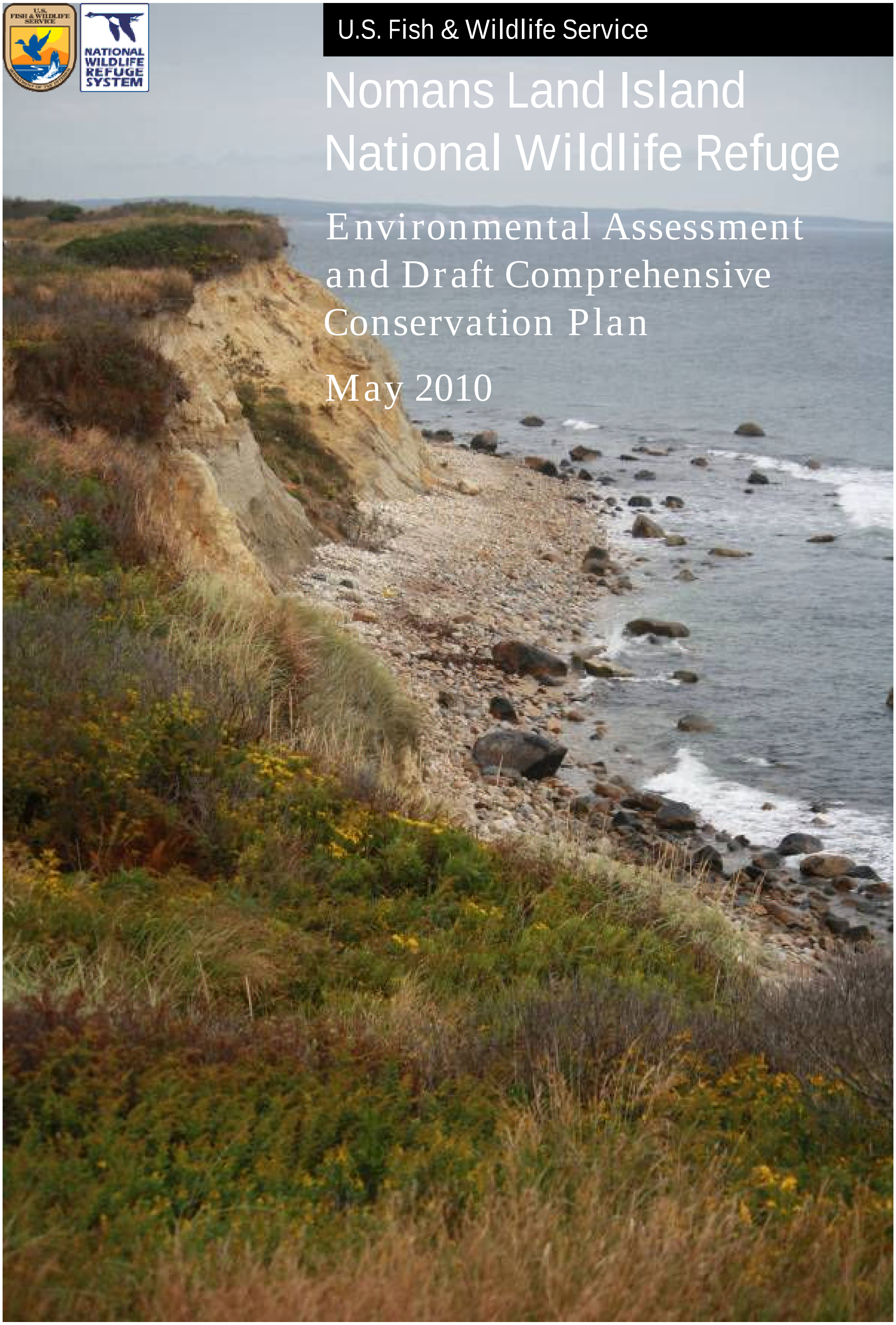
U.S. Fish & Wildlife Service

Nomans Land Island National Wildlife Refuge

Environmental Assessment and Draft Comprehensive Conservation Plan

May 2010



Nomans Land Island Cliffs
Erin Victory/TCI

This goose, designed by J.N. “Ding” Darling, has become the symbol of the National Wildlife Refuge System.

The U.S. Fish and Wildlife Service is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Service manages the 97-million acre National Wildlife Refuge System comprised of more than 548 national wildlife refuges and thousands of waterfowl production areas. It also operates 69 national fish hatcheries and 81 ecological services field stations. The agency enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Assistance Program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

Comprehensive Conservation Plans provide long term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service’s best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

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Refuge Vision Statement

We envision Nomans Land Island NWR to be a vital and unique maritime resource for migratory birds along the Atlantic Flyway. Our management will perpetuate the diversity of nesting, resting, and foraging habitats used by passerines, raptors, waterfowl and seabirds throughout the island. In particular, species of regional conservation concern including the peregrine falcon will benefit from land which is free from mammalian predators and from present-day human disturbances.

Nomans Land Island has a culturally rich human history that began thousands of years ago and our management will ensure that this legacy endures. Culturally sensitive management actions on the island, and strong partnerships with the Wampanoag Tribe of Gay Head (Aquinnah) and other partners, will foster cultural awareness and an appreciative and knowledgeable public.

With its recent history of human use, Nomans Land Island NWR will be a place few people can experience firsthand; yet we will provide meaningful alternatives for members of the public to experience the beauty and singularity of the Refuge. Through partnerships, education, interpretation and outreach, we hope to instill a sense of wonder about complex and dynamic coastal ecosystems, and underscore the value of the Refuge in conserving those resources.

Nomans Land Island National Wildlife Refuge
Environmental Assessment and
Draft Comprehensive Conservation Plan

May 2010

Type of Action:	Administrative – Development of a Comprehensive Conservation Plan
Lead Agency:	U.S. Department of the Interior, Fish and Wildlife Service
Location:	Nomans Land Island National Wildlife Refuge Chilmark, MA
Administrative Headquarters:	Eastern Massachusetts NWR Complex Sudbury, MA
Responsible Official:	Marvin Moriarty, Regional Director, Region 5, Northeast
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This Environmental Assessment (EA) and Draft Comprehensive Conservation Plan (CCP) analyzes three alternatives for managing the 628 acre Nomans Land Island National Wildlife Refuge over the next 15 years. This document also contains nine appendices that provide additional information supporting our analysis. Following is a brief overview of each alternative:

Alternative A: This alternative is referred to as our "No Action" or "Current Management" alternative, as required by the National Environmental Policy Act (NEPA). This alternative would maintain the status quo in managing this 628 acre refuge for the next 15 years. No major changes would be made to current management practices.

Alternative B: This alternative goes beyond the proposed actions in Alternative A, and features more active monitoring and habitat management to promote species of conservation concern. This would be facilitated through more frequent visits to the Refuge. An increase in off-site programming, interpretation and outreach would enhance our visitor services program. Strengthening partnerships and proposing new staff would build capacity for these endeavors.

Alternative C: This is the Service-preferred alternative. It represents the planning team's recommended strategies and actions for achieving Refuge purposes, vision and goals and responding to public issues. Here, the biological program would focus on more targeted management to benefit prioritized species of conservation concern. Off-site visitor services would be somewhat increased from current levels. In addition, this alternative includes a proposal for wilderness designation for the Refuge. As in Alternative B, strengthening partnerships is a Refuge priority.

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Chapter 1

Stephanie Koch/USFWS

Nomans Land Island's Rocky Shore

Purpose of and Need for Action

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Introduction

Nomans Land Island National Wildlife Refuge (NWR; Refuge) is a 628-acre island located in Dukes County, Massachusetts three miles southwest of Martha's Vineyard in the Atlantic Ocean (Map 1-1). The U.S. Fish and Wildlife Service (USFWS; Service; we; our) first began managing the eastern third of Nomans Land Island in 1970 under a Joint Management Agreement with the U.S. Navy, while they were actively using the island for military training purposes. In 1998, management of the entire island was transferred from the U.S. Navy to the Service for the protection and management of migratory birds.

Both the island and its surrounding waters have been closed to public access since the Navy began leasing it in the 1940's as an aerial bombardment and gunnery range (see Map 1-2 for an aerial photo of the island taken in 1938). Though range operations ended in 1996 and management responsibility for the island was transferred to the Service in 1998 to become a national wildlife refuge, the continued presence of unexploded ordnance (UXO) throughout the island requires that it remain administratively closed to the public. Waters surrounding the island continue to be restricted; however, this is not under the jurisdiction of the Service.

In Massachusetts, most public and private property extends to the normal low water line, but no farther than 1,650 feet from the high water line. Therefore, when we refer to Service management responsibility for Nomans Land Island NWR, or describe Refuge shoreline management actions, we generally mean those areas above the normal low water line. The Refuge encompasses its entire approved acquisition boundary (Map 1-1).

The Refuge is one of eight refuges that comprise the Eastern Massachusetts NWR Complex, which is headquartered in Sudbury, Massachusetts. Nomans Land Island is 1.6 miles east to west, and about one mile north to south (Stone and Webster 1996). Located in the Atlantic Ocean, it is heavily influenced by maritime processes (Map 1-3). Average tidal rise and fall is 8.5 feet, with extremes from 8.0 to 14.0 feet in storm or hurricane induced tides. Harsh oceanic winds, salt spray, and lack of shelter have created a brush, forb, grass, and sedge vegetative complex on the island.

This draft comprehensive conservation plan (CCP) and environmental assessment (EA) for the Refuge combine two documents required by federal law into one:

- a draft CCP, required by the National Wildlife Refuge System (Refuge System; NWRS) Administration Act of 1996, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law (PL) 105-57; 111 Stat. 1253; (Improvement Act)); and,

- an EA, required by the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq., 83 Stat. 852), as amended.

Following public review of this EA/draft CCP, our regional director will decide on the components of a final CCP to guide Refuge management decisions over the next 15 years. We will use the CCP to promote understanding of and support for Refuge management among state agencies in Massachusetts, tribal governments, our conservation partners, local communities and the public.

Chapter 1 explains the purpose of and need for preparing a CCP/EA, and sets the stage for four subsequent chapters and nine appendices. Specifically, it

- defines our planning analysis area,

- presents the mission, policies and mandates affecting the development of the plan,

- identifies other conservation plans we used as references,

- lists the purposes for which the Refuge was established and its land acquisition history,
- clarifies the vision and goals that drive Refuge management,
- describes our planning process and its compliance with NEPA regulations, and,
- identifies public and partner issues or concerns that surfaced as we developed the plan.

Chapter 2, “Alternatives Considered, Including the Service-Preferred Alternative,” presents three management alternatives and their objectives and strategies for meeting Refuge goals and addressing public and partner issues. It also describes the activities that we expect to occur regardless of the alternative selected for the final CCP. The range of alternatives includes continuing our present management of the Refuge unchanged, increasing habitat management and species monitoring activities while increasing visitor services on Martha’s Vineyard, and managing for focal species in priority habitat types, while moderately increasing visitor services on Martha’s Vineyard. We also include the results of our wilderness review in this chapter.

Chapter 3, “Affected Environment,” describes the physical, biological, and human environments of the Refuge.

Chapter 4, “Environmental Consequences,” assesses the environmental consequences of implementing each of three management alternatives. It predicts the foreseeable benefits and consequences affecting the socioeconomic, physical, cultural, and biological environments described in Chapter 3.

Chapter 5, “Consultation and Coordination with Others,” summarizes how we involved the public and our partners in the planning process. Public involvement is vital for the future management of this Refuge and all national wildlife refuges.

Nine appendices, a glossary with acronyms, and a bibliography (literature cited) provide additional documentation and references to support our narratives and analysis.

Map 1-1

Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan

Nomans Land Island National Wildlife Refuge

Sources:
Orthophoto from MassGIS

0 0.5 1 Miles

0 0.25 0.5 1 1.5 Kilometers

Map 1-2


Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan
Nomans Land - December 13th, 1938
Sources:
Image from USGS Earth Explorer.
Original source unknown.
Georeferenced in Arc to
MassGIS orthophotos.
RPS 010510
0
0.5
1
Miles
0
0.25
0.5
1
1.5
Kilometers
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Map 1-3

Sources:
Connecticut River watershed and Refuge Boundaries from USFWS.
Basemap USGS 1:250,000 DEM's. Bathymetry from MassGIS

The Purpose of and Need for the Proposed Action

We propose to develop a CCP for the Refuge that, in the Service's best professional judgment, best achieves the purposes, goals and vision of the Refuge and contributes to the National Wildlife Refuge System's mission, adheres to the Service's policies and other mandates, addresses identified issues of significance, and incorporates sound principles of fish and wildlife science.

NEPA regulations require our evaluation of a reasonable range of alternatives, including a proposed or preferred action and no action. The no-action alternative can be either (1) taking no management action, or (2) not changing current management. In this draft plan, Alternative A is the latter.

The purpose of adopting a CCP for this Refuge is to accomplish the following goals:

Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.

Goal 2. Promote awareness and stewardship of our coastal natural resources by working with our partners to provide off-site interpretation, education and outreach opportunities.

Goal 3. Recognize the archaeological and cultural importance of the island.

Goal 4. Protect, maintain, enhance, and preserve the wilderness character of Nomans Land Island NWR.

The need for a CCP is manifold. First, the Improvement Act requires us to write CCPs for all national wildlife refuges by 2012 to help fulfill the mission of the Refuge System. New policies to implement the strategic direction in the Improvement Act have developed since the Refuge was established. A CCP incorporates those policies and develops strategic management direction for the Refuge for 15 years, by

- stating clearly the desired future conditions for refuge habitat, wildlife, visitor services, staffing, and facilities;
- explaining concisely to state agencies, refuge neighbors, visitors, partners, and other stakeholders the reasons for management actions;
- ensuring that refuge management conforms to the policies and goals of the Refuge System and legal mandates;
- ensuring that present and future public uses are appropriate and compatible;
- evaluating wilderness values;
- providing long-term continuity and direction for refuge management; and,
- justifying budget requests for staffing, operation and maintenance funds.

Second, this Refuge lacks a master plan to implement that strategic management direction and guide our decisions. Several things have changed since the Service began managing a portion of the island as a refuge in 1970. Most notably, the Refuge has increased in size to encompass the entire island. In addition, new ecosystem and species conservation plans have developed that bear directly on refuge management. We have a better understanding about the vegetation and wildlife found on the Refuge than we did in 1970. Finally, as responsible stewards of federal lands, conveying our vision and priorities for the Refuge to our partners, local communities, and interested and affected individuals is imperative.

The Service and the Refuge System: Policies and Mandates Guiding Planning

The U.S. Fish and Wildlife Service and its Mission

As part of the Department of Interior, the Service administers the National Wildlife Refuge System. The Service mission is "Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

Congress entrusts to the Service the conservation and protection of these national natural resources: migratory birds and fish, federal-listed endangered or threatened species, inter-jurisdictional fish, wetlands, certain marine mammals, and national wildlife refuges. We also enforce federal wildlife laws and international treaties on importing and exporting wildlife, assist states with their fish and wildlife programs, and help other countries develop conservation programs.

The Service Manual, available online at http://www.fws.gov/policy/manuals, contains the standing and continuing directives on implementing our authorities, responsibilities, and activities. The 600 series of the Service Manual addresses land use management and sections 601-609 specifically address management of national wildlife refuges. We publish special directives that affect the rights of citizens or the authorities of other agencies separately in the Code of Federal Regulations (CFR); the Service Manual does not duplicate them (see 50 CFR 1–99 at http://www.gpoaccess.gov/cfr/index.html).

The National Wildlife Refuge System and its Mission and Policies

The National Wildlife Refuge System, of which Nomans Land Island NWR is a part, is the world's largest collection of lands and waters set aside specifically for the conservation of wildlife and the protection of ecosystems. More than 545 national wildlife refuges encompass more than 150 million acres of lands and waters in all 50 states and several island territories. Each year, more than 40 million visitors hunt, fish, observe and photograph wildlife, or participate in environmental education and interpretation on refuges.

In 1997, President Clinton signed into law the National Wildlife Refuge System Improvement Act. This act establishes a unifying mission for the Refuge System and a new process for determining the compatibility of public uses on refuges, and requires us to prepare a CCP for each refuge. It also states that the Refuge System must focus on wildlife conservation and that the mission of the Refuge System, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction on that refuge. The mission of the System is,

"to administer 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."

—National Wildlife Refuge System Improvement Act; Public Law 105–57

The Refuge Manual contains policy governing the operation and management of the Refuge System that the Service Manual does not cover, including technical information on implementing refuge polices and guidelines on enforcing laws. You can review that manual at refuge headquarters. These are a few noteworthy policies instrumental in developing this CCP. You may view them on the Web at http://www.fws.gov/policy/manuals/part.cfm?series=600&seriestitle=LAND%20USE%20AND%20MANAGEMENT%20SERIES

Policy on the National Wildlife Refuge System Mission, Goals and Purposes

This policy (601 FW 1) sets forth the Refuge System mission noted above, how it relates to the Service mission, and explains the relationship of the Refuge System mission and goals, and the purpose(s) of each unit in the Refuge System. In addition, it identifies the following Refuge System goals:

- Conserve a diversity of fish, wildlife, and plants;
- Develop and maintain a network of habitats;
- Conserve those ecosystems, plant communities, and wetlands that are unique within the United States;
- Provide and enhance opportunities to participate in compatible, wildlife-dependent recreation; and,
- Help to foster public understanding and appreciation of the diversity of fish, wildlife, and plants and their habitats.

This policy also establishes management priorities for the Refuge System.

- Conserve fish, wildlife, and plants and their habitats;
- Facilitate compatible wildlife-dependent recreational uses; and,
- Consider other appropriate and compatible uses.

Policy on Refuge System Planning

This policy (602 FW 1, 2, 3) establishes the requirements and guidance for Refuge System planning, including CCPs and step-down management plans. It states that we will manage all refuges in accordance with an approved CCP that, when implemented, will help

- achieve refuge purposes;
- fulfill the Refuge System mission;
- maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System;
- achieve the goals of the National Wilderness Preservation System and the National Wild and Scenic Rivers System; and,
- conform to other applicable laws, mandates, and policies.

This planning policy provides step-by-step directions and identifies the minimum requirements for developing all CCPs including reviewing any existing special designation areas such as wilderness and wild and scenic rivers, specifically addressing the potential for any new special designations, conducting a wilderness review, and incorporating a summary of that review into each CCP (602 FW 3).

Policy on the Appropriateness of Refuge Uses

Federal law and Service policy provide the direction and planning framework for protecting the Refuge System from inappropriate, incompatible or harmful human activities and ensuring that visitors can enjoy its lands and waters (when the Refuge is open to public use). This policy (603 FW 1) provides a national framework for determining appropriate refuge uses to prevent or eliminate those that should not occur in the Refuge System. It describes the initial decision process the refuge manager follows when first considering whether to allow a proposed use on a refuge. An appropriate use must meet at least one of the following four conditions.

1. The use is a wildlife-dependent recreational use as identified in the Improvement Act.

2. The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act became law.

3. The use involves the take of fish and wildlife under state regulations.

4. The use has been found to be appropriate after concluding a specified findings process using 10 specific criteria included in the policy.

You may view that policy on the Web at http://www.fws.gov/policy/603fw1.html.

Policy on Compatibility

This policy (603 FW 2) complements the appropriateness policy. The refuge manager first must find a use appropriate before undertaking a compatibility review of that use. If the proposed use is not appropriate, the refuge manager will not allow it, and a compatibility determination is unnecessary. However, the refuge manager must evaluate an appropriate use further, through a compatibility determination. The direction in 603 FW 2 provides guidance on how to prepare a compatibility determination. Other guidance in that chapter follows.

- The Improvement Act and its regulations require an affirmative finding by the refuge manager on the compatibility of a public use before we allow it on a national wildlife refuge.

- A compatible use is one "that will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge."

- The act defines six wildlife-dependent uses that are to receive enhanced consideration on refuges: "hunting, fishing, wildlife observation and photography, and environmental education and interpretation."

- The refuge manager may authorize those priority uses on a refuge when they are compatible and consistent with public safety.

- When the refuge manager publishes a compatibility determination, it will stipulate the required maximum reevaluation dates: 15 years for wildlife-dependent recreational uses; 10 years for other uses.

- The refuge manager may reevaluate the compatibility of a use at any time: for example, sooner than its mandatory date, or even before we complete the CCP process, if new information reveals unacceptable impacts or incompatibility with refuge purposes (603 FW 2.11, 2.12).

- The refuge manager may allow or deny any use, even one that is compatible, based on other considerations such as public safety, policy, or available funding.

Policy on Maintaining Biological Integrity, Diversity, and Environmental Health

This policy (601 FW 3) provides guidance on maintaining or restoring the biological integrity, diversity, and environmental health of the Refuge System, including the protection of a broad spectrum of fish, wildlife, and habitat resources in refuge ecosystems. It provides refuge managers with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and restore lost or severely degraded components of the environment. It also provides guidelines for dealing with external threats to the biological integrity, diversity, and environmental health of a refuge and its ecosystem.

Policy on Wilderness Stewardship

This policy (610 FW 1-3) provides guidance for managing Refuge System lands designated as wilderness under the Wilderness Act of 1964 (16 USC 1131–1136; PL 88–577). The Wilderness Act establishes a National Wilderness Preservation System (NWPS) that is composed of federally-owned areas designated by Congress as “wilderness areas.” The act directs each agency administering designated wilderness to preserve the wilderness character of areas within the NWPS, and to administer the NWPS for the use and enjoyment of the American people in a way that will leave those areas unimpaired for future use and enjoyment as wilderness. Our wilderness stewardship policy also provides guidance on development of wilderness stewardship plans and clarifies when prohibited uses may be necessary for wilderness preservation.

Service planning policy requires that we evaluate the potential for wilderness on refuge lands, as appropriate, during the CCP planning process (610 FW 1). Section 610 FW 4 of our Wilderness Stewardship Policy provides guidance on the wilderness review process. Sections 610 FW 1-3 provide management guidance for designated wilderness areas.


Erin Victory/TCI

Autumn Refuge colors

Policy on Wildlife-dependent Public Uses

This policy (605 FW 1) presents specific guidance about wildlife-dependent recreation programs within the Refuge System. We develop our wildlife-dependent recreation programs on refuges in consultation with state fish and wildlife agencies and stakeholder input based on specific criteria. Since the Refuge is administratively closed to the public (as required by the terms of the transfer from the U.S. Navy), the criteria that are specifically relevant to the off-site interpretation and education that we could offer are identified below:

1. promotes compliance with applicable laws and regulations and responsible behavior;

2. promotes resource stewardship and conservation;

3. promotes public understanding and increases public appreciation of America’s natural resources and our role in managing and conserving these resources;

4. uses facilities that are accessible to people and blend into the natural setting; and,

5. uses visitor satisfaction to help define and evaluate programs.

Native American Policy

Since the inception of the United States, the U.S. government has recognized the sovereignty of American Indian Tribes by entering into treaties with them. Moreover, the Constitution ascribes the official duties of conducting relations with the Tribes to the federal government, not the states (Tallbear undated), and judicial decisions have upheld this relationship over time. This government-to-government relationship provides the framework for all interactions between the U.S. government and American Indian Tribes. The U.S. government has also recognized the federal trust responsibility it has to, in the most general terms, assist American Indian Tribes in protecting their rights and property (Tallbear undated).

In addition, the Departments of the Interior and Commerce released a Secretarial Order (#3206) regarding American Indian Tribal rights and the Endangered Species Act that acknowledges this government-to-government relationship. Further, it states "Accordingly, the Departments will carry out their responsibilities under the act in a manner that harmonizes the federal trust responsibility to tribes, tribal sovereignty and statutory missions of the Departments…." All branches of the U.S. government have the responsibility to uphold the tenets of this relationship and to consider the rights, needs and values of Native American Tribes.

The Service developed and adopted a Native American Policy in 1994. The Service's purpose in creating this policy is to "articulate the general principles that will guide the Service's government-to-government relationship to Native American governments in the conservation of fish and wildlife resources."

The Native American Policy of the U.S. Fish and Wildlife Service (1994) is outlined as follows:

- The Service recognizes the sovereign status of Native American governments.
- There is a unique and distinctive political relationship between the United States and Native American governments…that differentiates Native American governments from other interests and constituencies.
- The Service will maintain government-to-government relationships with Native American governments.
- The Service recognizes and supports the rights of Native Americans to utilize fish and wildlife resources on non-reservation lands where there is a legal basis for such use.
- While the Service retains primary authority to manage Service lands, affected Native American governments will be afforded opportunities to participate in the Service's decision-making process for Service lands.
- The Service will consult with Native American governments on fish and wildlife resource matters of mutual interest and concern to the extent allowed by the law. The goal is to keep Native American governments involved in such matters from initiation to completion of related Service activities.
- The Service will assist Native American governments in identifying federal and non-federal funding sources that are available to them for fish and wildlife resource management activities.
- The Service will involve Native American governments in all Service actions that may affect their cultural or religious interests, including archaeological sites.
- The Service will provide Native Americans reasonable access to Service managed or controlled lands and waters for exercising ceremonial, medicinal and traditional activities recognized by the Service and by Native American governments. The Service will permit these uses if the activities

are consistent with treaties, judicial mandates, or federal and tribal law and are compatible with the purposes for which the lands are managed.

- The Service will encourage the use of cooperative law enforcement as an integral component of Native American, federal, and state agreements relating to fish and wildlife resources.

- The Service will provide Native American governments with the same access to fish and wildlife resource training programs as provided to other government agencies.

- The Service's basic and refresher fish and wildlife law enforcement training courses that are provided to other governmental agencies will also be available to Native Americans.

- The Service will facilitate the education and development of Native American fish and wildlife professionals by providing innovative educational programs and on-the-job training opportunities. The Service will establish partnerships and cooperative relationships with Native American educational institutions. The Service will also ensure that Native American schools and children are included in its environmental education outreach programs.

- The Service will actively encourage qualified Native Americans to apply for jobs with the Service, especially where the Service is managing fish and wildlife resources where Native Americans have management authority or cultural or religious interests.

- The Service will work with Native Americans to educate the public about Native American treaty and federally-reserved rights, laws, regulations and programs and programs related to fish and wildlife.

You may view this policy on the Web at http://www.fws.gov/northeast/nativeamerican/imp_plan.html.

Other Mandates

Although Service and Refuge System policy and the purpose(s) of each refuge provide the foundation for its management, other federal laws, executive orders, treaties, interstate compacts, and regulations on conserving and protecting natural and cultural resources also affect how we manage refuges. Federal laws require the Service to identify and preserve its important historic structures, archaeological sites, and artifacts. NEPA mandates our consideration of cultural resources in planning federal actions. The Improvement Act requires the CCP for each refuge to identify its archaeological and cultural values. Many of these that are relevant to Nomans Land Island are summarized below.

The following summaries were taken, in most cases, directly from our "Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service," located at http://www.fws.gov/laws/lawsdigest/indx.htm, and from our Draft U.S. Fish and Wildlife Service Tribal Consultation Guide (Monette 2009).

The Antiquities Act of 1906 as amended (PL 59-209; 34 Stat. 225; 16 USC 431-433) is the earliest and most basic legislation for protecting cultural resources on federal lands. It provides misdemeanor-level criminal penalties to control unauthorized uses. Appropriate scientific uses may be authorized through permits, and materials removed under a permit must be permanently preserved in a public museum. The 1906 act is broader in scope than the 1979 Archaeological Resources Protection Act, which partially supersedes it. Uniform regulations at 43 CFR Part 3 implement the act.

The Historic Sites, Buildings and Antiquities Act (16 USC 461–462, 464–467; 49 Stat. 666) of August 21, 1935, popularly known as the Historic Sites Act, as amended by Public Law 89–249, approved October 9, 1965, (79 Stat. 971), declares it a national policy for the first time to preserve historic sites and objects of national significance, including those located on refuges. It provides authorization to the Secretary of the Interior through the National Park Service to conduct archaeological surveys, and to designate, acquire, administer, protect and purchase properties of historic significance. National Historic and Natural

Landmarks are designated under the authority of this act, which are eventually incorporated into the National Historic Register under the 1966 National Historic Preservation Act.

The Archeological and Historic Preservation Act (16 USC 469–469c; PL 86–523,) approved June 27, 1960, (74 Stat. 220) as amended by Public Law 93–291, approved May 24, 1974, (88 Stat. 174) carries out the policy established by the Historic Sites Act (see above). It directs federal agencies to notify the Secretary of the Interior whenever they find that any alteration of terrain caused by a federal or federal-assisted licensed or permitted project may cause the loss or destruction of significant scientific, prehistoric or archaeological data. This expands the number of federal agencies responsible for carrying out this law. The act authorizes the use of appropriated, donated or transferred funds for the recovery, protection and preservation of those data.

The National Historic Preservation Act of 1966 (16 USC 470–470b, 470c–470n), Public Law 89–665, approved October 15, 1966 (80 Stat. 915) and repeatedly amended, provides for the preservation of significant historical properties (buildings, objects and sites) through a grant-in-aid program to the states. It establishes a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 USC 468–468d). This act establishes an Advisory Council on Historic Preservation, which became a permanent, independent agency in Public Law 94–422, approved September 28, 1976 (90 Stat. 1319). The act created the Historic Preservation Fund. It directs federal agencies, and any state, local or private entity associated with a federal undertaking, to conduct a Section 106 Review, or to identify and assess the effects of their actions on items or sites listed or eligible for listing on the National Register. Most significantly, this act established that archaeological preservation was an important and relevant component at all levels of modern society, and it enabled the federal government to facilitate and encourage archaeological preservation, programs and activities in the state, local and private sectors.

American Indian [Native American] Religious Freedom Act of 1978 as amended (PL 95-431; 92 Stat. 469; 42 USC 1996) resolves that it shall be the policy of the United States to protect and preserve for the American Indian, Eskimo, Aleut, and Native Hawaiian the inherent right of freedom to believe, express, and exercise their traditional religions, including access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites. Federal agencies are directed to evaluate their policies and procedures to determine if changes are needed to protect such rights and freedoms from agency practices. The act is a specific expression of First Amendment guarantees of religious freedom. It is not implemented by regulations.

The Archaeological Resources Protection Act (16 USC 470aa–470ll; Public Law 96–95) approved October 31, 1979, (93 Stat. 721), referred to as ARPA, largely supplanted the resource protection provisions of the Antiquities Act of 1906 for archaeological items. ARPA establishes detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from federal or Native American lands. It also provides detailed descriptions of prohibited actions, thereby strengthening enforcement capabilities. It establishes more severe civil and criminal penalties for the unauthorized excavation, removal, or damage of those resources; for any trafficking in those removed from federal or Native American land in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended (PL 101-601; 104 Stat. 3048; 25 USC 3001 et esq.) establishes rights of American Indian tribes and Native Hawaiian organizations to claim ownership of certain cultural items, including human remains, funerary objects, sacred objects, and objects of cultural patrimony, held or controlled by federal agencies and museums that receive federal funds. It requires agencies and museums to identify holdings of such remains and objects, and to work with appropriate Native Americans toward their repatriation. Permits for the excavation and/or removal of cultural items protected by the act require Native American consultation, as do discoveries of cultural items made during federal land use activities. The Secretary of the Interior's implementing regulations are at 43 CFR Part 10. In the case that human remains are discovered on the

Refuge, NAGPRA establishes a procedural framework to follow, and this process may also be coordinated with the Commonwealth of Massachusetts and its laws and procedural framework as necessary.

The Environmental Justice program, established by Presidential Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), requires federal agencies, including the Service, to ensure that all environmental policies and the disposal of toxic waste do not adversely impact minority and low-income communities, including Tribes. The common concern is that these communities are exposed to unfair levels of environmental risk arising from multiple sources, often coupled with inadequate government response.

Executive Order 13007 (Indian Sacred Sites), dated May 24, 1996, establishes new requirements for the protection and preservation of Indian religious practices. Each federal agency is required to accommodate access to, and ceremonial use of, Indian sacred sites by Indian practitioners, and avoid adversely affecting the physical integrity of such sacred sites. Each agency is required to develop and implement procedures in compliance with the Presidential memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments," including consultation with Tribal governments. The developed procedures, where practicable and appropriate, are to ensure that reasonable notice is provided about proposed actions or land management policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites. Each agency is to report to the President the procedures implemented or proposed to facilitate consultation with appropriate Tribes and religious leaders and the expeditious resolution of disputes relating to agency action on federal lands that may adversely affect access to, ceremonial use of, or the physical integrity of sacred sites.

On June 5, 1997, the Secretaries of the Interior and Commerce jointly issued Secretarial Order 3206 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act). This order provides guidance about the federal-tribal relationship, and its relationship to Tribal rights, trust responsibilities, and the Endangered Species Act. It clarifies responsibilities when action is taken under the Endangered Species Act effect (or may effect) Indian lands, Tribal trust resources, or the exercise of Indian Tribal rights. It further acknowledges the trust responsibility and treaty obligations of the United States toward Tribes and Tribal members, and the government-to-government relationship in dealing with Tribes. It directs that the responsibilities under the Endangered Species Act are to be carried out in a manner that harmonizes trust responsibilities, Tribal sovereignty, statutory missions, and strives to ensure that Tribes do not bear a disproportionate burden for the conservation of listed species.

Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), was signed on November 6, 2000. This EO is intended primarily to ensure adequate consultation with Tribal governments in developing policies that have direct effects on Indian Tribes, to respect Tribal administrative authority pertaining to these policies, and to prevent the imposition of unfunded mandates on Tribal governments. In recognition of this, the Service has created its own Tribal Consultation Guide as a tool for Service employees to better communicate with Native American Tribal governments in carrying out Service actions and policies.

The Service also owns and cares for museum properties. The most common are archaeological, zoological, botanical collections, historical photographs, historic objects, and art. Each refuge maintains an inventory of its museum property. Our museum property coordinator in Hadley, Massachusetts, guides the refuges in caring for that property, and helps us comply with the Native American Grave Protection and Repatriation Act and federal regulations governing federal archaeological collections. Our program ensures that those collections will remain available to the public for learning and research.

Chapter 4, “Environmental Consequences,” evaluates this plan’s compliance with the acts noted above, and with the Clean Water Act of 1977 as amended (33 USC 1251, et seq.; Public Law 107–303), the Clean Air Act of 1970 as amended (42 USC 7401 et seq.), and the Endangered Species Act (ESA) of 1973 (16 USC 1531–1544), as amended. Finally, we designed this EA/draft CCP to comply with NEPA and the Council on

Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500–1508).

Stephanie Koch/USFWS

American oystercatcher eggs

Conservation Plans and Initiatives Guiding the Project

Strategic Habitat Conservation

The Service has a goal of establishing and building capacity for science-driven landscape conservation on a continental scale. Our approach, known as Strategic Habitat Conservation, applies adaptive resource management principles to the entire range of species, groups of species, and natural communities of vegetation and wildlife. This approach is founded on an adaptive, iterative process of biological planning, conservation design, conservation delivery, monitoring and research. The Service is refining this approach to conservation in a national geographic framework. We will work with partners to develop national strategies to help wildlife, with a focus on declining species populations, adapt in a climate-changed world. This geographic frame of reference will also allow us to more precisely explain to partners, Congress and the American public why, where and how we target resources for landscape-scale conservation and how our efforts connect to a greater whole.

Climate Change

Secretarial Order 3289, issued on March 11, 2009, establishes a commitment by the Department of Interior to address the challenges posed by climate change to tribes and to the cultural and natural resources the Department oversees. Because tribes are likely to be disproportionately impacted by climate change due to their reliance on natural resources, the Department is committed to in-depth government-to-government consultation with tribes and Alaska Natives on the Departments' climate change policies and initiatives. This order promotes the development and use of renewable energy on public lands, adapting land management strategies to mitigate the effects of climate change, initiating multi-agency coalitions to address issues on a landscape level, and incorporating climate change priorities in long-term planning. These and other actions will be overseen by a Climate Change Response Council which is responsible for creating a Department-wide climate change strategy.

