

Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuge Management Plan

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Section 1: Executive Summary

- Coskata-Coatue Wildlife Refuge is a 1,117 acre property with abundant natural resources and amazing recreational possibilities. The property includes Coskata, part of Coatue, the Galls, and most of Great Point. Scenic and ecological values are high throughout the property. Adjacent to this property, the Nantucket Conservation Foundation owns and manages 495 acres at Coatue, and the U. S. Fish and Wildlife Service owns a portion of the tip at Great Point. The U. S. Coast Guard owns the Great Point lighthouse, which The Trustees has maintained and interpreted. The Trustees, in the past, have also had a management agreement with the U. S. Fish and Wildlife Service for the tip of Great Point, which is called Nantucket National Wildlife Refuge. This management plan proposes management for Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuge, called “the refuges” in this plan. This management plan does not include management of parts of Coatue owned by the Nantucket Conservation Foundation.
- This plan outlines the property’s purpose, significance, and interpretational themes. In addition to our overall goals and missions, items will guide the actions in this plan.
- Safety, the ability to manage shorebirds, the ability to counter resource threats, staff knowledge, and our interpretation capabilities will all be increased greatly with the implementation of this management plan.
- Over the last twelve years, the number of OSV permits has increased 250% and the number of rental permits for day use has increased 380%. Thirty-three percent of surveyed summer visitors feel that crowding is a problem at Coskata-Coatue.
- Less than ten percent of surveyed visitors are members of The Trustees; thus, significant opportunities exist for increasing stewardship opportunities.
- A comprehensive interpretive program will be launched at Coskata-Coatue. This program will increase the variety of tours, will create self-guided tours, will develop additional printed interpretive materials, and will increase the quality of all programs, in general.
- With regards to recreation, we will monitor the visitor experience and we will provide access to key recreation areas, while reducing or eliminating OSV access to other areas of the refuges.
- Threats to the natural resources include over-sand vehicles (OSVs), vandalism, unauthorized uses, predation, dogs, inconsistent management, and sea level rise.
- Coskata-Coatue is currently understaffed. This plan calls for a significant increase in staffing including full-time regional staff and part-time staff. The Chappaquiddick and Nantucket Superintendent will oversee the initial implementation of this management plan.
- Tern and Piping Plover protection will follow Federal and State guidelines at a minimum.
- Dogs will be prohibited on the refuges between April 1 and September 15. Between September 16 and March 31, dogs must be under the control of their owner at all times.

- An aggressive rat and cat trapping program will be continued.
- This plan will permanently reduce the existing OSV trail system by 36,000 feet (nearly 7 miles) and close another 3,500 feet during the breeding season, corresponding to a 45% reduction of the road system. Many beach habitats at Great Point, the Galls, and Coskata East Beach will be permanently closed year-round to OSVs. Shorebird habitats at Coskata West Beach will be closed between April 1 and August 31. Dunes at Coskata East Beach will be permanently protected with symbolic fencing.

Section 2. Introduction and Property Profile

2.1 Introduction

Coskata-Coatue Wildlife Refuge (CCWR) is a 1,117-acre property in Nantucket, Massachusetts, jutting out from the northeast corner of the island like a fish hook. Several generous people donated this amazing property to The Trustees of Reservations, beginning in 1974 when Harriet W. Backus donated 810 acres. Since then, Christoph and Pamela Lohmann have donated another 282 acres. The Trustees has also purchased other lands. The Trustees of Reservations manages the refuge for both public enjoyment and wildlife protection and seeks to do so within the context of the larger landscape, which includes Nantucket National Wildlife Refuge (NNWR), owned by the U.S. Fish and Wildlife Service and Coatue and the Haulover, owned and managed by the Nantucket Conservation Foundation. These three refuges form a protected complex of over 1,600 acres. In addition, the U. S. Coast Guard owns the Great Point lighthouse. Due to the high ecological value of the refuges, this document is an ecologically-driven management plan, which will guide the management of Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuge.¹

Over 10,000 people visit Coskata-Coatue every year and participate in diverse activities such as fishing, swimming, shellfishing, hunting, bird watching, and relaxing while enjoying the magnificent scenery.² Many of these visitors appreciate Coskata-Coatue for its beach access as well as its scenic resources. Due to the remoteness of Coskata-Coatue and Nantucket National Wildlife Refuge, these wildlife-dependent activities are primarily accessed by permitted and managed over-sand vehicles (OSVs), which operate under appropriate rules and regulations. The Nantucket Conservation Foundation and The Trustees of Reservations jointly manage OSV permitting for the three-refuge complex. NCF owns the Wauwinet gatehouse and parking lot for the refuges. Gatehouse staff are budgeted through NCF but hired, trained, and managed by The Trustees.

These diverse habitats include rare habitats—maritime dunes, barrier beach strand communities, salt marshes, and maritime juniper woodlands.³ These habitats are home to many uncommon and rare species—two plants and thirteen animals. Over half of these species are found on the barrier beach strand communities. Four of these species are terns. The Piping Plover, a Federally threatened species, breeds every year on the beaches of Coskata-Coatue. These habitats and species have become rare due to historical hunting, excessive human habitat impacts, and introduced predators such as the Feral Cat and Norway Rat. Excessive human uses have

¹ The Trustees of Reservations, in the past, had a management agreement with The U.S. Fish and Wildlife Service. In this document Nantucket National Wildlife Refuge and Coskata-Coatue Wildlife Refuge will be referred to jointly as “the refuges”.

² Based on visitor use surveys (Donnelly, M. P. and J. J. Vaske. 1991. *Visitor Beliefs about Impact Management at Coskata-Coatue Wildlife Refuge*. Vaske, Donnelly, & Associates, white paper.), permits issued, and rental vehicle day trips.

³ These habitats are described in more detail in Raleigh, E. L. 1998. *The Natural History of Coskata-Coatue Wildlife Refuge*. The Trustees of Reservations.

significantly reduced the quality of barrier beach communities along the entire Atlantic coast, threatening many species in the process.⁴

Land-use, glaciation, sea level rise, and coastal processes such as salt spray and storm events have shaped the animals and vegetation over time. Gnarled cedars and overwash show more recent evidence of these processes. The ridges and valleys of The Glades portray a rising sea level over thousands of years. The outwash below Coskata Woods shows the effects of glaciation. Shipwrecks, the lighthouse, local myths of mermaids, fishermen, and lonely lifesaving stations portray a rich maritime history. Sheep grazing, fire, and the uncut woods of Coskata are reflective of Nantucket's rich land-use history.

The combination of these factors—rich maritime and land-use history, landscape change over time, a diverse assortment of rare habitats and species, striking scenery, and a high number of visitors—creates an excellent opportunity for interpretation and education and a distinct need to manage Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuge in the best possible manner. Management to protect Piping Plovers and terns; management to protect rare and unusual habitats from their threats; and interpretation to engage visitors, to enhance their experience, and to encourage their stewardship of the two refuges are the major goals of this plan.

This document outlines the purpose and significance of Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuges and provides clear steps towards achieving goals set forth within this plan. All of our goals revolve around the purpose and significance of the refuges as well as The Trustees' mission and initiative and the goals of the U.S. Fish and Wildlife Service. The actions we will take are based on the best available knowledge, are adaptable, are goal-oriented, and can be monitored to determine whether an objective is being achieved.⁵ This plan will therefore serve as a blueprint to guide future activities at Coskata-Coatue Wildlife Refuge. The plan will be effective in 2001 and will be implemented according to the outlined steps in section 4. Approval of this plan by the U. S. Fish and Wildlife Service will also guide activities at Nantucket National Wildlife Refuge until such time as superceded by specific actions as a result of the on-going Comprehensive Conservation Plan.⁶

2.2 Missions and Goals

- The Trustees of Reservations preserves for public use and enjoyment properties of exceptional scenic, historic, and ecological value in Massachusetts and works to protect special places across the state.
- The U. S. Fish and Wildlife Service administers a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.⁷

⁴ See section 2.7.8.

⁵ A theoretical foundation and conceptual framework for this management plan comes from many sources. The planning process is delineated in *The Visitor Experience and Resource Protection (VERP) Framework: A Handbook for Planners and Managers*. September 1997. US Department of the Interior. The biological framework is described in Allen, T. F. H. and T. W. Hoekstra. 1992. *Toward a Unified Ecology*. New York: Columbia University Press. It includes an excellent discussion on levels of analysis ranging from the organism to the landscape. The integration of science and management is described in Vogt, K. A. J. C. Gordon, J. P. Wargo, et al. 1997. *Ecosystems: Balancing Science with Management*. New York: Springer-Verlag.

⁶ The CCP process is called for in the National Wildlife Refuge System Improvement Act of 1997 (P. L. 105-57).

⁷ From the National Wildlife Refuge System Improvement Act of 1997 (P. L. 105-57).

- We will increase interpretation and services to enhance visitor enjoyment, understanding, and appreciation of our natural and cultural heritage.
- We will ensure the protection of scenic, historic, and ecological integrity.⁸

2.3 The Refuges' Purpose

- To provide a refuge for rare shorebirds, specifically Piping Plovers and terns.
- To protect and preserve unusual and rare habitats and the rare species that depend on them.
- To instill a sense of appreciation, wonder, and stewardship in our visitors through education and interpretation of the refuges' many natural and historic features.
- To provide for public use and enjoyment in a variety of habitats under suitable rules and regulations.

2.4 The Refuges' Significance

- The refuges abound with unusual habitats: The Cedars, The Glades, and Coskata Woods. The Cedars are the largest maritime Eastern Red Cedar savanna and woodland in New England. The Glades is one of the largest salt marshes on Nantucket. Its geology—its ridge and valley formations—is highly unusual. Coskata Woods is one of the only remaining primary forests on Nantucket, with oaks over 200 years old.
- The refuges comprise by far the largest barrier beach complex on Nantucket. These beaches support a large array of wildlife, including many rare species—Piping Plovers, Least Terns, Northern Harriers.
- Visitors to the refuges find a place of amazing recreation possibilities, a place with many opportunities to seek solitude, and a place endowed with beautiful scenery. Coskata-Coatue Wildlife Refuge and Nantucket National Wildlife Refuge offer exceptional scenic features including broad vistas of salt marshes, cedar savannas, dunes, beaches, forests, shrublands, lagoons, and the lighthouse. From the refuges, visitors can see Monomoy Island and downtown Nantucket, with views of the Atlantic Ocean, Nantucket Sound, and Head of the Harbor surrounding them. The refuges are also a place where visitors can seek high levels of solitude. The sheer size of the refuges allow visitors to find sanctuary in many places. The tip of Great Point also offers the best fishing on Nantucket and is known world-wide for its sport fishing opportunities.

