adversely affecting water quality in wetlands and water bodies.

ACTION: 4: Develop a public wetlands education program, addressing the types, locations and functions of Provincetown's wetlands and other critical habitats and the threats facing them.

ACTION 5: Educate Town officials, landowners and other citizens on land preservation options in order to ensure the protection of critical habitat areas. Methods of preservation include regulatory measures such as mandatory cluster subdivisions, DRI set-asides and minimum lot size increases; Non-regulatory measures include fee acquisition, access easements and conservation restrictions.

ACTION 6: Improve management of Town land holdings, paying special attention to littering, beach cleanliness, illegal waste disposal and erosion caused by dirt bike use. Dedication of specific Town holdings to conservation and clear definition of uses for other Town properties, including authority over harborfront beaches, can also help establish Town protection priorities and mitigating the impacts of degrading uses.

ACTION 7: Add language developed by the Planning Board, Conservation Commission and Zoning Board of Appeals to the Development Impact Statement section of the Zoning Bylaw ensuring more explicit protection of habitat and endangered species.

ACTION 8: Identify and certify any vernal pools within the Town in collaboration with the Natural Heritage and Endangered Species Program.

ACTION 9: Establish guidelines within the Zoning By-law and other wetlands regulations to include expanded wetland buffers and a prohibition of wetland replication.

ACTION 10: Develop a clear cutting and site disturbance by-law to protect wildlife corridors and critical plant and animal habitat.

2.3.6 APPENDIX

A. Rare Species (as identified by the Natural Heritage and Endangered Species Program)

ENDANGERED SPECIES

This classification refers to any species of plant or animal in danger of extinction throughout all or a significant portion of its range, and species in danger of extirpation as documented by biological research and inventory.

Shortnose Sturgeon

One of the smallest species of sturgeon, rarely exceeding 1 meter in length, this fish winters in saline estuaries and the open ocean, with spring habitat including freshwater rivers and estuaries. There are no recently documented occurrences in Provincetown.

Sea Lime Grass

No recorded sightings since 1913.

Northern Right Whale

Also on the federal endangered list.

Spine-Crowned Clubtail

No verifiable observation of this plant species has occurred in Provincetown since 1878.

Weak Rush

The first and last sighting of this plant species in Provincetown occurred in 1984.

Oysterleaf

A distinctive perennial that flowers in August, the Oysterleaf is found on the foredunes of beaches where there is active sand deposition. It is susceptible to damage from off-road vehicles, foot traffic and storms. First observed in Provincetown in 1974, the Oysterleaf was seen locally as recently as 1992.

Lion's Foot

Not verified in Provincetown since 1905.

THREATENED SPECIES

This term applies to any species of plant or animal likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range. It also defines any species declining or rare as determined by biological research and inventory and likely to become endangered in the foreseeable future.

Blueberry Sallow

This invertebrate was last reported locally in 1983.

Few Fruited Sedge

This plant was last officially observed in 1987.

Gerhard's Underwing Moth

Last observed in Provincetown in 1981.

Piping Plover

This small shorebird is perhaps Cape Cod's most well known rare species as a result of debates over off-road vehicle use threatening nesting sites. Listed as a threatened species on the federal level as well, the Plover requires sandy beaches which are relatively flat and free of vegetation, preferring the dry light-colored sand found along the outer coastal shores. They often nest in the narrow areas between the high tide line and the foot of coastal dunes. The Piping Plover is protected at two sites in Provincetown.

Least Bittern

This smallest member of the Heron family inhabits freshwater wetlands where cattails and reeds predominate. This wading bird is thought to breed at less than 20 wetland sites in Massachusetts.

Adder's-Tongue Fern

Adder's Tongue is a small terrestrial fern, up to a foot in height, which is found in boggy meadows, marsh borders, wet fields, and moist woodland clearings where they thrive in open and sunny habitat. Once widespread in Massachusetts, there are currently eight known occurrences statewide.

Prickly Pear

The only cactus that is widespread in the eastern United States, Prickly Pears grows in sprawling clubs 2 to 3 feet across and generally less than a foot high. On the Outer Cape, it grows in dry, sandy fields, dense grassy areas which have been mowed, cemeteries, and roadside embankments.

Golden Club

This is an aquatic plant generally found in silty, muddy or peaty bottoms of shallow ponds, bogs and marshes.

Water-Willow Stem Borer

This nocturnal moth is found only in southeastern Massachusetts and nowhere else in the world. It is always found in association with water willows in shallow waters where they lay their eggs. Research indicates these moths may depend on water level fluctuations unique to this part of the state. They are vulnerable to changes in hydrology and to pesticides, as well as trampling of water willows along paths near pond edges. This species is also a candidate for federal listing with the U.S. Fish and Wildlife Service.

Eastern Spadefoot

A nocturnal, burrowing toad, the Spadefoot requires sand or sandy loam soils in pitch pine barrens, coastal oak woodlands or sparse shrub growth, interspersed with temporary ponds. It burrows up to eight feet below the surface of the ground, coming up to breed after heavy rains. With documented home range of up to 108 square feet, this species is vulnerable to habitat loss and pesticide use.

SPECIAL CONCERN SPECIES

This category includes any species of plant or animal which has been documented by biological research and inventory to have suffered a decline that could threaten the species if allowed to continue. Also, any species that occurs in such small numbers or with such restricted distribution or specialized habitat requirements that it could easily become threatened in Massachusetts.