As the principal agency responsible for the conservation of the nation's fish, wildlife, and plant resources, the Service has drafted a Climate Change Strategic Plan and a Five-Year Action Plan to jump-start implementation of the strategic plan. These plans provide a framework in which the Service works with others on a landscape-scale to promote the persistence of native species, habitats, and natural communities. Specifically, these plans are based on three overall strategies. These are: Adaptation (management actions the Service will take to reduce climate change impacts on wildlife and habitats), Mitigation (consuming less energy and using less materials in administering land and resources), and Engagement (outreach to the larger community to build knowledge and share resources to better understand climate change impacts). Both plans can be found at http://www.fws.gov/home/climatechange/strategic_plan.html.

Birds of Conservation Concern 2008 Report

The Service developed this report (USFWS 2008a) in consultation with leaders of ongoing bird conservation initiatives and such partnerships as Partners In Flight (PIF), the North American Waterfowl Management Plan (NAWMP) and Joint Ventures, the North American Waterbird Conservation Plan (NAWCP), and the U.S. Shorebird Conservation Plan. It fulfills the mandate of the 1988 amendment to the Fish and Wildlife Conservation Act of 1980 (100 Public Law 100–653, Title VIII), requiring the Secretary of the Interior, through the Service, to "identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973."

The report contains 46 lists that identify bird species of conservation concern at national, regional, and landscape scales. It includes a principal national list, regional lists corresponding to the regional administrative units of the Service, and species lists for each of the 35 bird conservation regions (BCRs) designated by the North American Bird Conservation Initiative (NABCI) in the United States, and two additional BCRs we created to fulfill the purpose of the report that include island "territories" of the United States. NABCI defined those BCRs as ecologically-based units in a framework for planning, implementing, and evaluating bird conservation.

We hope those national and regional reports will stimulate federal, state, and private agencies to coordinate, develop, and implement integrated approaches for conserving and managing the birds deemed most in need of conservation. This is one of the plans we considered in identifying species of concern in Appendix A and developing management objectives and strategies in Goal 1.

North American Waterfowl Management Plan (update 2004) and Atlantic Coast Joint Venture Implementation Plan (ACJV 2005)

Originally written in 1986, the North American Waterfowl Management Plan (NAWMP) describes a 15-year strategy among the United States, Canada, and Mexico to restore and sustain waterfowl populations by protecting, restoring and enhancing habitat. The plan committee, including representatives from each nation, has modified the 1986 plan twice to account for biological, sociological, and economic changes that influenced the status of waterfowl and the conduct of cooperative habitat conservation. The most recent modification, in 2004, (NAWMP 2004) updates the needs, priorities, and strategies for the next 15 years, increases stakeholder confidence in the direction of its actions, and guides partners in strengthening the biological foundation of North American waterfowl conservation. You may review the plan at http://www.fws.gov/birdhabitat/NAWMP.

To convey goals, priorities, and strategies more effectively, NAWMP 2004 is comprised of two separate documents: Strategic Guidance and Implementation Framework. The former is geared towards agency administrators and policy makers who set the direction and priorities for conservation. The latter includes supporting technical information for use by biologists and land managers.

The plans are implemented at the regional level in 14 habitat Joint Ventures and 3 species Joint Ventures: Arctic goose, American black duck, and sea duck. Our project area lies in the Atlantic Coast Joint Venture

(ACJV), which includes all the Atlantic Flyway states from Maine to Florida and Puerto Rico. The waterfowl goal for the Atlantic Coast Joint Venture is "Protect and manage priority wetland habitats for migration, wintering, and production of waterfowl, with special consideration to black ducks, and to benefit other wildlife in the joint venture area."

In 2009, a revision of the original ACJV Implementation Plan (ACJV 2009) was completed. The ACJV 2009 plan presents habitat conservation goals and population indices for the ACJV consistent with the NAWMP update, provides status assessments of waterfowl and their habitats in the joint venture, and updates focus area narratives and maps for each state. That document is intended as a blueprint for conserving the valuable breeding, migration and wintering waterfowl habitat present within the ACJV boundary based on the best available information and the expert opinion of waterfowl biologists from throughout the flyway. You may review the ACJV 2009 at http://www.acjv.org/acjv_publications.htm.

The Black Duck and Sea Duck Joint Venture plans also relate to Nomans Land Island NWR. American black ducks (Anas rubripes) have used the Refuge to breed and also as a stopover during migration. Multiple species of sea ducks can be found in the nearshore waters of the Refuge throughout the year, and may use Refuge beaches for resting. These plans can be viewed at http://www.pwrc.usgs.gov/bdjv/, and http://www.seaduckjv.org/pdf/sdjvprospectus.pdf.

We considered these plans in identifying species of concern in Appendix A, and in developing management objectives and strategies under Goal 1.

New England/Mid-Atlantic Bird Conservation Region (BCR 30) Implementation Plan (2008)

The Refuge lies in the New England/Mid-Atlantic BCR 30 (see Map 3-1). BCR 30 provides important resources for migratory birds whose ranges span the western hemisphere. The habitats associated with coastal ecosystems provide the highest habitat values and critical staging areas for migratory waterfowl, waterbirds, shorebirds, and landbirds. Forested upland communities are the second most important habitats for migratory birds in this BCR. Though the plan specifically highlights the Chesapeake and Delaware Bays, the Massachusetts Cape Cod and Islands area provides crucial resources for many migrating birds as they journey from their breeding sites in the north to non-breeding sites in Mexico, Central America, the Caribbean and South America.

Unfortunately, most of the lands in BCR 30 have been altered from their historic condition. Urban development and agriculture dominates much of the landscape. The loss or degradation of habitat (e.g., by fragmentation, agriculture, and invasive species) are the greatest threats to bird populations in BCR 30. This plan identifies the bird species and habitats in greatest need of conservation action in this region, activities thought to be most useful to address those needs, and geographic areas believed to be the most important places for those activities. This plan is meant to start a regional bird conservation initiative of partners across BCR 30 communicating their conservation planning and implementation activities to deliver high-priority conservation actions in a coordinated manner. You may view the BCR 30 implementation plan (Steinkamp 2008) at http://www.acjv.org/bcr30_draft.htm.

We considered this plan in identifying species of concern in Appendix A, and in developing management objectives and strategies under Goal 1.

North American Waterbird Conservation Plan (Version 1, 2002)

This plan (Kushlan et al. 2002) represents a partnership among individuals and institutions with the interest in, and responsibility for, conserving waterbirds and their habitats. The plan is just one element of a multi-faceted conservation program. Its primary goal is to ensure that the distribution, diversity, and abundance of populations and habitats of breeding, migratory, and non-breeding waterbirds are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean. It provides a framework for conserving and managing nesting water-dependent birds. In addition, it facilitates continent-wide planning and monitoring, national, state, and provincial conservation, regional coordination, and local habitat protection and management. You may access the plan at http://www.nawcp.org/pubs/ContinentalPlan.cfm.

In 2006, the Mid-Atlantic New England Working Group developed the Waterbird Conservation Plan for the Mid-Atlantic/New England/Maritimes (MANEM) Region (MANEM Waterbird Working Group 2006). This plan is being implemented between 2006 and 2010. It consists of technical appendices on (1) waterbird populations including occurrence, status, and conservation needs, (2) waterbird habitats and locations within the region that are crucial for waterbird sustainability, (3) MANEM partners and regional expertise for waterbird conservation, and (4) conservation project descriptions that present current and proposed research, management, habitat acquisition, and education activities. Summarized information on waterbirds and their habitats provides a regional perspective for local conservation action. You may access the plan at http://www.fws.gov/birds/waterbirds/manem/index.html.

We considered this plan in identifying species of concern in Appendix A, and in developing management objectives and strategies under Goal 1.

U.S. Shorebird (2001, 2nd Edition) and North Atlantic Regional Shorebird Plans

Concerns about shorebirds led to the creation of the U.S. Shorebird Conservation Plan in 2000 which was updated in 2001 (Brown et al. 2001). Developed in a partnership with individuals and organizations throughout the United States, the plan presents conservation goals for each U.S. region, identifies important habitat conservation and research needs, and proposes education and outreach programs to increase public awareness of shorebirds and of threats to them. You may read the plan at http://www.fws.gov/shorebirdplan/USShorebird/downloads/USShorebirdPlan2Ed.pdf.

In the Northeast, the North Atlantic Regional Shorebird Plan (Clark & Niles, North Atlantic Shorebird Habitat Working Group, 2000) was drafted to step down the goals of the continental plan to smaller scales to identify priority species, habitat and species goals, and implementation projects. You may view the North Atlantic Regional Shorebird Plan at http://www.fws.gov/shorebirdplan/RegionalShorebird/RegionalPlans.htm.

We considered this plan in identifying species of concern in Appendix A, and in developing management objectives and strategies under Goal 1.

Partners In Flight Bird Conservation Plans


Berlin Heck/USFS

Female eastern towhee

In 1990, PIF began as a voluntary, international coalition of government agencies, conservation organizations, academic institutions, private industries, and citizens dedicated to reversing the population declines of bird species and "keeping common birds common." The foundation of PIF's long-term strategy is a series of scientifically-based bird conservation plans using physiographic areas as planning units.

The goal of each PIF plan is to ensure the long-term maintenance of healthy populations of native birds, primarily non-game birds. The plan for each physiographic area ranks bird species according to their conservation priority, describes their desired habitat conditions, develops biological objectives, and recommends conservation measures. The priority ranking factors are habitat loss, population trends, and the vulnerability of a species and its habitats to regional and local threats.

Our project area lies in Physiographic Area 09 (see Map 3-1), the Southern New England Region (Dettmers and Rosenberg 2000). This plan can be accessed at http://www.blm.gov/wildlife/plan/pl_09_10.pdf.

We referred to this plan in developing our list of species of conservation concern in Appendix A, as well as our habitat objectives and strategies under Goal 1.

Partners in Amphibian and Reptile Conservation, National State Agency Herpetological Conservation Report (Draft 2004)

Partners in Amphibian and Reptile Conservation (PARC) was created in response to the increasing, well-documented national declines in amphibian and reptile populations. Many consider it the most comprehensive effort in herpetofaunal conservation in the nation. PARC members include state and federal agencies, conservation organizations, museums, the pet trade industry, nature centers, zoos, the energy industry, universities, herpetological organizations, research laboratories, forest industries and environmental consultants. Its five geographic regions—Northeast, Southeast, Midwest, Southwest and Northwest—can focus on national and regional challenges in herpetofaunal conservation. Regional working groups allow for region-specific communication. The Northeast working group has developed “Model State Herpetofauna Regulatory Guidelines” which we consulted as we developed our strategy. This document can be found at http://www.pwrc.usgs.gov/neparc/products/modelherpregs.htm.

The National State Agency Herpetological Conservation Report (NHCR) is a summary report (PARC 2004) sponsored by PARC that provides a general overview of each state wildlife agency’s support for reptile and amphibian conservation and research through September 2004. It lists amphibian and reptile species of concern for each state. Each state report was compiled in cooperation with its agency’s lead biologist on herpetofaunal conservation. That report can be accessed at http://www.parcplace.org/documents/PARCNationalStates2004.pdf. Its purpose is to facilitate communication among state agencies and partner organizations throughout the PARC network to identify and address regional and national herpetological priorities.

PARC intends to expand the scope of the NHCR to include other states, provinces, and territories. It will include other state agencies that are supporting herpetofaunal conservation and research, such as transportation departments, park departments, and forest agencies. The next NHCR report will integrate a list of the Species of Conservation Concern into each state’s comprehensive conservation wildlife strategy (see below).

Massachusetts Comprehensive Wildlife Conservation Strategy (Revised September 2006)

In 2002, Congress created the State Wildlife Grant Program (SWG), and appropriated $80 million in state grants. The purpose of the program is to help state and tribal fish and wildlife agencies conserve fish and wildlife species of greatest conservation need. The funds appropriated under the program are allocated to each state according to a formula that takes into account each state’s size and population.

To be eligible for additional federal grants, and to satisfy the requirements for participating in the SWG program, each state and U.S. territory was charged with developing a statewide “Comprehensive Wildlife Conservation Strategy” and submitting it to the National Advisory Acceptance Team by October 1, 2005. Each plan must address eight required elements, and each plan is to identify and focus on “species of greatest conservation need,” yet address the “full array of wildlife” and wildlife-related issues, and “keep common species common.”

The Massachusetts plan (MA DFG 2006), commonly referred to as the Massachusetts Comprehensive Wildlife Conservation Strategy (CWCS), resulted from that charge. It creates a vision for conserving

Massachusetts's wildlife and stimulates other state and federal agencies, and conservation partners to think strategically about their individual and coordinated roles in prioritizing conservation.

In addressing the eight elements below, the MA CWCS helps supplement the information we gathered on species and habitat occurrences and their distribution in our area analysis, and identify conservation threats and management strategies for species and habitats of conservation concern in the CCP. The expertise convened to compile this plan and its partner and public involvement further enhance its benefits for us. We used the MA CWCS in developing our list of species of concern in Appendix A, and the management objectives and strategies for Goal 1. These are its eight elements:

1. information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife;

2. descriptions of locations and relative condition of key habitats and community types essential to the conservation of species identified in element 1;

3. descriptions of problems that may adversely affect species identified in element 1 or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats;

4. descriptions of conservation actions necessary to conserve the identified species and habitats and priorities for implementing such actions;

5. plans proposed for monitoring species identified in element 1 and their habitats, for monitoring the effectiveness of the conservation actions proposed in element 4, and for adapting those conservation actions to respond appropriately to new information or changing conditions;

6. descriptions of procedures to review the plan at intervals not to exceed 10 years;

7. plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the plan strategy with federal, state, and local agencies and Native American tribes that manage significant areas of land and water within the state, or administer programs that significantly affect the conservation of identified species and habitats; and,

8. plans for involving the public in the development and implementation of plan strategies.

The State of Massachusetts submitted its CWCS in October, 2005, and it was revised in September, 2006. You may view it at http://www.mass.gov/dfwele/dfw/habitat/cwcs/pdf/mass_cwcs_final.pdf.

Other Information Sources

We also consulted the plans and resources below as we refined our management objectives and strategies, especially those with a local context.

Continental or National Plans

- Ducks Unlimited Conservation Plan; available at http://www.ducks.org/Conservation/ConservationPlan/1516/InternationalConservationPlan.html

- National Audubon Society Watchlist (Butcher et al. 2007); available at http://web1.audubon.org/science/species/watchlist/

- National Wetlands Research Center Strategic Plan; available at http://www.nwrc.usgs.gov/about/5-year-plan.htm

- Coastal Zone Management Act of 1972; available at http://www.nps.gov/history/local-law/FHPL_CstlZoneMngmt.pdf

- Marine Mammal Protection Act of 1972, as amended in 2007; available at http://www.nmfs.noaa.gov/pr/pdfs/laws/mmpa.pdf

Regional Plans

- Gulf of Maine-Ecosystem Priorities (Taylor 2008); available at http://www.gulfofmaine.org/ebm/toolkitsurvey/GulfofMaineEBMToolkitSurveyReport.pdf

State Plans

- BioMap Program (MA Natural Heritage Endangered Species Program (NHESP) 2004); available at http://www.mass.gov/dfwele/dfw/nhesp/nhbiomap.htm

- Living Waters Program (MA NHESP 2004); available at http://www.mass.gov/dfwele/dfw/nhesp_temp/land_protection/living_waters/living_waters_home.htm

- Massachusetts Natural Communities (Swain and Kearsley 2001); available at http://www.mass.gov/dfwele/dfw/nhesp/natural_communities/natural_community_classification.htm

- Our Irreplaceable Heritage-Protecting Biodiversity in Massachusetts; available at http://mass.gov/dfwele/dfw/nhesp/nhesp.htm

Local Plans

There are no local conservation plans that encompass the Refuge. Five prominent land conservation organizations – Martha's Vineyard Land Bank Commission, the Sheriff's Meadow Foundation, The Nature Conservancy, The Trustees of Reservations (TTOR), and the Vineyard Conservation Society – work together to conserve land for wildlife, scenic values, and preservation of the rural environment. Most of these organizations have developed management plans for their properties. TTOR manages the Cape Poge Wildlife Refuge and Wasque Reservation on Chappaquiddick Island, in part, to assist with the regional recovery of Piping Plovers, American Oystercatchers, and terns. Menemsha Hills, another TTOR property, is managed to restore and maintain maritime shrublands, grassy shrublands, glades and barrens. The Massachusetts Audubon Society manages the woodlands, meadows, ponds, saltmarsh and barrier beach habitat on its Felix Neck Wildlife Sanctuary for the benefit of wildlife. While there is no one overriding local conservation plan, the cooperative effort to protect, restore and manage natural lands on Martha's Vineyard is certainly a benefit to some of the species that also use Nomans Land Island Refuge, and vice versa.

Individual Species Plans

- Business Plan for the American Oystercatcher (National Fish and Wildlife Federation 2008); summary available at http://www.nfwf.org/Content/ContentFolders/NationalFishandWildlifeFoundation/GrantPrograms/Keystones/BirdConservation/AMOY_Biz_Plan.pdf

- A Landowner's Guide to New England Cottontail Habitat Management (Arbuthnot 2008); available at http://www.edf.org/article.cfm?contentID=8829&redirect=cottontail

- New England Cottontail Spotlight Species Action Plan (Tur 2009); available at http://www.fws.gov/filedownloads/ftp_NewEnglandFieldOffice

- Roseate Tern Recovery Plan (USFWS 1998); available at http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=B07O

Refuge Establishing Purposes, Land Acquisition History, and Boundary

In 1970, the Service began managing the eastern third of Nomans Land Island, formally used as a naval bombing range, under a joint management agreement with the U.S. Navy. In 1998, management responsibility of the island was transferred in full to the Service for the following purpose and under the following authority, “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds….” [16 USC §715d (Migratory Bird Conservation Act)]. This transfer was based on a set of terms set forth in a transfer agreement between the Navy and the Service. These terms reflect the presence of an unknown amount of UXO on the island, and the Navy’s continuing commitment to UXO removal. The terms mandate that the Service keep the island closed to the public because of the safety and liability concerns posed by UXO. The Navy is committed to continue surface ordnance clearing operations to a level commensurate only with minimal access by Service staff for management needs (see Appendix G, H).

Map 1-1 above depicts the current Refuge boundary. Table 1.1 below summarizes the land acquisition history of the Refuge.

Table 1.1. History of land acquisition for Nomans Land Island Refuge.

Year	Acres	Authority
1970	200+/-	Joint Wildlife Management Agreement with U.S. Navy
1998	628	Act Authorizing the Transfer of Certain Real Property for Wildlife (16 USC 667b)
TOTAL	628	

Refuge Administration

The Service administers Nomans Land Island Refuge as part of the Eastern Massachusetts NWR Complex, which also includes Assabet River, Great Meadows, Mashpee, Massasoit, Monomoy, Nantucket and Oxbow refuges. The refuge complex headquarters is located in Sudbury, Massachusetts.

The refuge complex has 15 permanent staff. Twelve are located at the complex headquarters in Sudbury: a project leader, a deputy project leader, two wildlife biologists, a visitor services manager, a refuge planner, two law enforcement officers, two maintenance staff and two administrative staff. The other three permanent staff are located on site at Monomoy NWR: a refuge manager and two biologists, one of whom has maintenance and boat operations as part of his duties. Three additional biologists are funded on a yearly term basis. In addition, seasonal interns and volunteers assist throughout the year. Nomans Land Island NWR does not have any dedicated staff.

Refuge Operational Plans ("Step-down" Plans)

Refuge planning policy lists more than 25 step-down management plans that generally are required on refuges. Those plans contain specific strategies and implementation schedules for achieving refuge goals and objectives. Some plans require annual revisions; others require revision every 5 to 10 years. Some require additional NEPA analysis, public involvement, and compatibility determinations before we can implement them.

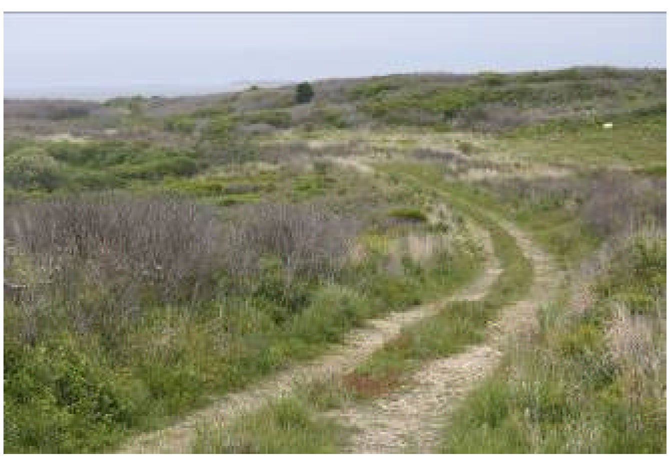
The status of step-down plans on the Refuge follows. This draft incorporates by reference those that are up-to-date. Chapter 2 provides more information about the additional step-down plans needed and their schedule for completion.

The following step-down plans have been completed, and apply to all eight refuges in the Eastern Massachusetts NWR Complex.

- Fire Management Plan (FMP)—completed in 2003
- Avian Influenza Surveillance and Contingency Plan—completed in 2007
- Hurricane Action Plan—completed in 2009

We plan to complete the following step-down plans after completion of the CCP (see Chapter 2). Additional plans may be required depending on the alternative selected for the final CCP. An updated Fire Management Plan is scheduled to be completed in 2010. Please see Appendix F for general fire program direction.

- Annual Habitat Work Plan (AHWP)
- Safety Management Plan, which includes UXO Inspection Logs
- Habitat Management Plan (HMP)
- Inventory and Monitoring Plan (IMP)
- Law Enforcement Management Plan
- Cultural Resources Management Plan


Erin Victory/TCI

Refuge trails

Refuge Vision Statement

Our planning team developed this vision statement to provide a guiding philosophy and sense of purpose in the CCP.

We envision Nomans Land Island NWR to be a vital and unique maritime resource for migratory birds along the Atlantic Flyway. Our management will perpetuate the diversity of nesting, resting, and foraging habitats used by passerines, raptors, waterfowl and seabirds throughout the island. In particular, species of regional conservation concern including the peregrine falcon will benefit from land which is free from mammalian predators and from present-day human disturbances.

Nomans Land Island has a culturally rich human history that began thousands of years ago and our management will ensure that this legacy endures. Culturally sensitive management actions on the island, and strong partnerships with the Wampanoag Tribe of Gay Head (Aquinnah) and other partners, will foster cultural awareness and an appreciative and knowledgeable public.

With its recent history of human use, Nomans Land Island NWR will be a place few people can experience firsthand; yet we will provide meaningful alternatives for members of the public to experience the beauty and singularity of the Refuge. Through partnerships, education, interpretation and outreach, we hope to instill a sense of wonder about complex and dynamic coastal ecosystems, and underscore the value of the Refuge in conserving those resources.

Refuge Goals

We developed these goals after considering the vision statement, the purposes for establishing the Refuge, the missions of the Service and the Refuge System, and the mandates, plans, and conservation initiatives above. These goals are intentionally broad, descriptive statements of purpose. They highlight elements of the vision for the Refuge that we will emphasize in its future management. The biological goals take precedence; but otherwise, we do not present them in any particular order. Each offers background information on its importance.

Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.

Goal 2. Promote awareness and stewardship of our coastal natural resources by working with partners to provide off-site interpretation, education and outreach opportunities.

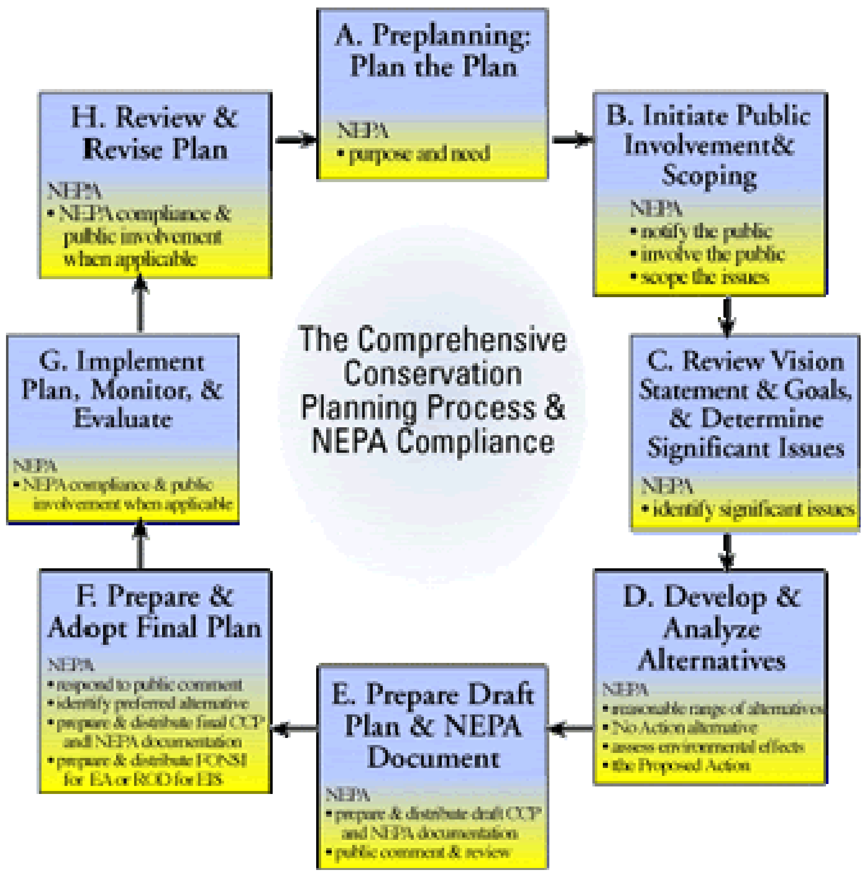
Goal 3. Recognize the archaeological and cultural importance of the island.

Goal 4. Protect, maintain, enhance, and preserve the wilderness character of Nomans Land Island NWR.

The Comprehensive Conservation Planning Process

Service policy (602 FW 3) establishes an eight-step planning process that also facilitates compliance with NEPA (Figure 1.1). Our planning policy and CCP training course materials describe the eight steps in detail. We followed the process depicted below in developing this EA/draft CCP.

Figure 1.1. The NEPA planning process.



Since 1970, we have focused on conserving lands within the approved refuge boundary, managing habitat for migratory birds, and establishing relationships with the community on Martha's Vineyard and our partners. In 1999, we began to prepare a CCP that would encompass all of the refuges in the Eastern Massachusetts NWR Complex. We published a Notice of Intent in the Federal Register, and began public scoping. By 2001, we determined that writing a plan for eight refuges was too cumbersome, and to focus on CCPs for the three northernmost refuges in the complex. The efforts for Nomans Land Island NWR were halted at that time.

In 2004, we began preparations for developing a joint CCP for Nomans Land Island and Monomoy refuges by collecting information on refuge resources and convening our core planning team, which consisted of refuge complex staff, regional division staff, representatives from the Wampanoag Tribe of Gay Head (Aquinnah), and the Massachusetts Department of Fish and Game (MA DFG). Public scoping meetings were held in April 2005 in Chilmark, Massachusetts. We discussed management issues, and compiled a project mailing list of known stakeholders, interested individuals, organizations, and agencies. Most of the planning effort during this period was focused on the CCP for the Monomoy Refuge. We developed a draft of the vision statement and goals and objectives for Nomans Land Island NWR, and also initiated a wilderness review. We initiated all of those steps as part of “Step A: Preplanning.”

In September 2008, we resumed this process after a delay due to the transfer of refuge personnel, and decided to split apart Nomans Land Island and Monomoy refuges into separate CCPs for efficiency. We once again engaged the public (“Step B: Initiate Public Involvement and Scoping”) for Nomans Land Island Refuge by distributing a planning update newsletter to approximately 530 individuals, organizations and agencies that announced the continuation of the planning process, and a public meeting to be held in October. We asked people if they wanted to remain on our mailing list.

Early in October 2008, we held both partner and public meetings in Chilmark on Martha’s Vineyard to discuss previously identified public issues and concerns, determine whether new issues existed or previously identified issues had changed, share our draft vision statement and tentative goals, describe the planning process, and explain how people could become involved and stay informed about the process. Those meetings helped us refine stakeholder and public concerns we would need to address in the planning process. We announced the location, date, and time of the public meeting in local newspapers, in the planning update, and on our website. Twenty-three people attended the public meeting. This meeting was followed by a month-long comment period where we continued to receive public and partner issues and concerns through email, letters, and comment form submissions.

Our next planning team meeting was held in mid-December 2008 where we worked on “Step C: Review Vision Statement, Goals, and Identify Significant Issues.” We also initiated “Step D: Develop and Analyze Alternatives.” We identified key issues, decided upon our three management alternatives, and identified strategies under each alternative.

In May 2010 we distributed a newsletter summarizing the three management alternatives we analyzed in detail for the CCP/EA. That completed Step D.

This EA/draft CCP represents “Step E: Prepare Draft Plan and NEPA document.” We will publish a Notice of Availability in the “Federal Register” announcing our release of this draft for its 30-day period of public review and comment. During that comment period, we will also hold a public meeting to obtain your comments. We expect to receive them by regular mail, electronic mail, or at the public meetings. After the comment period ends, we will review and summarize all of the comments we have received, develop our responses, and publish them in an appendix to the final CCP.

Once we have prepared the final CCP, we will submit it to our Regional Director for approval. He will determine whether it warrants a Finding of No Significant Impact (FONSI), and he may find its analysis adequate to issue a decision at that same time. If so, our implementation of the final CCP can begin immediately. If he has concerns, he may require us to revise the EA or complete an Environmental Impact Statement (EIS). We will announce his final decision by publishing a Notice of Availability in the “Federal Register,” where we will also notify people of the availability of the final CCP. That will complete “Step F: Prepare and Adopt a Final Plan.”

Then “Step G: Implement Plan, Monitor and Evaluate” can begin. As part of “Step H: Review and Revise Plan,” we will modify or revise the final CCP as warranted following the procedures in Service policy (602 FW 1, 3, and 4) and NEPA requirements. Minor revisions that meet the criteria for categorical exclusions (550 FW 3.3C) will require only an environmental action memorandum. As the Improvement Act and Service policy stipulate, we will review and revise the CCP fully every 15 years.

Issues, Concerns, and Opportunities

We define an issue as “any unsettled matter requiring a management decision.” That can be an “initiative, opportunity, resource management problem, threat to a resource, conflict in use, or a public concern.” Issues arise from many sources, including our staff, other Service programs, state agencies, other federal agencies, our partners, neighbors, user groups, or Congress. One of the distinctions among the proposed management alternatives is how each addresses those issues. The following summary provides a context for the issues that arose during the scoping process.

Habitat and Species Management

National wildlife refuges primarily propose the conservation of wildlife and habitats. This is our highest priority, and serves as the foundation for all that we do. Many refuges were established for a very specific purpose, such as protecting a particular species or habitat. Based on the purpose of this Refuge, and the discussions that took place up to the time of its establishment, the primary justifications for creating it were to protect a regionally important avian migration and feeding area.

How best to protect, restore, and/or enhance migratory bird habitat on the Refuge is an important issue we address in this draft plan. Much of the Refuge’s acreage is maritime shrubland habitat. Many migratory birds of conservation concern depend on this upland habitat type when breeding, wintering, or migrating. We heard a range of opinions on how to enhance these habitats, some of which can be labor-intensive and would require planting, mowing, or fire to maintain. The presence of UXO warrants particular care in determining management activities and requires further evaluation to ensure safety. The alternatives in Chapter 2 analyze different habitat management priorities.

The following key issues and concerns arose concerning habitat and species management.

- To what extent are Refuge species, such as the double-crested cormorant and gray seal, affecting local fisheries and what, if any, management actions to mitigate these effects could or should be taken on the Refuge?
- How will the presence of UXO affect habitat and wildlife management?
- How can we best monitor and manage for migratory and nesting avian species on the Refuge to include nest success and productivity information given restrictions in staff availability and access around the island due to safety issues?
- In what ways can we incorporate monitoring for impacts due to climate change?
- How can we effectively increase our survey and inventory efforts to account for rare plants and invertebrates present, as well as gain more access throughout the island to better quantify species abundance and richness?
- What are the most effective and efficient measures we can undertake to protect, restore, and conserve shrubland habitats on the Refuge?
- How can we best partner with the U.S. Navy to integrate our respective management plans for Nomans Land Island, coordinate schedules for burning, surveillance and cleanup operations, create a cultural resource protocol, and increase access around the island for staff?

Wilderness Review

As noted in the sections, “Policy for Refuge System Planning” and “Policy on Wilderness Stewardship,” we are required to review current Refuge lands and waters for their wilderness potential in the CCP planning process. We conducted an inventory of the Nomans Land Island NWR and determined that the lands and waters within the Refuge boundary meet the minimum criteria established in Section 2(c) of the Wilderness Act. Lands that meet these criteria are called wilderness study areas (WSAs).

The following key issues and concerns concerning the potential for new wilderness designations addressed in development of this CCP are:

- Is the Nomans Land Island WSA suitable for wilderness designation?

- If so, can we manage Nomans Land Island NWR to maintain wilderness values and character long-term, without jeopardizing our management to achieve the Refuge's established purposes and Refuge System mission?

Cultural Resource Protection

Nomans Land Island has a richly diverse human history. Native American ancestors of the federally recognized Wampanoag Tribe of Gay Head (Aquinnah) used the island perhaps as early as the Late Archaic Period (5,000 years before present; Jacobson 2000). Its use as a summer camp up until the late 1600's is likely, as shell heaps and arrowheads have been found on the island (Snow 1975). One thought about the island's name is that it stems from its ownership by Tequenomen, one of the last Native American residents of the island. In the 1800's, European Americans lived and farmed on the island, and in the 1900's, it became a bombing range for the U.S. Navy. The island was used for both prehistoric Native American and European American burials. Stone walls and cellar holes remain from nineteenth and early twentieth century farms. The Navy left an old airstrip and remains of equipment and ordnance from their use of the island as a bombing target.

The maritime influence on the island, the unconsolidated geological deposits, and the absence of forest make it susceptible to erosion. Wind and water continue to have an effect on the cliffs and beaches of the island and these dynamic processes can reveal long-buried artifacts of past occupation. This constitutes the biggest threat to the archaeological sites on the island. The Service is required to identify and preserve historic structures and archaeological sites and artifacts, and to assess the cultural value of the Refuge in this CCP. During scoping, we heard a desire to maintain the Luce cemetery, the only known and marked cemetery on the island, free of vegetation, and to document other remnants of human habitation on the island. We also heard many comments that recommended creating a protocol to delineate the protection of these resources, including human burials. We evaluate and address those concerns in our proposed management alternatives.

The following key issues and concerns arose regarding cultural resource protection and acquisition.

- How can we coordinate with partners to develop and implement a cultural resources protocol that best addresses future findings of archaeological human remains to ensure their protection, preservation and transfer to appropriate parties?

- What administrative steps (e.g., partnership agreement, Special Use Permits, Job Hazard Assessment, etc.) need to be taken to address future maintenance of the Luce Cemetery?

- Can we preserve eroding archaeological sites?

- How can we best inventory the known human habitation remains on the Refuge given limitations with respect to access, funding, and personnel, and what are the possibilities of partnering with the Chilmark Historical Commission for inventorying stone walls, cellar holes and other historical structures?

Tribal Relations

The Wampanoag Tribe of Gay Head (Aquinnah) has a historical, cultural and religious interest in Nomans Land Island, or Cappoaquidnet (the Wampanoag name for Nomans Land Island). In order to implement the Service's Native American Policy, this and other opportunities for closer cooperation and communication will be explored. These include recognizing the expertise of their biological and cultural resource professionals, and working together to strengthen our respective programs. The Tribe has invaluable resources in their educators and interpreters who have worked with living history museums and filmmakers. The Refuge could provide professional development and employment opportunities to the Tribe and learn Wampanoag history and increase cultural awareness through interactions with the Tribe. These and other factors are all opportunities for cooperation and implementation of our Native American Policy, and the issues related to the Refuge's unique government-to-government relationship with the Tribe will be addressed in the CCP.