2.5 The Refuges' Interpretation Themes

- Humans have been intricately tied to their surroundings on the refuges for thousands of years—through burning, sheep grazing, whaling, fishing, and navigating. The Great Point lighthouse, historic fishing stations, historic life saving stations, and legends of mermaids are testimony to a rich maritime history on the refuges. Even now, the tip of Great Point continues to be intricately tied to the sea and is seen as one of the best fishing spots in the world. In addition, the uncut woods at Coskata and the sheep commons at Coatue capture the essence of land-use on Nantucket—wood scarcity and protection as well as intensive sheep grazing. Ancient Wampanoag place-names such as Coskata, Coatue, and Nauma remind us that Native Americans used this land as well.
- Barrier beaches are the creation of intense oceanic processes and are the brunt of nor'easters, yet human use threatens species that have evolved in these habitats. Many species have disappeared from Nantucket's beaches and others have declined significantly. Their only hope for survival at the refuges is through our management efforts and the cooperation of our visitors.

⁸ The goals described here are also backed by visitor experience goals and principles drafted by the Visitor Experience Task Force, convened in 1999 to address visitor policies and goals of The Trustees of Reservations.

- Coskata Woods is one of the oldest forests in New England, with oak trees over 200 years old. How does Coskata Woods fit in with the bigger picture in the Islands Region?
- Salt marshes such as those in the Glades are vital resources that are home to rare species, provide nursery grounds for fisheries, clean waters, and are indicators of long-term climate changes.
- The Cedars are a rare habitat with an interesting flora and fauna adapted to its environment. Interesting butterflies blend in with the cedars and Bearberry heathlands. Eastern Red Cedar approaching 100 years old are gnarled and wind-blown. Prickly Pear Cactus survives in the bare sand environment.

2.6 Planning Constraints and Considerations

- We will be consistent with the policy framework set forth by State and Federal regulations and guidelines that address shorebird breeding habitat management⁹
- We will be fiscally responsible in our management efforts.
- Our management will be compatible with the policies set forth by our partners who manage adjoining conservation land.
- Our management will embrace visitor experience policies and membership goals.

2.7 An Overview of the Natural Landscape

2.7.1 Geology

Nantucket, “the land far away at sea,” is a monument to the power of ice and water. Its geologic history, although brief, is full of violent and amazing forces at work. The bedrock, which provides a foundation for Nantucket, consists of consolidated sedimentary, igneous, and metamorphic rock dating from Precambrian through the Mesozoic age.¹⁰

Twenty-five thousand years ago, the latest glaciation occurred: the Wisconsin glaciation. During this period, the Laurentide ice sheet advanced across New England, reaching the southernmost extent 21,000 years ago. Eighteen thousand years ago, the retreat northward began as the glacier began to melt. As the glacier retreated, it deposited overwash material, covering parts of the moraine in areas such as Coskata Woods.¹¹ This process formed the sandy soils that now make up Nantucket as well as the physiography we see today. This geological history provides the foundation for a harsh but beautiful landscape.

2.7.2 Coskata Woods

Probably due to its remoteness, Coskata Woods survived much of the clearing that occurred throughout Nantucket, and in 1711, a town law prohibited cutting in these woods. The result is a mature maritime oak forest with a diverse understory. Individual white and black oaks stretch upwards with thick, gnarled branches. Their old age—over 200 years in some cases—emanates from each twisting trunk. For decades, salt spray and wind from the ocean and poor soil conditions have slowed the upward growth of trees, creating broad but stunted canopies.

2.7.3 Coskata Pond

⁹ *Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act.* Northeast Region, U.S. Fish and Wildlife Service, April 15, 1994. and *Guidelines for Managing Recreational Use of Beaches to Protect Piping Plovers, Terns, and their Habitats in Massachusetts.* Massachusetts Division of Fisheries and Wildlife. Natural Heritage and Endangered Species Program, April 21, 1993.

¹⁰ 600 to 66 million years ago.

¹¹ Oldale, R. N. 1992. *Cape Cod and the Islands: the Geologic Story.* Parnassus Imprints, East Orleans, Massachusetts.

Coskata Pond is a lagoon that flows into the Head of the Harbor. The lagoon is a nursery ground for fish and is a shellfishing resource as well, specifically for soft shell clams and quahogs. Coskata Pond is a haven for waterfowl, shorebirds, and wading birds—herons, egrets, and ducks, for example.

2.7.4 *The Cedars*

The Cedars are located on Coskata and Coatue, which means “at the pine woods.” This stretch of maritime Eastern Red Cedar savanna and woodland, grows on Holocene dune deposits created when the sea level was lower than at present. A fire on Coatue in the 1800s, as well as sheep grazing during this time, portray this area’s land-use history and undoubtedly shaped the cedar savanna we see today. Interspersed among Eastern Red Cedars are Common Hairgrass and Red Fescue, which flow in golden waves with the wind. In cedar openings, Prickly Pear Cactus bloom around Independence Day. In the late summer, goldenrods bloom profusely, providing nectar for insects such as the Juniper Hairstreak.

2.7.5 *The Glades*

A ridge and valley pattern dominates the Glades, a unique salt marsh-maritime shrubland complex which is located between the Cedars and Coskata Pond. The topography occurs at a small scale, with only a few vertical feet separating the ridges from the valleys, yet the vegetation differs markedly along this elevation gradient. The marsh valleys are composed primarily of Salt Marsh Cordgrass, Salt Meadow Cordgrass, Spike Grass, Sea Lavender, and Glasswort. Ridges are composed of Groundsel Tree, Marsh Elder, Lance-leaved Goldenrod, Beach Plum, Red Fescue and Eastern Red Cedar. These ridges are some of the oldest dunes on Nantucket, formed recently in the Holocene when the glaciers had retreated and the sea level was rising. Now these dune areas have flooded, resulting in salt marshes within the valleys.¹² Sharp-tailed Sparrows, Whimbrel, Osprey, and many other shorebirds live in the Glades.

2.7.6 *Great Point Lagoon*

Distinct differences in soil characteristics affect vegetation patterns at the Great Point Lagoon. Soil moisture varies from saturated peat to dry sand dunes. Due to rainfall, evaporation, and overwash, the Great Point lagoon exhibits great temporal fluctuations in water levels and salinity, affecting species composition. Along the lagoon in more inundated organic areas are distinct bands of high and low marsh composed of Salt Meadow Cordgrass and Salt Marsh Cordgrass, respectively. Within the high marsh are also Salt Marsh Fleabane, Sea Lavender, and breeding Sharp-tailed Sparrows.

2.7.7 *Maritime Dunes*

Surrounding the Lagoon, along the Galls, and behind every beach berm of Coskata are dune complexes, covering approximately 200 acres. The degree of disturbance determines vegetation composition in these highly shifting environments at the land-ocean interface. Five primary plant associations can be found within the dunes of Coskata-Coatue: bayberry-beach plum alliances, heather alliances, beach grass alliances, sparse herbaceous alliances, and bearberry heathland alliances. These associations grade into one another and also mix with other areas. For example, the Cedars’ habitats include many species also found in the dune complexes—the presence of a species can therefore be seen in relation to its growing space requirements and is not exclusive to a particular community. Northern Harriers feed and nest in dune habitats. Across the country dune habitats and their species are threatened by excessive human use.¹³

¹² Oldale, Robert N. 1985. *A Geologic Map of Nantucket and Nearby Islands, Massachusetts*.

¹³ Endangered and threatened species range from Myrtle’s Silverspot Butterfly, found in California, to the Choctawhatchee Beach Mouse, found along the Gulf of Mexico.

2.7.8 Barrier Beach Strands

Beach habitats on the east coast are common but threatened by human use. Because beaches are linear communities, they do not occupy much physical space. This increases the density of human use impacts considerably as compared with forested ecosystems, for example, where visitors can be guided through trails with plenty of undisturbed habitat to either side. Jetties, structures built on the dunes, planting of exotic species, and heavy recreational use from millions of people, all create unnatural stresses upon beach habitats. Many plants and animals dependent on these habitats are threatened or endangered.¹⁴

Beaches are shaped and formed by shallow-water processes, waves, and storms creating the entire nine-mile length of shoreline for the refuge. Wave energy dictates the profile of the beach berm and longshore currents move sand parallel to the shore. At Great Point, two longshore currents, each moving north along either side of Great Point and the Galls, converge, creating a rip current.

Storm events and oceanic processes create habitat for many beach species. Tides push seaweed, such as wrack, onto the berm, creating a wrack line. This wrack line is home to many invertebrate species. Within the sands, other invertebrates depend on the diurnal flooding to filter food from the water. Feeding upon these animals are Piping Plovers, Sanderlings, and tiger beetles. Overwash created during storm events also provides breeding habitat for Piping Plovers and Least Terns. The terns, which feed on fish in the ocean, show the importance of marine inputs into terrestrial systems; without the ocean as a food source, Great Point would be devoid of its often-vast tern colony, which can number in the hundreds. Likewise, gray and harbor seals, which occupy the tip of Great Point, feed on the fish and invertebrates around the rip tide. Harp and hooded seals also occasionally frequent Great Point.

2.7.9 Head of the Harbor

Nantucket Harbor is one of the top Bay Scallop waterbodies in the Commonwealth. Its eel grass beds and clean water support a large variety of aquatic life.

2.8 Significant Ecological Features

1. An extensive barrier beach system. Coskata-Coatue includes nine miles of barrier beaches, Eastern Red Cedar savannas, salt marshes, lagoons, and dunes.
2. Excellent shorebird habitat. Since 1988, 83 pairs of Piping Plovers have nested at Coskata-Coatue Wildlife Refuge, an average of 6.4 pairs per year (see section 2.10). Based on nesting habitat alone, the carrying capacity for Piping Plovers is likely much higher.¹⁵ Human impacts and predators are likely reasons for a low number of breeding Piping Plovers.

¹⁴ In addition to rare species currently found at Coskata-Coatue, other rare species are not present yet may have been present historically. These species have been extirpated from much of their habitat due to a high level of human use. Oysterleaf (*Mertensia maritima*, Endangered) and Seabeach Amaranth (*Amaranthus pumilus*, Federally Threatened, Extirpated from Massachusetts) are potential plant species along foredunes of non-eroding beaches. Oysterleaf is at the southern edge of its range and occurs nearby on NCF property and Seabeach Amaranth is at the northern edge of its historical range. Northeastern Tiger Beetle (*Cicindela dorsalis dorsalis*, Federally Threatened, Extirpated from Nantucket) occurs at only a few sites in southern New England.