Coastal Heathland Cutworm

Last observed locally in 1982.

Chain Dot Geometer

This invertebrate has not been officially observed in Provincetown since 1891.

Broom Crowberry

Found only in southeastern Massachusetts, this is a low-growing, bushy evergreen shrub that blooms between March and May. It occurs in clumps or scattered patches in low shrub or moor communities, inhabiting dry, sandy flats. It can also be found in dry pitch pine/scrub oak barrens, relic sand dunes, and road bed embankments, often colonizing open areas created by human and natural disturbance.

Common's Panic Grass

This is a short perennial grass that grows in dry sandy fields and barrens on the coastal plain. It also is found in dry pitch pine/oak woods, colonizing openings and disturbed soil where there is little or no leaf litter. There are eight known occurrences in the state, its rarity due to habitat loss, forest succession, and the limits of its range.

Spotted Turtle

This turtle species dwells in marshy meadows, bogs, swamps, small ponds, ditches, and other shallow bodies of water. It often suns itself and hides in mud or debris when approached. Most occurrences are in southeastern Massachusetts.

Common Moor Hen (Gallinule)

Duck-like in habits but without webbed feet, the Moor Hen inhabits dense vegetation in freshwater marsh/cattail pond areas. It is currently documented at eight sites in Massachusetts.

Bushy Rockrose

This perennial flowering herb grows in dry open sandplains, low shrubby moors and grassy openings in pine barrens. It is also found occasionally in cemeteries and golf course roughs and is intolerant of shade and moisture.

Pale Green Pinion Moth

The first and last local sighting of this moth species occurred in 1983.

Coastal Swamp Metarranthis Moth

Not sighted in Provincetown since 1981.

Chain Fern Borer Moth

Not officially sighted since 1981.

Sandplain Blue-Eyed Grass

This low-growing perennial herb has blue flowers with yellow centers that bloom in summer. It occurs in loose colonies or as scattered individuals in dry, sandy fields near the coast.

Least Tern

The smallest of the four tern species that nest in Massachusetts, the Least Tern inhabits coastal beaches and barrier islands, nesting in dry, exposed unvegetated areas on sandbars or beaches between the drift line and the upland. It is vulnerable to predation and loss of nesting habitat due to natural disaster, development and recreational use of beaches.

Common Tern

The Common Tern frequently nests on barrier beach sand dunes and less frequently on sand spits and shingle beaches. It prefers areas with open ground for nesting and patches of vegetation as cover for the chicks.

Arctic Tern

The largest of the terns found on the Cape, the Arctic Tern migrates across the Atlantic Ocean to Africa and then south to Antarctica, traveling as much as 22,000 miles round-trip. It inhabits sandy, gravelly areas and nests above the high tide mark.

Eastern Box Turtle

This is a terrestrial turtle that inhabits fields, meadows, thickets, marshes, pastures, bogs, stream banks, and well-drained forest bottomland. It roams widely during rainy weather, often to forage in low, wet places. Home range is generally 150 to 750 feet in diameter and habitat loss has led to declining numbers. Since 1978, only 26 sites have been identified in the state.

Pine Barrens Zale

No recorded local observations since 1983.

WATCH LIST

Rich's Sea Blite

This is a fleshy prostrate plant found in the flat open areas in salt marshes above the level of daily tides. Massachusetts is the southern limit of its range.

In addition, the Checkered Rattlesnake Orchid was documented for the first time in Provincetown in 1994.

2.4 AIR QUALITY

2.4.1 INTRODUCTION

This part of the Natural Resources section addresses issues relating to air quality. Recognizing that Cape Cod generally enjoys good air quality, it is important to address the fact that in recent years, ozone levels have exceeded health-based standards during the summer months. Ground-level ozone is formed when volatile organic compounds (VOC) and oxides of nitrogen (Nox) – primarily from motor vehicle fueling and tailpipe emissions - combine in the presence of sunlight. Ozone occurs most frequently in the summer and it can affect people's health in a variety of ways: irritating the eyes, causing lung dysfunction, making existing respiratory ailments worse. An increase in traffic flow, boat usage, and bus traffic is no longer only a summer phenomenon – the tourist season continues to extend into the

“fringe” months before and after the summer season.

2.4.2 GOALS AND POLICIES

GOAL 1: To maintain and improve Provincetown’s air quality so as to ensure a safe healthful, and attractive environment for present and future residents and visitors.

POLICY A: Development of Regional Impact shall be in compliance with the Massachusetts State implementation Plan (SIP) and DEP’s Air Pollution Control Regulations, 310 CMR 7.00..

POLICY B: Mixed use Development which results in a net decrease in automobile mileage and air emissions should be encouraged.

POLICY C: Development and redevelopment should use energy-efficient means of construction, operation, and maintenance in order to reduce air emissions from stationary area sources.

POLICY D: Drive-through facilities should be discouraged in order to decrease emissions from engine idling.

2.4.3 ACTIONS/IMPLEMENTATION PROGRAM

ACTION 1: Examine existing land use patterns and identify suitable locations for mixed use development to reduce automobile travel and air emissions.

ACTION 2: Work with the Cape Cod Commission and the DEP to provide public education about ways that residents and businesses can improve air quality.