The following key issues and concerns arose about cultural resource protection and acquisition.

- What opportunities are there to partner with the Tribe for the mutual benefit of our biological and cultural resources?

Public Use/Community Relations

We are interested in increasing awareness and stewardship of our coastal natural resources, including those on Nomans Land Island Refuge, by providing interpretation and education opportunities on Martha's Vineyard. The lack of public access to the Refuge means that community relations need to be conducted in a different manner than traditional refuges. During public scoping, we learned that many people are in favor of keeping the Refuge closed to the public, given the safety issues and added benefits to wildlife. There were also some that advocated small group tours, or granting researchers more access. Some suggested ways we might conduct additional outreach. Increasing interpretation and education programs on Martha's Vineyard in cooperation with conservation partners was suggested. Others advocated the use of the media to provide updates and notification of management activities, particularly if there was any perceived impact on Martha's Vineyard.

In response to those comments and the issues below, our alternatives evaluate a range of quality visitor services opportunities for people to experience the Refuge through interpretation and education, and propose measures to promote Service visibility, community understanding and support for Refuge programs.

The following are key issues or concerns that arose about public uses and community relations.

- How can we communicate effectively with our partners and the public about the management activities we perform on the Refuge, including aerial herbicide spraying and prescribed burns, and the impacts, if any, there are for nearby residents and visitors?

- How can the status of contamination and remediation of the Refuge, and soil and water quality information, best be communicated with the public? How best can the Service provide regular updates on Refuge activities and species?

- How can we engage members of the public through increased interpretation and environmental education opportunities to provide an experience of the Refuge in other ways given the ban on public access?

Issues and Concerns Outside the Scope of this Analysis or Not Completely Within the Jurisdiction of the Service

The resolution of these issues falls outside the scope of this CCP or outside the jurisdiction or authority of the Service. These issues are only briefly addressed elsewhere, or are not addressed again in this EA/draft CCP.

- Conduct more studies to determine existence of depleted uranium and the impacts of contamination on residents of Martha's Vineyard. The Navy began environmental baseline studies in anticipation of the transfer of the island to the Service beginning in 1996. In 1998, the Navy addressed questions about the existence of depleted uranium (DU) on Nomans Land Island. At that time, they indicated that while DU can be used in combat as needed, firing during peacetime was very strictly regulated and could only be fired at test ranges that had a specific permit issued by the Naval Radiation Safety Committee. Furthermore, the accidental firing of DU was subject to a special investigation and formal report to the Chief of Naval Operations. Based on information from the Navy's Radiological Support Office, the U.S. Air Force, the Department of Defense Explosives Safety Board, and historical records, no accidental firings of DU ammunition occurred at Nomans Land Island, nor had the island ever been an authorized or permitted DU test area. In fact, DU was developed after live munitions testing ceased at Nomans Land Island. Despite this, repeated speculation about the presence of DU on the Refuge continued to surface. As a result, the Massachusetts Department of Environmental Protection required that the ordnance debris removed from the island in 1998 be surveyed for the potential presence of DU. Two surveys were completed in 1998. Both concluded that there were no unusual or elevated levels of gamma radiation associated with the ordnance. Please refer to Appendix H for more information on this and other contaminants surveys conducted on behalf of the U.S. Navy.

- Open the island up to public access, or at least to small groups for organized tours. While it is one of the Service's highest priorities to provide opportunities for the public to enjoy these public lands, it is not within our authority to grant any public access to Nomans Land Island. The terms of the transfer agreement with the U.S. Navy stipulate that this refuge remain "administratively closed" to public access. In addition, the transfer agreement places responsibility for UXO disposal on the U.S. Navy; requiring UXO disposal to the level required to safely open the island to public access is beyond the expertise and jurisdiction of the Service. The Navy has conducted three major UXO removal operations on the island, and has adopted an operations and maintenance plan containing procedures for maintaining the safety of those personnel managing the island. The Navy is preparing a Phase III/Feasibility Study Report selecting a final remedy for UXO and other contamination issues under CERCLA (Comprehensive Environmental Response, Compensation and Liability Act of 1980) and the Massachusetts Contingency Plan. The nature of that final remedy is beyond the jurisdiction of the Service and beyond the scope of this EA/draft CCP. Congressional approval of a wilderness designation by the Service, as recommended herein, may limit the mechanisms available to the Navy for site remediation. In the unlikely event that the Navy selects a remedy that invalidates any of the assumptions or factual bases for this EA/draft CCP, or the wilderness recommendation, or, if a CCP has been adopted, we may need to reopen the planning process.

- Conduct erosion control studies and/or dune rehabilitation on Refuge dune habitat. Due to safety concerns, it will not be possible to carry out an erosion control study or consider dune rehabilitation measures given the prevalence of UXO throughout the island.

- The island would be a good place for an anemometer or wind energy production. The installation of any such structure is outside the scope of this analysis at this time. Generally, such uses cannot be considered due to the prevalence of UXO throughout the island and would constitute a violation of the terms of the transfer agreement with the Navy. Additionally, siting wind energy facilities on the Refuge would not be considered an appropriate use of the Refuge. However, we will continue to review proposals as they come in, and will address specific concerns as warranted.

- Open nearshore waters and Refuge beaches to provide opportunities for traditional fishing. The U.S. Navy placed access restrictions to the Refuge and the waters surrounding the island, due to public safety concerns with the presence of UXO. It is outside the scope of this CCP and the Service's authority to remove these restrictions.

- Create a structure on-site to house Refuge staff. The presence of UXO and the terms of our transfer agreement with the U.S. Navy preclude any construction on the island, and any on-site staff. The terms were to maintain it as an "unmanned, unstaffed" national wildlife refuge.

- Partner with Massachusetts Audubon to create an interpretive boat tour around Nomans Land Island. Due to Naval water restrictions around the island, this will not be possible. Changing this policy is outside of the Service's authority.

Chapter 2


Erin Victory/TCI

Refuge shrubland

Alternatives Considered, Including the Service-Preferred Alternative

- Introduction
- Formulating Alternatives
- Actions Common to all of the Alternatives
- Alternatives or Actions Considered but Eliminated From Further Study
- Alternative A. Current Management
- Alternative B. Enhanced Wildlife Management and Visitor Services
- Alternative C. Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative)
- Matrix of the Alternatives

Introduction

This chapter describes our process for formulating alternatives, the actions that are common to all of the alternatives, and the three alternatives we analyzed in detail. At the end of this chapter, Table 2.1 compares how each of the alternatives addresses key issues, supports major programs, and achieves Refuge goals.

Formulating Alternatives

Relating Goals, Objectives, and Strategies

Refuge goals and objectives define each of the management alternatives identified below. Refuge goals are intentionally broad, descriptive statements of the desired future condition of refuge resources. By design, they define the targets of our management actions in prescriptive rather than quantitative terms. They also articulate the principal elements of the refuge purposes and vision statement, and provide a foundation for developing specific management objectives and strategies.

Objectives are essentially incremental steps toward achieving a goal and further define management targets in measurable terms. They vary among the alternatives and provide the basis for developing detailed strategies that monitor refuge accomplishments and evaluate progress. “Writing Refuge Management Goals and Objectives: A Handbook” (USFWS 2004) recommends writing “SMART” objectives that are: (1) specific; (2) measurable; (3) achievable; (4) results-oriented, and (5) time-fixed.

Where possible, we incorporated the principles of Strategic Habitat Conservation in the development of our objectives and strategies. According to Strategic Habitat Conservation: A Report from the National Ecological Assessment Team (2006), “This approach focuses on the ability of the landscape to sustain species as expressed in measurable objectives. Developing a strategy to attain a biological outcome, such as a population objective, requires documented and testable assumptions to determine whether the objective is met.” Not only will this approach ensure refuges are contributing to the NWRS and FWS mission and goals in a strategic, standardized and transparent way, but also refuges can ensure that they contribute to local and regional conservation priorities and goals as well (USFWS 2008b).

A rationale accompanies each objective to explain its context and importance. We will use the objectives in the alternative selected for the final CCP to write the Refuge step-down plans, which we describe later in this chapter.

Next we identified strategies, or the actions, tools, or techniques we may use to achieve each objective. The list of strategies in each objective represents the potential suite of actions we may implement. We will evaluate most of them further as to how, when, and where we should implement them when we write our Refuge step-down plans. We will measure our successes by how well our strategies achieve our objectives and goals.

Developing Alternatives, including the “No Action” or “Current Management” Alternative

A wide range of possible management objectives and strategies that could achieve our goals were identified by the planning team and public and partner input. Then we began the process of designing management alternatives. These are essentially packages of complementary objectives and strategies designed to meet Refuge purposes and the Refuge System mission and goals, while responding to the issues and opportunities that arose during the planning process. Objectives that seemed to fit together were grouped into “alternative themes”. For example, we considered such themes as “current management,” “enhanced wildlife management and vistor services,” and “natural processes management.” After evaluating how the objectives would interact, their compatibility with Refuge purposes, and the reality of accomplishing them within a reasonable period, these were formed into three management alternatives.

In this chapter we fully analyze three alternatives that characterize three different ways of managing the Refuge over the next 15 years. We believe they represent a reasonable range of alternative proposals for achieving the Refuge purpose, vision and goals, and addressing the issues Chapter 1 describes. Unless otherwise noted, Refuge staff would implement all actions.

Alternative A satisfies the NEPA requirement of a “no action” alternative, which we define as continuing the status quo, or current management. It describes our existing management priorities and activities, and serves as a baseline for comparing and contrasting Alternatives B and C. Current management efforts consist of limited biological, visitor services and enforcement activities as staff and funding allow. Please refer to Chapter 3, “Affected Environment,” for detailed descriptions of current Refuge resources and programs.

Please note that some of the objectives in Alternative A do not strictly follow Service guidance documents, because we are describing current management decisions and activities that were established prior to recent guidance documents. Our descriptions of those activities devolve from a variety of formal and informal management decisions and planning documents. Thus, the objectives in Alternative A are more subjective than are those in Alternatives B or C.

Alternative B emphasizes management of shrubland, coastal dune, intertidal/rocky beach, and freshwater habitats for priority bird species of conservation concern in BCR 30 and PIF Area 09 plans and the MA CWCS. In addition, this alternative would enhance our current level of species inventory and monitoring, visitor services on Martha’s Vineyard, and law enforcement and partnerships. We would evaluate further the possibility of releasing New England cottontail in the Refuge shrubland habitat. The increases in Refuge programs would be possible through the addition of permanent refuge complex staff. The continued presence of UXO throughout the island precludes our ability to provide access to the Refuge for members of the general public (see Chapter 3 for more information). One of our main visitor service priorities under this alternative is to provide other ways for the public to experience the Refuge in light of our obligation to enforce the ban on public access. The U.S. Navy would continue with their operations to remove UXO according to their schedule and objectives; however, the Service would largely assume responsibility for conducting prescribed burns to maintain shrubland habitat.

Alternative C, the Service-preferred alternative, includes an array of less active management actions that, in our professional judgment, works best toward achieving the Refuge purposes, our vision and goals (including a goal to maintain the wilderness character of Nomans Land Island), and the goals of other state and regional conservation plans. We also believe it most effectively addresses the key issues that arose during the planning process. Lastly, it is the most realistic given the relatively modest increase in staffing and funding that is anticipated over the next 15 years.

Actions Common to All of the Alternatives

All of the alternatives share some of the following common actions or elements. These occur at varying degrees or levels as described in each alternative. Some of them are required by law or policy, or represent management decisions that have undergone NEPA analysis including public review, agency review, and approval. Others may be administrative actions that do not require public review, but which we want to highlight in this public document.

All of the following actions are current practices or policies that would continue under all alternatives:

- using an adaptive management approach, including strategic habitat conservation, where appropriate,
- controlling pest plants and animals

- monitoring and abatement of diseases affecting wildlife health,
- facilitating or conducting biological research and investigations,
- addressing climate change,
- issuing special use permits,
- protecting cultural resources,
- developing an off-site interpretation program,
- completing findings of appropriate use and compatibility determinations,
- providing Refuge staffing and administration,
- cooperating with the Navy in its UXO removal program and the prohibition of public access,
- finalizing a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah),
- completing Refuge step-down plans, and,
- distributing Refuge revenue sharing payments.

Adaptive Management

All of the alternatives will include flexibility in management to allow us to respond to new information, spatial and temporal changes and environmental events, whether foreseen or unforeseen, or other factors that influence management. Our goal is to be able to respond quickly to any new information or events. The need for flexible or adaptive management is very compelling today because our present information on Refuge species and habitats is incomplete, provisional, and subject to change as our knowledge base improves.

We will continually evaluate management actions, both formally and informally, through monitoring or research, to consider whether our original assumptions and predictions remain valid. In that way, management becomes a proactive process of learning what really works. On March 9, 2007, Secretary of the Interior Kempthorne issued Secretarial Order No. 3270 to provide guidance on policy and procedures for implementing adaptive management in departmental agencies. In 2007, an intradepartmental working group developed a guidebook to assist managers and practitioners: "Adaptive Management: The U.S. Department of Interior Technical Guide." It defines adaptive management, the conditions under which we should consider it, and the process for implementing it and evaluating its effectiveness. You may view the guidebook at http://www.doi.gov/initiatives/AdaptiveManagement/documents.html.

Adaptive management, as it relates to refuge management, promotes flexible decision-making through an iterative learning process that responds to uncertainties, new information, monitoring results, and the natural variability in ecosystems. It is designed to facilitate more effective decisions and enhanced benefits. At the refuge level, monitoring management actions, outcomes and key resources will be very important. The refuge manager is responsible for changing management actions and strategies if they do not produce the desired conditions. Significant changes from what we present in our final CCP may warrant additional NEPA analysis and public comment.

Generally, we can increase monitoring and research that support adaptive management without additional NEPA analysis, though this is likely to be limited at Nomans Land Island NWR due to the presence of UXO. Many of our objectives identify monitoring elements. Our Inventory and Monitoring Plan will determine future survey efforts. Implementing an adaptive management approach supports all three goals of the Refuge.

Strategic Habitat Conservation

Strategic Habitat Conservation is a framework that utilizes adaptive management to redefine broad scale conservation from the general pursuit of conserving “more” habitat and species, to a more planned approach based on scientific data, at a landscape level, and in cooperation with partners. It starts with explicit, measurable objectives that are based on testable assumptions that can be evaluated, and is enacted through an iterative process of biological planning, conservation design, conservation delivery, assumption-driven research, and outcome-based monitoring. The goal is to set specific population objectives for species that are limited in some way by habitat (though this would be effective for other limiting factors as well), and to use targeted habitat management approaches to meet those objectives. Inherent in the process is a continual evaluation of biological outcomes and approaches, with the intent to adapt the overall conservation strategy to respond to changing circumstances and new information.

Controlling Pest Plants and Animals

At times, native plants and animals interfere with management objectives. The Refuge Manual (7 RM 14.4A) defines a pest as “Any terrestrial or aquatic plant or animal which interferes, or threatens to interfere, at an unacceptable level, with the attainment of refuge objectives or which poses a threat to human health.” This definition also includes non-native invasive species (see below).

Integrated Pest Management (IPM)

In controlling pests, whether non-native or native species, we use an integrated approach. The Refuge Manual (7 RM 14.4C) defines integrated pest management as “A dynamic approach to pest management which utilizes a full knowledge of a pest problem through an understanding of the ecology of the pest and ecologically related organisms and through continuous monitoring of their populations. Once an acceptable level of pest damage is determined, control programs are carefully designed using a combination of compatible techniques to limit damage to that level.”

The Refuge’s IPM program will be written and on file at the refuge complex headquarters when complete. The IPM is a step-down plan from the CCP and supplements both the CCP and HMP with documentation on how to manage invasive or pest species. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on the Refuge, where necessary. Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management would be approved for use on the Refuge where there likely would be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in the chemical profiles. Our control program would address the most critical problems first and can be adjusted to reflect regional Service priorities, the availability of new information, or a new resource.

Managing Invasive Species

The establishment and spread of invasive species, particularly invasive plants, is a significant problem that reaches across all habitat types. For the purposes of this discussion, we use the definition of invasive species contained in the Service Manual (620 FW 1.4E): “Invasive species are alien species whose introduction does or is likely to cause economic or environmental harm, or harm to human health. Alien species, or non-indigenous species, are species that are not native to a particular ecosystem. We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.” This discussion focuses solely on invasive plant species.

At least 14 species of invasive plants have been identified on Nomans Land Island NWR (see Appendix B), and our management of these invasive plants would vary in degree by the alternative chosen. In Alternative

C, any treatment would be subject to Minimum Requirements Analysis (MRA) under a wilderness scenario (see Alternative C and Appendix C).

Erin Victory/TCI

Phragmites on Nomans Land Island NWR

The unchecked spread of invasive plants threatens the biological diversity, integrity and environmental health of all national wildlife refuge habitats. In many cases, they have a competitive advantage over native plants and form dominant cover types, reducing the availability of native plants as food and cover for wildlife. Over the past several decades, government agencies, conservation organizations, and the public have become more acutely aware of the negative effects of invasive species. Many plans, strategies, and initiatives target the more effective management of invasive species, including “The National Strategy for Management of Invasive Species for the National Wildlife Refuge System” (USFWS 2003a), “Silent Invasion—A Call to Action,” by the National Wildlife Refuge Association (2002), and “Plant Invaders of Mid-Atlantic Natural Areas,” by the Service and the National Park Service (Swearingen et al. 2002).

Guidance on managing invasive species on refuges appears in the Service Manual (620 FW 1.7G). The following actions define our general strategies on the Refuge.

1. Manage invasive species on refuges under the guidance of the National Strategy for Invasive Species Management and within the context of applicable policy.

2. Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and to prevent new and expanded infestations of invasive species.

3. Evaluate native habitat management activities with respect to their potential to accidentally introduce or increase the spread of invasive species and modify our habitat management operations to prevent increasing invasive species populations.

4. Conduct Refuge habitat management (including working through partners) to prevent, control, or eradicate invasive species using techniques described through an integrated pest management plan, or other similar management plan. The plans comprehensively evaluate all potential integrated management options, including defining threshold/risk levels that will initiate the implementation of proposed management actions.

5. Refuge IPM planning addresses the abilities and limitations of potential techniques including chemical, biological, mechanical, and cultural techniques. See the additional discussion on IPM below.

The following actions define our specific strategies for the Refuge.

1. Treatment of the most problematic species as funding and staffing permit in accordance with the selected alternative.

2. Develop early-detection/rapid-response readiness regarding new invasions.

3. Remove the parent sources of highly invasive species (e.g., species that are high seed producers or vigorous rhizome producers).

4. Maintain accessibility to affected areas for control and monitoring if possible.

Monitoring and Abating Wildlife and Plant Diseases

The Service has not yet published its manual chapter on Disease Prevention and Control. In the meantime, we derive guidance on this topic from the Refuge Manual and specific directives from the Director of the Service or the Secretary of the Interior. The Refuge Manual (7 RM 17.3) lists three objectives for the prevention and control of disease.

1. Manage wildlife populations and habitats to minimize the likelihood of the contraction and contagion of disease.

2. Provide for the early detection and identification of disease mortality when it occurs.

3. Minimize the losses of wildlife from outbreaks of disease.

The Service published these objectives in 1982. Since then, in addition to diseases that cause serious mortality among wildlife, diseases transmitted through wildlife to humans have received more attention. One example is Lyme disease. In 2002, the Service published a Service Manual chapter (242 FW 5) on Lyme Disease Prevention to inform employees, volunteers, and national service workers about this disease, its prevention, and treatment.

Another serious wildlife disease that receives considerable attention worldwide is avian influenza. Of particular concern is the highly pathogenic Eurasian form (H5N1). In 2006, the Service instructed all refuges to prepare an Avian Influenza Surveillance and Contingency Plan. This plan covers all eight refuges in the Eastern Massachusetts NWR Complex, and was completed in 2007.

In addition to the diseases of wildlife, we will be attentive to the diseases and pests that affect the health of the ecosystems that Nomans Land Island NWR supports, and respond to varying degrees based upon the alternative chosen. Under all alternatives, we would continue to opportunistically monitor for, and report, seabird mortality events on Refuge beaches. In addition, we would record and report instances of seal entanglements or strandings, because these are instances that could lead to increased susceptibility to disease mortality. It is likely that other monitoring efforts would be minimal, and the occurrence of any wildlife or habitat disease element would be responded to only if they posed an immediate or serious threat to indigenous wildlife and habitat. The Service would respond at a level commensurate with staffing and funding.

These are the general strategies for preventing or controlling disease.

1. Continue to conduct disease surveillance in conjunction with other fieldwork.

2. Cooperate with state agencies, particularly the Massachusetts Department of Fish and Game by providing access for sampling and following protocols in the event of an outbreak.

3. Inform volunteers and others who work in the field about the dangers of Lyme disease and measures to avoid contracting it.

4. Monitor habitats for indicators of the increased occurrence of pests or disease. For example, anecdotally note changes in flowering or fruiting phenology that do not appear to be linked to global climate change, and be vigilant for signs of physical damage, decay, weakening, sudden death, particularly of major host species, and changes in wildlife use of habitats, such as the absence of breeding birds that used to appear regularly.

5. Follow the protocols in national, state, and refuge disease prevention and control plans.

Biological and Ecological Research and Investigations

The Refuge Manual and the Service Manual both contain guidance on conducting and facilitating biological and ecological research and investigations on refuges. In 1982, the Service published three objectives in the Refuge Manual for supporting research on units of the Refuge System (4 RM 6.2):

1. to promote new information and improve the basis for, and quality of, refuge and other Service management decisions;

2. to expand the body of scientific knowledge about fish and wildlife, their habitats, the use of these resources, appropriate resource management, and the environment in general; and,

3. to provide the opportunity for students and others to learn the principles of field research.

In 2006, the Service Manual provided supplemental guidance on the appropriateness of research on refuges: "We actively encourage cooperative natural and cultural research activities that address our management needs. We also encourage research related to the management of priority general public uses. Such research activities are generally appropriate. However, we must review all research activities to decide if they are appropriate or not as defined in section 1.11. Research that directly benefits refuge management has priority over other research" (603 FW 1.10D(4)).

All research conducted on the Refuge must be determined in writing to be both appropriate and compatible, unless we determine it to be an administrative activity. Because Nomans Land Island is closed to public access, no research will take place for any of the priority public uses. Research projects also must contribute to a need identified by the Refuge or the Service. We anticipate opportunities to conduct research on the Refuge to arise under any of the alternatives we propose in this draft CCP. However, because of the restrictions posed by the continued presence of UXO, we expect research will be extremely limited on the Refuge. In addition, researchers will be considered agents of the Service, and must conform to safety guidelines and protocols. If we consider research to be absolutely necessary to address resource management concerns, we will follow the guidance in the manuals, and will employ the following general strategies to determine the appropriateness and compatibility of future research proposals.

In general, we will employ the following strategies:

1. Seek qualified researchers and funding to help answer Refuge-specific management questions.

2. Participate in appropriate multi-refuge studies conducted in partnership with the USGS or other entity.

3. Coordinate with partners to initiate or conduct research on priority issues identified at local and regional scales.

All researchers will be required to submit detailed research proposals following the guidelines established by Service policy and Refuge staff. Special use permits will also identify the schedules for progress reports, the criteria for determining when a project should cease, and the requirements for publication or other interim and final reports. All publications will acknowledge the Service and the role of Service staff as key partners in funding and/or operations.

Climate Change

Climate change is an issue of increasing public concern because of its potential effects on land, water, and biological resources. The issue was pushed to the forefront in 2007 when the Intergovernmental Panel on Climate Change (IPCC), representing the world's leading climate scientists, concluded that it is "unequivocal" that the Earth's climate is warming, and that it is "very likely" (a greater than 90 percent certainty) that the heat-trapping emissions from the burning of fossil fuels and other human activities have caused "most of the observed increase in globally averaged temperatures since the midtwentieth century" (IPCC 2007). The Northeast is already experiencing rising temperatures, with potentially dramatic warming expected later this century under some model predictions. According to the Northeast Climate Impacts Assessment (NECIA) team, "continued warming, and more extensive climate-related changes to come could dramatically alter the region's economy, landscape, character, and quality of life" (Frumhoff et al. 2007).

Other predicted climate-related changes, beyond warming temperatures, include changing patterns of precipitation, significant acceleration of sea level rise, changes in season lengths, decreasing range of nighttime versus daytime temperatures, declining snowpack, and increasing frequency and intensity of severe weather events (Inkley et al. 2004). Since wildlife species are closely adapted to their environments, they must respond to climate variations, and the subsequent changes in habitat conditions, or they will not survive. Unfortunately, the challenge for wildlife is all the more complicated by increases in other environmental stressors such as pollution, land use developments, ozone depletion, exotic species, and disease. Wildlife researchers and professionals, sportsmen, and other wildlife enthusiasts are encouraging positive and preemptive action by land managers. Some recommendations for action include: reducing or eliminating those environmental stressors to the extent possible; managing lands to reduce risk of catastrophic events; managing for self-sustaining populations; and, looking for opportunities to ensure widespread habitat availability (Inkley et al. 2004).

The Service is becoming more aware and knowledgeable about the impacts of climate change on national wildlife refuges. A draft Climate Change Strategic Plan and a Five-Year Action Plan have been drafted to provide specific direction to the Service's climate change response initiatives (see Chapter 1). Nomans Land Island could be a prime location for long term and remote research and monitoring. To date, a SLAMM (Sea Level Affecting Marshes Model; Clough and Larson 2009) analysis has been conducted to predict Refuge shoreline changes over the next century under four different sea level rise scenarios (see Chapter 3 and Appendix I). At the Refuge, we recognize the need for an increase in biological monitoring and inventories, two actions that are critically important for land managers to undertake in order to effectively respond to the uncertainty of future climate change effects. The alternatives would differ, however, in the extent to which these monitoring efforts take place, as well as the ability to monitor shoreline and other impacts associated with climate change. This would primarily be based on the availability of staff and funds. Under all alternatives, it will be important to coordinate with the state's climate change strategies as they are further refined. The establishment of the North Atlantic Landscape Conservation Cooperative (LCC; see Chapter 3) will also facilitate the exchange of information and coordination among agencies in the region to implement climate change strategies.

Special Use Permits

All of the alternatives would require the Refuge manager to evaluate activities that require a special use permit for their appropriateness and compatibility on a case-by-case basis. Because the Refuge is administratively closed to the public, the number of special use permits that will be issued will be extremely limited.

We will only approve permit requests that provide a direct benefit to the Refuge, or for research that will strengthen our decisions on managing natural resources on the Refuge. The Refuge manager also may consider requests that do not relate directly to Refuge objectives, but to the protection or enhancement of native species and biological diversity in the region and support the goals of recognized ecoregional conservation teams, such as the ACJV.

Protecting Cultural Resources

As a federal land management agency, we are responsible for protecting all cultural resources; specifically, archaeological sites and historic structures eligible for listing or listed on the National Register of Historic Places.

Under all the alternatives, we will evaluate the potential for impact on archaeological and historical resources as required for management actions, or the absence thereof, that would potentially lead to disturbance of those sites. We would develop and implement protocols for coordination, emergency response, and proper handling and disposition of such resources in coordination with local, state and federal partners and policies. These protocols will be incorporated into the Refuge's Law Enforcement Management and Cultural Resources Management step-down plans. We will consult with the Massachusetts State Historical Preservation Office (MA SHPO) and the Tribal Historic Preservation Officers (THPO) for the Wampanoag Tribe of Gay Head (Aquinnah) and the Mashpee Wampanoag Tribe. These activities will ensure that we comply with section 106 of the National Historic Preservation Act, regardless of the alternative. Compliance may require a State Historic Preservation Records survey, literature survey, or field survey. In addition, under Alternative C, any cultural activities requiring site disturbance would be evaluated through a MRA to comply with wilderness policy guidelines. In all cases, any ground disturbance activities would require UXO Tech Support, and would therefore require coordination with the Navy.

Off-Site Interpretation

The National Wildlife Refuge System Improvement Act of 1997 designated six priority public uses on national wildlife refuges: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Nomans Land Island NWR, however, presents a unique situation because of the ban on public access. Due to the presence of UXO throughout the island, we are obligated to maintain this requirement for public health and safety (see section on Unexploded Ordnance below). Therefore, none of the six priority public uses are offered on the Refuge under any alternative.

Interpretation, including outreach on Martha's Vineyard, will be offered to varying degrees under all alternatives, dependent upon the availability of staff and resources.

The following criteria are provided to ensure quality wildlife-dependent recreation on national wildlife refuges by the General Guidelines for Wildlife-Dependent Recreation, Fish and Wildlife Service Manual, 605 FW 1:

1. promotes safety of participants, other visitors, and facilities;
2. promotes compliance with applicable laws and regulations and responsible behavior;
3. minimizes or eliminates conflict with fish and wildlife population or habitat goals or objectives in an approved plan;
4. minimizes or eliminates conflicts with other compatible wildlife-dependent recreation;
5. minimizes conflicts with neighboring landowners;
6. promotes accessibility and availability to a broad spectrum of the American people;
7. promotes resource stewardship and conservation;

8. promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources;

9. provides reliable/reasonable opportunities to experience wildlife;

10. uses facilities that are accessible to people and blend into the natural setting; and,

11. uses visitor satisfaction to help to define and evaluate programs.

To the extent possible, we will strive to follow all guidelines applicable to off-site environmental education and interpretation. The other four priority uses are sufficiently provided for on Martha's Vineyard, to some degree, by partners. Both Martha's Vineyard and Nomans Land Island NWR have similarities in wildlife and habitat, and also provide access to freshwater and marine environments. Therefore access restrictions on the Refuge do not locally eliminate those opportunities, and equivalent experiences can be had on Martha's Vineyard for the priority public uses.

In recent years, the Service has recognized the importance of connecting children with nature. Scholars and health care professionals are suggesting a link between a disconnection with the natural world and some physical and mental maladies in our nation's youth (Louv 2005). We intend to promote the concept of connecting children and families with nature in all of our compatible recreational and educational programming and will work with local partners to provide environmental education and interpretation programs.

Appropriateness and Compatibility Determinations

Chapter 1 describes the requirements for determinations of appropriateness and compatibility for refuge uses. As previously discussed, we will continue to maintain and enforce the ban on public access on the Refuge for public safety reasons. Given these circumstances, there are no activities allowed on the Refuge except as allowed by the Refuge manager and in compliance with agreements set forth with the U.S. Navy. Therefore, activities typically addressed by findings of appropriateness and compatibility determinations do not apply to Nomans Land Island NWR.

Refuge Staffing and Administration

Our proposals in this document do not constitute a commitment for staffing increases or funding for operations or maintenance. Congress determines our annual budgets, which our Washington headquarters and regional offices distribute to field stations. Chapter 3 presents our levels of staffing, operating and maintenance funds for the Refuge. The activities shared among the alternatives we describe below pertain to staffing, administration, and operations: some are new; others are ongoing. Implementing them supports all our Refuge goals.

Permanent Staffing and Operational Budgets

In all the alternatives, our objective is to sustain levels of annual funding and staffing that allow us to achieve Refuge purposes, as interpreted by the goals, objectives, and strategies in this CCP. Often, many highly visible projects are conducted through special project funds that typically have a one- to two-year duration. Although those funds are very important, their flexibility is limited, because we cannot use them for any other priority project that may arise. Additionally, we cannot anticipate when or if we will receive these funds.

In response to declines in operational funding nationwide, we developed the "Strategic Workforce Plan for the National Wildlife Refuge System in Region 5" (Phase 2; January 16, 2007) to support a new base budget approach. Its goal is a maximum of 75 percent of a refuge station budget to cover salaries and fixed costs, while the remaining 25 percent or more will be operating and maintenance funds. Our strategy is to improve the capability of each refuge manager to do the project work of the highest priority, and not to have the refuge budget tied up in inflexible, fixed costs. Unfortunately, in a level or declining budget environment, that also may have implications for the level of permanent staffing.

In 2008, the Service approved a national staffing model which identifies the number of staff needed at each refuge or refuge complex throughout the country. The model indicated that the Eastern Massachusetts NWR Complex should have 39.5 permanent positions. As previously indicated, there are currently 16 permanent employees in the refuge complex. In all of the alternatives, and within the guidelines of the new base budget approach, we would seek to fill positions which we believe are necessary to accomplish our highest priority projects, though it is unlikely that all 39.5 positions would be filled under any alternative. Under all alternatives, we will update our organizational chart, as it does not accurately reflect current staffing. The staffing requests in Alternative B would provide depth in our biological, visitor services and law enforcement programs. Appendix E identifies the staffing requests in each alternative.

Facilities Construction and Maintenance

Under all proposed alternatives, we will continue to install and maintain Refuge and regulatory signs on the Refuge, and maintain the existing access pathways on the island, including the water control structure on the wetland near Rainbow Pond, and the two moorings. Under Alternative C, however, these activities would be subject to evaluation through a MRA and modified if necessary to comply with wilderness guidelines. We will continue to build relationships with the Tribe and our partners to display and distribute Refuge informational material.

Refuge Operating Hours

Again, due to the presence of UXO on Nomans Land Island, we are obligated to maintain and enforce the ban on public access on the Refuge (see the Unexploded Ordnance secion below). Warning signs will continue to be posted around the island, pending approval of a MRA under Alternative C, and trespassers in violation of this policy will be held accountable by Service law enforcement personnel. The U.S. Coast Guard patrols and enforces the water restriction area around Nomans Land Island NWR.

Erin Victory/TCI

Two of the eight Refuge warning signs

Cooperating with the Navy in its UXO Removal Program and the Prohibition of Public Access

In 1998, all of Nomans Land Island became part of the Refuge System when the Service was granted management responsibility from the U.S. Navy. Prior to that time, the island was first leased and then sold to the Navy for both live and practice bombing. Live bombing occurred from 1943 to 1952, and practice bombing continued until 1996 when all range operations ended to prepare for the transfer to the Service.

Because of the safety and liability issues associated with 54 years of bombing, conditions were included in the transfer document (see Appendix G) for both the Navy and the Service to uphold in order to make the transfer feasible. The document states that the Navy will continue the “investigations, studies and remedial action” necessary for the environmental cleanup of the unexploded ordnance on the island, and states that they will continue to take responsibility for that unexploded ordnance so long as the Service “shall administratively close the island to all public access, conduct periodic surveillance and install and maintain appropriate and adequate warning devices” (Conditions, Covenants, and Reservations of Transfer, attached to June 26, 1998 letter to Secretary of the Interior Bruce Babbitt from Assistant Secretary of the Navy Robert Pirie, Jr.).

The island is not cleared of UXO to levels that would permit access under safety regulations to the general public. In addition, natural processes such as frost heave and erosion will continue to expose subsurface UXO over time. Volunteers or researchers acting as agents of the Service to accomplish objectives set forth in this CCP are permitted on the island provided they are accompanied by Service personnel. Only certain portions of the island are cleared for use by Service staff. Service staff, volunteers and researchers undergo a safety briefing prior to visiting the island. Given safety and liability concerns, we are obligated to maintain and enforce the ban on public access under all alternatives, and we will continue to post regulatory signs and conduct patrols. Though it is not in our jurisdiction, the waters surrounding the island are also restricted to public use because of the danger of unexploded ordnance; this closure is monitored and enforced by the U.S. Coast Guard.

At present, the Service and Navy have been operating under the terms of the transfer agreement, and the Navy’s draft Operations and Management Plan which closely follows the transfer agreement. This has met the needs and requirements of each agency to date by requiring coordination of management activities that have positively benefited the Refuge. The Navy’s draft Operations and Management Plan outlines responsibilities for the Services as follows: maintenance of warning signs, periodic surveillance of the island, documentation of this surveillance, and reporting any UXO debris discovered during site visits. The Navy’s responsibilities as outlined in their draft Operations and Maintenance Plan are: ongoing site visits for inspection and possible remediation and surface clearances, response to reports of any UXO debris discovered on the island, and the provision of a UXO safety handout to the Service.