¹⁵ Scott Melvin, personal communication. Also see: Frey, S. N. and E. L. Raleigh. *The Fate of Piping Plovers, The Islands Region, 1988-1998*. The Trustees of Reservations, white paper. In 1996, 14 pairs nested at Coskata-Coatue. As a comparison, Monomoy Island regularly hosts over 10 pairs. Please note, however, that the habitat changes every year so the carrying capacity may vary considerably.

Significant habitat also exists for Least Terns, which often number in the hundreds (see section 2.11).¹⁶

3. Migratory staging. The Glades, Coskata Pond, and beach habitats all provide excellent migratory bird habitat.
4. Marine resources. Coskata Pond and the oceanic habitats surrounding Coskata-Coatue provide feeding areas for birds, mammals, and humans.
5. Winter habitat. Snowy Owl, Peregrine Falcon, and many other birds use Coskata-Coatue in the wintertime.
6. Unusual and rare plant communities. Eastern Red Cedar savannas at the Cedars are likely the largest representation of this habitat in New England.¹⁷ Coskata Woods is a primary oak forest with trees over 200 years old. The Glades ridge and valley topography creates an unusual microtopography environment. Maritime dune communities such as those at Great Point and along the Cedars are rare in Massachusetts.¹⁸ Barrier beach strand is a rare habitat, especially considering those that are protected from intensive human disturbances.¹⁹ Salt marshes are also an uncommon habitat.²⁰ Most of these habitats are also protected under the Massachusetts Wetlands Protection Act.²¹ These habitats contain mainly native plant species, with no invasive species problems.²²
7. Seal haul-out. The point at Great Point is periodically a haul-out location for Harbor and Gray Seal. Arctic seals such as Hooded Seal will occasionally come ashore as well, often during cold winter months.
8. Rare and unusual species.
 - Roseate Tern (*Sterna dougallii*), Federally Endangered, Pelagic Seabird Family (occasional non-breeding pairs)
 - Northern Harrier (*Circus cyaneus*), State Threatened, Hawk Family (on average, at least two pair per year over the last four years)
 - Piping Plover (*Charadrius melodius*), G3, Federally Threatened, Plover Family (population varies; see section 2.10)
 - Prickly Pear Cactus (*Opuntia humifusa*), State Special Concern, Cactus Family (over 20 plants)
 - American Sea-blite (*Suaeda americana*), State Special Concern, Saltwort Family (last seen in 1986)
 - Least Tern (*Sterna antillarum*), State Special Concern, Pelagic Seabird Family (annual colonies, sometimes large colonies; see section 2.11)
 - Common Tern (*Sterna hirundo*), State Special Concern, Pelagic Seabird Family (occasional small breeding colonies; see section 2.11)

¹⁶ Coskata-Coatue once supported the largest Least Tern population in Massachusetts. Least Terns, however, will move as habitat and feeding conditions change. In the future, large populations of Least Terns may return.

¹⁷ This habitat loosely fits within the maritime juniper woodland community described in: Swain, P. C. and J. B. Kearsley. 2000 draft. *Classification of the Natural Communities of Massachusetts*. Natural Heritage and Endangered Species Program. The Cedars are similar to the juniper woodland on East Beach, Chappaquiddick and less similar to those with more inland influences. These habitats are high-priority habitats: ranked S1. They are uncommon along the entire Atlantic Coast, for Eastern Red Cedar is replaced by other shrub species on barrier beaches and islands further south.

¹⁸ Ranked S2 in Swain and Kearsley. 2000 draft.

¹⁹ Ranked S3 in Swain and Kearsley. 2000 draft.

²⁰ Ranked S3 in Swain and Kearsley. 2000 draft.

²¹ Melvin, S. M. and S. M. Roble. 1990. The Massachusetts Wetlands Protection Act: Protecting Rare Wildlife Habitat. *New York State Museum Bulletin*. 471, pp. 224-227.

²² Phragmites is the only potentially invasive species present. It covers only a small portion of one wetland. Future spread of this species and potential invasion by other species should be monitored closely.

- Arctic Tern (*Sterna paradisaea*), State Special Concern, Pelagic Seabird Family (rare breeder; see section 2.11)
- Gray Seal (*Halichoerus grypus*), State Special Concern, True Seal Family (occasional haul-outs)
- Cooper's Hawk (*Accipiter cooperii*), State Special Concern, Hawk, Kite, and Eagle Family (one pair in Coskata Woods, 1999)
- Seabeach Knotweed (*Polygonum glaucum*), State Watch List, Buckwheat Family (common in fenced areas)
- Wild Cherry Sphinx (*Sphinx drupiferarum*), State Watch List, Sphinx Family (uncommon)
- Saltmarsh Sharp-tailed Sparrow (*Ammodramus caudacutus*), State Watch List, Blackbird, Oriole, et al. Family (20+ pair, 1999)
- Osprey (*Pandion haliaetus*), State Watch List, Osprey Family (on average one pair annually for the last four years)
- Juniper Hairstreak (*Mitoura grynea*), Unusual species, Harvester, Copper, and Hairstreak Family (unknown, 1999, The Cedars, only Nantucket record?)
- Harbor Seal (*Phoca vitulina concolor*), protected marine mammal,²³ True Seal Family (occasional haul-out)

2.9 Threats

1. Oversand vehicles. Oversand vehicles (OSV) have a direct and indirect impact on dunes, vegetation, and wildlife. Direct impacts of OSVs are destruction of vegetation, crushing of Piping Plovers,²⁴ killing of seals,²⁵ dune erosion,²⁶ and damage to foraging and nesting habitats.²⁷ Indirect effects of OSVs are more difficult to study. They include: disturbance to adult plovers and chicks and changes in foraging behavior.²⁸ When Piping Plovers are having less feeding success due to reduced food supplies or are disturbed by OSVs, their chances at survival decline.²⁹
2. Vandalism. Vandals have occasionally caused significant damage. These include defacing the Great Point lighthouse, driving in shorebird areas, removing or cutting symbolic fencing, and damaging or destroying shorebird nests.

²³ Since 1972, the Marine Mammal Protection Act has protected these amazing creatures.

²⁴ Melvin, S.M., A. Hecht, and C.R. Griffin. 1994. Piping plover mortalities caused by off-road vehicles on Atlantic coast beaches. *Wildlife Society Bulletin* 22: 409-414. Crushing of plovers by OSVs has not occurred at Coskata-Coatue since guidelines were established.

²⁵ Zall, E. Seal Struck by Off-road Vehicle, Police Investigate. *The Inquirer and Mirror*, March 7, 1996. Note: the Harbor Seal was killed at Great Point.

²⁶ Dune erosion is apparent on Coskata East Beach.

²⁷ OSV activity reduces the abundance of invertebrates on beach habitats by reducing wrack upon which invertebrates feed and by crushing invertebrates directly. The best example of this is the Northeastern Beach Tiger Beetle, which is now a threatened species. Knisley, C. B. and J. M. Hill. 1992. Effects of habitat change from ecological succession and human impact on tiger beetles. *Virginia Journal of Science*. 43: 133-142.

²⁸ In habitats with few people, plovers spend approximately 90% of their time foraging, whereas on beaches with human disturbances, plovers typically spend significantly less time feeding. From: Burger, J. 1994. The Effect of Human Disturbance on Foraging Behavior and Habitat Use in Piping Plover (*Charadrius melodus*). *Estuaries* 17(3): 695-701.

²⁹ Evidence of this is described in: Goldin, M. R. 1993. *Effects of Human Disturbance and Off-Road Vehicles on Piping Plover Reproductive Success and Behavior at Breezy Point, Gateway National Recreation Area, New York*. M. S. Thesis, University of Massachusetts.

3. Unauthorized uses. Refuge staff has reported trash, noise, illegal substances, violence, and open fires. Rave parties at night in 2000 have contributed to vandalism of resources. Open fires also occur with smaller parties as well.
4. Predators. Feral Cat, Northern Harrier, Norway Rat, American Crow, and Gulls are all predators of terns and plovers. At least ten chicks, two adults, and three nests were lost to Feral Cats at Coskata-Coatue. Due to the difficulties in ascertaining the actual cause of chick loss, the impact of Feral Cats is likely much higher at Coskata-Coatue. One nest was confirmed predated by a Norway Rat, with other partial egg predation likely attributed to rats.³⁰ Both Feral Cats and Norway Rats are exotic species, whereas other predators are native. Even native predators, such as Gulls, have expanded their ranges and increased in numbers due to human activity.³¹
5. Dogs. Dogs have likely been involved in the destruction of three Piping Plover nests at Coskata-Coatue. Indirect effects of dogs, such as through harassing plovers and terns could be significant. Dogs are regularly found off-leash.
6. Inconsistent management. Poor staff coverage and mismanagement of natural resources can increase the incidence of threats mentioned above. All these threats can be significantly reduced through adequate management. Delayed action to protect resources, inadequate action, and lack of rule enforcement are all in evidence.³²
7. Sea level rise. Presently, sea levels are rising by about ten centimeters every century, with estimates up to 30 centimeters reported.³³ The combination between the longshore current erosion, storms, and sea level rise can cause extreme erosion; Nantucket loses substantial amounts of land each decade to erosion. An increased rate in sea level rise, in part, is likely due to global warming.

2.10 Piping Plover Productivity

Due to our concern over Piping Plover productivity, this section specifically looks at individual beach sites in terms of Piping Plover productivity (table one). None of these sites has produced enough chicks to create a stable or growing population.³⁴

Table One: Piping Plover Productivity by Site, 1988-2000

Site	Breeding Pairs	Hatch Success	Fledge Success	Productivity
Great Point, NNWR	1	100%	50%	2.00
Great Point, CCWR	61	57.9%	40.8%	1.05
The Galls	15	41.1%	30.4%	0.47
Coskata West Beach	4	12.5%	50%	0.25
Coskata East Beach	4	26.7%	0%	0.0

2.10.1 Coskata East Beach

³⁰ See: Frey, S. N. and Raleigh, E. L. 1999. for more details.

³¹ In the case of gulls, municipal solid waste disposal sites led to an increase in gull numbers. Recent capping of these sites, including the one on Nantucket, has moved many gulls to barrier beach sites.

³² For example, in many cases symbolic fencing did not provide adequate buffers, likely leading to abandonment. In other cases, areas should have been closed in a more timely fashion. Dogs are continually off-leash and other rules such as speeding are not adequately enforced. Night-time coverage is non-existent.

³³ Oldale, 1992.

³⁴ 1.25 chicks fledged per breeding pair is the current estimate needed to maintain the current population. This means, at a minimum, between 50 and 55% of all eggs must hatch and between 50 and 55% of all chicks must fledge for the Piping Plover population to increase with certainty (Massachusetts Natural Heritage Program estimates).