Future Navy Involvement

The Navy retains responsibility for contaminants and Munitions and Explosives of Concern (MEC) that remain on Nomans Land Island as a result of past military operations. The Navy’s current management of residual MEC is based on the Service’s designation of Nomans Land Island as an unstaffed wildlife refuge. Any change to this designation that would result in increased exposure to MEC would require additional cleanup at the Service’s expense.

As noted elsewhere in this document, the Navy has been working with the Service and the Massachusetts Department of Environmental Protection (MA DEP)on the cleanup of the site since the mid-1990's. Contaminant remediation has taken place and extensive clearance operations were conducted in 1998. In addition there have been two limited follow-up MEC surface clearances, in 2003 and 2008, to address MEC that was exposed by erosion.

Because risk to public safety remains due to pervasive UXO throughout the island, the Navy, in compliance with CERCLA, will conduct ongoing five year reviews of the site so long as human use of the site is restricted. The nature and extent of these five year reviews on Nomans Land Island by the Navy are subject to the alternative chosen in the Navy’s Phase III/Feasibility Study Report.

A draft Phase III/Feasibility Study (FS) Report has been prepared for the Navy which identifies and evaluates appropriate Remedial Action Alternatives (RAAs) to address the risk to safety for Nomans Land Island. Risks to the environment, human health, and public welfare have been previously addressed and closure attained. The feasibility of alternatives for remedial actions is evaluated according to criteria set forth in CERCLA and the 2004 Naval Facilities Engineering Command - Guidance for Optimizing Remedy Evaluation, Selection, and Design, and is consistent with the guidance and regulations from the Massachusetts Contingency Plan. The public will be provided an opportunity to comment on the Phase III/Feasibility Study Report in 2010. Once that report is finalized, the Navy will prepare a Proposed Plan to indicate the preferred remedy.

We do not anticipate any conflicts with our proposed management of the Refuge, including wilderness, as a result of these final Navy plans. If the Navy's future actions should result in an invalidation of any of the actions of this CCP, we would then revisit the CCP process and amend our CCP accordingly at that time.

Partnership Agreement with the Wampanoag Tribe of Gay Head (Aquinnah)

This CCP recognizes and takes into account the government-to-government relationship of the Service and the Wampanoag Tribe of Gay Head (Aquinnah) (Tribe). The Service also recognizes the Tribe as an important local repository of cultural knowledge and as an integral part of the history of Nomans Land Island. Since 1999, the Service and Tribe have worked together, through discussions and meetings, to facilitate this government-to-government relationship and to carry out the federal trust responsibility we have towards the Tribe. While the terms of a formal partnership agreement are still being discussed, the Service and Tribe remain committed to the partnership. Representatives of the Tribe are on the core planning team for this CCP, and work with the Service's Native American liaison on fish and wildlife grant opportunities.

Under all alternatives, we will continue our efforts to facilitate communication with the Tribe in general, and to address issues and concerns regarding cultural resource protocols, and all other aspects of our developing relationship. Discussions to date have focused on access for ceremonial purposes at sites and times to be determined, the repatriation of Native American remains, cultural and natural resource protection, public outreach, and training and educational opportunities for members of the Wampanoag Tribe. The U.S. Navy also has a government-to-government relationship with the Tribe, and will need to be included in our discussions. Our goal is to create and finalize a mutually reciprocal partnership agreement that takes into account the inherent limitations and safety concerns presented by the presence of UXO on the island while honoring our federal trust responsibilities to the Wampanoag Tribe.

Developing Refuge Step-down Plans

Service planning policy identifies 25 step-down plans that may be applicable on any given refuge. Three have been completed for the refuge complex as a whole, which includes Nomans Land Island NWR. We have identified six additional plans below as the most relevant to this planning process for the Refuge, and we have prioritized their completion. Several are ongoing as part of the refuge complex planning, but others will be completed depending upon the alternative chosen and its associated level of funding and staffing to complete them. This draft CCP presents sections of the Refuge HMP that require public review; we will incorporate them into the final version of the HMP within three years of approval of the final CCP.

We will also develop an AHWP and IMP as the highest priority step-down plans, regardless of the alternative selected for implementation. We describe them in more detail below. To keep them relevant we will modify and update them as we obtain new information. The completion of these plans supports all Refuge goals. All of the alternatives schedule the completion of these step-down management plans, according to the staffing and budgeting restrictions specific to each alternative.

All of the alternatives incorporate by reference the following completed plans that apply to the entire Eastern Massachusetts NWR Complex:

- Fire Management Plan—completed in 2003
- Avian Influenza Surveillance and Contingency Plan—completed in 2007

- Hurricane Action Plan—completed in 2009

All of the alternatives schedule the completion of these step-down management plans for the Refuge after completion of the CCP. An updated Fire Management Plan is scheduled to be completed in 2010. Please see Appendix F for general fire program direction.

- Annual Habitat Work Plan, annually
- Safety Management Plan, which includes UXO Inspection Logs, within 1 year of CCP approval
- Habitat Management Plan, within 3 years following CCP approval
- Inventory and Monitoring Plan, within 5 years of CCP approval
- Law Enforcement Management Plan, within 5 years of CCP approval
- Cultural Resources Management Plan, within 5 years of CCP approval

Habitat Management Plan

The HMP will incorporate the selected alternative's habitat objectives developed herein, and will identify "what, which, how, and when" actions and strategies we would implement over the 15-year period to achieve those objectives. Specifically, the HMP will define management areas and treatment units, identify the type or method of treatment, establish the timing for management actions, and define how we will measure success over the next 15 years. In this CCP, the goals, objectives, and list of strategies in each objective identify how we intend to manage habitats on the Refuge and will represent the varying levels of habitat management under each alternative. We base both the CCP and HMP on current resource information, published research, and our own field experiences. We will update our methods, timing, and techniques as new, credible information becomes available. To facilitate our management, we will regularly maintain our GIS (Geographic Information System) database, documenting any major changes in vegetation or shoreline at least every five years, as staffing and funding allow. As appropriate, we will incorporate the actions common to all alternatives into the HMP.

Annual Habitat Work Plan and Inventory and Monitoring Plan

The AHWP and IMP for the Refuge are also priorities for completion upon CCP approval. Regardless of the alternative chosen, those plans also are vital for implementing habitat management actions and measuring our success in meeting the objectives, though the levels will vary according to the alternative chosen. Each year, we will generate an AHWP that will outline specific management activities for that year. The IMP will outline the methodology to assess whether our original assumptions and proposed management actions support our habitat and species objectives. The IMP may also be used to monitor the potential effects of global climate change on refuge habitats and wildlife populations. We will prioritize our inventory and monitoring needs in the IMP. The results of inventories and monitoring will provide us with more information on the status of our natural resources and allow us to make more informed management decisions.

Distributing Refuge Revenue Sharing Payments

As described in Chapter 3, we have provided funding in the form of shared revenues to the Town of Chilmark for Nomans Land Island since the Refuge was established. Those annual payments are calculated by formula determined by, and with funds appropriated by, Congress. All of the alternatives will continue those payments in accordance with the law, commensurate with changes in the appraised market value of refuge lands, or new appropriation levels dictated by Congress.

Additional NEPA Analysis

For all major federal actions, NEPA requires the site-specific analysis and disclosure of their impacts, either in an EA or EIS. Generally, those include the administrative actions listed in Chapter 4. Most of the actions proposed in the three alternatives and fully analyzed in this draft are described in enough detail to comply with NEPA, and would not require additional environmental analysis. Although this list is not all-inclusive, the following projects fall into that category:

- development of the HMP;
- development of the IMP;
- the proposed construction of a new interpretive trail proposed at the Aquinnah Cultural Center;
- control of invasive plants;
- implementing a predator or pest management program; and,
- enhancing our off-site priority public use programs.

Alternatives or Actions Considered but Eliminated from Further Study

1. More intensive mechanical management of Refuge habitats.

   Much more intensive mechanical management of Refuge habitats, including mowing of land to establish or maintain grassland habitat, was considered to be logistically challenging to get equipment to the island, and impractical given the presence of UXO distributed throughout the island. Removal of all UXO is not practical or feasible, and therefore precludes intensive mechanical habitat management.

2. Allowing some of the six priority uses on Refuge.

   While we recognize the ecological and cultural importance of the island to the local communities on Martha's Vineyard as well as a number of interest groups, opening up the island to the general public, even for small parties, for any of the six priority uses is not a viable option. Our guiding document with the U.S. Navy, the transfer agreement, stipulates that the Refuge must remain administratively closed. With this restriction, and due to the safety concerns, we do not and will not provide any public access. The Navy's responsibility is to remove the surface UXO only to the extent necessary for an unmanned, unstaffed national wildlife refuge, which were the original terms of the agreement. Any public uses are in violation of that agreement, are not provided for in the level of UXO clearance, and are prohibitive in terms of safety, liability, feasibility and cost.

3. Managing Refuge upland habitats to revert back to forest.

   Like many other coastal Massachusetts islands, Nomans Land Island was originally forested. In the 1800's, much of the island was cleared of these forests in favor of farming and raising sheep. Since then, human uses on the island have been too intensive to allow forests to become re-established. One alternative we considered was to allow natural succession back to forest in the upland habitat. This was considered unlikely, however, because wind and salt spray can delay succession for long periods of time, and there is no guarantee that adequate seed sources persist for forests to re-establish on the island. In addition, forest management operations would possibly require machinery over time that would be logistically difficult to address and could conflict with safety concerns over UXO. Moreover, as early successional habitat continues to decline in the Northeast, many regional bird conservation plans advocate managing shrubland where possible to benefit breeding and migrating birds.

Alternative A. Current Management

This alternative describes current Refuge programs on the 628-acre island for habitat management, wildlife inventories and monitoring, administrative infrastructure and staffing, and visitor services. This alternative describes a "snapshot in time" of current management actions.

Habitat Management

Our present habitat management program, while generally passive, uses the strategy of adaptive management to adjust invasive species treatment and species monitoring protocols as new information becomes available. Due to the dynamic nature of coastal island habitat, it is vulnerable to dramatic seasonal and annual changes. See Chapter 3 for a description of the types of Refuge habitat.

Under current management, we would continue to passively manage Refuge habitats and to treat invasive species along established maintenance paths when possible. The location of the Refuge, and current staffing and funding levels restrict our ability to maintain a consistent presence, or to actively oversee and implement management actions. Rather, the only active habitat management or alterations would be as a result of any continuing Navy operations on the island and some degree of invasive species management.

As a coastal island, Nomans Land Island is susceptible to the effects of global climate change, particularly increases in sea level. For this reason, like many other refuges along the Atlantic seaboard, we completed a SLAMM analysis in 2009 that predicts potential impacts to the Refuge over the next century under different sea level rise scenarios. Because those are long-term scenarios, management actions are not warranted immediately and would likely be better addressed in future CCPs. We would, however, continue to be cognizant of the indicators of climate change (e.g., sea level rise) on the Refuge. In addition, the Refuge would continue to work to reduce non-climate environmental stressors, including treatment of invasive species, opportunistically monitoring for disease and mortality, and reducing pollution by using hybrid vehicles for transportation from Sudbury for Refuge visits.

Erin Victory/TCI

Regeneration after a prescribed burn on the Refuge

Inventories and Monitoring

Under current management, the Service conducts basic surveys and monitoring of Refuge wildlife. This includes breeding bird surveys (BBSs), marshbird callback surveys, and inventories of nesting shorebird and colonial waterbird species. We would continue all of these efforts under this alternative, and continue to conduct occasional migratory raptor banding with partners, and record seal use of the beach and seabird mortality events when possible. In addition, if the Navy performs prescribed burns in the future as part of its ongoing UXO removal commitment, we would continue to monitor the vegetation response to determine the effectiveness of these burns. As with all of our activities, the degree to which we can conduct monitoring and inventories depends on the availability of funding and staff, and the contributions of partners and volunteers.

Visitor Services

Current visitor services programs are restricted to a virtual tour on the Refuge website, which allows remote opportunities for interpretation and wildlife observation. The distance of the Refuge from Sudbury and current levels of staffing and funding limits our capabilities to provide environmental education and interpretation programs on Martha's Vineyard. None of the six priority wildlife-dependent uses are allowed on the Refuge, as we are obligated to maintain and enforce the ban on public access for safety reasons. Under this alternative, we would maintain this level of visitor services.

Refuge Administration

In this alternative, Refuge staffing would remain at current levels at the Eastern Massachusetts NWR Complex headquarters in Sudbury, Massachusetts. Given the government-to-government relationship we have with the Tribe and our federal trust responsibility towards them, we would continue to develop our relationship with them and endeavor to create a mutually agreeable partnership agreement between the Service and the Tribe. We would also continue to enforce the ban on public access to the Refuge, and would continue to install, maintain and enforce regulatory signs posted around the Refuge.

In the discussion that follows, we describe in detail the goals, objectives, and strategies that we would implement under Alternative A.

Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.

Objective 1.1. Native Maritime Shrubland Habitat (Breeding Wildlife)

Over the next 15 years, continue to minimally manage approximately 400 acres of maritime shrubland habitat that supports nesting focal species of conservation concern, including eastern towhee (Pipilo erythrophthalamus) and gray catbird (Dumetella carolinensis).

Rationale

Shrub habitat comprises various shrub species or a diverse mix of young trees that provides an abundance of insect food for breeding birds that need to consume large amounts of protein for reproduction and feeding young. The structural density in this habitat provides cover from predators and shelter from harsh weather. This habitat on the Refuge is one of the primary reasons the island is a regional landbird focus area in BCR 30 (Steinkamp 2008). This designation highlights an area's importance and relative conservation value across the landscape due to its biological features and habitat characteristics preferred by priority birds (Steinkamp 2008).

Despite the importance of maintaining shrubland habitat in the region and to support breeding birds of conservation concern, current levels of staffing and funding preclude active management of this habitat type. This is especially true given the travel distance and transportation logistics in getting to the island. Under Alternative A, we would continue to take a passive approach to habitat management, and allow natural processes or UXO clearance operations by the U.S. Navy (see Chapter 3) to direct habitat condition. Because shrubland is already established, it is likely that little effort is needed to maintain it beyond prescribed burns every decade or so depending on the specific site conditions (Tefft 2006). Occasional burns would only be conducted by the Navy if they deemed it necessary, and over the long term these burns would likely keep the Refuge's upland habitat in an early successional or shrubland condition. However, should the Navy decide that burns are not required, the Service may not be able to maintain this land in shrubland habitat for focal early successional landbirds of conservation concern.

There are no target densities for breeding birds under this alternative. Upon its inception, breeding bird surveys were conducted annually on the Refuge for the first five years, and would continue to be conducted every three years to collect baseline data for species of conservation concern including the eastern towhee and gray catbird.

Strategies

Continue to:

- Allow natural processes to influence Refuge shrub habitat, except for potential prescribed burns conducted by the Navy as part of their operations and maintenance plan.
- Provide oversight and coordination with Navy contaminant and UXO cleanup and strive towards actions that benefit shrubland birds.
- Control invasive species and map new infestations, when feasible.
- Maintain the two existing access loop paths.
- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To measure relative abundance for gray catbirds and eastern towhees, conduct annual breeding bird surveys for the first five years and then once every three years thereafter throughout the life of the CCP.
- ➢ To evaluate quality of shrubland habitat as a result of prescribed burning for breeding landbirds, conduct vegetation surveys for species composition and community structure annually for the first two to three years post-burn, and every five years thereafter.
- ➢ To maintain desired quality and characteristics of shrublands, annually conduct scouting for new invasive plant species or infestations, and monitor effectiveness of control techniques.
- ➢ Complete habitat map within three years.

Objective 1.2. Native Maritime Shrubland Habitat (Migrating Wildlife)

Over the next 15 years, continue to minimally manage approximately 400 acres of maritime shrubland habitat that supports migrating landbirds, including raptors (e.g., state endangered peregrine falcon (Falco peregrinus)).

Rationale

In addition to its value to breeding birds, shrub habitat is important because many other birds rely on it at various times during the year. Many shrub species bear fruit in the fall, which helps boost the fat reserves for migrating or over-wintering birds. As part of the Atlantic Flyway, Nomans Land Island NWR provides an important stop-over site for many migrating bird species, including raptors. In particular, for state-listed peregrine falcons, the Refuge is the most important stopover site in Massachusetts (T. French, personal communication; see Chapter 3).

Currently, we partner with the Massachusetts Audubon Society to band raptors as the opportunity arises, but we use no standardized monitoring protocol for raptors or other migrating landbirds. Under Alternative A, we would continue this level of species monitoring as staffing, funding and transportation logistics restrict our abilities to be more proactive. We would also continue to take a passive approach to habitat management, allowing natural processes or UXO clearance operations by the U.S. Navy to direct habitat condition, with the exception of controlling invasive species when possible.

Strategies

Continue to:

- Allow natural processes to influence Refuge shrub habitat, except for potential prescribed burns conducted by the Navy as a part of their operations and maintenance plan.
- Provide oversight and coordination with Navy contaminant and UXO cleanup and strive towards actions that benefit migrating shrubland birds.
- Maintain the two existing access loop paths.
- Control invasive species and map new infestations, when feasible.
- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To evaluate quality of shrubland habitat as a result of prescribed burning for migrating landbirds, conduct vegetation surveys for species composition and community structure annually for the first two to three years post-burn, and every five years thereafter.
- ➢ To maintain desired quality and characteristics of shrubland habitat, annually conduct scouting for new invasive plant species or infestations and monitor effectiveness of control techniques.
- ➢ Collaborate with partners band migrating raptors for baseline tracking as opportunity allows.
- ➢ Complete habitat map within three years.

Objective 1.3. Vegetated Dune Habitat

Over the next 15 years, continue to minimally manage approximately15 acres of vegetated dune habitat consisting of American beach grass (Amophilla species) and other herbaceous vegetation which provides suitable nesting habitat for shorebirds (including American oystercatchers (Haematopus palliates), piping plovers (Charadrius melodus) and terns (primarily common (Sterna hirundo) and roseate terns (Sterna dougallii)).

Rationale

Coastal beach and dune habitat continues to be some of the most threatened habitats in the U.S. They are naturally unstable, dynamic ecosystems that are subject to erosion and accretion processes due to wind and wave action (MA DFG 2006). Many species rely upon these variable processes to provide continual habitat and food resources. These primarily include nesting and migrating bird species, mammals such as seals and voles, and a host of invertebrates.


Erin Victory/TCI

Vegetated dune habitat

In the past, this habitat on Nomans Land Island supported breeding colonies of arctic (Sterna paradisaea), common and roseate terns. All three of these species are listed in the BCR 30 and PIF Area 09 plans as priority species of conservation concern, are state listed, and the roseate tern is federal listed as endangered. Today only common terns continue to use Nomans Land Island NWR to breed, and in very low numbers. In 2009, there was only one breeding pair of common terns documented on the Refuge. The initial decline in use by tern species coincided with increasing numbers of several species of breeding gulls on Nomans Land Island. It is well documented that gulls are nest predators of tern and other coastal bird species, and also compete with terns and other species for nesting habitat (O'Connell and Beck 2003, Donehower et al. 2007). In recent years, gull numbers along the coast have been decreasing, and we are unsure if the number of nesting gulls in the limited sandy dune habitats has increased, decreased, or stayed stable on the Refuge. A permit for removal of nesting gulls was secured for use in 2009, but no control actions took place.

American oystercatchers are a species of high conservation concern, and breed on the Refuge in low numbers. They are only found along the North American Atlantic coast, and according to the U.S. Shorebird Conservation Plan (Brown et al. 2001), the population estimate for the species is approximately 7,500. In 2009, there were three breeding pairs on the Refuge. We would continue to monitor American oystercatcher and other breeding shorebirds annually under this alternative, and to measure productivity when possible. Though piping plovers have not been documented on the Refuge since 1980, annual visits incorporate visual assessment of potential piping plover habitat, and when found, subsequent monitoring for breeding individuals.

Service biologists visit the Refuge a few times per year. Given the transportation logistics, staff must try to address all habitat, species monitoring and management needs throughout the island in a one- to three-day time period. While productivity is measured for American oystercatcher when possible, tern nest success and productivity are not monitored, and any surveys or management beyond tern inventories are inconsistent and opportunistic. Invasive species in this habitat are removed as the opportunity arises. Without additional staff and resources, we would continue this level of management under this alternative.

Strategies

Continue to:

- Conduct limited and specific predator control actions annually, as needed and as permits are approved.
- Control invasive species and map new infestations, when feasible.
- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To determine number of nesting pairs of common and roseate terns, conduct annual inventories during the breeding season throughout the life of the CCP.
- ➢ To determine number of nesting pairs and estimate productivity of American oystercatchers, conduct annual surveys during the breeding season and opportunistically record reproductive success throughout the life of the CCP.
- ➢ To determine presence of piping plover, annually assess dune habitat for piping plover nesting suitability, and if found, monitor for nesting pairs.
- ➢ To maintain desired quality and characteristics of vegetated dune habitat, annually conduct scouting for new invasive plant species or infestations and monitor effectiveness of control techniques.
- ➢ Complete habitat map within three years.

Objective 1.4. Marine Intertidal Beach and Rocky Shore

Over the next 15 years, continue to passively oversee approximately 100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants (Phalacrocorax auritus)), migrating shorebirds and, marine mammals (seals).

Rationale

The beaches of Nomans Land Island NWR are regionally important because of the island's land protection status. Throughout the Atlantic coast, quality beach habitat is imperiled due to increases in human uses and development (see the rationale for Alternative A, Objective 1.3). Because Nomans Land Island has been closed to the public for approximately the last 56 years and there are no records of mammalian mesopredators (e.g., raccoons, skunks, foxes) on the island, gulls are the only known species that adversely impact beach nesting species of priority conservation concern on the island.

A SLAMM analysis was conducted for the Refuge in early 2009. With the SLAMM analysis, we now have projected estimates of sea level increases by years 2025, 2050 and 2100 under four sea level rise scenarios, and how those scenarios might impact the Refuge. Because those are long-term scenarios, management actions are not warranted immediately and would likely be better addressed in future CCPs. We would, however, continue to be cognizant of the indicators of climate change (e.g., sea level rise) on the Refuge, and work to reduce non-climate environmental stressors.

The intertidal beach and rocky shores of the Refuge provide important nesting, resting and forage habitat for many priority species of conservation concern. Gray (Halichoerus gryphus) and harbor (Phoca vitulina) seals use the beaches during the fall and winter, and are protected under the Marine Mammal Protection Act. Migrating shorebirds also use Refuge beaches as a stopover site for resting and feeding. During the breeding season, double-crested cormorants nest along the Refuge shoreline. American oystercatchers, typically associated with vegetated dune habitat, can also be found nesting in the cobble along the Refuge shoreline. Though we address American oystercatcher in Objective 1.3, monitoring activities would be the same for any breeding pairs found in this rocky shore habitat.

Currently, we conduct inventories of nesting double-crested cormorants when possible (generally every other year or every third year), but do not collect any information on productivity given our current limitations in staffing and our limited time frame when we visit the Refuge. We obtain additional shoreline data including recording seal use of the beach and documenting evidence of seabird mortality when possible. Under Alternative A, we would continue this level of monitoring.

Strategies

Continue to:

- Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events.
- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Conduct census of nesting double-crested cormorants every three years throughout the life of the CCP.
- ➢ Document seal presence on the Refuge shoreline annually, and report entanglements to the New England Aquarium stranding staff.
- ➢ To maintain desired quality and characteristics of intertidal beaches and rocky shores, annually conduct scouting for new invasive plant species or infestations and monitor effectiveness of control techniques.
- ➢ Continue to walk the periphery of the island annually and report any seabird mortality events in coordination with SEANet as weather, funding and time permits.
- ➢ Complete habitat map within three years.

Objective 1.5. Scrub Shrub and Emergent Wetlands, Bogs, and Open Water

Over the next 15 years, continue to minimally manage approximately 100-150 acres of freshwater wetland communities to support breeding marshbirds (including but not limited to Virginia rail (Rallus limicola)) and native plant and animal communities.

Rationale

A number of different wetland types exist on the Refuge. They range from ponds to permanently flooded marshes to seasonally flooded marshes. These habitats support a small black-crowned night-heron (Nycticorax nycticorax) rookery, and waterfowl such as American black ducks, mallards (Anas platyrynchos), and American green-winged teal (Anas crecca). Mammals including muskrat (Ondatra zibethicus), reptiles such as spotted turtles (Clemmys guttata), waterbirds including Virginia rails, and passerines including song sparrows (Melospiza melodia) and red-winged blackbirds (Agelaius phoeniceus) use these Refuge wetlands as well. Other species that may use these habitats on the Refuge are northern pintail (Anas acuta), blue-winged teal (Anas discors), northern shoveler (Anas clypeata), glossy ibis (Plegadis falcinellus), and least bittern (Ixobrychus exilis). What remains unknown, however, is the fish and invertebrate composition of these waters, as there has been very little UXO clearance in any of the island's ponds or wetlands. Because of this, access for more comprehensive surveys is limited around these wetlands. Many of the species listed above have been identified as species of conservation concern, or have warranted concern due to regional population declines.


Erin Victory/TCI

Refuge wetlands

Under Alternative A, we would continue to conduct marshbird callback surveys to obtain trend information for species such as Virginia rail and least bittern. Treatment of invasive Phragmites (common reed; Phragmites australis) and purple loosestrife (Lythrum salicaria) would continue as needed, and surveys for rare plants would occur as opportunity and staff availability arise. All other species would be documented as encountered, and no other habitat management would be conducted.

Strategies

Continue to:

- Control purple loosestrife and Phragmites through biological, chemical, and/or mechanical means as needed, and as time and funding permits, and map new infestations.

- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Continue to conduct callback surveys when possible for secretive nesting marshbirds to monitor overall diversity, evaluate habitat use patterns, and obtain trend information.

- ➢ Work with partners to conduct wetland plant surveys to identify rare wetland plant species when possible, and record observations of other wetland species, particularly rare wetland invertebrates.

- Continue monitoring invasive plants, particularly Phragmites and purple loosestrife, to prevent unacceptables levels of loss of habitat quality. If the patch sizes of Phragmites attain a solid stand (regardless of size) that reasonably can be sprayed or, it threatens a rare community, initiate appropriate control measures to decrease Phragmites to a tolerable level. We may leave untreated any patches that are static or inaccessible by any currently available means until we determine a feasible solution or efficacious method.

- Complete habitat map within three years.

Goal 2. Promote awareness and stewardship of our coastal natural resources by working with our partners to provide off-site interpretation, education and outreach opportunities.

Objective 2.1. Environmental Education and Interpretation

Over the next 15 years, continue to maintain the current level of interpretation.

Rationale

As we have described, the presence of UXO throughout the Refuge and the terms of the original transfer agreement with the U.S. Navy present a unique case where we cannot allow any of the six priority uses on the Refuge itself, including environmental education and interpretation. Any Refuge environmental education or interpretation programs would take place off-site on Martha's Vineyard. Currently, the distance from refuge complex headquarters in Sudbury and staffing and funding levels preclude our ability to provide more than an interpretive website which includes a virtual tour of Nomans Land Island.

Strategies

Continue to:

- Interpret the Refuge through the virtual tour on the Refuge website.

Monitoring Elements

- Maintain Refuge website and virtual tour.

Objective 2.2. Community Partnerships and Outreach

Over the next 15 years, maintain existing partnerships with the Tribe, and regional and local organizations and agencies to ensure that citizens of and visitors to Martha's Vineyard are aware of the biological resources that exist on Nomans Land Island, the Service presence there, and the connection of Nomans Land Island NWR to the Refuge System.

Rationale

It is of utmost importance for us to reach out and collaborate with the Tribe and our other conservation partners in the region, including the Town of Chilmark, Massachusetts Audubon Society, TTOR and others. Through them, we are able to facilitate communication regarding Refuge management, local conservation issues, and potential cooperative opportunities. It is particularly important to cultivate an awareness and appreciation in local communities of the Refuge's unique contribution to the Refuge System mission. In addition, these partnerships are important to our biological program as well, and we would continue to strengthen and develop collaborative initiatives with them to accomplish our objectives under this alternative. In addition, we would continue to issue press releases for large-scale management activities that take place on the Refuge to keep the Martha's Vineyard community informed. The amount of future outreach would remain minimal under this alternative, however, with only the basic amount of outreach conducted.

Strategies

Continue to:

- Explore the possibility of a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) to determine outreach and other opportunities for partnership.

- Issue press releases for large-scale management activities on the Refuge.

Monitoring Elements

- ➢ Number of partnership projects planned or accomplished.

- ➢ Number of press releases issued

Goal 3. Recognize the archaeological and cultural importance of the island.

Objective 3.1. Archaeological and Cultural Resources

Over the next 15 years, follow Service protocol to prevent the loss of, and document, the archaeological and cultural resources on Nomans Land Island when possible. Continue to develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that would incorporate limited access for cultural and ceremonial use of the Refuge.

Rationale

Despite the rich human history of Nomans Land Island and the number of archaeological sites that exist, both documented and undocumented, we would be unable to pursue active archaeological investigation under this alternative. Current levels of staffing and funding preclude our ability to proactively identify and protect archaeological sites, or to bring in UXO-certified archaeologists to conduct any site inventories. Under this alternative, we would continue to ensure activities on the Refuge are in compliance with the National Historic Preservation Act, to document cultural and/or archaeological items as encountered, and to notify the appropriate agencies should any be found. In addition, we would continue to work with the Wampanoag Tribe of Gay Head (Aquinnah) to complete a mutually beneficial partnership agreement, including cultural and ceremonial use of the Refuge by the Tribe.

Strategies

Continue to:

- Coordinate with the Navy to ensure compliance with the National Historic Preservation Act as necessary.

- Record cultural and archaeological items and/or sites as encountered annually, or as necessary, and contact the appropriate agencies and organizations.

- Collaborate with the Wampanoag Tribe of Gay Head (Aquinnah) to develop a mutually beneficial partnership agreement incorporating cultural and ceremonial use of the Refuge by the Tribe.

Monitoring Elements

- ➢ Number of archaeological sites protected.

Objective 3.2. Burial Site Protection

Continue to maintain the Luce cemetery by removing vegetation when possible, and continue to explore opportunities to work with volunteers from interested groups in Chilmark over the next 15 years.

Continue to pursue the possible repatriation of Wampanoag tribal remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a partnership agreement between the Tribe and the Service.


Stephanie Koch/USFWS

Luce Cemetery

Rationale

Federal laws require the Service to identify and preserve its important historic structures, archaeological sites, and artifacts. The Luce cemetery and other potential burial sites are protected under the historic preservation laws listed in Chapter 1. NEPA mandates our consideration of cultural resources in planning federal actions. The Improvement Act requires the comprehensive conservation plan for each refuge to identify its archaeological and cultural values.

Under Alternative A, Service staff would continue to maintain the Luce cemetery by removing vegetation as time and opportunity allows, or with the help of volunteers. We would also continue to explore a partnership with the Chilmark Historical Commission to take leadership in maintaining the cemetery through volunteers that would visit the island in concert with Service staff, and only after appropriate safety training.

It is also likely that there are remains of ancestral Tribal members on the Refuge. While no known sites exist, any remains would be protected if discovered in the conduct of Refuge operations in compliance NAGPRA and other federal mandates. We would continue to work with the Tribe towards a partnership agreement, including repatriation and the protection of potential future discoveries of burial sites on the Refuge. Any ground disturbance activities would require UXO Tech Support, and would therefore need to be coordinated with the Navy.

Strategies

Continue to:

- Maintain the Luce cemetery by Service staff as opportunity allows, and continue to explore a partnership with the Chilmark Historical Commission for volunteers to conduct site visits with Service staff to remove vegetation at the cemetery when possible.

- Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge.

Monitoring Elements

- ➢ Number of volunteer work hours.
- ➢ Number of remains protected.

Objective 3.3 Cultural Interpretation

Over the next 15 years, continue to coordinate with the Tribe and our partners to interpret the cultural and archaeological resources of the island as staff availability and resources allow.

Rationale

As described in Chapter 3, Nomans Land Island has a culturally rich and interesting human history, yet cultural interpretation by the Service is minimal for the Refuge due to lack of sufficient staff time and resources. The web virtual tour currently consists of a segment on the stone walls and the remnant of a structure known as the wine cellar still visible on the island. Under Alternative A, this level of cultural interpretation would not change.

Strategies

Continue to:

- Interpret the Refuge's cultural history through the virtual tour on the Refuge website.

Monitoring Elements

- ➢ Number of accessioned museum property collections.
- ➢ Number of partnership projects planned or accomplished.

Alternative B. Enhanced Wildlife Management and Visitor Services

This alternative describes an expansion of current management in all areas over the next 15 years both on and off Nomans Land Island NWR, as funding and staff levels permit. The guiding philosophy under this alternative is to more actively manage the different habitats of the Refuge to meet the needs of focal species of conservation concern. It also expands the visitor services programs to emphasize environmental education, interpretation and outreach to promote community involvement and knowledge of the island's natural resources and the role of the Refuge in the Refuge System. We would also seek to enhance our current, and to create new, partnerships with local conservation organizations and civic groups. Under Alternative B, we would continue our adaptive management approach of modifying actions based on new information, especially with shifting coastal habitat dynamics, and with a constant effort to collect more and better data upon which to make management decisions. See Chapter 3 for a description of the types of Refuge habitat.

Habitat Management and Protection

Under this alternative, we would incorporate the principles of adaptive management, and specifically Strategic Habitat Conservation where possible, as habitat management is the primary tool in attaining population objectives under this framework. In shrubland habitat, we would delineate at least two habitat patches, and use prescribed burning on a rotational basis so that each patch would burn every 7 to 12 years or as necessary to maintain the desired habitat condition. Fire breaks would be employed when and where possible to define these patches prior to conducting a burn. Biological, chemical and/or mechanical means to remove invasive plant species throughout the island would also be employed. To assess vegetative condition over time, particularly to evaluate post-fire effects, an updated, accurate cover type map and detailed vegetation surveys are needed to provide a baseline, and would be one of our priorities under this alternative. Predator control measures would be employed as necessary to support nesting focal species of conservation concern.

We would work closely with the U.S. Navy to coordinate all management actions. We would also endeavor to work with them to provide additional trails or means of access throughout the island, as the additional survey and monitoring efforts detailed in this alternative are hampered by the current lack of approved trails.

Habitat management would also include the protection of known cultural and archaeological sites on the island, particularly in dune areas where erosion is a concern. We would also work with volunteers and partners to maintain the island cemetery by removing vegetation annually or as needed.

Inventories and Monitoring

The Service would continue inventory and monitoring efforts to provide key information on the trust resources as long as we have the necessary staff and resources to accomplish them, and as weather permits. These include breeding bird surveys, secretive marshbird callback surveys, and inventories of breeding terns, American oystercatchers and double-crested cormorants. Productivity of nesting waterbirds would be measured when possible. In shrubland habitat, the primary focus would be on nesting gray catbirds and eastern towhees as they are both species of regional conservation concern and can be used to indicate habitat quality. Leach's storm petrels (Oceanodroma leucorhoa) would eventually be included in monitoring efforts as well. We would also work with partners to monitor migrating birds, including raptors, and would seek to adopt a standardized protocol for a rapid assessment of annual migration trends. Given the gaps in knowledge we have about many of the other taxonomic groups on the Refuge, we would evaluate ways to incorporate invertebrate (particularly pollinators), and rare plant surveys on site visits. We would target any alterations or additions to these on-going surveys toward helping us understand better the implications of our management actions and ways to improve our efficiency and effectiveness.

In addition, Refuge staff would evaluate the feasibility of introducing New England cottontail (Sylvilagus transitionalis) on the Refuge.

Passive monitoring would include recording observations of seals using Refuge beaches and evidence of seabird mortality along Refuge shores.

As in Alternative A, we would continue to be cognizant of the indicators of climate change, and would continue to work towards reducing non-climate environmental stressors. Under Alternative B, the Refuge would initiate shoreline monitoring via aerial photos. We would also endeavor to address the state's climate change priorities once they are refined, and would work within the North Atlantic LCC to promote research, education, and collaboration.