At Coskata East Beach, Piping Plovers have had no nesting success. All nesting attempts were in the overwash section. Four eggs were lost to a nor'easter, three were lost to American Crow, and four were abandoned due to unknown reasons.³⁵ Four chicks were lost after two days to unknown causes. Due to the growth of Beach Grass, the habitat has been declining since the overwash was created in 1991.

2.10.2 *Coskata West Beach*

Abandonment and egg failure are significant for this stretch of beach. Out of a total of four nests, two eggs hatched and one chick fledged for a productivity of 0.25. These nesting attempts were typically just south of The Galls. In all cases the distance between a nest and the waters of Nantucket Sound was much less than a 50-yard symbolic fencing buffer. To the southwest towards Coatue, only one nest and some adult activity has been recorded.

2.10.3 *The Galls*

This site has the highest predation rate on The Trustees' properties in the Islands Region (39%), due in large part, we suspect, to Feral Cats (35% of chicks). A vandal destroyed one nest, another two nests were lost due to Norway Rat, and American Crow and overwash were also responsible for nest losses. Although the habitat at The Galls is excellent, Beach Grass is expanding, reducing the area of prime habitat.

2.10.4 *Great Point, Coskata-Coatue Wildlife Refuge portion*

With 61 breeding pairs in nine years, Great Point produces the most plover eggs of any of The Trustees' properties in the Islands Region, although its fledgling productivity is only fourth highest at 1.05. It is also historically the most active Piping Plover habitat on Nantucket. Until 1999, Great Point had never experienced a year with zero productivity. Both 1999 and 2000 had no productivity. Fifty-nine percent of eggs hatched, yet only 41% of chicks fledged. Over the years, 64 chicks have fledged from Great Point. A similar number (72), however, were lost to unknown causes. Much of the unknown losses may be due to either feral cat or avian predation. Most nesting occurs in the lagoon area of Great Point.

2.10.5 *Great Point, Nantucket National Wildlife Refuge portion*

In 1996, one pair nested at Nantucket National Wildlife Refuge. That year, 14 pairs also nested at The Trustees' Coskata-Coatue Wildlife Refuge, the highest number ever monitored. Two chicks fledged. Two hypotheses arise from this nesting attempt: 1) that as breeding pairs increase, nesting will occur in lower-quality habitats, and 2) Piping Plover success can occur even in the highest use areas during peak productivity, if guidelines are followed.

2.11 Tern Colonies

Least Tern, Common Tern, and Arctic Tern have all bred at Coskata-Coatue. Roseate Tern have not bred but are occasionally found in and around colonies. Colonies have historically been on the western side of Great Point and on The Galls. As table two shows, the number of Least Tern pairs fluctuates dramatically, with population peaks apparently following major changes in habitat. In 1984, a storm destroyed the Great Point lighthouse and, in 1991, Hurricane Bob and the "Perfect Storm" changed the beaches of Coskata-Coatue considerably. Following these two years of intense storms, we see the population of Least Terns increase significantly over five or six years then decline dramatically. During the times of rapid increase, shorebird monitors often noted high tern productivity.³⁶ At the peak in 1997, poor productivity was noted. Little is known

³⁵ A significant buffer was provided between the nests and OSV corridor.

³⁶ Shorebird monitoring reports, 1985-2000.

about how terns respond to changes in their food source—small fish species. These changes may also be reflective of changing predation and other habitats available in the region.³⁷

Habitat change may create the overall carrying capacity for a site, but human use has the potential to reduce long-term populations of terns. Over the years, monitors have witnessed dogs running in tern colonies, have seen terns set aflight by OSVs, and have recorded human footprints that crushed tern colony nests.

*Table Two: Breeding Terns at Coskata-Coatue*³⁸

Year	Least Tern Pairs	Common Tern Pairs	Arctic Tern Pairs
1978	138	12	0
1979	0	2	0
1980	89	0	0
1981	146	1	0
1982	80	1	1
1983	30	0	0
1984	40	0	0
1985	55	0	0
1986	291	No data	0
1987	200	No data	0
1988	566	1	0
1989	12	0	0
1990	26	0	0
1991	63	0	0
1992	118	1	0
1993	175	1	1
1994	414	0	0
1995	563	2	1
1996	1,025	30	0
1997	1,152	100	0
1998	32	0	0
1999	100	1	0
2000	8	0	0

2.12 Visitor Use

Over ten thousand unique visitors come to Coskata-Coatue Wildlife Refuge every year, making a total of over 30,000 vehicle trips.³⁹ Due to the remoteness of the refuge, less than one percent of

³⁷ Region-wide, tern habitats may act like metapopulations, where not all habitats are occupied every year by large colonies.

³⁸ Note: tern colonies have not nested at Nantucket National Wildlife Refuge.

³⁹ Based on the number of visits for permit holders and rental vehicle drivers reported in visitor use surveys (Donnelly, M. P. and J. J. Vaske. 1991. *Visitor Beliefs about Impact Management at Coskata-Coatue Wildlife Refuge*. Vaske, Donnelly, & Associates, white paper.), permits issued, and rental vehicle day trips. We are assuming three people per vehicle trip, on average. This number is equivalent to the number of ORV trips to access the entire Cape Cod National Seashore back in 1976. From: Godfrey, P. J. and M. M. Godfrey. 1980. Ecological Effects of Off-road Vehicles on Cape Cod. *Oceanus* 23(4). Two hundred twenty-one visitor use surveys were completed in 1999, a representative sample for the summer months. Late spring and fall were not surveyed. We believe that visitors in the fringe months would be mainly local fishermen, with less rental use and lower overall use.

the visitors we surveyed accessed the refuges by foot.⁴⁰ A very small proportion of visitors also access the refuge by boat. As based on a visitor use survey conducted during the summer of 1999, visitors participated in wildlife-dependent recreation such as fishing, enjoying the scenery, nature studies, hunting, clamming, beachcombing, birdwatching. Other activities such as swimming and sunbathing were major activities.⁴¹ Other visitors participated in The Trustees' Natural History Tours. Visitors with rental vehicles were primarily sightseeing (39%) and were interested in learning more about the refuges (73%) whereas visitors who owned their vehicle were primarily fishing (38%). People were primarily visiting the property to find peace and quiet, to relax, and to enjoy the scenery.⁴² Well over 90% of visitor use survey respondents had their expectations met in terms of relaxation and enjoying the scenery. In addition, rental vehicle drivers were interested in learning more about the refuges and exploring a new place.⁴³ Visitors came from all over the world, but were primarily from Massachusetts (32%), Connecticut (14%), New York (14%), and New Jersey (10%). Seven percent of survey respondents were from Nantucket.⁴⁴

Eighty-six percent of respondents listed Great Point as a site they had visited, meaning approximately 75,000-day visits are made to Great Point every year.⁴⁵ By contrast with this high number, only 6% of respondents visited the Cedars and only 11% of respondents visited Coskata Woods. Clearly, the tip of Great Point, which is owned by the U.S. Fish and Wildlife Service, is the destination site for most visitors. Most visitors come during the summer months. Fishermen come during the early summer and late fall, primarily.

Visitors report several problems. The largest problem issues are poor quality restrooms (39.4%⁴⁶), too many people (33.2%), speeding vehicles (26.5%), and visitors not following rules and regulations (16.6%). The first issue is a carrying capacity issue, the second two issues are enforcement and public awareness issues. Only 12% of visitors listed dogs as a problem, although they are regularly seen off leash. In this case, dogs are more of a problem to wildlife than to a high quality visitor experience. Activities such as open fires and "rave parties" occur at night and are therefore less obtrusive as staff will clean up after these events. They are, however, threats to the natural resources and facilities. Despite these problems, people's expectations still appear to be met.

Most people are repeat visitors. The most frequent source of information for Coskata-Coatue, however, is through word-of-mouth—either through friends or relatives (38% of respondents). Fourteen percent of respondents learned about Coskata-Coatue through a car rental agency.

⁴⁰ To the couple's credit they did make it to Great Point, although we gave them a ride back to the gatehouse.

⁴¹ A visitor use survey conducted by The Trustees of Reservations had 221 respondents. 27.2% of respondents listed fishing as their primary activity, 26% listed swimming and sunbathing, and 23.6% listed touring and sightseeing.

⁴² 65% of respondents listed finding peace and quiet as a very important reason for visiting, 83.9% of respondents listed enjoying the scenery as a very important reason, and 86.6% of respondents listed enjoying the scenery as very important.

⁴³ 73% of rental vehicle drivers were somewhat or very interested in learning more about the refuges and 93% were interested in exploring a new place.

⁴⁴ In the summer, off-island visitors overwhelm the number of islanders. This is reflective of the island as a whole.

⁴⁵ Based on our estimates from permits and visitor surveys. Assuming three people per vehicle, on average.

⁴⁶ Percent of respondents who consider the issue to be either a small or big problem.

People entering Coskata-Coatue with rental vehicles (2,925 day passes issued in 2000), however, are typically not repeat visitors, with less than 20% of them visiting more than five times.⁴⁷

2.12.1 Interpretation

A Natural History Tour is the only on-going interpretation for Coskata-Coatue Wildlife Refuge. Approximately 800 people participated in the tour in 2000. This tour is led by a naturalist and costs \$30 for adults and \$15 for children. The tour visits and interprets the Haulover, Coskata Woods, the Glades, the Galls, Great Point, and the Great Point lighthouse.⁴⁸ Shorebirds, plants, seals, and other wildlife are interpreted as well. Tour participants, in general, are interested in learning more about the refuges, and enjoying the scenic, natural, and historic features of a new place. An interpretive guide, *The Natural History of Coskata-Coatue Wildlife Refuge*, is available at the gatehouse for \$4. Fifty-six percent of survey respondents wanted to learn more about natural and cultural features. Specifically they were interested in maritime history, shorebirds, and coastal ecology. They were interested in learning more about these topics through printed materials and a self-guided natural history tour.

2.12.2 Membership

Currently, less than ten percent of visitors are members of The Trustees. Fifteen percent of people visiting with their own vehicle were members and 2% of visitors with rental vehicles were members.⁴⁹ Many people do not even know that The Trustees of Reservations own Coskata-Coatue, or that the U.S. Fish and Wildlife Service owns the tip of Great Point.⁵⁰ Presently, membership is not pursued aggressively anywhere. The Great Point Circle, begun in 2000, has attracted over 100 people in its first year. The entry membership level for the Great Point Circle is \$500.

2.12.3 Visitor Services, Staffing, and Infrastructure

Extant visitor services and infrastructure includes a gatehouse, OSV trails, road and trail signs, parking areas, restrooms, on-site rangers, a property superintendent, and a property map. No visitor center, drinking water, or concession stands are provided. The property map is outdated and reflects an older OSV trail system. Thirty-four percent of respondents want more on-site rangers. Fifty-seven percent of respondents want more restrooms, and 45% of respondents said that the quality of existing restrooms were a problem. Current restrooms are chemical toilets, which are located at the Great Point lighthouse (4) and near Coskata Pond (2). A restroom does not exist at the gatehouse parking lot, owned by the Nantucket Conservation Foundation; gatehouse staff currently uses the facilities at the Wauwinet Inn. Most people were satisfied with the number of signs and trails, although a greater percentage of people (25%) wanted more trails than those wanting less trails (6%).

Visitors access the property through an access road at Wauwinet. Located prior to entering the property of the Wauwinet Inn, is a refuge gatehouse and parking lot. Gatehouse staff checks vehicles for permits. Permits are issued at the gatehouse, and maps and other information are

⁴⁷ By contrast with this number, 40% of visitors bringing their own vehicle visited more than five times and 53% of Nantucket residents visiting more than five times.

⁴⁸ Most survey respondents remember these sites following the visit, when filling out a visitor use survey. Visiting such a diversity of sites is contrasted by the visitation of other user groups, who tend to visit specific areas. For example, 100% of tour participants visited the lighthouse whereas less than 50% of other survey respondents visited the lighthouse.

⁴⁹ Members and non-members do not differ significantly on their primary activity or on their opinions about problems at the refuges. The inability to differentiate significantly between them may, however, be due to the low number of members.

⁵⁰ *Nantucket Informal Evaluation*. 1999. U.S. Fish and Wildlife Service, white paper.

distributed. Visitors can navigate the property by means of blaze orange numbered trail markers. These trail markers correspond to numbers on the property map. Current OSV trails are shown in map one. As people leave the property, they can re-inflate their tires 100 feet down the road from the gatehouse.

Coskata-Coatue Wildlife Refuge is staffed typically between 9 am and 5 pm with one to two rangers and one to two gatehouse staff, depending on the day of the week. The property superintendent, tour guide, and shorebird biologist are also present on the property during this time, although their hours are more variable. After 5 pm the property is generally not staffed. Ranger and gatehouse staffing is between Memorial Day and Columbus Day, with some staffing further into October, when fishing is still good.

A refuge manager's home was completed in 2001. This home will also serve as the Nantucket headquarters for The Trustees of Reservations and will provide office space, storage space, and parking for refuge vehicles. Housing will not be available for other staff when occupied by a refuge manager.

2.12.4 *Permitting and Fees*

OSV permits are \$85 of which The Trustees receive 75% and Nantucket Conservation Foundation receives 25%. A \$10 discount is offered to The Trustees' members. Only two percent of permit holders took advantage of this offer, however. In 2000, 3,072 permits were issued. A recent increase in permits issued may be due to other beaches on Nantucket being closed, namely Smith's Point. Rental permits are \$225 per vehicle, paid by the agency, plus an additional \$20 for a day, paid by the renter. 2,734 day-passes were issued for rental vehicles. Pedestrians access the property free of charge.

2.12.5 *Costs*

Running a refuge has its share of annual costs. Costs include printing, meeting expenses, capital equipment reserve, equipment, postage, taxes, telephone, travel, vehicle repairs, contract services, administration, ecological management, maintenance, ranger and gatehouse staff salary, refuge manager salary, fringe benefits, and tour expenses. The largest items are salaries, administration, ecological management, tour expenses, and capital equipment reserve.

2.12.6 *Insects*

Mosquitoes, greenheads, and horseflies are all a vital part of the food web at Great Point and are indicators of a healthy wetland system. These insects are particularly voracious during the late summer in Coskata Woods, the Glades, the Cedars, and any adjacent beaches. In many ways, these insects control visitor densities—a hiking trip through Coskata Woods in late July is not a pleasant experience.

2.13 Town of Nantucket Context

As a whole, Nantucket is nearly 40% open space, with over 12,000 acres protected. All three barrier beaches on Nantucket Island are protected. These barrier beaches—Coscata-Coatue, Eel Point, and Smith's Point—are home to most shorebirds on Nantucket. Other shorebird sites are Low Beach, and scattered sites on the South Shore. Since 1996, when the Town of Nantucket took Smith's Point by eminent domain, and after a late 1995 town meeting rejected expanded beach driving, vehicle use has been more heavily regulated. A sharp division still occurs as to OSV driving on Nantucket, with advocates wanting less restrictions and others—beach pedestrians, private property owners, and shorebird advocates—wanting less vehicles on beaches along the South Shore. OSV use still occurs on most beaches, and town beach permits (\$30) provide access to a number of them. With a town beach sticker, however, some people feel they

are able to drive any beach. As on Coskata-Coatue, beaches elsewhere on Nantucket have seen increases in vehicle use. This typifies the rapid growth in the town—one of the highest in the Commonwealth. With this growth has come a dramatic increase in the costs of housing, which affects The Trustees' and other not-for-profit organizations' abilities to attract seasonal staff.⁵¹

2.14 Other Refuge Complex Landowners

Within the refuge complex, the Lohmann Family, who has generously donated 282 acres to The Trustees, own one inholding at Great Point that includes two cottages. In addition, other parties claim smaller sections of the refuge in the Cedars and the Glades.

⁵¹ The above description comes from various newspaper articles collected in the Islands Regional Office. Including: Weyant, G. Expanded Beach Driving Rejected. *The Inquirer and Mirror*, August 10, 1995. and Balling, J. Town Takes Smith's Point Despite Cries of Protest. *The Inquirer and Mirror*, February 29, 1996.

Section 3: Resource and Visitor Experience Management Plan

3.1 Introduction

With the missions, goals, and purpose of The Trustees and the U. S. Fish and Wildlife Service in mind (sections 2.2 through 2.5), the resource and visitor experience management plan provides a blueprint for action at Nantucket National Wildlife Refuge and Coskata-Coatue Wildlife Refuge. The plan specifically addresses the protection of ecological integrity of the refuges and enhancing visitor enjoyment, understanding, and appreciation of our natural and cultural heritage through increased interpretation and services. These goals are reflected in the purpose of the refuges, restated here due to their vital importance.

- To provide a refuge for rare shorebirds, specifically Piping Plovers and terns.
- To protect and preserve unusual and rare habitats and the rare species that depend on them.
- To instill a sense of appreciation, wonder, and stewardship in our visitors through education and interpretation of the refuges' many natural and historic features.
- To provide for public use and enjoyment in a variety of habitats under suitable rules and regulations.

This plan provides sections on ecological research, road management and management units, education and interpretation, permits, fees, membership, visitor experience carrying capacity, signs, printed material, staffing, infrastructure, recreation, cat and rat trapping, rules, and Piping Plover and tern guidelines.

3.2 Habitat and Shorebird Protection Guidelines for the Refuges

These guidelines are based on both Federal and state guidelines.¹

- Maintain a minimum of a 50-yard buffer around Piping Plover nests.²
- Close areas immediately if a 50-yard buffer is not possible due to a nest's proximity to the high tide line and if monitoring shows that Piping Plovers are affected by human disturbances.
- All suitable nesting habitat will be delineated with posts and warning signs or symbolic fencing prior to April 1.
- Nesting shorebird signs will be used only in areas with nesting shorebirds; other areas will be delineated with wildlife habitat signs.
- Piping Plover chicks will be protected by a vehicle free zone extending 1,000 yards to either side of the nest site.³ All roads will be closed within this zone unless an area is considered "inaccessible to plover chicks because of steep topography, dense vegetation, or other

¹ *Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act.* Northeast Region, U.S. Fish and Wildlife Service, April 15, 1994. and *Guidelines for Managing Recreational Use of Beaches to Protect Piping Plovers, Terns, and their Habitats in Massachusetts.* Massachusetts Division of Fisheries and Wildlife. Natural Heritage and Endangered Species Program, April 21, 1993.

² Buffers are based on research that showed disturbances by pets at 46 yards and by OSVs at 40 meters, on average. From: Hoopes, E. M., C. R. Griffin, and S. M. Melvin. 1992. *Relationship Between Human Recreation and Piping Plover Foraging Ecology and Chick Survival.* White paper.

³ As described in the USFWS guidelines (Federal Guidelines). This is, in general, the potential home range of Piping Plover chicks.

naturally-occurring obstacles.”

- Restrictions on vehicles will begin on the 26th day after the last Piping Plover egg is laid or as soon as hatching occurs as determined through intensive monitoring at dawn and dusk, if plover nests are found with a full clutch.
- Restrictions on vehicles will also begin as soon as hatching of terns begins. The closed area will extend from low water marks on both sides of the beach and at least 100 yards from the outer nests of a colony. The buffer will be extended if tern chicks move outside the colony boundaries so that at least 100 yards is maintained between chicks and vehicles.
- Vehicle restrictions can end after chicks have fledged (35 days old or when capable of flight for Piping Plovers and when capable of flight for terns).
- Vehicle and pedestrian access into tern nursery areas will be prohibited. Vehicle restrictions can end after adult terns are no longer feeding young terns.
- A symbolically-fenced, 50-foot buffer will protect seals using the beach as a haul-out.

3.3 Rules and Code of Conduct

Our rules will be enforceable and our code of conduct will be based around respect for other visitors, so as to avoid conflicts or diminished visitor experience. All rules will be clearly stated and firm. All permit holders will sign an agreement to abide by these rules and code of conduct. This agreement also indemnifies The Trustees, NCF, and USFWS against damages.

1. **Dogs are allowed between September 16 and March 31.** A code of conduct will be developed for dog owners. The code of conduct will state that owners will clean up after their dogs and must be under their owner’s control at all times.⁴
2. **Dogs are prohibited between April 1 and September 15.** This is when both high visitor use and the potential and/or presence of rare shorebirds occurs. To a tern or plover, a dog is a predator and may disturb feeding chicks. Prohibiting dogs during the shorebird season significantly reduces the risk of disturbance to plover and tern chicks.⁵
3. **Kite flying is prohibited within 200 yards of nesting or territorial adult or unfledged juvenile Piping Plovers or tern colonies.** Kites can cause adult plovers and terns to fly from their nest, thinking that it is a predatory bird.⁶
4. **Oversand vehicle (four wheel drive) access is by valid permit only.**
5. **Tires must be deflated to 12-15 psi before entering the refuge complex to prevent damage to roads and to avoid getting stuck.** Over-inflated tires make OSVs more prone to getting stuck and will create bumps in a sand road.
6. **Vehicles must use existing roadways and parking areas to prevent damage to wildlife habitat and vegetation.** Driving off roadways is strictly prohibited and can cause serious damage to vegetation or kill wildlife.
7. **Speed limit: 15 MPH**
8. **Speed limit: 5 MPH when adjacent to posted shorebird nesting habitat.**
9. **Pedestrians must not enter wildlife habitat or nesting areas.** Nesting wildlife is sensitive to human disturbances.⁷ Habitats can be impacted by pedestrian use.
10. **No open fires.**

⁴ Based on The Trustees’ dog policy draft.