Visitor Services

Under Alternative B, we would expand existing opportunities for the visitor services programs appropriate for Nomans Land Island NWR (see Map 2-1).

Given the unique history of Nomans Land Island and its resources, we recognize that it is an important ecological, cultural, and archaeological resource. Due to persistent hazards associated with the UXO, we are obligated to enforce the ban on public access. Therefore, our main priority under this alternative would be to provide alternative ways for people to experience the Refuge and to promote knowledge of its resources and understanding of its role in the Refuge System. To accomplish this, we would redesign the virtual web tour by evaluating the possibility to utilize professional photographers and videographers to capture the diverse wildlife and habitats on the island, and management and monitoring activities. We would also evaluate the potential to broadcast live during staff site visits on local access television, radio, or web feed at the Aquinnah Cultural Center (ACC). We would explore the opportunity to partner with the Tribe to create a virtual tour based on the biological and cultural resources of importance to them, particularly from Nomans Land Island.

Other ways for people to learn about the Refuge would be explored on Martha's Vineyard as well. We would seek partnerships to help us achieve new and expanded environmental education and interpretation programs. To this end, we would propose to partner with the ACC to create a kiosk and an interpretive trail with informational signs and a spotting scope from which to view Nomans Land Island. We would work with local schools and libraries to provide curriculum-based programs and features such as a coastal resources trunk for school children.

The Service would collaborate with partners to sponsor and participate in additional outreach opportunities for visitors and residents of Martha's Vineyard. We would participate in at least one community event per year, and increase awareness of the Refuge by submitting regular press releases, and through messaging via signage and materials (such as brochures, rack cards, etc.).

Refuge Administration

This alternative proposes additional staff that would provide support for the expansion of the biological, visitor services and law enforcement programs. We would base any increases in staffing on available, permanent sources of funding, and would consider them in the context of regional and Refuge priorities.

Given the government-to-government relationship we have with the Tribe and our federal trust responsibility towards them, one of our priorities would be to continue to develop our relationship with them and endeavor to create a mutually agreeable partnership agreement between the Service and the Tribe. Signs posted on the Refuge itself would also need to be maintained; otherwise no other facilities or infrastructure other than the maintenance paths, moorings, and storage containers exist in association with Nomans Land Island NWR.

Transportation to the Refuge for Refuge staff is primarily supplied by private contractor and occasionally our partners on Martha's Vineyard, and under this alternative we would explore options to keep a Service-owned boat locally, or to see what other options are available to supplement that need.

The section that follows describes in detail the goals, objectives, and strategies that we would implement in Alternative B.

Map 2-1


U.S. FISH & WILDLIFE SERVICE
NATIONAL WILDLIFE REFUGE SYSTEM
Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan
Proposed Interpretive Trail at
the Aquinnah Cultural Center
Aquinnah Cultural Center
Gay Head
Menemsha Pond
Proposed Interpretive Trail
Squibnocket Pond
Nomans Land Island NWR
Sources:
Connecticut River watershed and
Refuge Boundaries from USFWS.
Basemap USGS 1:250,000 DEM's
Bathymetry from MassGIS
0 0.5 1 2 3 Miles
0 0.5 1 2 3 4 5 Kilometers
N
W
E
S

Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.

Objective 1.1. Native Maritime Shrubland Habitat (Breeding Wildlife)

Annually manage approximately 400 acres of maritime shrubland habitat for breeding gray catbirds, eastern towhees, and other species of high conservation concern, including Leach's storm petrel and rare plants. Evaluate the feasibility of introducing New England cottontail within five years, and if determined to be feasible, then begin species introduction within three years of determination.

For gray catbirds, provide dense native deciduous shrubs and vine tangles in shrub-sapling successional stage at least 2.5 meters (approximately 8.2 feet) tall, and providing complex horizontal structure to within 0.5 meters (or approximately 1.5 feet) of the ground surface. Abundant species should include (but are not limited to) those in generas Cornus, Prunus, Rubus, and Vitis. Minimum territory size of at least one acre is required, but nest density increases linearly with shrub density, so larger contiguous habitat blocks are preferable. Achieve approximately 1.0 pair of breeding gray catbirds every 4.0 acres (based on breeding territory size and average breeding density observed in the best shrubland habitat in past years on the Refuge).

For eastern towhees, provide dense native deciduous shrubs and vine tangles in mid to late secondary successional stage at least 2.0 meters (approximately 6.5 feet) tall, and provide well-developed litter layer and preferably dense low cover extending to the leaf litter. Abundant species should include (but are not limited to) those in genera Vitis and Smilax. Minimum territory size can be as large as 5.0 acres, but in high density nesting areas in Massachusetts, as many as 1.5 pairs per acre have been documented. Achieve approximately 1.0 pair of breeding eastern towhees per 3.0 acres (based on breeding territory size and average breeding density observed in the best shrubland habitat in past years on the Refuge).

The percentage of maritime shrubland that meet these specific vegetative characteristics will differ annually, depending on the time lapsed since the last prescribed burn. Given the slow rate of succession on the island which is heavily influenced by persistent winds, we expect a total of at least 70 percent of the upland habitat to fall into one of these two habitat categories.

For New England cottontail, if released, provide dense native shrubs and vine tangles with understory habitat density of 20,000 woody stems per acre which are at least 20 inches tall and less than 3.0 inch diameter. Minimum patch size is 25 acres (but larger is better) and should be in close proximity to other large patches.

Rationale

Though there is some question as to how much of the pre-European settlement landscape was early successional habitat, there does seem to be agreement that coastal southern New England was much more prone and likely to be susceptible to disturbance, by both natural and anthropogenic processes (Cronon 1983, Covell 2006, Motzkin and Foster 2002). The paleoecological record for coastal islands including Nantucket, Martha's Vineyard, Block Island and Long Island indicate that grasslands were uncommon in these areas in the absence of natural disturbances capable of creating and maintaining them (Motzkin and Foster 2002). Unfortunately the paleoecological record is not as clear in distinguishing between shrublands, early forests and mature forests given similarities in species composition across habitat types, and in typing fossil pollen to species. However, there is indication that shrublands were more common in coastal New England, relative to the rest of New England, prior to European settlement based on a combination of paleoecological data and ethno-historical information (Motzkin and Foster 2002).

Nevertheless, it is widely agreed that during the era of farm abandonment in the late 1800's to 1900's, there was a preponderance of shrubland habitat as farm fields went fallow, which caused a boost in shrubland-dependent bird populations in the region. Since then, much of the landscape has reverted back to forests, and the suppression of natural events such as fire, floods, and beaver activity has minimized disturbances, resulting in a decreasing amount of early successional habitat in the Northeast. Many populations of bird species dependent upon this habitat are declining with them. Out of 40 shrubland-dependent bird species, 22 are experiencing population declines (Tefft 2006).

Shrub habitat comprises various shrub species or a diverse mix of young trees that provide an abundance of insect food for breeding birds that need to consume large amounts of protein for reproduction and feeding young. The structural density in this habitat provides cover from predators and shelter from harsh weather. This habitat on the Refuge is one of the primary reasons the island is a regional landbird focus area in BCR 30 (Steinkamp 2008). This designation highlights an area’s importance and relative conservation value across the landscape due to its biological features and habitat characteristics preferred by priority birds.

From BBS data collected on the island since 2001, over 25 species of landbirds have been documented using Refuge habitat. These include song sparrows, common yellowthroats (Geothlypis trichas), and savannah sparrows (Passerculus sandwichensis). Northern harriers (Circus cyaneus;state threatened) are likely nesting on the island as well. Two others, eastern towhees and gray catbirds, use shrub habitat to breed and are both priority species included in regional conservation plans (BCR 30, PIF Area 09).

Species are listed in regional conservation plans if population trends indicate decreasing numbers regionwide, and/or if a large percentage of their total population occurs in the region. The eastern towhee is a species of priority conservation concern due to regional declines, and is a species of greatest conservation need (SGCN) in Massachusetts. BBS data since the mid 1960’s show population declines for the eastern towhee throughout southern New England (-7.1 percent per year, BBS data from 1966-1999; Dettmers and Rosenberg 2000).

The gray catbird, on the other hand, has an increasing population trend of 1.1 percent per year (BBS data from 1990-1998), and is included as a priority species of conservation concern because 6.0 percent of its total population occurs in southern New England (Dettmers and Rosenberg 2000). This is an indication that this region provides an important contribution to the total population of that species and warrants placing it on regional conservation lists, despite its recent population trends.

Overall conservation goals in BCR 30 are to maintain the gray catbird population at the estimated 799,157, and to increase the eastern towhee population estimate by 50 percent, or from approximately 310,000 to 465,000. This would be at a density of 0.4 breeding individuals per acre for the eastern towhee (Steinkamp 2008). According to PIF Area 09 plan, the estimated population for eastern towhees is 85,000 based on BBS data. The overall population objective for the entire PIF Area 09 plan is to maintain a sustainable population size between 85,000 and 100,000 (Dettmers and Rosenberg 2000). Differences in the population estimates for these two conservation plans are due in large part to the differences in land area included in each ecoregion. Both plans use BBS survey data and provide rough approximations of population size. In Massachusetts, the state level population objective recommended by PIF is to increase the population from 93,000 to 130,000 individuals (Rosenberg 2004).

BBS data on Nomans Land Island from 2001 to 2007 collected by Refuge biologists resulted in an average of 1.3 eastern towhees and 0.76 gray catbirds per survey point. Current survey points are spaced at approximately 250 to 450 meters (or 820 to 1476 feet). Under the assumption that most birds are detected at a 75 meter (246 foot) radius, this means that one survey point covers 4.3 acres. Extrapolating point density to the density of birds per acre suggests 1.0 pair of eastern towhees per 3.3 acres and 1.0 pair of gray catbirds per 5.5 acres during this time frame. Though the territory size for each species on the Refuge is not known, we would target a slightly higher density of at least 1.0 pair of eastern towhees per 3.0 acres and 1.0 pair of gray catbirds per 4.5 acres. For the eastern towhee, this target density would come close to that recommended by BCR 30.

It is recommended that 250,000 acres of shrubland habitat be maintained in southern New England to meet the total conservation objectives for many of the shrubland-dependent bird species in PIF Area 09 (Dettmers and Rosenberg 2000). Because of reduced exposure, patch-size requirements for shrub species are much smaller than the minimum size requirements for area-sensitive grassland species. Patches less than 25 acres provide suitable habitat. Minimum patch sizes vary according to habitat quality (vegetation density), landscape and surrounding vegetation (Tefft 2006). According to regional conservation plans, there are more high priority species dependent upon shrubland habitat than grassland habitat (Steinkamp 2008). For these and the historical reasons listed above, we would target the maintenance of shrubland over grasslands on the Refuge.

By actively managing at least 400 acres of shrub habitat on Nomans Land Island under Alternative B, we would be providing protected habitat for many of these species. We would maintain shrub habitat on at least two habitat patches by implementing prescribed burns on a rotational basis so that each patch is burned every 7 to 12 years, or as habitat conditions warrant to benefit breeding birds of conservation priority. Burns would occur during the dormant season (fall/spring) to minimize impacts to both breeding birds and invertebrates on the Refuge. Both the eastern towhee and gray catbird are common breeders in the upland shrub habitat on Nomans Land Island and through monitoring their breeding densities over time they would also act as one indicator of habitat quality.

Dr. Thomas G. Barnes/USFWS

Gray catbird

Refuge upland habitats also supported breeding Leach's storm petrels as recently as 2002, (S. Koch personal communication). The Leach's storm petrel (state endangered) is at the southernmost extent of its range and very rare in Massachusetts. As such, they are listed as SGCN in the Massachusetts CWCS (MA DFG 2006). There are only two known offshore breeding sites in the state: Penikese Island and Nomans Land Island (MA DFG 2006). Management actions under this alternative would take the possible presence of this species into consideration and would seek to minimize any adverse impacts. Furthermore, when possible we would incorporate habitat improvements, such as vegetation clearing, to improve their breeding habitat on the Refuge.

Under this alternative, we would also explore the option of releasing New England cottontail, a candidate species under consideration for federal listing under the ESA due to population declines, on the Refuge. This species is particularly suited to shrubland habitats and is geographically restricted to the northeast. New England cottontails were known to historically occur on Nantucket and Martha's Vineyard, but with the introduction of eastern cottontails in the late-1800s and early 1900s, along with other factors, are now considered extirpated from the island. It is possible there was a historic, native population of New England cottontails on the Refuge, given the prevalence of this species on neighboring coastal islands and the historical connectivity between them and Cape Cod. Archaeological evidence from Native American middens may substantiate this, but New England cottontails were likely extirpated once sheep were introduced to the island (A. Tur, personal communication).

Current populations of New England cottontails on Cape Cod are genetically distinct from other known populations and as such should be managed as a distinct unit. These populations exist in an area with tremendous anthropogenic influences, competition from non-native eastern cottontails, mammalian predation, and loss of habitat from succession. Releasing New England cottontails to Nomans Land Island NWR would provide habitat that is free from these disturbances. While densities of New England cottontails in coastal scrub communities have not been assessed, densities of one to two cottontails per acre (target densities for the Region are 1.5 cottontail per acre) is a reasonable estimate (A. Tur, personal communication). Given this, the island could support a mid-winter population of 600 rabbits, which would meet one the conservation goals for New England cottontails (Tur undated).

In the last several years, efforts throughout New England have been made to locate remnant New England cottontail populations, and to fill in knowledge gaps about their home ranges, habitat requirements, genetic diversity and population dynamics. Despite these efforts, there is still much that remains unknown about the ecology of the species that would help us better determine the suitability of Nomans Land Island NWR as a host site. This includes confirming the likelihood of their past presence on Nomans Land Island, evaluating similar introductions on coastal islands, evaluating the genetic viability of a population on the Refuge, the feasibility of New England cottontail management on the Refuge, and assessing the impact of such an introduction on other rare or sensitive species located on the Refuge. Prior to any introduction on the Refuge, these and other information gaps need to be filled in order to determine the feasibility of such an introduction. Coordination has already begun with state and federal experts to make the New England cottontail a regional priority, and Nomans Land Island NWR has been identified as a site with high potential for the reasons previously listed. Because this is a time-sensitive issue given the rate of habitat loss, a determination would need to be made as soon as possible, but not before all available information has been compiled to ensure a well-informed decision. The Service would make every effort under this alternative to compile the needed information to make a determination within five years, and if releasing New England cottontail on the Refuge is determined to be feasible, then we would release New England cottontails on the Refuge within three years following the determination.

The addition of a part-time Refuge biologist would enable greater emphasis to be placed on investigating and managing Refuge biota for targeted species of conservation concern, including rare plants, and would make many of these projects possible. It is also important to note that, although our objective statements focus on birds of priority conservation concern identified in regional and state plans, we are also striving through our management to “keep common birds common.”

Strategies

Continue to:

- Implement a biologically-based prescribed fire regime every 7 to 12 years, or as habitat conditions warrant, during the dormant season to maintain native shrub communities to benefit nesting gray catbirds and eastern towhees, and possibly New England cottontails. Through the use of fire breaks when and where possible, delineate at least two habitat patches and burn on a rotational basis so that each patch is burned every 7 to 12 years.

Within five years of CCP approval:

- Explore the possibility of introducing New England cottontail on the Refuge, taking into account biological and ecological considerations as well as overall feasibility, in one to five years through researching the following factors:

    - Compile information on similar introductions

- Research/verify Nomans Land Island biogeography
- Obtain detailed information about vegetative structure on the Refuge
- Identify the specific habitat requirements for New England cottontail
- Evaluate the genetic viability of an isolated New England cottontail population on the island
- Identify Refuge management prescriptions and feasibility required to maintain a New England cottontail population
- Evaluate impacts of New England cottontail introduction on other rare or sensitive Refuge species

- Initiate a concerted effort to control non-native invasive species through chemical, biological, and mechanical means island-wide within one to five years.
- Work with the U.S. Navy to identify areas where additional trails can be established to support monitoring and management actions.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Measure relative abundance of gray catbirds and eastern towhees, by conducting annual surveys during the breeding season for the first three to five years and then once every three years thereafter throughout the life of the CCP. To survey upland breeding habitat more thoroughly and thereby improve abundance estimates, increase breeding bird survey routes on the Refuge in one to two years by establishing new upland access routes in collaboration with the Navy if possible.
- ➢ Determine total shrubland acres providing habitat for gray catbird and eastern towhee through vegetation monitoring, and complete an updated habitat map for the Refuge within three years.
- ➢ Conduct inventories for rare plants every 5 to 10 years as time and weather conditions allow to document presence, and evaluate habitat management needs for rare plants when found.
- ➢ Conduct surveys for Leach's storm petrels to determine presence and relative abundance, evaluate habitat use , and identify potential areas for habitat protection or enhancement projects every 5 to 10 years.
- ➢ To evaluate the effectiveness of prescribed burning on shrubland habitats conduct post-burn surveys (within one month of burn) to document the area burned and relative intensity of the burn. Measure species composition, vertical and horizontal structure, and berry production to evaluate if burning is producing desired habitat results in years one, three, and seven after a burn.
- ➢ To maintain desired quality and characteristics of shrublands, annually conduct scouting for invasive plant species. We will afford zero tolerance to species that are highly invasive and stand-replacing. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than 10 percent, and fundamental objectives are not compromised. Mechanical, chemical or biological control measures will be

implemented as needed and when feasible, and control techniques will be monitored for effectiveness.

- If introduced, annually monitor Refuge population status of New England cottontail through some combination of live-trapping and/or pellet surveys. Vegetation monitoring to evaluate habitat suitability for this species would likely include stem counts, percent cover, and possibly species composition. Potential impacts on sensitive Refuge resources identified as a result of the introduction assessment would also be monitored and documented.

Objective 1.2. Native Maritime Shrubland Habitat (Migrating Wildlife)

Annually manage approximately 400 acres of maritimeshrubland stop-over habitat for migrating landbirds, raptors (such as state endangered peregrine falcons), and butterflies (including monarchs (Danaus plexippus)).

Rationale

Much of why shrublands are so important in southern New England is described in Alternative B, Objective 1.1. In addition to its value to breeding birds, shrubland habitat is important because many other birds rely on it at various times during the year. Our responsibility for providing quality shrubland bird habitat is not limited to the breeding season. Many shrub species bear fruit in the fall, which helps boost the fat reserves for migrating or over-wintering birds. The Refuge acquisition boundary lies in an important migratory bird pathway along the Atlantic flyway. The Refuge provides an important stop-over site for many migrating bird species, including raptors. In particular, for peregrine falcons, state listed as endangered, the Refuge is the most important stopover site in Massachusetts (T. French, personal communication; see Chapter 3). Other raptor species that have been documented during migration include bald eagle (Haliaeetus leucocephalus), Cooper's hawk(Accipiter cooperii), northern harrier, sharp-shinned hawk (Accipiter striatus), American kestrel (Falco sparverius) and merlin (Falco columbarius).

We would continue to work with the Massachusetts Audubon Society to monitor and band raptors when possible under this alternative. Furthermore, we would seek a standardized migration monitoring protocol to begin to monitor trends of raptors and other landbirds utilizing Refuge upland habitats.

Erin Victory/TCI

Chokeberry

Coastal states have the primary responsibility for most of the native shrubland habitat in the region (Dettmers 2003, Litvaitis 2003). Shrub-dominated communities persist the longest at high elevations and in areas exposed to marine salt spray (Latham 2003). The loss and degradation of naturally maintained shrublands has been extensive throughout the region. Although fragmented by roads and development, coastal Massachusetts, including Nomans Land Island supports persistent maritime shrublands.

Shrubland-associated birds consistently rank near the top of lists of species showing population declines. Vegetation structure, microhabitat conditions, and landscape context are the most important habitat features for these birds, rather than specific plant species (Dettmers 2003).

The Refuge's maritime shrubland is important to migrating landbirds. The use of an area as a migratory stopover depends, in part, on its quality (e.g., presence of fruiting shrubs) and its location in relation to ecological barriers (such as large bodies of water). Coastal habitats support large concentrations of migrating songbirds, particularly young of the year.

Many landbirds shift from a largely insectivorous diet during the breeding season to a diet high in fruits during migration, hence the importance of Nomans Land Island NWR's maritime shrub with its high concentration of fruit-bearing species. This diet shift is particularly well documented in thrushes, vireos, warblers, mockingbirds and their relatives (Parrish 2000). Parrish (2000) captured red-eyed vireos (Vireo olivaceus), a highly frugivorous migrant, over ten times more frequently in coastal maritime scrub than in old orchard habitat on Block Island. Observations of migratory landbirds feeding on fruits show that these birds can spend less time and encounter more "prey" while foraging on fruit, an important implication for a bird's energy budget (Parrish 2000).

Under this alternative, we would also emphasize monitoring pollinators using the Refuge, particularly monarchs during migration, as many of these species are of conservation concern due to losses in the habitat and nectar corridors that facilitate migration. Pollinators play a crucial role in flowering plant reproduction. A recent study of the status of pollinators in North America by the National Academy of Sciences (NAS) found that populations of some native pollinators are declining, which may in part result from habitat loss, degradation, fragmentation, nontarget effects of pesticides, competition from invasive species, and introduced diseases (NAS 2007). Flower-visiting Lepidoptera, many of which are actual or potential pollinators, currently dominate the list of endangered species: 17 species of butterfly and 3 species of moth constitute more than half of all insect species listed as endangered (http://ecos.fws.gov/servlet/TESSWebpage). Eastern population trends of monarch butterflies over the last 10 years for breeding, migration, and wintering phases, while highly variable, reported relative abundance values below average from 2002 to 2006 (North American Monarch Conservation Plan [NAMCP 2008]). However, large fluctuations in yearly populations of monarch butterflies make it difficult to detect long-term trends for short time intervals, indicating a continued need for annual survey data (NAMCP 2008).

Strategies

Continue to:

- Implement a biologically-based prescribed fire regime every 7 to 12 years, or as habitat conditions warrant, during the dormant season to maintain native shrub communities to benefit migrating landbirds, pollinator species, and migrating raptors. Through the use of fire breaks when and where possible, delineate at least two habitat patches and burn on a rotational basis so that each patch is burned every 7 to 12 years.

Within five years of CCP approval:

- Initiate a concerted effort to control non-native invasive species through chemical, biological, and mechanical means island-wide within one to five years.

- Work with the U.S. Navy to identify areas where additional trails can be established to support monitoring and management actions.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To evaluate benefits for migrating landbirds and raptors, conduct surveys during peak migration to measure relative abundance and diversity every two to three years throughout the life of the CCP.

- ➢ To evaluate benefits for pollinator species, conduct surveys every 5 to 10 years to determine species presence and abundance, diversity, phenology and host plant preferences.

- To evaluate the effectiveness of prescribed burning on shrubland habitats conduct post-burn surveys (within one month of burn) to document the area burned and relative intensity of the burn. Measure species composition, vertical and horizontal structure, and berry production to evaluate if burning is producing desired habitat results every one to five years.

- Complete updated habitat map for the Refuge within three years.

- Conduct inventories for rare plants every 5 to 10 years as time and weather conditions allow to document presence, and evaluate habitat management needs for rare plants when found.

- To maintain desired quality and characteristics of shrubland habitat, periodically conduct scouting for non-native plant species. We will afford zero tolerance to species that are highly invasive and stand-replacing. Occurrences of non-native plant species may be tolerated as long as their cumulative coverage is no more than 10 percent and fundamental objectives are not compromised.

Objective 1.3. Vegetated Dune Habitat

Annually manage approximately 15 acres of vegetated dune habitat to benefit rare plants and beach-nesting birds, including piping plovers, terns and American oystercatcher. Provide a mix of open sandy habitat and herbaceous vegetation including (but not limited to) American beach grass (Amophilla species), beach pea (Lathyrus japonicus), and goldenrod (Solidago species) to provide habitat for nesting terns (including common and roseate terns). Ratio of open sandy areas to vegetated areas will vary throughout the 15 acres but will provide a mix of 30 percent open (preferred by roseate terns) to 70 percent open (preferred by common terns). In years when piping plovers nest, maintain an average productivity of 1.5 chicks per pair according to state and federal guidelines. In years when terns nest, maintain an average productivity of 1.0 chick per nest. Minimize the presence of nesting great black-backed and herring gulls on at least 5.0 acres of the best suitable nesting habitat for terns. This management will also benefit nesting American oystercatchers, for which there is a target productivity of 0.35 chicks per pair (the minimum necessary for maintaining the population).

Rationale

Coastal beach and dune habitat continues to be some of the most threatened habitats in the U.S. They are naturally unstable, dynamic ecosystems that are subject to erosion and accretion processes due to wind and wave action (MA DFG 2006). Many species rely upon these variable processes to provide continual habitat and food resources. These primarily include nesting and migrating bird species, mammals such as seals and voles, and a host of invertebrates. The interruption of these natural processes, through development or beach stabilization efforts, and increases in recreational use can reduce available habitat for species of conservation concern (USFWS 1996).

According to the Coastal Barriers Task Force (1992), factors including population growth in coastal areas, and increases in affluence, leisure time, motorized vehicles, accessibility and recreational diversity have lead to a greater intensity in human use, development and modification of coastal resources since World War II. These uses are the greatest threats to coastal habitats because of the subsequent alterations that result (MA DFG 2006). Though these threats do not apply directly to Nomans Land Island, they do highlight the need to conserve what intact dune and beach habitats exist along the Atlantic coast. Therefore, the Service has the opportunity and responsibility to protect and maintain these important coastal dynamics to maintain coastal dunes and shoreline processes that provide habitat for declining wildlife species.

The Service has the responsibility for protecting migratory birds under international migratory bird treaties with Mexico and Canada. Providing habitats for declining coastal beach and dune-dependent species on this Refuge will counter habitat loss elsewhere along the Atlantic coastal plain region. We also consider the needs of birds of conservation concern on a sub-regional or statewide scale, such as colonial waterbirds and shorebirds, as identified in the MA CWCS and BCR 30 Plan, and for which the Refuge appears to be able to contribute towards conservation goals.

Birds that are dependent upon coastal beach and island habitats (i.e., terns and plovers) are some of the fastest declining bird groups because of habitat loss and degradation of these key waterfront areas. Hence, several national bird conservation organizations and federal and state agencies advocate management to benefit beach nesting birds in such plans as the PIF Area 09 Plan, the BCR 30 plan, and the MA CWCS. In fact, in these plans, coastal habitats contain the most species ranked as highest or high priority species of conservation concern in the region (Steinkamp 2008). Arctic, common, and roseate terns are listed in these plans as priority species of conservation concern, are state listed, and roseate terns are federal listed as endangered. Tern populations, once considered to be vast along the coasts of northeastern United States and eastern Canada, are now crowded onto a few nesting places (Kress and Hall 2004).

Nomans Land Island has historically supported breeding colonies of arctic, common and roseate terns. Their breeding populations on the Refuge reached peak levels in the early 1970's, at 35 (arctic tern), 1200 (common tern) and 400 (roseate tern) pairs respectively, but began to dramatically decline by the mid to late 1970's.

Phylis Cooper/USFWS

Common tern with fish

Today, of these three species, only the common tern continues to use Nomans Land Island NWR to breed, and with recent counts of 2 to 20 nests (2005 to 2008, see Chapter 3), they are in far lower numbers than in previous years. In 2001, statewide population estimates were 1,697 for roseate tern, 14,378 for common tern and 3,420 for least tern (MA DFG 2006). The decline in use by tern species on the Refuge has coincided with the appearance of breeding gulls on the island, and these gull numbers have grown over time. It is well documented that gulls are nest predators of tern and other coastal bird species, and also compete with terns and other species for nesting habitat (O'Connell and Beck 2003, Donehower et al. 2007).

Kress and Hall (2004) found that islands not meeting some or all of the following criteria are usually unsuitable for terns: 1) islands tend to be gull free; 2) have no (or few) predators; 3) are near an abundant supply of available food; and, 4) have suitable nesting habitat (vegetation and substrate) for one or more species of nesting terns. The appearance of nesting gulls (herring, great black-backed, and laughing) often makes an island or a portion of an island unsuitable for terns. The large gulls nest earlier, displacing terns from potentially high quality nesting sites to alternative sites. The threat of predation or presence of predators (i.e., gulls) on an island may also prevent terns from occupying that site (Kress and Hall 2004).

In recent years, gull numbers along the coast have been decreasing, and we are unsure if the number of nesting gulls in the limited sandy dune habitats has increased, decreased, or stayed stable on the Refuge. Over the last decade, less frequent fires than in the 1980's have allowed Refuge upland habitats to transition into a shrubby vegetative complex, and this may be causing more gulls to seek suitable nesting habitat along Refuge beaches.

During the 2008 tern breeding season on Monomoy National Wildlife Refuge, located off the coast of Chatham, Massachusetts, common tern and least tern colonies on South Monomoy Island were subject to disturbance and depredation from predators including gulls (Iaquinto et al. 2008). Predator control measures were implemented throughout the breeding season to improve hatching and fledging success of tern clutches. On Nomans Land Island NWR, the presence of gulls was likely a contributing factor to the decline in tern abundance. A permit for removal of nesting gulls was secured for use in 2009, but no control actions took place.

According to MANEM (2007), population objectives for roseate tern include increasing the total Mid-Atlantic/New England/Maritimes population to 6,200 to 7,600 breeders, and recommend 1.2 chicks per year per pair for sustainability. Population goals for the common tern are to increase the overall population, though a target number is not specified, and a sustainable productivity of 0.8 to 0.9 chicks per year per pair is suggested. For the least tern, it is recommended that the population be restored, or increased, to 13,600 to 16,600 breeders, and a productivity of 0.6 fledglings per year per breeding adult.

Other shorebirds periodically use the island's beach habitat for nesting. Over the last several decades, there have been occasional confirmed or suspected nesting occurrences by piping plover, spotted sandpiper (Actitus macularius) and killdeer (Charadrius vociferous) on Refuge beaches. The piping plover, federal listed as threatened, was last documented in 1980 on the Refuge. The U.S. Shorebird Conservation Plan (Brown et al. 2001) estimates the Atlantic population of piping plover to be at approximately 2,600, with a tentative population objective of 4,000. The regional estimate for PIF Area 09 is 2,300 (Dettmers and Rosenberg 2000).

Historically, the American oystercatcher was believed to have been extirpated from Massachusetts but began recolonizing the state in the 1960's. It is listed in the U.S. Shorebird Conservation Plan, is SGCN in Massachusetts and is a species of highest priority conservation concern in both PIF Area 09 and BCR 30. The U.S. Shorebird Conservation Plan (Brown et al. 2001) estimates the total range-wide population for American oystercatcher to be approximately 7,500, making it very vulnerable to external factors. While more data is needed to better determine American oystercatcher population trends, regional preliminary population estimates are around 2,649 (Steinkamp 2008). In 2004, there were 189 pairs recorded at 58 sites in Massachusetts, with the largest numbers on Nantucket, Martha's Vineyard, Monomoy National Wildlife Refuge, and Boston Harbor Island (MA DFG 2006). No population objective was provided for this species.

Clearly the Refuge beach and dune ecosystem provides vital habitat for regional and local species of conservation concern amidst a declining trend in this habitat availability throughout the Atlantic Coast. As such, it affords us the opportunity to work with other partners in the region through the North Atlantic LCC (see Chapter 3) to coordinate efforts and share science to most effectively manage coastal habitats for these species.

The increase in staffing under this alternative for biological programs would expand our monitoring and management capabilities in this habitat. We would monitor nest success and productivity of tern colonies, and emphasize roseate tern recovery plan protocols where possible. A priority management objective would be to maintain beach and dune habitat availability for beach nesting birds by preventing succession. Different methods of vegetation removal identified in the Tern Management Handbook (Kress and Hall 2004) include: mowing (where practical), hand pulling vegetation, herbicide treatments, prescribed burning, use of landscape fabrics, burying vegetation under sandy soil, and grazing. We would also work with our partners to monitor rare plants and to treat invasive species where possible.

Strategies

Continue to:

- Annually select the optimal five acres for nesting terns, and evaluate predator control actions when warranted.

- Control invasive species through most effective means as necessary, be it chemical, biological, and/or mechanical and map new infestations on an annual basis.

- Work with partners to accomplish objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To determine number of nesting pairs of common and roseate terns, conduct annual surveys during the breeding season throughout the life of the CCP. Estimate productivity for any breeding roseate terns, but only measure productivity for common terns if numbers exceed 50 pairs. If after five years less than 50 common tern pairs are found to use the Refuge for nesting, evaluate the appropriateness of actively attracting nesting terns and implement actions to rebuild the tern colony, or abandon efforts.

- ➢ To evaluate quality of vegetated dunes for nesting terns, conduct periodic vegetation surveys for vegetation cover, height, species composition, and vegetation to bare ground ratio. If tern numbers or productivity falls, and estimates of the vegetation measurements are suggestive as being the cause, then this would be a trigger point for evaluating the management regime of the vegetated dunes.

- ➢ To determine number of nesting pairs and estimate productivity of American oystercatchers, conduct annual surveys during the breeding season and monitor reproductive success throughout the life of the CCP, and band American oystercatcher chicks when possible. Continue to census and monitor American oystercatchers that nest along the cobble shoreline.

- ➢ To determine presence of piping plover, annually monitor dunes for suitable piping plover nesting sites and if found, monitor for nesting pairs.

- ➢ To maintain suitable nesting habitat for terns, annually monitor for nesting gulls located near the identified optimal five acre tern nesting area on staff visits during May and June and remove gull nests as needed.

- ➢ Complete updated Refuge habitat map within three years.

- ➢ To maintain desired quality and characteristics of vegetated dune habitat, annually conduct scouting for invasive species. We will afford zero tolerance to highly invasive or stand-replacing species. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than five percent of the vegetation dune habitat type, and fundamental objectives are not compromised. Control techniques will be monitored for effectiveness.

Objective 1.4. Marine Intertidal Beach and Rocky Shore

Annually minimally manage approximately 100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants), migrating shorebirds (e.g., semipalmated sandpiper, short-billed dowitcher and lesser yellowlegs), and marine mammals (seals).

Rationale

See Objective 1.3 for information about the importance of beach and dune habitat for wildlife species.

The intertidal beach and rocky shores of Nomans Land Island NWR provide important nesting and foraging habitat for many priority species of conservation concern, and are regionally important because of the island's land protection status. Throughout the Atlantic coast, quality beach habitat is imperiled due to increases in human uses and development (see the rationale for Alternative B, Objective 1.3). Even those coastal areas that are protected from human disturbance still pose a threat to nesting birds due to the increases in predators that are associated with increased human disturbance. For example, nest predators that occur regionally but that are not native to BCR 30 include red fox (Vulpes vulpes), coyote (Canis latrans), Norway rat (Rattus norvegicus) and Virginia opossum (Didelphis virginiana). Other predators that have experienced rapid population increases include Northern raccoon (Procyon lotor), gulls (Larus species), and crows (Corvus species) (Steinkamp 2008). Because Nomans Land Island has been closed to the public for the last sixty or so years and there are no records of mammalian mesopredators on the island, gulls are the only known taxa that adversely impact beach nesting species of priority conservation concern on the island. This is a unique occurrence in an area as heavily populated as southern New England, and highlights the responsibility of the Service to protect and maintain sensitive coastal habitat.

As a part of the Atlantic Flyway, Nomans Land Island NWR serves as an important stop-over site for many migrating birds (Clark and Niles 2000). Species including semipalmated sandpipers rely heavily upon coastal habitats throughout the northern Atlantic as they travel between winter habitat in South America and breeding habitat in the arctic (Steinkamp 2008). The wrack line hosts a number of invertebrates that are food resources for shorebirds. During the breeding season, species including double-crested cormorants nest along these beach strands. American oystercatcher, though typically associated with vegetated dune nesting habitat, are also found nesting along the cobble shoreline. Monitoring and management for oystercatchers would follow that described in Objective 1.3.