⁵ Based on The Trustees’ dog policy draft.

⁶ Kite flying within 100 yards of Piping Plovers caused them to stop feeding 100% of the time. Hoopes, E. M. *et al.* 1992.

⁷ Pedestrians, for example, can disturb Piping Plovers at an average distance of 23 yards. From: Hoopes, E. M. *et al.* 1992.

11. **Parties greater than 20 people must be permitted.** The Refuge Manager must be contacted for approval of large parties.
12. **The refuge is closed between 10 pm and 5 am except for fishing.** Other nighttime activities are often associated with unauthorized activities.
13. **Conduct which disturbs the tranquility of the refuges or its enjoyment by others is prohibited.** Respect the peace and quiet of those around you in this wildlife refuge.
14. **Waterfowl and deer hunting will follow hunting regulations.** Waterfowl and deer hunters will be allowed to hunt with the refuge manager's permission.
15. **Shellfishermen will follow shellfishing regulations.**
16. **Fishermen will follow catch limit regulations.**
17. **Vehicles and pedestrians are prohibited from within 25 feet of stranded and hauled-out seals.** Seals are disturbed by the presence of humans. A 25-foot buffer for individual seals will typically avoid undue disturbances. For haul-out sites with groups of seals, a larger buffer is needed because they are usually staying at a site for extended periods and are more wary of human disturbances.

3.4 Feral Cat and Norway Rat Trapping

Feral Cats and Norway Rats are predators of Piping Plovers and terns (see section 2.9). The goal of our trapping program is to reduce predation on and harassment of ground-nesting birds, specifically Piping Plovers and terns. As live Feral Cat trapping was a success in 1999, removing five cats from Coskata-Coatue, trapping efforts will continue beginning in March, 2001. Live cat trapping should begin in the late winter, when cats are likely the hungriest. A live cat trapping program consists of locating traps in areas frequented by cats and where other animals are less likely to eat the bait. Ecology staff will monitor cat tracks throughout the refuge and determine the appropriate trap locations. Traps will initially be set as feeding stations; trap doors will be tied open. A half can of moist cat food, preferably a fish flavor will be used to attract the cats. Plywood and a rock will be placed on the trap as cover for the cats. The traps will be set as feeding stations for one week. At the end of the week, if the food is eaten regularly, the traps will be set. Trapped cats will be sent to the MSPCA for their care.

Norway Rats, although present at Coskata-Coatue, have not been trapped previously. A rat trapping program at Coskata-Coatue will undergo several steps. First, ecology staff will ascertain the distribution of rats. Second, high density and priority areas will be determined. Third, a trapping program will be initiated in these areas based on methodologies the ecology staff will create.

3.5 Recreation

As described in section 2.12, visitors to Coskata-Coatue are seeking a variety of wildlife-dependent recreation activities. Primarily, visitors are seeking to access Great Point, which provides outstanding fishing opportunities. For this section, we will improve the safety of and communication with visitors, we will monitor the visitor experience, and we will provide access to key recreation areas, while reducing or eliminating OSV access to other areas of Coskata-Coatue. Our actions are presented in table one.

Table One: Recreation Actions

Action	Description/Rationale
Restrict or eliminate OSV use in key habitat areas, while recognizing that OSVs are used as a means rather than an ends	OSV use is required to access remote areas of Coskata-Coatue, specifically Great Point. This OSV use is primarily a means to conduct wildlife-compatible recreation, primarily fishing. As Great Point is regarded as some of the best sport fishing in the world, this plan will maintain access to Great Point. Shorebird habitats, however, will be protected (see 3.10).
Monitor Rental OSV use	Rental vehicle users have been singled out in the past as being less likely to follow rules and to visit for reasons other than wildlife-compatible recreation. This should be closely monitored. We would also like to know whether or not rental vehicle users are participating in our new interpretive programs and are becoming members. In addition, vehicle rental agencies will be contacted about our rules and management changes and they should be encouraged to inform renters about these issues.
Develop and implement consistent hunting rules at Coskata-Coatue	Hunting will be by permission only. We will clarify what we expect from hunters while they visit our property. The rules will include sections on safety and procedures as determined by the Refuge Manager.
Refine a set of beach and water safety guidelines	These guidelines will inform visitors about the inherent risks of swimming, especially without the presence of official lifeguards. The current signs should be maintained, for they warn visitors without placing liability on The Trustees. Wavers and a liability clause for tour participants are currently being examined.
Closely monitor dog use at Coskata-Coatue	Where dogs are permitted, we need to determine how well are rules are being followed. Visitor satisfaction should also be monitored with respect to dog use issues. If our dog-related rules are not adequately followed or dogs are becoming a significant visitor experience problem, further restrictions will be added. ⁸
Monitor the visitor experience	We will monitor visitor satisfaction with visitor use surveys. This will be ongoing and at least once every three years.

3.6 Staffing and Infrastructure

Staffing and Infrastructure create the framework through which many goals can be realized. Road access changes are described in section 3.10. Safety, the ability to manage shorebirds, the ability to counter resource threats, staff knowledge, and our interpretation capabilities will all be increased greatly with the implementation of actions listed in table two.

Table Two: Staffing and Infrastructure Actions

Action	Description/Rationale
Implementing the management plan	Initially implementing this plan will require increased coordination and management efforts. The Islands Regional Director and Islands Regional Ecologist will coordinate the implementation of the plan.
Increase our capacity to patrol Coskata-Coatue	An additional need exists to patrol Coskata-Coatue. Current staffing is inadequate to meet the goals laid out in this management plan. We recommend increasing the presence of seasonal rangers (40 hrs/wk) on Coskata-Coatue through an Assistant Superintendent (6 months), who will report to the Regional Director, and four seasonal ranger positions (40 hrs/wk), who will report to the Assistant Superintendent. This will allow for better enforcement of our rules.

⁸ Based on the criteria established in The Trustees' dog policy draft.

Action	Description/Rationale
Improve our ability to manage the variety of habitats at Coskata-Coatue	Shorebird management is currently inadequate. Additional staffing and a different chain-of-command is needed. We recommend creating an Ecology Assistant position (six months) to oversee a Shorebird Protection Program and to manage habitats according to this management plan (section 3.10). The Ecology Assistant will report to the Regional Ecologist. In addition, a Shorebird Biologist (4 months) will report to the Ecology Assistant.
Develop an information manual and train all staff	We want to ensure that natural resource, The Trustees, and other pertinent information can be provided to all visitors. Rangers and other staff must be knowledgeable, courteous, and willing to answer questions. This will increase visitor knowledge and satisfaction of Coskata-Coatue and The Trustees. An information manual should delineate what staff should know for their position. Informative material should include all available materials of interest in a well-organized, easily understood manner. Staff training should occur early in the season and should be thorough and reinforced periodically, if needed.
Increase our ability to handle emergencies at Coskata-Coatue	This will be accomplished by incrementally increasing staff training as well as equipment available for use. All staff will be First Responder trained, with the ability to administer oxygen. In addition, tour staff and rangers will be trained as Lifeguards. A defibrillator, oxygen, and backboards will eventually be present on site.
Increase staff housing opportunities	As we increase staff and as housing becomes prohibitively expensive on Nantucket, our operations in the future will rely on affordable housing availability. Affordable housing should be pursued aggressively. When the refuge manager's home is occupied, no housing will be available for part-time staff. Options include purchasing another home, arranging for housing opportunities at the Lohmann family cottage, providing housing subsidies, or increasing staff wages.
Close redundant roads, roads through prime shorebird habitat, and roads in sensitive areas.	The road system at Coskata-Coatue will be significantly different upon the implementation of this plan. 45% of roads will be closed to protect the Piping Plover, terns, dunes, barrier beach plants, natural processes, bearberry heathlands, juniper woodlands, wrack lines, and the intertidal zone of beaches. This is described in detail in section 3.10 below.
Improve the condition of restroom facilities	A large percentage (39.4%) of surveyed visitors reported that poor quality restrooms were a problem. Restrooms must be regularly maintained. Restrooms should also be considered for the gatehouse parking area at Wauwinet.

3.7 Permitting, Fee Structure, Membership, and Carrying Capacity Issues

The Trustees of Reservations shares its fee structure with the Nantucket Conservation Foundation (NCF). Oversand-vehicle permit fees must be approved by both organizations. Since 1979, permits have increased from 873 to 3,072, an increase of 250%. Over the same period, rental use has increased from 569 to 2,734 day trips, an increase of 380%. Currently, one-third of surveyed visitors believe that crowding is a problem at Coskata-Coatue, indicating that Great Point may be approaching a carrying capacity with respect to the visitor experience. Despite a problem with crowding, however, people still managed to have their expectations of peace and quiet met. Lack of knowledge about The Trustees and low membership on Nantucket are also issues this plan will address. Our membership initiatives are aimed at 1) providing revenue used to protect and manage the property and its natural resources, and 2) moving a visitor to take a stewardship position as opposed to a visitor position. Our actions are as follows:

- The Trustees will continue to pursue membership, with incentives to become members of both NCF and The Trustees.
- The Trustees will continue to promote the Great Point Circle.
- The Trustees will continue to review and set fees for OSV permits and rental permits based on management expenses, in collaboration with NCF.
- The Trustees will encourage membership through education and interpretation activities.

- The Trustees will encourage membership through contacts with refuge personnel.

3.8 Education, Interpretation, Signs, and Printed Materials

Our goals for interpretation and education are to instill a sense of appreciation, wonder, and stewardship in our visitors and to increase the diversity, scope, and outreach of our interpretive and educational programs. These goals will revolve around our interpretive themes (section 2.5). Signs and printed information are important in communicating our rules and code of conduct, navigation to and around the property, communicating our key interpretational themes, and ensuring a standard feel is achieved for the organization. The actions to achieve these goals are described in table three.