Since 1989, double-crested cormorants have nested on the Refuge. Using the highest estimates from available data, counts from 2001 through 2006 show an average of 571 double-crested cormorant nests per year on the Refuge (see Chapter 3). Once extirpated from the region, double-crested cormorants returned to Massachusetts to breed around 1937 (Wires and Cuthbert 2006) and despite some setbacks (population declines due to the effects of dichlorodiphenyltrichloroethane, or DDT), they have been slowly increasing in numbers since. Cormorants are opportunistic piscivores that feed on a diversity of prey, tending towards those species that are most abundant and most easily captured (Trapp et al. 1997). Concomitant with this increase in double-crested cormorant numbers throughout their range over the last several decades is an increasing concern over the perceived impact this species has on aquaculture and fisheries.

In 2003, the Service, in cooperation with the U.S. Department of Agriculture (USDA), released an EIS for double-crested cormorant management on aquaculture facilities and public lands and waters in certain states that allow for the take of this species under particular circumstances, and by permit (USFWS 2003b). This EIS, however, was considered largely for the Great Lakes and other freshwater systems. Based on available literature, Trapp et al. (1997) concluded that relative to other biotic and abiotic factors, double-crested cormorants have a minor overall impact on sport fisheries, with some localized exceptions. To determine the predatory impact a cormorant population exerts on a fishery, fish mortality from cormorant predation must be compared with total annual fish mortality and other sources of mortality, including angling or commercial fishing (VanDeValk et al. 2002). This requires estimating cormorant diet composition and population size, fish population size and mortality, and sport/commercial catch. Without this information cormorant impacts on fisheries cannot be fully addressed (Diana et al. 2006). Consensus by professionals in the Northeast is that currently not enough evidence exists to verify the concerns regarding losses to fisheries due to cormorant depredation in this region. In addition, cormorants are not impacting Refuge resources, and therefore the Refuge would not initiate research.

MANEM (2007) population goals for double-crested cormorants are to maintain the population at 155,767 to 190,381 breeders, and achieve a productivity of 2.6 young per nest per year for sustainability. In recognition of the perceived conflicts this species has with other species, MANEM also recommends that monitoring be initiated to assess the nature of these conflicts on a case-by-case basis in order to determine specific management needs. We would continue to inventory nesting double-crested cormorants every three years.


Stephanie Koch/USFWS

Double-crested cormorant nesting colony

The intertidal beaches and rocky shores of the Refuge provide habitat for other species throughout the year as well. Harbor and gray seals are frequently found on the Refuge beaches in the fall and winter, and a leatherback turtle (Dermochelys coriacea) scapula was found on the gravel spit in 1989. The shoreline also provides us with important information about species we normally don't have the occasion to monitor or see. The remains of dolphins and seabirds have been found on several occasions along the shoreline, and particularly with seabirds, give us an indication of mortality events that may be widespread. Under Alternative B, Refuge staff would take a more active role in monitoring beached birds, and seal use of the beach. We would report sightings when possible to SEANet, a regional program to systematically monitor beached birds and track spatial and temporal trends.

Midwinter waterfowl surveys indicate large numbers of focal waterfowl species using the waters around Martha's Vineyard that include American black ducks, Atlantic brant (Branta bernicla) , Canada goose (Branta canadensis), scoter species (Melanitta species), bufflehead (Bucephala albeola), long-tailed duck (Clangula hyemalis), common eider (Somateria mollissima), scaup species (Aytha species), mallard, and merganser (Mergus and Lophodytes) species. Though this is off the Refuge and outside of USFWS jurisdiction, many can be seen in near-shore waters, and some may use Refuge beaches.

Based on the results of SLAMM analysis, we know that this habitat is subject to loss under sea level rise scenarios over the next century. Given that these are long-term scenarios, immediate action is not warranted; therefore within the context of this CCP over the next fifteen years, we would continue to reduce non-climate environmental stressors as described in Alternative A. In addition, under Alternative B, we would monitor and evaluate shoreline conditions relative to climate change and sea level rise using aerial photos, cooperate with the state on their climate change priorities once refined, and utilize the North Atlantic LCC to facilitate climate change research, education, and collaboration. Under this alternative, we would also coordinate with the Tribe and other partners to treat for invasive species, to establish a shipwreck notification protocol, and to monitor migrating shorebird species.

Strategies

Continue to:

- Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events.

Within five years of CCP approval:

- Work with partners to control invasive species (e.g., sea cucumbers, algae) within one to five years.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Conduct surveys of double-crested cormorant nesting colony to determine number of nesting pairs every three years throughout the life of the CCP.

- ➢ Conduct migratory shorebird surveys (and submit to International Shorebird Survey (ISS)) when possible to monitor overall diversity and relative seasonal abundance. Monitor the intertidal zone and shoreline erosion rate through aerial photos of critical habitats for nesting and migrating shorebirds to evaluate the potential for abatement. Review SLAMM analysis and monitor for any changes in Refuge shoreline as a result of sea level rise or other factors associated with climate change.

- ➢ To maintain desired quality and characteristics of intertidal beaches and rocky shores, conduct scouting for invasive species within one to five years of CCP completion. We will afford zero tolerance to highly invasive or stand-replacing species. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than five percent of the intertidal beach/rocky shore habitat type, and fundamental objectives are not compromised. Control techniques will be monitored for effectiveness.

- ➢ Annually monitor for seabird die-off events in coordination with SEANet as opportunity allows, and record seal use of the Refuge shoreline and report entanglements to the New England Aquarium.

- ➢ Complete updated Refuge habitat map within three years.

Objective 1.5. Scrub Shrub and Emergent Wetlands, Bogs, and Open Water

Annually manage approximately 100 to 150 acres of freshwater wetland communities to support breeding marshbirds (including Virginia rail), native plant communities, and to benefit rare wetland plants including Arethusa bulbosa. Maintain robust emergent vegetation including cattails (Typha) and bulrush (Scirpus) (Conway 1995).

Rationale

Despite regulations and other protective measures, wetlands continue to be lost each year throughout the U.S. Though this rate has slowed over the last several decades, it is estimated that the current rate of loss is between 70,000 to 110,000 acres per year. Massachusetts, with twelve percent of its land area in wetlands, was one of the first states to adopt laws to protect wetlands in the 1960's (http://www.fws.gov/northeast/wetlands/pages/primer.htm).

Threats to wetlands in general include filling and dredging, impounding, nutrient inputs from roads, fields or septic systems, and invasive species (MA DFG 2006). Yet, their utility as intact ecosystems far outweighs any perceived value of alteration. They act as buffers to flood waters by storing the excess water and slowly releasing it over the floodplain; they filter out sediments and chemicals for downstream waters, and they slow the effects of shoreline erosion (U.S. Environmental Protection Agency (USEPA) 1995). Their value to wildlife is inestimable. Over a third of the threatened and endangered species in the U.S. rely solely on wetland habitat and nearly all 190 species of amphibians are dependent upon these habitats (USEPA 1995, http://www.fws.gov/northeast/wetlands/pages/primer.htm). Eighty percent of America's breeding population and more than 50 percent of its 800 species of protected migratory birds rely on wetlands (Mitsch and Gosselink 1993, citing Wharton, et al. 1982). Species from many taxonomic groups use wetlands for cover, food, drinking water and for breeding, migrating and winter habitat.

Refuge wetlands include ponds, permanently flooded marshes and seasonally flooded marshes. They support a small black-crowned night-heron and, historically, a snowy egret (Egretta thula) rookery, both SGCN in Massachusetts, as well as American black duck, a focal species of highest priority conservation concern in regional plans including BCR 30 and PIF Area 09. Though no comprehensive surveys have been done of these wetland habitats beyond secretive marshbird surveys, they do support muskrat, which are experiencing unexplained regional population declines (CT DEP 2008, VT FWD 2006), and spotted turtle.

Based upon these secretive marshbird surveys, Virginia rails are common breeders on the Refuge. Though they generally inhabit and nest in water depths of < 30 cm (though nest sites can range from 0 to 71 cm; Conway 1995), preliminary observations on the Refuge indicate that they use upland habitat which is not typical for the species. This may be explained by the absence of mammalian predators on the island, however, further research is required to determine the ecology of the species on the Refuge. Though MANEM (2007) does not provide a target population goal for Virginia rail, it does recommend continuing to monitor the species, achieving a productivity of 4.4 chicks per brood per two years, and a density of 25 pairs per hectare (about 2.0 acres) for sustainability. Due to the limited access around the wetlands on the Refuge, there is insufficient data at present to determine current abundance for this species. We would endeavor to work with the Navy to provide additional access for more complete survey coverage, if possible.

Refuge wetlands are the least well-known habitat type on the Refuge. Very little, if any, UXO clearance has been conducted in any of the ponds, precluding any attempt to inventory fish and invertebrate species. In addition, access restrictions around the island due to the presence of UXO limit our abilities to traverse wetland areas. In Alternative B, we would discuss options with the Navy to provide additional access around the island so we would be better able to inventory and manage Refuge biota associated with wetlands. We would continue to treat wetland invasive species and would work with our partners to monitor rare wetland plants.

Strategies

Continue to:

- Control purple loosestrife at the brackish pond and reinitiate control of Phragmites and other invasive aquatic plant species on an annual basis, as well as map new infestations.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- Continue to conduct callback surveys for secretive nesting marshbirds to monitor relative abundance and evaluate habitat use patterns. If possible, collaborate with the Navy to establish additional access through upland and wetland habitat. If new access routes are established, create new marshbird survey routes within one to three years and survey annually for the first three to five years on the new routes, and once every three to five years thereafter to monitor abundance.

- Conduct wetland plant surveys to identify rare species within one to five years of CCP completion.
- Complete updated Refuge habitat map within three years.
- Monitor and treat invasive plants, particularly Phragmites and purple loosestrife, to prevent unacceptable levels of loss of habitat quality. If the patch sizes of Phragmites attain a solid stand (regardless of size) that reasonably can be sprayed, or it threatens a rare community, initiate appropriate control measures to decrease Phragmites to a tolerable level. We may leave untreated any patches that are static or inaccessible by any currently available means until we determine a feasible solution or efficacious method. Control techniques will be monitored for effectiveness.

Goal 2. Promote awareness and stewardship of our coastal natural resources by working with our partners to provide off-site interpretation, education and outreach opportunities.

Objective 2.1. Environmental Education and Interpretation

Over the next 15 years develop and implement quality environmental education and interpretation programs and activities with the Tribe and our partners to further communicate our knowledge and understanding of Nomans Land Island coastal ecosystems and the federal trust resources that depend upon them. In the next five years, work with the Tribe on creating a display for their interactive kiosk, and with the Aquinnah Cultural Center on an interpretive trail and spotting scope to view Nomans Land Island NWR.

Rationale

Environmental education is a curriculum-based process designed to develop a citizenry that has the awareness, concern, knowledge, attitudes, skills, motivations, and commitment to work toward solutions of current environmental problems and the prevention of new ones. The National Association of Interpreters defines “interpretation” as a communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource. Both are included in the six wildlife-dependent public use priorities within the Refuge System, according to the Refuge Improvement Act of 1997.

Per the General Guidelines for Wildlife-Dependent Recreation, Fish and Wildlife Service Manual, 605FW 1, we will provide a quality off-site wildlife-dependent recreation program to the extent possible, given staffing and funding limitations and the ban on public access on the Refuge. The characteristics of a quality program are listed in this chapter in the “Actions Common to All Alternatives” section.

As we have described, the presence of UXO throughout the Refuge and the terms of the original transfer agreement with the U.S. Navy present a unique case where we cannot allow any of the six priority uses on the Refuge itself, including environmental education and interpretation. Any environmental education or interpretation programs for Nomans Land Island NWR would take place off-site on Martha’s Vineyard.

The addition of visitor services staff under this alternative would allow us to provide off-site environmental education and interpretation programs by alternative methods for the public to experience Nomans Land Island. We would coordinate with the Aquinnah Cultural Center to establish a Refuge kiosk, walking trail with informational signs and a spotting scope at their facility to enable people to see and learn about Nomans Land Island NWR. We would also work with the Tribe to explore opportunities for interpretive displays that highlight the importance of coastal resources to them, and to develop educational programs that focus on the importance of Refuge resources.

We would work with our other conservation partners, Massachusetts Audubon Society, TTOR, the Tribe, and the Town of Chilmark to create opportunities for interpretive and environmental education programs and displays. We would also prioritize communicating with and educating people about the management actions we pursue, why, when, how long it will take and be explicit about the potential impacts. At a minimum, this information would be available on the Refuge website.

Strategies

Continue to:

- Review and update the website annually. Evaluate possible updates for the virtual tour that include:
  - The use of professional photographers/videographers to capture bird use of the island, Service monitoring activities, and “before and after” invasive plant treatments and prescribed burns.
  - Filming a visit to Nomans with Wampanoag Tribe members interpreting natural and cultural resources significant to them.
  - Developing an audio or video broadcast from the Refuge during fall migration, while breeding bird surveys are being conducted, and/or at sunset in late summer or fall, provided it is feasible. This could be broadcast to the Aquinnah Cultural Center, kiosk, and/or other locations in Chilmark, including local access television.

Within five years of CCP approval:

- Create a general brochure and rack card for the Refuge within two years to be distributed at appropriate sites on Martha’s Vineyard.
- Partner with the Aquinnah Cultural Center and Tribe to develop a kiosk display and an interpretive trail with panels and a spotting scope, and create brochures and materials to be distributed at the Center and kiosk within five years.

Within 10 years of CCP approval:

- Develop an environmental education trunk and other materials for local classrooms and investigate opportunities with Teach-the-teacher and local libraries within seven years.
- Coordinate with partners including Wampanoag Tribe of Gay Head (Aquinnah) and Massachusetts Audubon Society to develop environmental education capabilities within seven years.

Monitoring Elements

- ➢ Foot trail/pedestrian visits to interpretive trail at ACC.
- ➢ Number of students and teachers participating in off-site programs.
- ➢ Number of environmental education management actions implemented.
- ➢ Number of particpants included in off-site talks/programs led by NWRS staff or volunteers.
- ➢ Number of brochures printed and distributed annually.
- ➢ Amount of information updated on the Refuge website.

Objective 2.2. Community Partnerships and Outreach

Establish and encourage reciprocal partnerships with Tribal, regional, and local organizations and agencies to ensure that citizens of and visitors to Martha's Vineyard are aware of the biological, cultural and historic resources that exist on Nomans Land Island, the Service presence there, and the connection of Nomans Land Island NWR to the Refuge System.

Rationale

Given our current limitations in staff and funding, it is of utmost importance for us to reach out and collaborate with the Tribe and our other conservation partners in the region, including the Town of Chilmark, Massachusetts Audubon Society, TTOR and others. It is through these partners that we would strive to develop an effective outreach program targeted at local communities and residents who may be unaware that a national wildlife refuge is nearby. In addition, these partnerships are important to our biological program, and we would continue to strengthen and develop collaborative initiatives with them to accomplish our objectives.

It is important that local residents understand, appreciate, and support the Refuge System mission and the Refuge's unique contribution to that mission. To accomplish this, we would regularly update the Refuge website and submit press releases that detail management actions and upcoming initiatives on the Refuge. We would also participate in at least one community event each year and make available an electronic Refuge newsletter.


Erin Victory/TCI

USFWS and MA DFG meet on the Refuge

Strategies

Within five years of CCP approval:

- Post opportunities on the Refuge website for volunteers to become involved with visitor services programs when possible, within three years.

- Notify public of large-scale management activities, their purposes, and possible impacts by submitting notices and/or press releases in a timely fashion, updating the Refuge website, and posting relevant plans online, within three years.

- Develop an electronic newsletter for the refuge complex which includes Nomans Land Island NWR updates and by contacting interested parties on our Refuge mailing list within three years.

- Participate in at least one local special event annually that interprets the importance of Nomans Land Island NWR and its natural resources within five years.

Monitoring Elements

- ➢ Number of participants at special events hosted off-site.
- ➢ Number of special events hosted off-site.
- ➢ Number of partnership projects planned.
- ➢ Maintain and update website.
- ➢ Number of press interviews conducted and articles appearing in print or web media about the Refuge.

Goal 3. Recognize the archaeological and cultural importance of the island.

Objective 3.1. Archaeological and Cultural Resources

Improve knowledge of the prehistoric and historic archaeology sites on the Refuge by initiating a cultural resources overview and identifying at least one new project over the next 15 years.

Develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that would incorporate limited access for cultural and ceremonial use of the Refuge.

Rationale

Archaeological evidence from Nomans Land Island indicates that it was occupied during the Late Archaic-Early Woodland Periods (5,000 to 2,700 years before present (YBP); Jacobson 2000). A collection at the Andover Peabody Museum holds a number of projectile points representative of these time periods, and unambiguously demonstrates the presence of a community on the island, undoubtedly the ancestors of the Wampanoag Tribe of Gay Head (Aquinnah). In addition to this site, there are several other known archaeological sites on the Refuge. The Massachusetts Historical Commission (MHC; also SHPO) has five prehistoric sites on record, and one historical ruin. The Service has included the Luce cemetery in its site inventory.

The National Historic Preservation Act requires the Service to identify and preserve its important historic structures, archaeological sites, and artifacts. Several other laws include protection for sites and artifacts. Some of these are: Archaeological Resources Protection Act; Archaeological and Historic Preservation Act; Historic Sites, Buildings and Antiquities Act; Native American Grave Protection and Repatriation Act (see Chapter 1 for a more complete list and summaries). In addition, NEPA mandates our consideration of cultural resources in planning federal actions. The Improvement Act requires the comprehensive conservation plan for each refuge to identify its archaeological and cultural values.

Under this alternative, we would incorporate those actions described under Alternative A. In addition, we would initiate an effort to be proactive in preserving archaeological sites and artifacts by initiating a cultural resource overview and by working with the Tribe and our partners to establish a protocol to be implemented whenever they are found. If feasible, we would also attempt to protect known archaeological sites from erosion until further inventory and excavation can be undertaken. We would take into account the effects of sea level rise as a result of climate change on these sites and evaluate possible methods to protect them if possible. We would continue our efforts to develop a mutually beneficial partnership agreement with the Tribe that would incorporate limited access to the Refuge for cultural and ceremonial purposes.

Strategies

Within five years of CCP approval:

- Add known archaeological sites and historic structures to Service site inventory within five years.
- Within five years, develop a protocol to identify and protect archaeological artifacts.
- Initiate a concerted effort to find things already collected by people from Nomans Land Island within the next five years.
- Prepare a cultural resource overview within the next 15 years for Nomans Land Island to synthesize all the information and add palaeoenvironmental reconstruction. Use aerial photos to relate old maps and descriptions to current situation.
- Evaluate the need to implement dune restoration projects to prevent erosion and protect archaeological sites within the next five years.
- Collaborate with the Wampanoag Tribe of Gay Head (Aquinnah) to develop a mutually beneficial partnership agreement incorporating cultural and ceremonial use of the Refuge by the Tribe.

Monitoring Elements

- ➢ Number of archaeological sites.
- ➢ Number of partnership projects planned.
- ➢ Completed cultural resources overview.

Objective 3.2. Burial Site Protection

Coordinate with the Tribe and Chilmark Historical Commission volunteers to maintain, manage and protect, on at least a bi-annual basis, the Luce cemetery on the Refuge by removing vegetation in conjunction with Service staff site visits over the next 15 years.

Continue to pursue the possible repatriation of Wampanoag remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a partnership agreement between the Tribe and the Service.

Rationale

The Luce cemetery is located on the eastern side of the island and has one visible headstone dated from the 1800's. It is believed to contain the remains of Eben, Thomas and Celia Luce, and perhaps bodies of those cast ashore during storms, and other residents of the Nomans Land Island communities (Wood 1978). See Alternative A for additional information on the cemetery. Additionally, it is likely that ancestral members of the Wampanoag Tribe of Gay Head (Aquinnah) are buried on the Refuge, although no burial sites are presently known.

Again, federal laws require the Service to identify and preserve its important historic structures, archaeological sites, and artifacts. The Luce cemetery and any other burial sites on the Refuge are protected under the historic preservation laws listed under Alternative A, Objective 3.1 (see also Chapter 1). NEPA mandates our consideration of cultural resources in planning federal actions. The Improvement Act requires the comprehensive conservation plan for each refuge to identify its archaeological and cultural values. In addition, the Luce cemetery and any other burial sites on the Refuge are important and relevant to communities and organizations on Martha's Vineyard, as historically residents of Nomans Land Island and Martha's Vineyard were interconnected.

Under Alternative B, we would have greater capacity to coordinate with the Chilmark Historical Commission to conduct research on the Luce cemetery and the residents it contains as well as bi-annual maintenance by vegetation removal with the addition of visitor services staff. All cemetery maintenance volunteers would be permitted access only in concert with Service staff and would be required to undergo safety training prior to accessing the Refuge. In addition, we would continue to discuss repatriation of Tribal remains to the Refuge with the Wampanoag Tribe of Gay Head (Aquinnah), and protection of existing Tribal burial sites. While no known sites exist, any remains would be protected if discovered in the conduct of Refuge operations in compliance NAGPRA and other federal mandates. We would continue to work with the Tribe towards a partnership agreement, including repatriation and the protection of potential future discoveries of burial sites on the Refuge. The proposed protocol enumerating steps to take when archaeological items are found, as described in Objective 3.1, would also be applied under this objective in the case that burial sites are located. This would ensure the protection of these sites. In all cases, any ground disturbance activities would require UXO Tech Support, and would therefore need to be coordinated with the Navy.

Strategies

Continue to:

- Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge.

Within five years of CCP approval:

- Work with partners to evaluate the threat of erosion to the cemetery, and determine the best course of action to protect it within the next one to three years.

- Allow the Chilmark Historical Commission to maintain the part of the cemetery within the enclosed wall within five years.

- Encourage the Chilmark Historical Commission to conduct research in primary documents to learn more about residents buried in the cemetery and incorporate the results in a narrative report within five years.

Within 10 years of CCP approval:

- If safety-approved by the Navy, work with partners such as the Chilmark Historical Commission to conduct non-invasive remote sensing survey (Ground Penetrating Radar, magnetometer, or soil resistivity) of Luce Cemetery, to determine whether there are unmarked graves in or outside the stone wall of the cemetery within 5 to 10 years.

Monitoring Elements

- ➢ Number of burials protected.
- ➢ Number of investigations completed.
- ➢ Volunteer maintenance of Luce cemetery.

Objective 3.3. Cultural Interpretation

Within 10 years of CCP approval, work with the Tribe, the Chilmark Historical Commission and other partners to provide at least two activities, displays or materials that interprets the cultural and archaeological resources of the island.

Rationale

Nomans Land Island has a culturally rich history, as described in Chapter 3. Prior to European settlement, Nomans Land Island was used by the ancestors of the Wampanoag Tribe of Gay Head (Aquinnah), at least as early as the Late Archaic-Early Woodland Periods (5,000 to 2,700 YBP; Jacobson 2000). Not much is known about the history of Nomans Land Island between the Early Woodland Period and 1602, the year Bartholomew Gosnold "discovered" the island for Europeans. The island had a number of different ownerships by Wampanoags and Europeans until finally being annexed to the Town of Chilmark in 1714.

European Americans farmed and lived on the island prior to its use as a bombing range by the U.S. Navy. The island was inhabited until 1939 when the last people left and it was leased to the Navy shortly thereafter. Today, what remains of the human history on the island are pre-Contact archaeological sites, the Luce cemetery, stone walls, and cellar holes and other structural remnants from the nineteenth and early twentieth century farms, and of course remnants of military structures and UXO. Given the human history of the island, and its cultural ties to Martha's Vineyard communities and the Tribe, the historical and cultural value of Nomans Land Island remains high.

Erin Victory/TCI

Old stone cellar remains

The tangible remains of the island's pre-Contact and European-American history provide a wealth of resources the Service can use to interpret the island's cultural history. In addition, this history has had various impacts on the Refuge's habitats over time and can help us understand the plants and wildlife that use it today. Refuge vegetation and wildlife are a product of its history, and within this context people can have an understanding and appreciation for how humans impact ecosystems. With the addition of a part time visitor services staff member under Alternative B, we would have greater capability to make this one of the Refuge priorities, and would have more resources to work with our partners to interpret these landscape and cultural resource changes through time.

Strategies

Within 10 years of CCP approval:

- Develop educational materials in concert with partners for distribution and displays (including for ferries, kiosks, and museum, etc.) within 5 to 10 years.

- Coordinate with partners to interpret and, when appropriate, display Nomans Land Island artifacts within 5 to 10 years.

- Use the Service's cultural resource overview, the Wampanoag Tribe's oral history, document research and information in the Chilmark Historical Commisson's archives to create a web page about the history of Nomans Land Island within 5 to 10 years.

- Work with the Wampanoag Tribe and the Chilmark Historical Commission to conduct an oral history project to collect information about Noman's Land Island within 5 to 10 years. Pursue support, including Visitor Service challenge cost share grant (with the Tribe as a partner).

- Include information about the island's significance to the Wampanoag Tribe, presented by Tribe members, the Luce cemetery, and other historical information about the island in the enhanced virtual tour on the web site within 5 to 10 years.

- Pursue a cultural resource overview with paleoenvironmental reconstruction of the island within 5 to 10 years.

- Allow the Chilmark Historical Commission to document stone walls, cellar holes, and other evidence of human habitat for cultural history within five to ten years. We would first consult with the Navy to determine the feasibility of this and ensure this took place within approved safety zones. Once complete, we would add this information to the virtual tour on the Refuge website.

Monitoring Elements

- Number of partnership projects planned.

- Number of historic buildings and/or structures.

- Number of accessioned museum property collections.

- Number of cultural resource management actions implemented.

- Completion of cultural resource overview.

Alternative C. Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative)

Alternative C is the alternative our planning team proposes to recommend to our Regional Director for implementation. It includes an array of management actions that, in our professional judgment, work best towards achieving the Refuge's purposes, the vision and goals, and would make an important contribution to conserving federal trust resources of concern in coastal southern New England. This alternative provides the most appropriate level and type of management for Service staff managing the eight refuges in the complex, given the relatively modest increase in staff and funding that is anticipated over the next 15 years. Therefore, we believe this is the most reasonable, feasible, and practicable alternative and is achievable within the 15-year timeframe.

The emphasis in this alternative would be on managing priority habitats for priority focal species as necessary; otherwise natural processes would be the primary mechanism at work on Refuge habitats. Shrubland and vegetated dune habitat in particular would be prioritized for management activities that would maintain or increase suitability for migrating landbirds and breeding shorebirds and waterbirds. In addition, we would analyze the possibility of introducing New England cottontail to the Refuge's shrubland habitat, as in Alternative B. Under this alternative, Nomans Land Island NWR would remain closed to public access and off-site visitor services would be expanded compared to current levels, but would be much reduced from levels described under Alternative B.

Under this alternative, Nomans Land Island WSA would be recommended suitable for designation and inclusion in the NWPS. Since Congress has reserved the authority to make final decisions on wilderness designation, the wilderness recommendation is a preliminary administrative determination that would receive further review and possible modification by the Director, the Secretary of Interior, or the President.

The analysis of environmental consequences is based on the assumption that Congress would accept the recommendation and designate Nomans Land Island NWR as wilderness. The boundary of the Nomans Land Island Wilderness would coincide with the Refuge boundary, the normal low water mark. The information and analyses in the EA/draft CCP would be used to fulfill the additional steps required to recommend a WSA for wilderness designation. These steps include compiling a wilderness study report and a legislative EIS to accompany the wilderness recommendation.

We would continue our adaptive management approach of modifying actions based on new information with a concerted effort to collect data upon which to make management decisions. See Chapter 3 for a description of the types of Refuge habitat.

Habitat Management and Protection

Under this alternative, shrubland habitat management would be limited to maintaining quality maritime shrubland for migrating landbirds as needed, relying primarily on natural processes of wind and salt spray to delay succession. Adaptive management, including Strategic Habitat Conservation, would be applied to determine if and when prescription burns would be warranted based on periodic vegetation monitoring, and provided that prescribed fire is found acceptable through a MRA under a wilderness scenario. Any prescribed burns would be coordinated with the Navy's ongoing UXO cleanup and oversight. The analysis for the potential introduction and possible restoration of New England cottontail would be conducted, including via wilderness stewardship policy (610 FW 2.17). If the decision is made to release New England cottontail on the Refuge, shrubland management actions would likely be modified to meet guidelines for that species, but would not deviate from the methods approved through MRA.

Management of other habitat types on the Refuge would largely entail invasive species treatment and/or removal as needed and possible improvements to vegetated dune habitats to benefit breeding shorebirds and waterbirds when warranted so long as the methods employed are approved through MRA.

Inventories and Monitoring

The primary focus of this alternative in shrubland habitat would be vegetation monitoring to ensure habitat conditions are optimal for migrating landbirds and raptors. Invasive species monitoring would also be conducted throughout the Refuge when possible. Inventories for nesting terns, American oystercatchers and double-crested cormorants would continue under this alternative, though productivity would not be monitored for double-crested cormorants or small numbers of nesting terns. Migrating shorebird species would be noted as well. All other inventories, surveys and monitoring activities, including BBS and secretive marshbird callback surveys, would no longer occur. Biologists would continue to monitor for wildlife diseases in conjunction with other activities when possible. If New England cottontail were released on the Refuge, additional monitoring efforts would likely be enacted to determine the success of introduction as well as the vitality of the population and habitat quality.

As in Alternative A, we would continue to be cognizant of the indicators of climate change, and would continue to work towards reducing non-climate environmental stressors. Under Alternative C, the Refuge would initiate shoreline monitoring via aerial photos. We would also endeavor to address the state's climate change priorities once they are refined, and would work within the North Atlantic LCC to promote research, education, and collaboration.

Wilderness Management

We will manage the Nomans Land Island Wilderness according to the provisions of the Wilderness Act and Service Wilderness Stewardship Policy (610 FW 1-3). The wilderness area would be managed to accomplish Refuge purposes and the Refuge System mission, while also preserving wilderness character and natural values for future generations. Refuge management strategies and techniques would be chosen to comply with wilderness stewardship principles and prevent degradation of wilderness character.

Uses that are "generally prohibited" in wilderness (use of motorized vehicles, motorized equipment, and mechanical transport) would be allowed within the Nomans Land Island Wilderness for emergency purposes and when necessary to meet minimum requirements for the administration of the area as wilderness and to accomplish Refuge purposes. The island would continue to be accessible by motorboat.

All Refuge management activities and Refuge uses that require "generally prohibited uses" would be evaluated through a MRA, a decision-making process to determine if the activities are necessary and to identify measures to mitigate impacts to wilderness character. We also use the MRA to identify the minimum impact methods and tools to accomplish necessary activities safely and with a minimal amount of impairment to wilderness character.

All Refuge step-down management plans would incorporate guidance to ensure that the strategies, actions, tools, and techniques outlined in the step-down plans are consistent with wilderness management. A stand-alone Wilderness Stewardship Plan would be prepared or combined with the HMP.

Visitor Services

Under this alternative, offsite visitor services would increase slightly from current management, but would be less than that proposed under Alternative B. Interpretive programs and materials would incorporate information on the wilderness values of Nomans Land Island. We would propose to partner with the Aquinnah Cultural Center to establish an interpretive trail with informational signs and a spotting scope at their location on Martha's Vineyard (see Map 2-1), and associated brochures about the Refuge. We would also propose to partner with the Tribe to develop a display for their proposed kiosk at the Gay Head cliffs.

Refuge Administration

Under this alternative, no new staff would be hired at the refuge complex specifically to work on the actions and strategies identified in this plan for Nomans Land Island NWR. Any additional work on the Refuge would be conducted by current and new staff that we believe will occur over time as the national staffing model is deployed. Some wildlife monitoring and habitat management would occur, some invasive species management would occur, coordination with the Navy on contaminants and UXO issues would continue, an off-site interpretive trail would be developed, existing access paths and the regulatory signs on the island would be maintained, and we would continue to patrol the island for trespassing. The methods these actions employ would need to be approved for use through MRA to comply with wilderness stewardship policy. We would also maintain communication and partnerships with the Town of Chilmark and the Tribe. We would continue to work on a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) for access to the Refuge for ceremonial purposes and for the other purposes listed in the section of the chapter entitled "Actions Common to All Alternatives".

Transportation to Nomans Land Island for Refuge staff is primarily supplied by private contractor and occasionally our partners on Martha's Vineyard, and under this alternative we would explore options to keep a Service-owned boat locally, or to see what other options are available to supplement that need.

The section that follows describes in detail the goals, objectives, and strategies that we would implement in Alternative C.

Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.

Objective 1.1. Native Maritime Shrubland Habitat

Annually provide approximately 400 acres of maritime shrubland stop-over habitat with no more than 10 percent invasive species tolerated, for migrating landbirds, raptors (such as peregrine falcons), butterflies (including monarchs) and other species of high conservation concern.

Shrubland species composition should be composed of no more than 10 percent non-native species and dominated by native fruit-bearing species, including (but not limited to) species from the genera Amelancier, Viburnum, Sambucus, Prunus, Cornus and Vitis, northern bayberry, pokeweed, and other species with persistent fruit (catbrier and Sumac species) which will benefit fruit-eating neotropical migrant landbirds. Shrub species composition should provide abundant berries from late August through the end of October and provide a combination of fat, carbohydrate and protein sources.

Evaluate the feasibility of introducing New England cottontail on the Refuge within five years, and if determined to be feasible, introduce the species within three years of determination. If released, provide dense native shrubs and vine tangles with understory habitat density of 20,000 woody stems per acre which are at least 20 inches tall and less than 3 inches in diameter. Minimum patch size is 25 acres (but larger is better) and should be in close proximity to other large patches.

Rationale

Much of why native maritime shrublands are important in southern New England is described in Alternative B, Objective 1.1, and its value to migratory landbirds is described in Alternative B, Objective 1.2.

Nomans Land Island NWR has considerable value to migrating landbirds across many taxonomic groups due to its location along the Atlantic Flyway, array of habitat types, and its abundant fruit-bearing shrubland species. It is anticipated that management of shrublands for migrating landbirds will continue to provide habitat for breeding landbirds, like gray catbirds and eastern towhees, and other species of high conservation concern dependant on maritime shrublands. This would likely include invasive species treatment, though this would be subject to MRA. Vegetation monitoring every five years will provide information on horizontal and vertical structure, stem density, and berry production to evaluate habitat quality for migrating landbird species.

Erin Victory/TCI

Arrowwood is a common Refuge shrub

Prescribed fire would still be utilized to achieve habitat objectives in this altnernative if approved through MRA; however, instead of burning on a set periodic schedule, we would burn only as habitat conditions warrant based on vegetation monitoring. Wind and salt spray can considerably delay succession in martime habitats, and it is not known how long quality Refuge shrubland habitat will persist without fire management and still provide a benefit to species of concern. A similar shrubland site (containing many of the same shrub species) in Aquinnah on Martha's Vineyard has not been burned in approximately 50 years (T. Simmons, personal communication), though this may be conditional on factors of which we are unaware. It is possible that Nomans Land Island could be burned with a frequency similar to that in Alternative B, however, there is the potential for much greater variation in burn frequency; ultimately, this determination would be based on habitat metrics.

Under this alternative, we would continue to work with Massachusetts Audubon Society to monitor and band raptors when possible. We would also seek a rapid assessment protocol to track trends for raptors and other landbirds utilizing Refuge upland habitats during migration.

As in Alternative B, we would consider releasing New England cottontail on the Refuge (see Alternative B, Objective 1.1). The Service would make every effort under this alternative to compile the needed information to make a determination within five years. Part of this determination would be to attempt to validate the historical presence of this species on the island, in compliance with wilderness stewardship policy (610 FW 2.17). If releasing New England cottontail on the Refuge is determined to be feasible, then we would release New England cottontails on the Refuge within three years of determination.

Strategies

Continue to:

- Coordinate with the U.S. Navy annually to promote communication and to exchange information on their operations and management planning for the Refuge.

- Implement a biologically-based fire regime as habitat conditions warrant during the dormant season to maintain native shrub communities for migrating landbirds and New England cottontails if released on the Refuge.