Table Three: Education, Interpretation, Signs, and Printed Materials Actions

Action	Description/Rationale
Continue to improve the Natural History Tours	Tours are the only way we currently engage the public that does not have access to a four-wheel drive vehicle (aside from the occasional pedestrian). The tour can be improved by: 1) increasing our contacts with local B&Bs, Chamber of Commerce, and other organizations and businesses dealing with tourism, 2) increasing staff training, 3) improving staff qualifications, 4) increasing staff retention, and 5) assembling an information guide for tour leaders. For these and other tours, finding a suitable means to transport participants to the Wauwinet gatehouse (30 min. from downtown) is a major obstacle. All options should be pursued to address this problem.
Create additional Naturalist-guided tours	Abbreviated lighthouse tours, kayak tours in Coskata Pond and Head of the Harbor, and other specialized tours led by a naturalist will create a wider variety of programs for visitors seeking new experiences or seeking shorter tours.
Promote corporate tours	Corporate tours are a means to engage the corporate world in the appreciation of nature and provide significant opportunities to generate revenue for our programs.
Create an interpretive exhibit for and restore the interior of the lighthouse	All tours end at the lighthouse, which is currently lacking in any interpretation. Renovating the interior of the lighthouse with an interpretive exhibit would provide visitors with a richer experience. Along these lines, The Trustees should ensure that they retain access to the lighthouse and should pursue all means to do so, including renewal of a five-year license agreement with the U. S. Coast Guard. Means of opening the lighthouse to non-tour visitors should be pursued.
Create a Coskata Woods interpretive trail	An overgrown trail, ending at Coskata Pond, already exists in Coskata Woods. Coskata Woods provides excellent interpretive possibilities. The trail will likely be used before and after the insect season.
Create a Quest—A self-guided adventure	Survey respondents wanted a self-guided interpretive trail. We can go one step further and engage them in a Quest. Using a printed guide available at the gatehouse or through rangers, visitors will learn about the maritime history and coastal ecology through their own observations. The Quest will guide them through this process. The Quest can also lead visitors to explore other Trustees' properties with similar activities
Engage the public through various media	Our actions need public attention. We need to actively engage local and regional media, wherever necessary, to carry out our message.
Ensure signs are updated	Signs should reflect goals and presentation elements laid out in <i>The Communications and Marketing Long-Range Strategic Plan</i> . Sign placement and timing is extremely important, especially with respect to shorebird signs, which should be used only when nesting shorebirds are present.

Action	Description/Rationale
Use Temporary Interpretive Panels Throughout the Refuge	Interpretive panels will reflect our on-going property management and should explain clearly what our goals are for various sites. Interpretive themes (section 2.5) will be a focus for these panels.
Update the Coskata-Coatue trail map and brochure	The trail map will reflect changes in the ORV road system, updated information on rules and code of conduct, interpretive themes, and related materials.
Create a Guide to OSV driving at Coskata-Coatue	This guide will be available to all permit holders and will inform them of our rules, contacts in case of emergency, courtesy issues involved in OSV driving, who The Trustees are, and what people can do to avoid getting stuck. If they are stuck, this guide can help too. ⁹

3.9 Management Units

Twelve management units will be created at Coskata-Coatue. Each of these units has a management prescription, which will guide activities within that unit. For all units, shorebird and habitat guidelines and our rules will be followed. These rules and guidelines are our minimum standards for Coskata-Coatue Wildlife Refuge. The management units, existing roads in 2001, and proposed roads are shown in the attached maps.

For Nantucket National Wildlife Refuge, we examined several management options. These were: 1) no action, 2) closing NNWR to all vehicles and pedestrians, 3) closing NNWR to all vehicles, 4) closing all NNWR beaches to vehicles, with a small (less than 10 vehicle) currently-existing parking area at the Great Point lighthouse as the only OSV access, 5) providing balanced use open to wildlife-dependent recreational uses at NNWR. Those areas accessible to OSVs must still comply with Federal guidelines. The most acceptable option to The Trustees is number five. Option five can be achieved through several scenarios, which are presented below in table four (units 1,2, and 5) with all other unit prescriptions.

Table Four: Management Unit Prescriptions

Unit	Name	Management Prescription
1	Great Point, North	<ul style="list-style-type: none"> • The beach is open to OSVs. • This will be the primary OSV destination point. Historically this unit has been the destination point for the majority of visitors. • Roadways accessing this unit must be managed to ensure safety. • Maritime dunes will be closed to pedestrians. • When seals are present, their habitat will be fenced with a 50-foot buffer. Signs will interpret seals and explain our rules regarding seal protection. • The Trustees' Great Point Ranger will actively patrol this area. • Habitat will be fenced according to suitable habitat guidelines.
2	Great Point, Northwest	<ul style="list-style-type: none"> • The beach is closed to OSVs. • Open to wildlife-dependent recreational uses. • No vehicular use. • Lagoon access road will be closed. • OSVs may park at the lighthouse parking and other dune parking areas; pedestrians can then access the point from the parking areas or Unit 1. • Maritime dunes will be closed to pedestrians. • Restroom facilities will be located at the lighthouse. • Interpretive displays will be created at the lighthouse. • The Trustees' Great Point Ranger will actively patrol this area.

⁹ See CSEP guide for Cape Poge and Wasque as a model.

Unit	Name	Management Prescription
3	Great Point, West and The Great Point Lagoon	<ul style="list-style-type: none"> No vehicular use. 4,000 feet of OSV roads will be closed in this unit. Wildlife-dependent recreational uses will be allowed along the west beach. The Great Point Lagoon and surrounding habitats will be closed to pedestrians (the entire unit except for the west beach). Signs will be used to post closed areas. The Trustees' Great Point Ranger will actively patrol this area.
4	Great Point, East	<ul style="list-style-type: none"> No vehicular use. 4,000 feet of OSV roads will be closed in this unit. Wildlife-dependent recreational uses will be allowed along the east beach. Maritime dunes will be closed to pedestrians. All existing roadways from crossover roads to the east beach will be closed.
5	Private property	<ul style="list-style-type: none"> No vehicular use on the east beach, except for residents to access private property. 500 feet of OSV roads will be closed in this unit. Visitors may access Great Point through the designated crossover OSV trail. Wildlife-dependent recreational uses will be allowed along the east beach. Maritime dunes will be closed to pedestrians. Pedestrians must respect private property and not enter driveways.
6	The Galls, East	<ul style="list-style-type: none"> Visitors may drive through this area on a single OSV track. Visitors may pull their vehicles off the track. Symbolic fencing will delineate the habitat to the west of this track (unit 7) One small parking area will be located in the center of this unit for access to a pedestrian crossover to unit 7. The Trustees' Galls and Coskata-Coatue Ranger will actively patrol this area.
7	The Galls, West	<ul style="list-style-type: none"> No vehicular use allowed outside of designated parking areas. 4,500 feet of OSV roads will be closed in this unit. To access the west side of the Galls, there will be two controlled parking areas accessed from Unit 6 at the north and south ends of the Galls to accommodate wildlife-dependent recreational uses. These parking areas will accommodate ten vehicles each. Parking areas will be along the beach. Parking areas will be fenced with metal posts and wire, with openings for pedestrians. One pedestrian crossover will be fenced on both sides with stakes and twine. Wildlife-dependent recreational uses are allowed along the west beach. All habitats outside of the west beach will be closed to pedestrians. Signs will be used to post closed areas. Symbolic fencing will post the boundary between unit six and seven. The Trustees' Galls and Coskata-Coatue Ranger will actively patrol this area.
8	Coskata West Beach	<ul style="list-style-type: none"> Vehicular access will be prohibited on the beach (3,500 feet) between April 1 and September 31. The northern interior road (pre-existing) will be rehabilitated to allow access between the east beach and the Cedars cross-over road in unit 10. The Trustees' Galls and Coskata-Coatue Ranger will actively patrol this area.
9	Coskata East Beach, North	<ul style="list-style-type: none"> A single track OSV trail with turn-outs will allow access to markers 2 and 3. The trail will be behind the primary dune and overwash areas. Vehicular use is prohibited on the east beach. 4,500 feet of OSV roads will be closed in this unit. One pedestrian crossover will be fenced on both sides with stakes and twine. A small turnout area will provide limited parking for this crossover trail. The Trustees' Galls and Coskata-Coatue Ranger will actively patrol this area.

Unit	Name	Management Prescription
10	Coskata-Coatue, West	<ul style="list-style-type: none"> • A single track OSV trail with turn-outs (to allow for two-way traffic) will allow access to Coatue and Coskata Pond in unit 11 from marker 3 and the Cedars' crossover trails. • 18,000 feet of OSV roads will be closed in this unit. • The cross-over road will be maintained to crossover between marker 2 and Coskata West Beach through the Cedars.
11	The Cedars and The Glades	<ul style="list-style-type: none"> • A one-way OSV trail with turn-outs will allow travel from Unit 10 to marker 7 and the mouth of Coskata Pond. • 5,000 feet of historical roads through the Glades will remain closed.
12	Coskata Woods and Coskata East Beach, South	<ul style="list-style-type: none"> • Existing roads will be improved. Using symbolic fencing placed ten feet from the toe of the dune, the primary dunes will be protected from OSV-induced erosion. • Signs will warn visitors that this beach road may be impassable at high tide. • A one-way OSV trail with turn-outs will allow travel behind the primary dunes. • Existing turn-outs at Coskata Pond will be maintained. • Restroom facilities will be available along the interior road. • A self-guided interpretive pedestrian trail will be created along the pre-existing trail through Coskata Woods. This trail will be closed if Cooper's Hawk are nesting adjacent to the trail. • The Trustees' Galls and Coskata-Coatue Ranger will actively patrol this area.

3.10 Research

Coskata-Coatue is a diverse and large property with many management issues and interpretive possibilities. Our planned research revolves around our goals and purpose (sections 2.2 and 2.3).

Table Five: Research Actions

Action	Description/Rationale
Research and survey property boundaries	Determining property boundaries, specifically those with Nantucket National Wildlife Refuge is necessary when considering future land management activities.
Create a land-use history for the refuge	The land-use history will primarily be an interpretive tool, but will also inform habitat management activities.
Monitor the Piping Plover, terns, American Oystercatcher, Saltmarsh Sharp-tailed Sparrow, and Northern Harrier	We need to track the populations of these rare species. Plover and tern monitoring will follow the <i>Massachusetts Tern and Piping Plover Handbook: a manual for Stewards</i> . Estimates of tern productivity will be calculated using standard methods.
Research habitat management issues in the Cedars, including ascertaining the viability of the Prickly Pear Cactus and the use of fire, clearing, or other tools to manage the cedar savanna habitats	Describe and inventory the Juniper Hairstreak, determine past land-use practices, assess whether or not management is needed to protect the Cedars' habitats over the long-term. Study the Prickly Pear Cactus in terms of life history and its status at Coskata-Coatue.
Research the resources of other habitats at Coskata-Coatue	We will continue to research habitats at Coskata-Coatue in order to learn more about the resources we protect.

Section 4: Implementation

4.1 Introduction

This section outlines the current staffing and budget structure, the staffing requirements and costs for each action, and other aspects of implementing the management plan as described in Section 3. The success of this plan depends first and foremost on acceptance of this plan by the U. S. Fish and Wildlife Service and the development of acceptable management agreements.