Within five years of CCP approval:

- Explore the possibility of introducing New England cottontail on the Refuge, taking into account biological and ecological considerations as well as overall feasibility, in one to five years through researching the following factors:

    - Compile information on similar introductions
    - Research/verify Nomans Land Island biogeography
    - Identify the specific habitat requirements for New England cottontail
    - Obtain detailed information about vegetative structure on the Refuge
    - Evaluate the genetic viability of a limited, isolated New England cottontail population on the island
    - Identify Refuge management prescriptions and feasibility required to maintain a New England cottontail population

    - Evaluate impacts of New England cottontail introduction on other rare or sensitive Refuge species

- Initiate a concerted effort to map and control invasive species through chemical, biological, and mechanical means island-wide within one to five years.

- Work with the U.S. Navy to identify areas where additional trails can be established to support monitoring and management actions.

- Provide oversight and coordination with Navy contaminant and UXO cleanup and strive towards actions that benefit shrubland birds.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ To evaluate benefits for migrating landbirds and raptors, conduct surveys during peak migration to measure relative abundance and diversity every two to three years throughout the life of the CCP and band raptors as time and funding permits.

- ➢ To evaluate benefits for pollinator species, conduct surveys every 5 to 10 years to determine species presence and abundance, diversity, phenology and host plant preferences.

- ➢ To evaluate habitat quality for Refuge focal species (migrating landbirds and possibly New England cottontail), measure stem density, berry production, shrubland species composition and vertical and horizontal structure, every five years.

- ➢ To evaluate the effectiveness of prescribed burning on shrubland habitats conduct post-burn surveys (within one month of burn) to document the area burned and relative intensity of the burn. Measure species composition, vertical and horizontal structure, and berry production to evaluate if burning is producing desired habitat results every one to five years.

- ➢ To maintain desired quality and characteristics of shrublands for migrating landbirds and raptors, annually conduct scouting for invasive plant species. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than 10 percent, and fundamental objectives are not compromised.

- ➢ If introduced, annually monitor status of New England cottontail through some combination of live-trapping, track surveys, and/or pellet surveys. Vegetation monitoring to evaluate habitat suitability for this species would likely include stem counts, percent cover, and possibly species composition. Potential impacts on sensitive Refuge resources identified as a result of the introduction assessment would also be monitored and documented.

- ➢ Complete an updated habitat map for the Refuge within three years.

Objective 1.2. Vegetated Dune Habitat

Annually conduct minimal management in approximately 15 acres of vegetated dune habitat consisting of American beach grass (Amophilla species) and other herbaceous vegetation to benefit rare plants and provide suitable nesting habitat for shorebirds (including American oystercatchers and piping plovers) and terns (including common and roseate terns).

Rationale

The importance of this Refuge habitat for shorebird and colonial waterbird species of concern is discussed in Alternative B, Objective 1.3.

Under Alternative C, our general philosophy would be to let natural processes shape Refuge habitat, and we would conduct only baseline monitoring activities. This includes annually monitoring invasive species, and monitoring for rare plants and changes to the Refuge shoreline associated with sea level rise as opportunity allows over the next 15 years. Some level of invasive species would be tolerated unless or until they posed a direct threat to dune habitat quality. If that is found to be the case, then invasive species management would be subject to MRA.

Baseline monitoring for nesting terns, American oystercatchers, and any other nesting shorebirds, would continue under this alternative. Roseate terns are often found associated with large common tern colonies, which affords them added protection from predators. Therefore, should a common tern colony exceeding 50 pairs become established on the Refuge, we would evaluate the need to conduct predator control measures to ensure the persistence of the tern colony. Despite a reduction in management activities to allow natural processes to shape Refuge habitat, we would make every effort to be in compliance with federal guidelines should any federal-listed species (e.g., roseate tern, piping plover) become established on the Refuge. As in Alternative B, we would endeavor to partner with the North Atlantic LCC in coordinating regional shorebird conservation efforts, and in applying the latest science to Refuge shorebird management.

Strategies

Continue to:

- Evaluate the need for predator control strategies if common tern colony exceeds 50 pairs.

- When feasible, control invasive species and map new infestations.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- To determine presence and numbers of breeding roseate terns and common terns, conduct annual surveys during the breeding season throughout the life of the CCP.

- To determine habitat quality for priority species, visually inspect herbaceous upland vegetation every three to five years.

- To determine the number of nesting pairs of American oystercatchers, conduct annual surveys and monitor productivity incidental to other activities in both vegetated dune and cobble shoreline habitat.

- To determine presence of piping plover, annually monitor dunes for suitable piping plover nesting sites and if found, monitor for nesting pairs.

- To maintain desired quality and characteristics of vegetated dune habitat, annually conduct scouting for invasive species. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than 10 percent of the vegetation dune habitat type. Control techniques will be monitored for effectiveness.

- Complete updated habitat map for the Refuge within three years.

Objective 1.3. Marine Intertidal Beach and Rocky Shore

Annually passively oversee 100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants), migrating shorebirds (e.g., semipalmated sandpiper, short-billed dowitcher and lesser yellowlegs), and marine mammals (seals).

Rationale

See Alternative B, Objective 1.4 for a discussion of the importance of this habitat to regional species of concern. Under Alternative C, we would continue to contribute to landscape scale monitoring efforts (e.g, ISS) by conducting baseline monitoring activities. In the event that there is a higher conservation need for shorebird management on the Refuge, the Service will consider allocating additional staff time and funding and reevaluate its monitoring program and incorporate habitat management techniques as appropriate and as approved through MRA.

Based on the results of SLAMM analysis, we know that this habitat is subject to loss under sea level rise scenarios over the next century. Given that these are long-term scenarios, immediate action is not warranted; therefore within the context of this CCP over the next fifteen years, we would continue to reduce non-climate environmental stressors as described in Alternative A. In addition, under Alternative C, we would monitor and evaluate shoreline conditions relative to climate change and sea level rise using aerial photos, cooperate with the state on their climate change priorities once refined, and utilize the North Atlantic LCC to facilitate climate change research, education, and collaboration.

Strategies

Continue to:

- Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Conduct surveys of double-crested cormorant nesting colony to determine number of nesting pairs every three to five years throughout the life of the CCP.

- ➢ Conduct annual migratory shorebird surveys in conjunction with other tasks (as time and funding allows) for ISS reporting.

- ➢ Record observations of seal occurrences on the Refuge annually and coordinate with the New England Aquarium to respond to seal entanglements, and report seabird die-off events to SEANet.

- ➢ Monitor the intertidal zone and shoreline erosion rate through aerial photos of critical habitats for nesting and migrating shorebirds. Monitor for shoreline changes resulting from rising sea level or other factors associated with climate change.

- ➢ To maintain desired quality and characteristics of intertidal beaches and rocky shores, conduct scouting for invasive species within one to five years of CCP completion. Occurrences or stands of more stable patches of invasive plants may be tolerated in the short term as long as their cumulative coverage is no more than 10 percent of the intertidal beach/rocky shore habitat type. Control techniques will be monitored for effectiveness.

- ➢ Complete updated habitat map for the Refuge within three years.

Objective 1.4. Scrub Shrub and Emergent Wetlands, Bogs, and Open Water

Annually minimally manage approximately 100 to 150 acres of freshwater wetland communities to support breeding marshbirds (including but not limited to Virginia rail) and native plant and animal communities.

Rationale

Same as Alternative A, Objective 1.5, though under this alternative habitat management actions would be subject to MRA.

Strategies

Continue to:

- Control purple loosestrife and Phragmites through biological, chemical, and/or mechanical means as needed, and as time and funding permits and map new infestations.

- Work through existing partnerships to meet objectives.

Monitoring Elements

Conduct appropriate monitoring and survey programs as funding and staffing permits to measure our success in achieving our objectives. The results may trigger adjustments to management strategies or refinement of our objectives. Examples of monitoring or surveys that we may implement include:

- ➢ Continue monitoring invasive plants, particularly Phragmites and purple loosestrife, to prevent unacceptables levels of loss of habitat quality. If the patch sizes of Phragmites attain a solid stand (regardless of size) that reasonably can be sprayed or, it threatens a rare community, initiate appropriate control measures to decrease Phragmites to a tolerable level. We may leave untreated any patches that are static or inaccessible by any currently available means until we determine a feasible solution or efficacious method. Control techniques will be monitored for effectiveness.

- ➢ Complete updated habitat map for the Refuge within three years.

Goal 2. Promote awareness and stewardship of our coastal natural resources by working with our partners to provide off-site interpretation, education and outreach opportunities.

Objective 2.1. Environmental Education and Interpretation

Over the next 15 years update existing interpretive materials, develop Refuge brochures and pursue a partnership to develop an interpretive trail and associated viewing area at the Aquinnah Cultural Center.

Rationale

The lack of additional staffing limits our ability to increase our environmental education and interpretation capabilities from what they are under current management. The additional programming and interpretive features described under Alternative B would not apply under this alternative as staff site visits and the level of monitoring and management activities on the Refuge would be much reduced. However, we recognize that the existing level provided is insufficient, therefore we would endeavor to address this by updating existing information, developing a Refuge brochure, and with the permission of the Aquinnah Cultural Center, we would coordinate with them to develop an interpretive trail with informational panels and a spotting scope. In addition, we would endeavor to add a display to the Tribe's interactive kiosk proposed for the Gay Head Cliffs.

Karen Terwilliger/TCI

ACC entrance sign, Aquinnah, MA

Strategies

Within five years of CCP approval:

- Update existing materials and create Refuge brochure.
- Maintain virtual tour on website.
- Collaborate with ACC and Town of Aquinnah to install interpretive trail and panels on Land Bank property and at ACC Historical Museum.

Within 10 years of CCP approval:

- Collaborate with Wampanoag Tribe to place materials at kiosk and install virtual tour on e-kiosk at Gay Head.
- Cooordinate with Town of Chilmark and Marthas Vineyard Cultural Council to provide and distribute Refuge information throughout the town and Island-wide.

Monitoring Elements

- ➢ Number of partner projects planned.
- ➢ Maintain and update website.

Objective 2.2. Community Partnerships and Outreach

Establish and encourage reciprocal partnerships with Tribal, regional, and local organizations and agencies to ensure that citizens of and visitors to Martha’s Vineyard are aware of the biological resources that exist on Nomans Land Island, the Service presence there, and the connection of Nomans Land Island NWR to the Refuge System.

Rationale

How much we value and rely on our partners is described under Alternative B, and under Alternative C we would emphasize collaboration with the Tribe and our other partners on Martha's Vineyard to reach a broader audience for raising awareness of the Refuge. While our outreach efforts would be increased from Alternative A, they would be less intensive than under Alternative B. We would continue to keep residents of Martha's Vineyard informed of Refuge activities and any initiatives by keeping the Refuge website updated and by submitting press releases as necessary. We would also continue to further strengthen partnerships within the region, and coordinate with these partners to accomplish biological objectives.

Strategies

Continue to:

- Provide resource information to Town of Chilmark for first and second grade classrooms in conjunction with existing school programs.
- Maintain website; issue news releases as needed.
- Participate in one local special event every five years on Martha's Vineyard.
- When funding allows, hire a local resident as a summer visitor services intern to conduct outreach and interpretive programming.

Monitoring Elements

- ➢ Number of media articles about the Refuge.
- ➢ Maintain website.

Goal 3. Recognize the archaeological and cultural importance of the island.

Objective 3.1. Archaeological and Cultural Resources

Follow Service protocol to document and prevent the loss of archaeological and cultural resources on Nomans Land Island NWR when possible over the next 15 years.

Develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that would incorporate limited access for cultural and ceremonial use of the Refuge.

Rationale

Under this alternative, we would note any evidence of new sites or artifacts as encountered during site visits and would notify the proper agencies. We would coordinate with the Tribe and our other partners, the Town of Chilmark, U.S. Coast Guard, U.S. Navy, and MA state law enforcement to establish a protocol for the preservation of archaeological and cultural resources as they are discovered, and would ensure that Navy operations were in compliance with the National Historic Preservation Act. We would continue to develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that provides limited access for cultural and ceremonial purposes.

Strategies

Continue to:

- Coordinate with the Navy to ensure compliance with National Historic Preservation Act coordination as necessary.

- Record cultural and archaeological items and/or sites as encountered annually and contact the appropriate agencies and organizations.

- Collaborate with the Wampanoag Tribe of Gay Head (Aquinnah) to develop a mutually beneficial partnership agreement incorporating cultural and ceremonial use of the Refuge by the Tribe.

Within 10 years of CCP approval:

- Develop a protocol for when archaeological and/or cultural items are found within 10 years.

Within 15 years of CCP approval:

- Conduct a cultural resources overview within the next 15 years.

Monitoring Elements

- ➢ Number of archaeological sites protected

Objective 3.2. Burial Site Protection

Maintain the Luce cemetery as staff availability and opportunity allows over the next 15 years. Continue to pursue the possible repatriation of Wampanoag tribal remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a partnership agreement between the Tribe and the Service.

Rationale

As described in Alternative B, the Luce cemetery on Nomans Land Island has cultural importance to communities on Martha's Vineyard. In Alternative C, Refuge staff would be primarily responsible for maintaining the cemetery while on the Refuge when possible, as staff visits would be equivalent in frequency to Alternative A, and visits to the Refuge would be of shorter duration and have a more targeted itinerary.

It is also likely that there are remains of ancestral Tribe members on the Refuge. While no known sites exist, any remains would be protected if discovered in the conduct of Refuge operations in compliance NAGPRA and other federal mandates. We would continue to work with the Tribe towards a partnership agreement, including repatriation and the protection of potential future discoveries of burial sites on the Refuge. Any ground disturbance activities would require UXO Tech Support, and would therefore need to be coordinated with the Navy.

Strategies

Continue to:

- Maintain the Luce cemetery by Service staff as opportunity allows.

- Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge.

Within five years of CCP approval:

- Work with partners to evaluate the threat of erosion to the cemetery and determine the best strategy to protect it within one to three years.

Monitoring Elements

- Protection of Luce cemetery site.

Objective 3.3. Cultural Interpretation

Within the next 15 years, work with partners to provide at least one activity, display or set of materials that interprets the cultural and archaeological resources of the island.

Rationale

The cultural importance of Nomans Land Island to the Tribe and residents of Martha's Vineyard has been described under Alternative B. Under this alternative, we would endeavor to work with the Tribe and our other partners to provide some level of Refuge cultural resource interpretation to Martha's Vineyard, despite no change in staffing from present. We would also work with the Chilmark Historical Commission to make available the results of any research conducted on those residents interred in the Luce cemetery.

Strategies

Continue to:

- Work with partners to interpret known cultural and archaeological resources associated with Nomans Land Island as opportunity allows, including maintenance of the virtual tour on the website.

Monitoring Elements

- Number of partner projects planned.
- Number of accessioned museum property collections.

Goal 4. Protect, maintain, enhance, and preserve the wilderness character of Nomans Land Island NWR.

Objective 4.1. Protect and Maintain Wilderness Values

Upon CCP approval, continue to maintain the wilderness character (e.g., naturalness, solitude, supplemental values) of Nomans Land Island. Achievement of this objective will be evaluated by assessing loss or degradation of values that qualified it for potential designation (see Appendix C) over the next 15 years.

Rationale

Nomans Land Island NWR is located in the Atlantic Ocean three miles south of Martha's Vineyard. The Refuge has been and will remain closed to public access. Human visitors to the island are limited to Refuge and Navy personnel and authorized researchers or volunteers. In 1996, the Navy ceased using the area for military purposes and transferred management responsibility of the island to the Service in 1998. The island has been and would continue to be managed as a wild, natural area. Nomans Land Island generally appears to have been affected primarily by the forces of nature, with the imprint of human uses and activities substantially unnoticeable. Natural processes would continue to be the primary force at work in the island's habitats.

Pending and after wilderness designation, Nomans Land Island NWR would be managed to accomplish Refuge purposes and the Refuge System mission, while also preserving wilderness character and natural values for future generations. Refuge management strategies and techniques would be chosen to comply with wilderness stewardship principles and prevent degradation of wilderness character. Refuge management activities and Refuge uses would be conducted in such a manner as not to detract from the wilderness values identified in the Wilderness Review (Appendix C).

Strategies

Continue to:

- Evaluate Refuge management activities and Refuge uses through an MRA and use the minimum tool necessary to manage Refuge resources.
- Manage Nomans Land Island as wilderness.
- Monitor values of wilderness character including qualities of “untrammeled,” “naturalness,” “undeveloped,” and “solitude or primitive and unconfined recreation.”
- Provide off-site interpretation opportunities to inform the public about Refuge wilderness values.

Monitoring Elements

- Number of interpretive projects planned regarding wilderness.

Table 2.1. Matrix of the Alternatives.

Refuge Resource or Program	Alternative A: Current Management	Alternative B: Enhanced Wildlife Management and Visitor Services	Alternative C: Natural Processes Emphasis, Focal Species Management and Wilderness Designation (Service-Preferred Alternative)
Goal 1. Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern.			
Responds to Issues: How can we best monitor and manage for migratory and nesting avian species on the Refuge? How can we effectively increase our survey and inventory efforts to fill in information gaps and maintain diversity? What are the most effective and efficient measures we can undertake to protect, restore, and conserve shrubland and grassland habitats on the Refuge?			
Shrubland Habitat	Obj 1.1: Over the next 15 years, continue to minimally manage approximately 400 acres of maritime shrubland habitat that supports nesting focal species of conservation concern, including eastern towhee and gray catbird.Obj 1.2: Over the next 15 years, continue to minimally manage approximately 400 acres of maritime shrubland habitat that supports migrating landbirds, including raptors (e.g., state endangered peregrine falcon). Strategies for Obj 1.1 and Obj 1.2: Allow natural processes to influence Refuge shrub habitat, except for potential prescribed burns conducted by the Navy as part of their operations and maintenance plan. Provide oversight and coordination with Navy	Obj 1.1: Annually manage approximately 400 acres of maritime shrubland habitat for breeding gray catbirds, eastern towhees, and other species of high conservation concern, including Leach's storm petrel and rare plants. Evaluate the feasibility of introducing New England cottontail within 5 years, and if determined to be feasible, then begin species introduction within 3 years of determination. Obj 1.2: Annually manage approximately 400 acres of maritimeshrubland stop-over habitat for migrating landbirds, raptors (such as state endangered peregrine falcons), and butterflies (including monarchs). Strategies for Obj 1.1:	Obj 1.1: Annually provide approximately 400 acres of maritime shrubland stop-over habitat with no more than 10 percent invasive species tolerated, for migrating landbirds, raptors (such as peregrine falcons), butterflies (including monarchs) and other species of high conservation concern. Strategies for Obj 1.1: Coordinate with the U.S. Navy annually to promote communication and to exchange information on their operations and management planning for the Refuge. Within five years , explore the possibility of introducing New England cottontail on the Refuge Implement a biologically-based prescribed fire regime as habitat conditions warrant during

	contaminant and UXO cleanup and strive towards actions that benefit shrubland birds. Control invasive species and map new infestations, when feasible. Maintain the two existing access loop paths Work through existing partnerships to meet objectives.	Within five years , explore the possibility of introducing New England cottontail on the Refuge. Strategies for Obj 1.1 and 1.2: Implement a biologically-based prescribed fire regime every 7 to 12 years, or as habitat conditions warrant, during the dormant season. Through the use of fire breaks burn on a rotational basis. Initiate a concerted effort to control invasive species and map new infestations within 1-5 years. Work with the U.S. Navy to identify areas where additional trails can be established to support monitoring and management actions.	the dormant season to maintain native shrub communities. Initiate a concerted effort to control invasive species within one to five years.
Vegetated Dune	Obj 1.3: Over the next 15 years, continue to minimally manage approximately15 acres of vegetated dune habitat consisting of American beach grass (Amophilla species) and other herbaceous vegetation which provides suitable nesting habitat for shorebirds (including American oystercatchers and piping plovers) and terns (including common and roseate terns). Strategies for Obj 1.3: Conduct limited and specific predator control actions annually, as needed	Obj 1.3: Annually manage approximately 15 acres of vegetated dune habitat to benefit rare plants and beach-nesting birds, including piping plovers, terns and American oystercatcher. Provide a mix of open sandy habitat and herbaceous vegetation including (but not limited to) American beach grass (Amophilla species), beach pea, and goldenrod to provide suitable nesting habitat. In years when piping plovers nest, maintain an average productivity of 1.5 chicks per pair according to state and federal	Obj 1.2: Annually conduct minimal management in approximately 15 acres of vegetated dune habitat consisting of American beach grass (Amophilla species) and other herbaceous vegetation to benefit rare plants and provide suitable nesting habitat for shorebirds (including American oystercatchers and piping plovers) and terns (including common and roseate terns). Strategies for Obj 1.2: Evaluate the need for predator control strategies if common tern colony

	and as permits are approved. Control invasive species and map new infestations, when feasible. Work through existing partnerships to meet objectives.	guidelines. If terns nest, maintain an average productivity of 1 chick per nest. Minimize nesting greater black-backed and herring gulls on at least 5 acres of the best suitable nesting habitat for terns. Strategies for Obj 1.3: Annually select the optimal five acres for nesting terns, and evaluate predator control actions when warranted. Control invasive species through most effective means as necessary, be it chemical, biological, and/or mechanical and map new infestations on an annual basis. Work with partners to accomplish objectives..	exceeds 50 pairs. When feasible, control invasive species and map new infestations.
Marine Intertidal Beach / Rocky Shore	Obj 1.4: Over the next 15 years, continue to passively oversee approximately 100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants), migrating shorebirds and, marine mammals (seals). Strategies for Obj 1.4: Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events. Utilize existing partnerships to meet objectives.	Obj 1.4: Annually minimally manage approximately100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants), migrating shorebirds (e.g., semipalmated sandpiper, short-billed dowitcher and lesser yellowlegs), and marine mammals (seals). Strategies for Obj 1.4: Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events. Work with partners to control invasive species	Obj 1.3: Annually passively oversee 100 acres of marine intertidal beach and rocky shore habitat to benefit nesting waterbirds (double-crested cormorants), migrating shorebirds (e.g., semipalmated sandpiper, short-billed dowitcher and lesser yellowlegs), and marine mammals (seals) Strategies for Obj 1.3: Coordinate with partners to respond to emergency bird mortality and marine mammal stranding events.

		(e.g., sea cucumbers, algae) within one to five years.	
Scrub Shrub and Emergent Wetlands, Bogs, and Open Water	Obj 1.5: Over the next 15 years, continue to minimally manage approximately100-150 acres of freshwater wetland communities to support breeding marshbirds (including but not limited to Virginia rail) and native plant and animal communities. Strategies for Obj 1.5: Control purple loosestrife and Phragmites as time and funding permits and map new infestations. Utilize existing partnerships to meet objectives.	Obj 1.5: Annually manage approximately100 to 150 acres of freshwater wetland communitiesto support breeding marshbirds (including Virginia rail), native plant communities, and to benefit rare wetland plants including Arethusa bulbosa. Maintain robust emergent vegetation including cattails (Typha) and bulrush (Scirpus) (Conway 1995). Strategies for Obj 1.5: Control purple loosestrife at the brackish pond and reinitiate control of Phragmites and other invasive aquatic plant species on an annual basis.	Obj 1.4: Annually minimally manage approximately 100 to150 acres of freshwater wetland communities to support breeding marshbirds (including but not limited to Virginia rail) and native plant and animal communities. Strategies for Obj 1.4: Control purple loosestrife and Phragmites through biological, chemical, and/or mechanical means as needed, and as time and funding permits and map new infestations. Work through existing partnerships to meet objectives.
Goal 2. Promote awareness and stewardship of our coastal natural resources by working with our partners to provide interpretation, education and outreach opportunities.			
Responds to Issues: How can we communicate effectively with the public about the management activities we perform on the Refuge and what, if any, impacts there are for them? How can we best communicate the state of remediation of the Refuge, updates on Refuge activities and species? How can we engage members of the public through interpretation and education to provide an experience of the Refuge in other ways given the ban on public access?			
EE/I	Obj. 2.1: Over the next 15 years, continue to maintain the current level of interpretation. Strategies for Obj. 2.1: Interpret the Refuge through the virtual tour on the Refuge website.	Obj. 2.1: Over the next 15 years develop and implement quality environmental education and interpretation programs and activities with the Tribe and our partners to further communicate our knowledge and understanding of Nomans Land Island coastal ecosystems and the	Obj. 2.1: Over the next 15 years update existing interpretive materials, develop Refuge brochures and pursue a partnership to develop an interpretive trail and associated viewing area at the Aquinnah Cultural Center. Strategies for Obj. 2.1: Update existing materials

		federal trust resources that depend upon them. In the next 5 years, work with the Tribe on creating a display for their interactive kiosk, and with the Aquinnah Cultural Center on an interpretive trail and spotting scope to view Nomans Land Island NWR. Strategies for Obj. 2.1: Review and update the website annually. Evaluate possible updates for the virtual tour Create a general brochure and rack card for the Refuge within two years to be distributed at appropriate sites on Martha's Vineyard. Partner with the Aquinnah Cultural Center and Tribe to develop a kiosk display and an interpretive trail with panels and a spotting scope, and create brochures and materials to be distributed at the Center and kiosk within five years. Develop an environmental education trunk and other materials for local classrooms and investigate opportunities with Teach-the-teacher and local libraries within seven years. Coordinate with partners including Wampanoag Tribe of Gay Head (Aquinnah) and Massachusetts Audubon	and create Refuge brochure Maintain virtual tour. Collaborate with ACC and Town of Aquinnah to install interpretive trail and panels on Land Bank property and at ACC Historical Museum. Collaborate with Wampanoag Tribe to place materials at kiosk and install virtual tour on e-kiosk at Gay Head Cooordinate with Town of Chilmark and Marthas Vineyard Cultural Council to provide and distribute Refuge information throughout the town and Island-wide.

		Society to develop environmental education capabilities within seven years.	
Community Partnership/Outreach	Obj. 2.2. Over the next 15 years, maintain existing partnerships with the Tribe, and regional and local organizations and agencies to ensure that citizens of and visitors to Martha's Vineyard are aware of the biological resources that exist on Nomans Land Island, the Service presence there, and the connection of Nomans NWR to the Refuge System. Strategies for Obj. 2.2. Explore the possibility of a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) to determine outreach and other opportunities for partnership. Issue press releases for large-scale management activities on the Refuge.	Obj. 2.2. Establish and encourage reciprocal partnerships with Tribal, regional, and local organizations and agencies to ensure that citizens of and visitors to Martha's Vineyard are aware of the biological, cultural and historic resources that exist on Nomans Land Island, the Service presence there, and the connection of Nomans Land Island NWR to the Refuge System. Strategies for Obj. 2.2. Post opportunities on the Refuge website for volunteers to become involved with visitor services programs when possible, within three years. Notify public of large-scale management activities, their purposes, and possible impacts by submitting notices and/or press releases in a timely fashion, updating the Refuge website, and posting relevant plans online, within three years. Develop an electronic newsletter for the refuge complex which includes Nomans Land Island NWR updates and by contacting interested parties on our Refuge mailing list within three years.	Same objective as B. Strategies for Obj. 2.2. Provide resource information to Town of Chilmark for 1st and 2nd grade classrooms in conjunction with existing school programs. Maintain website; issue news releases as needed. Participate in special events every five years. When funding allows, hire a local resident as a summer visitor services intern to conduct outreach and interpretive programming

		Participate in at least one local special event annually that interprets the importance of Nomans Land Island NWR and its natural resources within five years.	
Goal 3. Recognize the archeological and cultural significance of Nomans Land Island NWR.			
Responds to Issues: How can we best address future findings of human remains and cultural preservation items to ensure their protection, preservation and transfer to appropriate authorities? How can we best inventory the known human habitation remains on the Refuge given limitations with respect to access, funding, and personnel? Can we, and if so how, allow access to the Wampanoag Tribe of Gay Head (Aquinnah) for traditional tribal ceremonial purposes?			
Archaeological and Cultural Resources	Obj. 3.1: Over the next 15 years, follow Service protocol to prevent the loss of, and document, the archaeological and cultural resources on Nomans Land Island when possible. Continue to develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that would incorporate limited access for cultural and ceremonial use of the Refuge. Strategies for Obj. 3.1: Coordinate with the Navy to ensure compliance with the National Historic Preservation Act as necessary. Record cultural and archaeological items and/or sites as encountered annually, or as necessary, and contact the appropriate agencies and organizations.	Obj. 3.1: Improve knowledge of the prehistoric and historic archaeology sites on the Refuge by initiating a cultural resources overview and identifying at least one new project over the next 15 years. Develop a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) that would incorporate limited access for cultural and ceremonial use of the Refuge. Strategies for Obj. 3.1: Add known archaeological sites and historic structures to Service site inventory within five years. Within five years, develop a protocol to identify and protect archaeological artifacts. Initiate a concerted effort to find things already collected by people from Nomans Land Island	Same as A.

	Collaborate with the Wampanoag Tribe of Gay Head (Aquinnah) to develop a mutually beneficial partnership agreement incorporating cultural and ceremonial use of the Refuge by the Tribe.	within the next five years. Prepare a cultural resource overview within the next 15 years for Nomans Land Island to synthesize all the information and add palaeoenvironmental reconstruction. Use aerial photos to relate old maps and descriptions to current situation. Evaluate the need to implement dune restoration projects to prevent erosion and protect archaeological sites within the next five years. Collaborate with the Wampanoag Tribe of Gay Head (Aquinnah) to develop a mutually beneficial partnership agreement incorporating cultural and ceremonial use of the Refuge by the Tribe.	
Burial Site Protection	Obj. 3.2: Continue to maintain the Luce cemetery by removing vegetation when possible, and continue to explore opportunities to work with volunteers from interested groups in Chilmark over the next 15 years. Continue to pursue the possible repatriation of Wampanoag tribal remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a partnership agreement	Obj. 3.2: The Service will coordinate with the Tribe and Chilmark Historical Commission volunteers to maintain, manage and protect, on at least a bi-annual basis, the Luce cemetery on the Refuge by removing vegetation in conjunction with Service staff site visits over the next 15 years. Continue to pursue the possible repatriation of Wampanoag remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a	Obj. 3.2: Maintain the Luce cemetery as staff availability and opportunity allows over the next 15 years. Continue to pursue the possible repatriation of Wampanoag tribal remains on the Refuge and coordinate with the Tribe regarding existing burial sites, if found, through the development of a partnership agreement between the Tribe and the Service. Strategies for Obj. 3.2: Maintain the Luce cemetery by Service staff

	between the Tribe and the Service. Strategies for Obj. 3.2: Maintain the Luce cemetery by Service staff as opportunity allows, and continue to explore a partnership with the Chilmark Historical Commission for volunteers to conduct site visits with Service staff to remove vegetation at the cemetery when possible. Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge.	partnership agreement between the Tribe and the Service. Strategies for Obj. 3.2: Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge. Work with partners to evaluate the threat of erosion to the cemetery, and determine the best course of action to protect it within the next one to three years. Allow the Chilmark Historical Commission to maintain the part of the cemetery within the enclosed wall within five years. Encourage the Chilmark Historical Commission to conduct research in primary documents to learn more about residents buried in the cemetery and incorporate the results in a narrative report within five years. If safety approved by the Navy, work with partners such as the Chilmark Historical Commission to conduct non-invasive remote sensing survey (Ground Penetrating Radar, magnetometer, or	as opportunity allows. Meet with representatives of the Wampanoag Tribe of Gay Head (Aquinnah) to continue to develop a mutually beneficial partnership agreement incorporating repatriation of Wampanoag Tribal remains, and the protection of potential Tribal burial sites on the Refuge. Work with partners to evaluate the threat of erosion to the cemetery and determine the best strategy to protect it within one to three years.

		soil resistivity) of Luce Cemetery, to determine whether there are unmarked graves in or outside the stone wall of the cemetery within five to ten years.	
Cultural Interpretation	Obj. 3.3: Over the next 15 years, continue to coordinate with the Tribe and our partners to interpret the cultural and archaeological resources of the island as staff availability and resources allow Strategies for Obj. 3.3: Interpret the Refuge's cultural history through the virtual tour on the Refuge website.	Obj. 3.3: Within 10 years of CCP approval, work with the Tribe, the Chilmark Historical Commission and other partners to provide at least two activities, displays or materials that interprets the cultural and archaeological resources of the island. Strategies for Obj. 3.3: Develop educational materials in concert with partners for distribution and displays (including for ferries, kiosks, and museum, etc.) within five to ten years. Coordinate with partners to interpret and, when appropriate, display Nomans Land Island artifacts within five to ten years. Use the Service's cultural resource overview, the Wampanoag Tribe's oral history, document research and information in the Chilmark Historical Commisson's archives to create a web page about the history of Nomans Land Island within five to ten years. Work with the Wampanoag Tribe and the Chilmark Historical Commission to conduct an oral history project to	Obj. 3.3: Within the next 15 years, work with partners to provide at least one activity, display or set of materials that interprets the cultural and archaeological resources of the island. Strategies for Obj. 3.3: Work with partners to interpret known cultural and archaeological resources associated with Nomans Land Island as opportunity allows, including maintenance of the virtual tour on the website.

		collect information about Noman's Land Island within five to ten years. Pursue support, including Visitor Service challenge cost share grant (with the Tribe as a partner). Include information about the island's significance to the Wampanoag Tribe, presented by Tribe members, the Luce cemetery, and other historical information about the island in the enhanced virtual tour on the web site within five to ten years. Pursue a cultural resource overview with paleoenvironmental reconstruction of the island within five to ten years. Allow the Chilmark Historical Commission to document stone walls, cellar holes, and other evidence of human habitat for cultural history within five to ten years. We would first consult with the Navy to determine the feasibility of this and ensure this took place within approved safety zones. Once complete, we would add this information to the virtual tour on the Refuge website.	
Goal 4. Protect, maintain, enhance, and preserve the wilderness character of Nomans Land Island NWR.			
Responds to Issues: Is the Nomans Land Island WSA suitable for wilderness designation? If so, can we manage Nomans Land Island NWR to maintain wilderness values and character long-term, without jeopardizing our management to achieve the Refuge's established purposes and Refuge System mission?			

Wilderness Values	N/A	N/A	Obj. 4.1: Upon CCP approval, continue to maintain the wilderness character (e.g., naturalness, solitude, supplemental values) of Nomans Land Island. Achievement of this objective will be evaluated by assessing loss or degradation of values that qualified it for potential designation (see Appendix C) over the next 15 years. Strategies for Obj. 4.1: Evaluate Refuge management activities and Refuge uses through an MRA and use the minimum tool necessary to manage Refuge resources. Manage Nomans Land Island as wilderness. Monitor values of naturalness and solitude. Provide off-site interpretation opportunities to inform the public about Refuge wilderness values.

Chapter 3


Erin Victory/TCI

Refuge cliffs and dunes

Affected Environment

- Introduction
- The Physical Landscape
- Land Use History
- Current Conditions
- The Regional Socio-Economic Setting
- Refuge Administration
- Refuge Natural Resources
- Refuge Biological Resources
- Refuge Visitor Services Program
- Refuge Archaeological and Cultural Resources
- Refuge Wilderness Resources

Introduction

This chapter describes the physical, biological, and sociological environment of Nomans Land Island NWR. We begin with the physical landscape, the setting of the Refuge and our project area, including historical information, followed by Refuge administration and programs and then, descriptions of specific Refuge resources.

The Physical Landscape

Watershed

A watershed is a terrestrial concept that describes an area where all the water (subsurface and surface) converges in the same place. This is a hierarchical system that derives from the smallest stream outward to regional watercourses. Though a watershed map has not been derived for Nomans Land Island, the following inferences about the local hydrology can be made based on water sampling conducted by the Navy (Foster Wheeler Environmental Corporation 2001). Topology and geology are the primary factors influencing surface and subsurface water flow on the island. While many hydrological features are present, there are no apparent streams that connect them. Therefore, there may be some amount of surface water flowage from higher to lower elevations during rain events, however, water movement is primarily though groundwater flow.