4.2 Overview of Current Staffing & Budget Structure

The current staff structure is composed of a Regional Director, Islands Regional Ecologist, Islands Regional Naturalist, Refuge Manager, two part-time ranger, three gatehouse staff (shared with NCF), and one Shorebird Biologist. All staff are The Trustees of Reservations employees. The U. S. Fish and Wildlife Service currently does not have any staff on site. Income for The Trustees is derived from several sources including contributions, tours, and permits. In addition, Great Point Circle memberships have generated income used for property management. Of the OSV permit income, \$84,885 was derived from rental vehicle permits. The total FY-00 budget for Coskata-Coatue Wildlife Refuge was \$237,928, including almost \$70,000 in staff salaries.

In the future, as this management plan comes to fruition, increased numbers of Piping Plovers and terns will lead to more closures. More closures mean that fewer people will purchase permits. In terms of income, The Trustees will likely have to derive more income from tours, specifically corporate tours, the Great Point Circle, increased membership, and fundraising (building the endowment). Due to the variability and uncertainty surrounding OSV permit fee revenues, these additional income sources will stabilize the total income for Coskata-Coatue Wildlife Refuge, thereby ensuring that The Trustees' will be able to provide the necessary resources to implement this management plan.

4.3 Implementation Costs and Staff Requirements

Additional costs will be incurred and additional staff requirements will be needed upon the initiation of this management plan. Table one describes our management actions, point people, staff requirements, and equipment costs. These costs, in many cases, are supplemental and, in general, do not include already established full-time salaries and overhead costs.

Table One: Equipment Costs and Staff Requirements

Action	Point Person	Staff Requirements	Costs	Priority Level: Year of Action
Implementing the management plan	Regional Director	30 hours per week	\$4,400 in annual travel costs	2001, continuing until the plan is fully implemented
Rat and cat trapping	Regional Ecologist	15 hours per week	\$1000 initially for traps, MSPCA costs, bait, and other equipment expenses; \$500 per year thereafter for five years.	2001 and on-going until these species are no longer a problem.
Develop and implement consistent hunting rules at Coskata-Coatue	Refuge Manager	20 hours to create rules; 40 hours talking with hunters	\$100 in printing expenses (one-time cost)	Lower priority, 2002.

Action	Point Person	Staff Requirements	Costs	Priority Level: Year of Action
Refine a set of beach and water safety guidelines	Refuge Manager	40 hours to create guidelines; gatehouse and ranger staff will disseminate materials as needed	\$300 for printing	Lower priority, 2002.
Monitor rental OSV use, closely monitor dog use at Coskata-Coatue, and monitor the visitor experience	Regional Ecologist	150 hours every third year	\$500 for survey materials	2003
Increase our capacity to patrol Coskata-Coatue	Assistant Superintendent	120 hours per week of active patrolling: four full-time seasonal rangers (40 hrs/wk). Patrols are from 8 am to midnight, with two shifts: 8 am to 4 pm and 4 pm to midnight. During these hours, two rangers will be staffed (one at Great Point, one at Galls-Coskata-Coatue), between Memorial Day and Labor Day, reducing coverage in September and October. Patrolling duty also includes staff located at the Lohmann Cottage, who will periodically need to work after-hours.	\$13,000 for two ATVs. \$3,000 in additional gasoline costs for ATV's and additional patrols.	High priority, 2001.
Develop an information manual and train all staff	Interpretation and Education (I&E) Coordinator	60 hours initial development; 40 hours training per year.	\$300 for printing	High priority, 2001.
Increase our ability to handle emergencies at Coskata-Coatue	Assistant Superintendent	First Responder training, Lifeguard training	\$4,000 for a defibrillator; \$350 for lifeguard training and \$120 for first responder training, per person. ¹	2002 and on-going; increase capacity over time as feasible.

¹ The number of people needing training will vary each year.

Action	Point Person	Staff Requirements	Costs	Priority Level: Year of Action
Increase staff housing opportunities	Regional Director	100 hours of Regional Director and other staff time	Unknown	High priority, on-going.
Improve our ability to manage the variety of habitats at Coskata-Coatue primarily through closing redundant roads, roads through prime shorebird habitat, and roads in sensitive areas.	Regional Ecologist	600 hours initial year (using many staff); 100 hours in subsequent years.	First year, \$6,000 for fencing; \$3000 per year in maintenance costs per year thereafter. ² \$4,000 in travel costs for the Regional Ecologist.	High priority, 2001. Focus will initially be on Great Point, The Galls, and Coskata West Beach.
Improve the condition of restroom facilities	Assistant Superintendent	10 hours per week	Ranger staff time	On-going work.
Continue to improve the Natural History Tours	I&E Coordinator	60 hours to create an information packet; 30 hours a year in training; 80 hours a year in outreach and brochure distribution	\$4,000 per year in reprinting tour brochures (10,000 copies; include other tour offerings in the brochure as well; see below); \$4,800 for Regional Naturalist travel expenses.	High priority. The tour will be improved over time, with initial work (2001) focused on outreach and content.
Create additional Naturalist-guided Tours	I&E Coordinator and Refuge Manager	When implemented this would require between 300 and 600 hours per year, depending on demand	\$5,500 for kayaks (five double and four single kayaks), \$2,500 for inflatable and motor (for safety and rescue), \$1,875 for paddles, and \$750 for life vests; \$7,000 in annual depreciation and maintenance costs for an additional tour vehicle.	2002.
Promote corporate tours	I&E Coordinator	Between 100 and 300 hours per year, depending on demand	Costs will be shared with the above programs	On-going development.
Create an interpretive exhibit for and restore the interior of the lighthouse	Refuge Manager and I&E Coordinator	200 hours	\$7,000 for signs; interior renovations need to be contracted	2003, lower priority.
Create a Coskata Woods interpretive trail	I&E Coordinator	40 hours clearing trail; 100 hours designing the trail	\$1,000	2003, lower priority.
Create a Quest—A self-guided adventure	I&E Coordinator	100 hours of development	\$1,000	2003, lower priority.

² Based on costs per mile on Cape Poge Wildlife Refuge.

Action	Point Person	Staff Requirements	Costs	Priority Level: Year of Action
Engage the public through various media	Regional Director	100 hours for first year, 40 hours on average for additional years.	Minimal—printing and mailing press releases	On-going. High priority for first implementation year.
Ensure shorebird and other signs are updated	Regional Ecologist	40 hours	\$500	On-going.
Use temporary interpretive panels throughout the refuge	Regional Ecologist	40 hours	\$300 plus the purchase of a high-quality printer for the Islands Regional Office	High priority, 2001.
Update the Coskata-Coatue trail map and brochure	GIS Manager	40 hours	\$2,500 per year in printing expenses	High priority, 2001.
Create a guide to OSV driving at Coskata-Coatue	I&E Coordinator	20 hours	\$500 per year	Lower priority.
Research and survey property boundaries	Refuge Manager	20 hours	Contract through a surveyor, costs unknown. Split costs with USFWS.	High priority; must be completed prior to any land swap.
Create a land-use history for the refuge	Regional Ecologist	200 hours	\$500	Lower priority, 2002.
Monitor the Piping Plover, terns, American Oystercatcher, Saltmarsh Sharp-tailed Sparrow, and Northern Harrier	Regional Ecologist	60 hours per week during the breeding season	\$1,500 for laptop computer and supplies	On-going.
Research habitat management issues in the Cedars, including ascertaining the viability of the Prickly Pear Cactus and the use of fire, clearing, or other tools to manage the cedar savanna habitats	Regional Ecologist	200 hours over several years	\$1,000 for supplies.	On-going, lower priority.
Research the resources of other habitats at Coskata-Coatue	Regional Ecologist	300 hours over several years	\$1,000 for supplies	Lower priority, 2002.

The equipment costs and staff requirements to implement this management plan include \$77,835 in equipment purchases and a significant increase in staff hours needed to implement the plan. In the future, we also expect replacement costs for equipment to increase (e.g. replacing kayaks and ATVs as necessary and depreciating for vehicles). Additional staff includes the addition of an Ecology Assistant, an Assistant Superintendent, a Naturalist/Tour Coordinator, and two rangers (four total). Initial work will require the

assistance of other staff from the Islands Region and possibly from other parts of the organization. For example, the Regional Director and Regional Ecologist will oversee the implementation of this management plan over the next several years. The long-term operation of Coskata-Coatue can be handled through the following staffing:

- Refuge Manager
- Assistant Refuge Manager
- Interpretation and Education Coordinator
- Regional Ecologist
- Regional Director
- Seasonal Rangers (three 16-week positions; one 22-week position)
- Naturalists/Tour Guides (one 20-week positions and one 16-week position, potentially increasing to three as the program develops). One of the tour guides will be the tour coordinator as well. The tour coordinator will eventually be a six-month position and will also conduct other interpretation and education programs during the late spring and fall.
- Ecology Assistant
- Shorebird Biologist
- Gatehouse Staff (three part-time positions)

4.4 Medouie Creek and Staff Housing

Medouie Creek will become the center of operations for Coskata-Coatue Wildlife Refuge. The Refuge Manager will work at Medouie Creek and staff the office when not at Coskata-Coatue. The housing will temporarily provide housing for other staff until the Refuge Manager lives at Medouie Creek. Medouie Creek will also be used as a place where visitors can come to the office for information, a place for storage, a place for staff meetings, a place for The Trustees functions, and a place for vehicle parking.

Again, once the Refuge Manager is living at Medouie Creek, staff housing becomes limiting. *The success of this management plan depends on highly-qualified, stable staff.* The housing climate on Nantucket is such that we must act and create a solution to our housing dilemma.

4.5 Volunteers

Volunteers form the backbone of The Trustees, which is governed by the Standing Committee, a group of dedicated volunteers. In addition to the Standing Committee, a variety of other volunteer committees exist, including regional committees and property committees. Volunteers also participate in events such as Conservation Works.

The Nantucket Committee is an advisory group for Coskata-Coatue Wildlife Refuge and other Nantucket-related issues. The committee meets once a year and provides advice with respect to management and financial issues. The committee also works on membership and development.

4.6 Membership

As less than 10 percent of surveyed visitors were members, increasing members on Nantucket is a priority. This fits in well with our state-wide goal to double membership in three years. In the Islands Region, the greatest opportunity for membership growth exists on Nantucket. Specific ways to increase membership on Nantucket are:

- The Great Point Circle
- Providing significant vehicle permit discounts for members.
- Increasing our profile at Coskata-Coatue so that people know who The Trustees are
- Educating visitors about The Trustees through one-on-one contacts with staff

- Educating visitors about The Trustees through tour brochures, property guides, and other printed material
- Providing discounts for first-time members
- Providing tour discounts for members
- Increasing interpretation opportunities and improving visitor services to increase visitor satisfaction