This generally takes place from the south-central and north-central hills into the lower wetland areas between, and then outward where it is eventually discharged into the ocean. Around the periphery of the island, there is subsurface saltwater intrusion, and it is because of this that the groundwater on the island is isolated from that on Martha's Vineyard. Much of the ponds on the island are below the seasonal water table and are therefore groundwater fed, though Ben's and Rainbow Ponds are also fed by surface water runoff as well. These two ponds are hydraulically connected to the surrounding wetlands through groundwater flow. Some ponds have outlets that discharge directly into the ocean.

Extrapolating outward, the Refuge does not fit into the traditional watershed concept at a more regional scale because it is a maritime island and is therefore isolated and subject to oceanic processes. However, the 628-acre Nomans Land Island NWR has been included within the Martha's Vineyard Island watershed, which incorporates Martha's Vineyard, the Elizabeth Islands and Nomans Land Island. In total, it drains approximately 89 square miles and includes 13 streams, 42 lakes and 125 miles of coastline. Watershed priorities have been identified by the State of Massachusetts for the Martha's Vineyard watershed. Because Nomans Land Island is uninhabited and closed to the public, many of the priorities are not applicable to the Refuge, beyond increasing opportunities for environmental education. You may access this information through the Massachusetts Office of Energy and Environmental Affairs website, and searching for "Martha's Vineyard Watershed" (http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Air%2C+Water+%26+Climate+Change&L2=Preserving+Water+Resources&L3=Massachusetts+Watersheds&sid=Eoeea&b=terminalcontent&f=eea_water_marthasvineyard&csid=Eoeea).

On a larger scale, the Cape Cod watershed encompasses both the Martha's Vineyard and Nantucket Island watersheds and other small islands south of Cape Cod. It is classified by the U.S. Geological Survey as hydrologic unit (HUC) 01090002. The watershed extends 70 miles into the Atlantic Ocean and is surrounded by the salt waters of Buzzards Bay, Cape Cod Bay, Nantucket Sound, and the Atlantic Ocean. The watershed drains approximately 440 square miles and 559 miles of coastline. The Massachusetts Executive Office of Energy and Environmental Affairs provides more information about the watershed at Massachusetts Executive Office of Energy and Environmental Affairs-Cape Cod, and you can go to http://cfpub.epa.gov/surf/huc.cfm?huc_code=01090002 for more information from the USGS.

Geographical Setting

Biophysical Ecoregion

The Nature Conservancy (TNC) has divided the continental United States into 63 ecoregions which are large geographic areas that share similar geologic, topographic, ecological, and climatic characteristics. These ecoregions are modified from the U.S. Forest Service “Bailey System” (Bailey 1995). TNC has developed Ecoregional Conservation Plans that identify conservation targets and prioritize conservation actions.

Nomans Land Island NWR is in the North Atlantic Coast (NAC) ecoregion as described by TNC (see Map 3-1). This ecoregion extends from Pemaquid Point in Maine south to Delaware Bay. Flat topography, low elevations (<600 feet), scattered moraines, large rivers draining into estuaries and bays, and a mild, humid climate characterize this region. Rocky coasts dominate the shorelands in the north, grading into salt marsh communities to the south. The once extensive forest graded from white pine-oak-hemlock forest, to dry oak-heath forests, to mesic coastal oak forests from north to south. Wetlands, beaver meadows, pine barrens, and heathlands were embedded in this forested landscape. Hundreds of years of land clearing, agriculture, and widespread development has fragmented the landscape and eliminated large areas of forest. Still, smaller ecological systems remain, including barrier beaches and dunes, salt marshes, and freshwater wetlands (TNC 2006a). Current action sites for TNC exist on Martha’s Vineyard and the Cape, where land protection and management activities are already occurring. Nomans Land Island has been classified by TNC as an additional ecoregional priority.

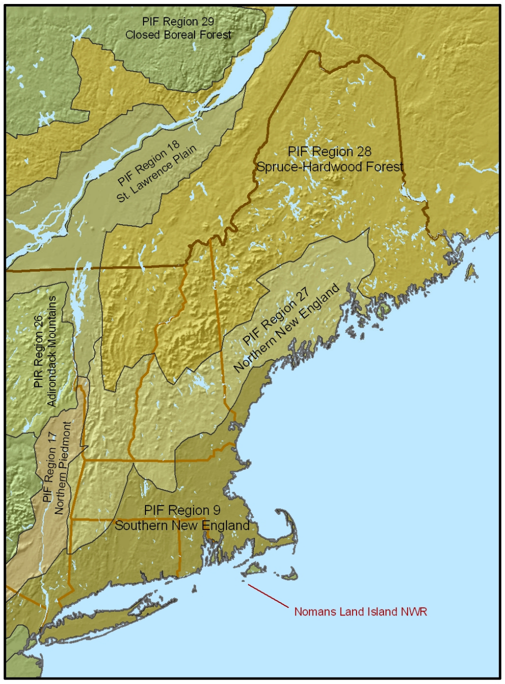
Atlantic Coast Flyway

Nomans Land Island NWR is within the Atlantic Flyway (see Map 3-1). Flyways have been used for many years in North America as the unit for managing waterfowl populations because they allow land managers to link efforts to conserve migratory bird species and their habitats on breeding, migration, and wintering grounds. The Atlantic Coast Joint Venture area includes the entire U.S. Atlantic Coast lying completely within the Atlantic Flyway. In this large area, the ACJV partners work together to assess the status, trends, and needs of bird populations and their habitats. The partners then use this information to help guide the distribution of resources to the needs and issues of highest priority.

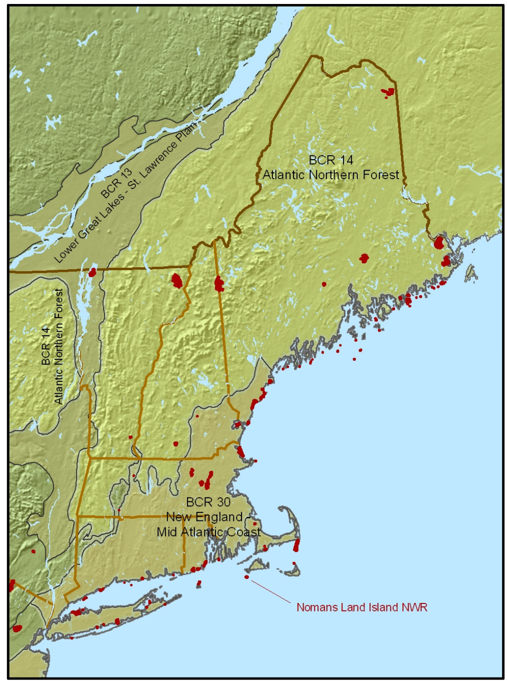
Map 3-1

Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan

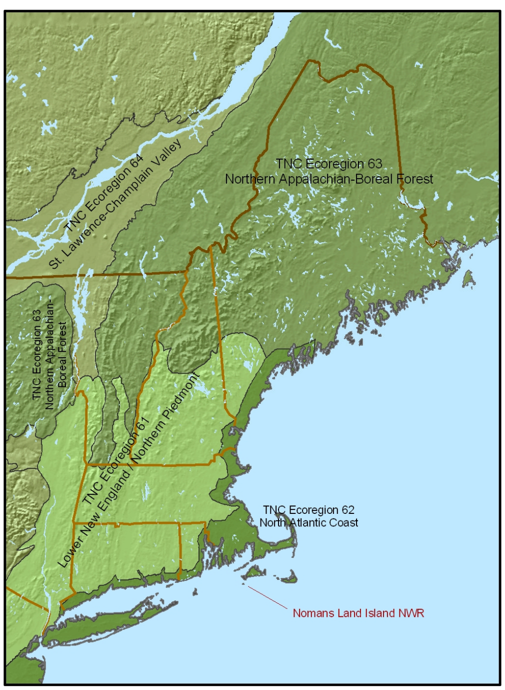
Conservation Regions



Partners in Flight Physiographic Areas



Bird Conservation Regions



The Nature Conservency Ecoregions

Atlantic Flyway

Landscape Conservation Cooperatives

In cooperation with the USGS, the Service is initiating a new approach to landscape conservation through a national geographic network that will create a spatial frame of reference to build partnerships and connect projects to larger scale biological priorities. These 21 geographic areas are aggregates of Bird Conservation Regions (see Chapter 1), and provide a basis for forming Landscape Conservation Cooperatives with other federal agencies, non-governmental organizations, states, tribes, universities and other stakeholders to accomplish conservation goals.

Nomans Land Island NWR is located in the North Atlantic LCC which combines BCRs 14 (Northern Atlantic Forest) and 30 (New England/Mid-Atlantic Coast), and contains 12 out of 13 Northeast states as well as the District of Columbia (Map 3-2). Near Nomans Land Island, there exist many conserved lands with which the Refuge can partner along Cape Cod and associated islands (Map 3-3).

Consisting of a diverse array of ecosystems, from high elevation spruce-fir forests to coastal islands, there will be many different conservation priorities to be addressed in the North Atlantic LCC. On a landscape level, these will include climate change and extirpation of wildlife populations from disease or habitat loss. Many partnerships for watershed, fish, and migratory bird conservation already exist within this geographic region and will provide a basis from which to initiate the LCC, which will also incorporate Canadian partners as well. This LCC will focus on federal-listed and candidate species such as Atlantic salmon, piping plover, red knot, Canada lynx, New England cottontail, dwarf wedgemussel and Karner blue butterfly, among others. For more information, go to, http://www.fws.gov/science/SHC/lcc.html.

Map 3-2


Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan
USFWS Land Conservation Cooperatives
Unclassified
Quebec
Upper Midwest and Great Lakes
Ontario
North Atlantic
Maine
New Brunswick
Nova Scotia
North Atlantic
VT
NH
MA
CT
New York
Pennsylvania
Appalachian
Nomans Land Island NWR
NJ
MD
Virginia
South Atlantic
Sources:
LCC and Refuge Boundaries from USFWS.
Basemap from ESRI.
0 50 100 200 300 400 500 600 Miles
0 100 200 400 600 800 Kilometers
N
W
E
S

Map 3-3

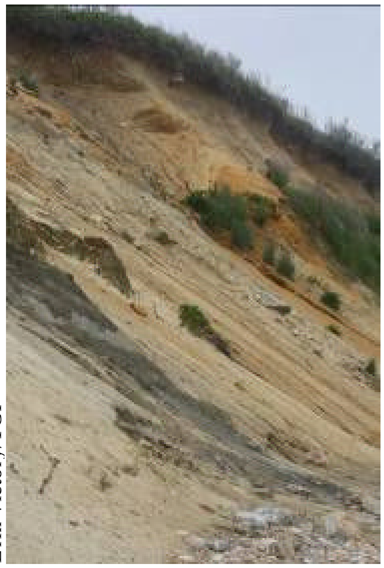
Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan

Conserved Lands in the Vicinity of Nomans Land Island National Wildlife Refuge

Sources:
Connecticut River watershed and Refuge Boundaries from USFWS.
Basemap USGS 1:250,000 DEM's
Bathymetry from MassGIS

Notable Physiographic and Landform Features

Geomorphic regions or "physiographic provinces" are broad-scale subdivisions based on terrain texture, rock type, and geologic structure and history. Our project area lies in the Sea Island Section of the Atlantic Coastal Plain delineated by the U.S. Geological Survey (http://tapestry.usgs.gov/physiogr/physio.html). Many of these islands off the coast of Massachusetts mark the southern limit of the last glacial maximum (21,000 YBP), and are where terminal moraines of clay-rich, poorly sorted glacial materials were deposited between 15,000 to 20,000 years ago. This had an influence on the subsequent development of beaches, off-shore islands, and other landforms (http://tapestry.usgs.gov/features/features.html).


Erin Victory/TCI
Eroding cliffs reveal geology

The surface of Nomans Land Island NWR is comprised of a glacial moraine deposit of sand, gravel, cobble and large boulders. The island is four sided and there is about 4.25 miles of shoreline. The continuous wave action of the Atlantic Ocean has eroded the western and southern shores, creating shoreline with steep 50-foot bluffs that expose clay deposits. Below these bluffs around much of the island is a narrow beach of coarse gravel, cobble and boulder. The northern shore does not receive such continuous wave impact, and is characterized by a gentle sloping sand-gravel beach and prominent sand spit. Maximum relief on the island rises to 110 feet above mean sea level, with impounded freshwater ponds at the 38 to 42 foot mean sea level elevation. General slope is to the north, and there are sporadically spaced moraine hills, valleys, and perched water table bogs. The presence of peat-bog fossil material substantiates historical accounts of timber on the island (French 1973c).

Major Historical Influences Shaping Landscape Vegetation

Estimating what the historic natural vegetation types were on the Refuge, how they were distributed, and what ecological processes influenced them prior to major, human-induced disturbance, can help us evaluate future management options. However, many ecologists caution against selecting one point in time, and instead, recommend evaluating the "historical range of variation" for each habitat type.

According to noted ecologist Robert Askins of Connecticut College, "This approach recognizes that the proportions of grassland, shrub land, young forests, and old-growth forests have shifted constantly over the past few thousand years as the climate changed and people have modified the land by hunting, burning, and farming. Preserving the biological diversity of any region requires a range of habitat types, including those created by natural disturbances. If there are no natural or artificial disturbances generating grassland, shrub land, and young forest, then not only will early succession obligates be in trouble, but so will mature forest specialists that use early succession habitats at key points in their life cycles. Only large public lands like refuges, parks, preserves can sustain the full range of early succession and forest habitats, so in most regions land managers will need to cooperate to ensure that these habitats are adequately represented across the regional landscape" (Askins 2002).

A brief summary of influences on natural vegetation patterns across the landscape follows.

Glaciation

Massachusetts, like all of New England, was covered by the Laurentide ice sheet during the last glacial maximum (LGM), approximately 21,000 to 18,000 YBP). The glacier reached its southernmost extent at Martha's Vineyard, Nantucket and Nomans Land Islands, marked by the deposition of terminal moraines on these islands (http://pubs.usgs.gov/gip/capecod/glacial.html). These are formed when the glacier becomes static, having reached the southernmost point where its rate of advancement is roughly equal to that of its rate of melt, resulting in essentially zero net advancement. These terminal moraines are a build up of the rock debris, or glacial till, that is embedded in the glacier that gets sloughed off and deposited along the leading edge of the glacier. The sedimentation on these islands is consistent with this process (Motzkin and Foster 2002).

At LGM, much of what is now the submerged continental shelf along the Massachusetts coast was exposed dry land because much of the world's water was locked up in continental ice sheets. It is estimated that worldwide sea levels were lower than today by 279 to 427 feet (Pielou 1991). By approximately 18,000 YBP, the ice sheet began to retreat in response to the warming climate and by about 14,000 to 15,000 YBP it had at least reached what is now the northern border of Massachusetts. As the ice sheets retreated, sea levels gradually rose. In addition, the earth's crust was slowly rebounding from the heavy weight of ice, but not as fast as sea levels were rising. This caused coastal flooding along the northern New England coast as far south as Boston (Jorgensen 1971). By about 12,000 YBP the coastline between the Bay of Fundy and Cape Cod was much as it is now (Pielou 1991).

The advance and subsequent retreat of the glacier, and changing climate had a profound impact on the local biota. With the advance of the glacier, many northern species were locally displaced and subsisted in southern areas of refugia. The retreating glacier marked a period of time when much of the physical environment was in a constant state of flux. Climatic factors such as temperature, precipitation, humidity, and atmospheric carbon dioxide were fluctuating. The earth's crust was rebounding at the same time that sea levels were rising, and the local hydrology was still in a dynamic state. The glacier itself was directly altering the landscape as it retreated by depositing till, boulders, isolated slabs of ice that melted to form kettle hole ponds, and by forming proglacial lakes as a result of the voluminous meltwater pouring off the retreating glacial front (Williams 2002, Jackson et al. 2000, Prentice et al. 1991). Combined, these factors made for ever-changing conditions as plant and wildlife species attempted to recolonize the area.

As the climate warmed and the ice retreated farther north, continual weathering and erosion of rock over time released nutrients and created new soils for plants to grow. Just south of the glacier, it is thought that tundra-like vegetation was dominant on the landscape, though there may have been places where the ice abutted spruce forests (Pielou 1991, Jackson et al. 2000). The tundra-like landscape was dominated by sedges and dwarf shrubs for several thousand years. As the climate warmed, these plants and associated animals followed the glacier as it receded north. The tundra continued to retreat, eventually restricted to the highest mountaintops (Davis 1983, Marchand 1987).

It has been shown that regional temperature and moisture levels working in concert may explain the variability in post-glacial phytogeography in southern New England better than climatic temperature alone. By 14,600 YBP spruce populations were prevalent in New England and they persisted until 11,600 YBP when white pine became the dominant taxa, replacing spruce during a drier, warmer climatic period. Hemlock (Tsuga canadensis), beech (Fagus grandifolia) and birch (Betula) increased by about 8,200 YBP, replacing the white pine (Pinus strobus) after a concurrent rise in moisture availability. Hemlock, a more mesic species, experienced a population crash around 5,400 YBP, which was originally thought to have been due to the first ever recorded occurrence of a pathogen. However, recent evidence indicates that its decline took place during a drier microclimate which may also have been a factor. Deciduous species such as hickory (Carya) and chestnut (Castanea dentata) were much slower to reach New England, 6,000 BP and 3,000 YBP respectively. This was likely due to regionally cooler temperatures and lower moisture levels than today (Shuman et al. 2004, Shuman et al. 2005).

For the first few thousand years after glacial retreat (about 11,500 YBP), sea level was 300 feet lower than today (Mulholland et al. 1998). Much of the area now inundated, including Vineyard Sound and the area between Martha's Vineyard and Nomans Land Island was probably occupied by Native Americans. Gradually, sea levels continued to rise, and by 10,000 YBP, sea level was 45 feet lower than today, and Martha's Vineyard and Nomans Land Island were still connected to the mainland. Three thousand YBP, water level was 16 feet lower than today, and by 2,000 YBP, sea level was 6.6 feet lower (Mulholland et al. 1998). It is thought that up until approximately 1,000 years ago, a sand spit connected Martha's Vineyard to Nomans Land Island (LaFarge 1933).

Erin Victory/TCI

View of Martha's Vineyard from the Refuge

Large mammals, including mastodons, wandered the spruce parkland and grassy savanna, but disappeared quickly at the same time as the glacier receded and humans advanced across the region. Thirty-five to 40 large mammals became extinct 9,000 to 12,000 YBP, while other mammals that were present then, such as white-tailed deer (Odocoileus virginianus), are still present today in New England (Pielou 1991, Askins 2002).

More Contemporary Influences on Vegetation Patterns

Natural disturbances vary across New England, depending on geographic location, forest type, and local conditions. Before European settlement, coastal regions experienced the highest rates of disturbance because of the prevalence of sandy pine-oak barrens, high densities of Native Americans, higher frequencies of hurricanes, and longer snow free periods. These disturbance regimes may have maintained about one to three percent of the inland northern hardwoods forests, greater than 10 percent of the coastal pine-oak barrens, and perhaps seven percent of spruce swamp and spruce flat habitats in early successional habitat (Lorimer and White 2003). However, it is likely that Nomans Land Island was mostly forested before European settlement.

Native insects and disease, ice storms, droughts, floods, landslides, and avalanches have caused minor and major disturbances. Lorimer and White (2003) depict hurricane frequencies as varying from 85 years in southeastern New England, 150 years through central Massachusetts and the southeast corner of New Hampshire, to 380 years or more in northern New England. Lorimer (1977) estimated catastrophic disturbances from fire and windthrow at intervals of 800 and 1,150 years, respectively.

After European settlement, agriculture, logging, fire, windthrow, exotic pests and diseases, fluctuations in wildlife species abundance and distribution, and development have significantly altered the New England landscape. Agriculture had the greatest effect on New England's forests, causing major changes in cover types and soils over a wide area. Intense fires fueled by logging slash did have a lasting impact on forest vegetation patterns (DeGraaf and Yamasaki 2001).

Sheep Grazing

Grazing was common throughout the New England coast during the eighteenth and nineteenth centuries. As European settlement increased, coastal islands were cleared of forests, and though fire was used to some extent, it was the chronic, intensive disturbance created by plowing, harrowing, and grazing by sheep and cattle that had a more lasting impact on modern vegetation (Motzkin and Foster 2002). As a result, the landscape changed from a primarily forested one with small-scale disturbances that created a shifting mosaic of openings, to one in which grasslands were ubiquitous by the 1800's. On Nomans Land Island, the beech, sassafras, hickory and oak forests were cleared during the 1800's and sheep grazed year-round in the moderate coastal climate (Snow 1975). Sheep-raising was profitable for more than 150 years. Upwards of 800 sheep from Chilmark and the mainland pastured on the island (Otteson 1998); Martha's Vineyard had up to 20,000 sheep grazing pastures by the late eighteenth century (Motzkin and Foster 2002).

The impacts this had on local vegetation was rapid and long lasting. Grazing controlled the growth of woody species while increasing grass, herb, shrub and weed species. Overgrazing, on the other hand, created areas that were nutrient deficient and led to a loss of vegetation cover, wind erosion, and in some cases, dune development (Foster and Motzkin 2003). On the Refuge, trees did not reforest the island due to the effects of grazing and the pruning effects of salt spray. In addition to the vegetative changes on the island as a result of this activity, the number and variety of mammals greatly declined due to lack of habitat (Snow 1975).

The abandonment of these practices in the late 1800's resulted in the gradual reforestation of many areas, with the exception of coastal habitats which slowed the process of succession due to heavy winds, salt spray and the absence of seed sources. Modern shrub, grass and heathland communities are primarily the result of the intensive agricultural land use practices by European settlers, and likely do not represent ecological communities or species associations found prior to European settlement (Foster et al. 2002). However, these modern open land communities do support many species of conservation concern and therefore have high conservation value. They provide much needed habitat for current day indigenous species that have lost habitat throughout their ranges as a result of human development and other anthropogenic factors.

Fire

The history of fire on Nomans Land Island prior to the twentieth century is largely unknown. Archaeological evidence from Nomans Land Island indicates that Native Americans were using the island by at least 5,000 years ago (Jacobson 2000), and there is agreement in the literature that Native Americans did use fire as a tool to clear the forest understory and small openings around their seasonal camps (Motzkin and Foster 2002, DeGraaf and Yamasaki 2001). On Martha's Vineyard, paleoecological evidence shows charcoal records that indicate the occurrence of fire over time, but the origin, extent and frequency of these fires are not known (Foster et al. 2002). Given the geologic similarities and physical proximity between the two islands, and presumed similarities in Native American land use on both islands, fire has almost certainly had an impact on the island's vegetation over time.

More recently, fires, likely due to bombing, have occurred on Nomans Land Island NWR, but because of the infrequent visits to the island, our information is incomplete. There are records of fire occurring prior to 1973 (French 1973b) but the acreage and location are unknown. Frequent fires occurred in the early 1980's and greatly reduced the height and density of woody vegetation (Ladd 1982b). About one third of the island burned in April of 1980 (Atwell 1980). A "fairly large fire" occurred again in early winter of 1980-1981, followed by two small fires in the spring of 1981 (Ladd 1981). In addition, several spot burns of 1 to 10 acres occurred on the southern side of the island in the spring of 1982 (Ladd 1982a, Ladd 1982b) and small fires and spot burns occurred again in 1983 (about 25 acres; Ladd 1983a, Ladd 1983b). The southern part of the island was burned again in 1984 (Ladd 1984) and much of the island was burned in 1985 (Organ 1985). In 1986, Refuge staff noted that fires during the spring continued to reduce the thick growths of upland shrubs such as bayberry, rose, arrowood and greenbrier, thereby opening up additional areas for goose browse production and gull nesting (Atwell 1986). The eastern half of the island experienced a wildfire that burned about 200 acres in 1991. The cause of this fire is unknown, but due to the point of origin, it appears not to have been the result of any military activity (USFWS 1991).

Prescribed burns occurred on Nomans Land Island NWR in 1997, 1998 and 2008 as part of the Navy's ordnance surveys and removal. The most recent burn in 2008 had an estimated 80 percent coverage (Phillips 2008).

Occasional, dormant-season burns (winter or spring burns), as carried out by the military, appear to have increased the stem density and cover of clonal shrubs on the island, such as bayberry and arrowwood (per Vollick/Mitchell site visit, July 2001). This is consistent with fire ecology literature for these species. Increased cover of berry-producing shrubs may provide habitat for a variety of neotropical migratory songbirds in the fall.

Land Use History

Early Native American Influences

There is some indication in the archaeological record of paleo-Indian people populating New England, likely including the Cape Cod region, shortly after the post-glacial recolonization of many plant species in the region (12,000-9,000 YBP). However, given the paucity of data available from this time period, it is not possible to provide much insight into their relationship to the landscape or their subsistence strategies beyond the now disabused notion that they were specialized in hunting megafauna. It appears more likely that while seasonal big game movements and hunting was an important factor, they also incorporated a more generalist strategy that utilized all the technology and resources available to them (MHC 1986).

The Early Archaic Period (9,000-7,000 YBP) is represented from archaeological sites found on Cape Cod and Nantucket, though none have been documented on Martha's Vineyard. These indicate a regional movement pattern around a centralized area, though there were some differences in subsistence patterns noted between those sites found interior, and sites found associated with hydrological features. The Middle Archaic (7,000-5,000 YBP) period shows a marked increase in the number of sites found, and thus indicates an increase in the population or at least occupation of the Cape Cod region. Sites representing this time period are found on Cape Cod (34), Nantucket (12) and Martha's Vineyard (25). These sites were associated with headwaters of streams and other areas with access to anadromous fish runs. There is also indication from sites on Martha's Vineyard of hunting and fishing activities. By the Late Archaic Period (5,000-2,700 YBP), there were several traditions, or tool forms, in use (Laurentian, Susquehanna, Small-stemmed and Orient) that indicate an adaptability and utilization of a wide range of resources and a more fixed presence on the landscape (MHC 1986).

In the Cape Cod region, Early Woodland (2,700-2,000 YBP) sites are not well represented, in part due to overlap in traditions (Small-stemmed in particular) from the Late Archaic Period and in part due to problems with ceramic analysis and dating techniques. However, there are sites that represent the Early Woodland period in conjunction with Middle (2,000-1,200 YBP) and/or Late Woodland periods (1,200-400 YBP) as well. The Early Woodland period ushers in an era of ceramic use, as well as the use of materials from other geographic locations indicating contacts with other regions which were important, but not pervasive. It was primarily a regionally insular way of life. Quartz, quartzite and felsite were the primary materials used, and these were easily found along local beaches and river channels. The Late Woodland period is the time when the pre-historic Cape Cod regional population was at its peak, and sites indicate the use of every habitat type. The remains of sea mammals, terrestrial mammals, shellfish and great auk have been associated with these sites (MHC 1986).

Within the last 1000 years, there was a noticeable shift to a more sedentary lifestyle. While similar shifts have been associated with the onset of agrarian enterprise in the Great Lakes region, there have been no village sites in the Cape Cod region associated with fossil evidence of domesticated plants. Instead, this sedentism is evidenced in archaeological sites through an increase in the size and density of shell middens, and the shift in seasons for shellfishing; from the summer months to the winter months, presumably to take advantage of the summer growing season. This increasing emphasis on horticultural endeavors in the last 1000 years is likely due to a more favorable climate. As a result, subsistence patterns, settlement patterns, and social organization may have changed or been influenced, resulting in changes to how early Native Americans interacted with the landscape. However, exactly how these changes were incorporated and what effects they had are still largely absent from the archaeological record (MHC 1986).

Every major archaeological period is represented on Martha's Vineyard and would be expected to be found on Nomans Land Island as well. In fact, five pre-Contact sites (prior to the 1600's) have been documented to date on the island, and one confirms the presence of Native Americans at least as early as the Late Archaic-Early Woodland period (5000-2700 YBP; Jacobson 2000). The modern south shore of Nomans Land Island is close to the location of the mainland shore 10,000 years ago, and may have attracted pre-Contact settlement by paleo-Indian people (Mulholland et al. 1998). According to the Wampanoag Tribe, the island's original name was Cappoaquidnet, and it is likely that it later acquired its present name from the name of its Wampanoag sachem, Tequenoman (http://www.wampanoagtribe.net/Pages/Wampanoag_Way/chilmark). The origin of the island's present name, however, is still unconfirmed.

Oral traditions of the Wampanoag Tribe of Gay Head (Aquinnah) tell that the first Indians on Martha's Vineyard were the giant, Maushop (Proto-Algonquian for "big man" or "giant") and his wife, Squant (derived from the seventeenth-century word, Squáuanit, the woman's god) and their children. One Maushop story recurs frequently, but was first collected in 1792 and published in the Massachusetts Historical Society Collections in 1806. In this story, Maushop separates Nomans from Martha's Vineyard by making marks with his toe across the beach, isolating a section of the isthmus that separates (or joins) them. Water rushed into the cuts on each side of the isthmus and eroded the rest of the beach, separating the islands (Simmons 1986). In fact, Nomans Land Island was likely attached to Martha's Vineyard until recent geological time, within the past 1,000 years. The separation of Nomans Land Island from the Vineyard reflects rising sea level, but the event that finally removed the spit was a storm (LaFarge 1933).

Natural processes were the dominant forces acting on the pre-European landscape. Native prairies, extensive beaver meadows, periodic fires, and occasional hurricanes created a "shifting mosaic" of open land habitat within the forested landscape (Cronon 1983, DeGraaf and Yamasaki 2001). Low-intensity natural disturbances including wind, ice and insects were frequent and local, while higher-intensity large-scale disturbances including hurricanes, tornadoes, and insect epidemics were infrequent. Beavers (Castor canadensis)created extensive wet meadow habitat, although there is no evidence that large grazing animals would have maintained open areas in the uplands (Foster and Motzkin 2003).

Native Americans also contributed to this "shifting mosaic" of open land habitat in southern New England through shifting local agrarian areas for maize, bean and squash crops. They also cut trees for fuel and used fire as a tool to clear the forest understory to aid in travel and hunting game such as white-tailed deer (Marchand 1987, DeGraaf and Yamasaki 2001). Despite some disagreement in the literature regarding how extensive these open land habitats were, Foster and Motzkin (2003) suggest an emerging view that New England native populations were mobile and practiced shifting agriculture that created a mosaic of forest ages, but not extensive areas of cleared land (that would result in extensive grasslands, heathlands, or shrublands). Southern New England tribes were more sedentary than northern New England tribes, and therefore likely set repeated fires that would have had a more lasting impact on the landscape (Patterson and Sassaman 1988).

European Influences

Captain Bartholomew Gosnold, an English explorer, was one of the first white men to record the discovery of Nomans Land Island. Although Native Americans were already occupying the island, the Duke of York claimed authority over the island for New York in 1664. The island was first called Nomans Land Island in 1666 (Banks 1911), and although there are a variety of explanations, the true origin of the name remains uncertain.

The Duke of York granted the island to four men in 1666 with the stipulation that they construct a harbor within three years, develop a fishing trade and pay annually one barrel of cod fish as a quitrents (Banks 1911). However, the grant was forfeited when the men did not meet the conditions, and the island reportedly remained in the control of the Duke for the next 14 years. Although the crown claimed control over the island, records indicate that the first deed record of ownership documents aboriginal ownership at least by 1674 when Sachem Cascanabin sold the western half of the island to his brother Tackquabin in 1686

(Wood 1978). Then, "When [New York] Governer Dongan invested Matthew Mayhew in 1685 with the Lordship of Martha's Vineyard, he included Nomans Land Island by name in the patent and a few days afterwards, Mayhew sold it to Dongan, who thus came into possession of the Island by purchase. . . Dongan sold it on August 3, 1689, to William Nichols of Islip, Long Island…." Then, “John Philip, sachem, sold the island in 1692 to Matthew Mayhew as steward for £50 and Mayhew sold his rights to Nichols the next year” (Banks 1911).

By 1702, Nomans was “well watered and well wooded”, and was “very fertile…it is claimed that one of the fields of grass has yielded so large a crop that it could not be cured on the surface of the field” (Sewall in Wood 1978). It was evidently being used in some form of agricultural production, but had not yet had any permanent European habitation. Its Native American inhabitants were Seventh Day Indians, or Sabbatarian Baptists (Sewall in Banks 1911). Sabbatarian Baptists observed Saturday as the Sabbath and underwent religious persecution in England. Some came to Newport, Rhode Island in 1665 (Ward undated).

William Nichols retained the island for twenty-five years, likely without having occupied it, until it was annexed to the Town of Chilmark, Massachusetts (Banks 1911, Wood 1978). In 1715, Nichols sold Nomans Land Island to Jacob Norton whose family kept it for over 50 years (Banks, 1911). Norton may have been the first Englishman to settle on the island, building the Jacob Norton House on the island between 1715 and 1722 (Henry Scott, The Story of a House, Perhaps the Island’s Oldest, in Mulholland et al. 1998). The Norton family owned the entire island until 1772, when Jacob's daughter, Abigail, sold one-fourth of the island to John Banester (Wood, 1978).

With the death of the Norton descendents in the mid-1700’s, the ownership of the island becomes unclear due to a variety of litigations between claimants, and remains unclear for the next century (Wood 1978). During the eighteenth and nineteenth centuries, the island was owned by several people, and had several permanent inhabitants, including Israel Luce who was buried on the island upon his death in 1787. The fishing opportunities on Nomans began attracting many people during the fishing season. Two villages arose, Gull Town (also known as Crow Town; Wood 1978) and Jimmy Town, and there were over 20 dwellings and fishing shacks that were home to about 40 families. In addition, the island housed a church, school, store, gristmill, graveyard, and a boardinghouse for sailors.

The three major occupations were fishing, raising sheep, and piloting. Men fished in the early spring; about 50 fishermen and their families moved to the island during the cod fishing season. Seasonal cod fishing was important on Nomans Land, and the last community there was focused on fishing (Mulholland et al. 1998). Because there was no safe harbor to anchor their boats, early fishermen fished mostly with hand lines in double ended boats which could easily be hauled on shore. In the late spring, men sheared sheep that inhabited the island. Later, sheep were actually transported to the island from Martha's Vineyard in the spring and summer, and then taken back in the fall (Chilmark Open Space Plan 1984). By the turn of the twentieth century, the woods were gone (Banks 1911). Several low stone walls on the northern side of the island and a wood and stone cistern near the center of the island provide evidence of the community that lived on the island.

Human Influences over the past 100 years

In the early twentieth century, fishing and raising sheep was much less profitable. In 1914, the island was purchased by Joshua Crane (Chilmark Open Space Plan 1984). The island was used as a hunting and fishing camp by the family (Crane et al. 1970), and was named The Crane Estate. Crane created “The Goose Club” with his sportsmen friends, and introduced Belgian hares for fur and meat, muskrats, and birds for trapping and shooting, and he stocked the lakes and ponds with trout for good fishing (Wood 1978). The hare population exploded and the Cranes tried to eliminate them. An admirer of Scotland, Crane also planted Scotch pine and heather along the banks of Ben’s Pond (Wood 1978). Joshua Crane introduced Hampshire sheep which produced good wool sold in Boston. Later, his trustees introduced Dorset Delaine sheep shortly before the Navy took over the island. Artist Alexander Crane, Joshua Crane’s son, painted numerous watercolors of the island. A year-round caretaker, Ralph Waldo Wood, lived on the island from 1924 to 1933 (Wood 1978).

In the early 1940s, the U.S. Navy began leasing the island from Joshua Crane as a radar triangulation point for Buzzards Bay and Newport, permitting only military access. In 1943, it was also used as a gunnery range and for bombing activity. For several years immediately following WWII, a Construction Battalion unit, the Seabees, were stationed on the island. Their purpose was to improve the airstrip, erect structures including a radio tower, and to maintain the bombing range. These structures were eventually removed or demolished, and no one has lived on the island since then. However, from 1943 to 1952, Nomans Land Island was used as a military aerial bombardment and gunnery range and live munitions were employed to train military pilots. In 1952, the Navy outright purchased the island from the Crane estate through a declaration of eminent domain, and continued training exercises from 1952 until 1996, substituting dummy bombs for the live ones used during the war (Stone and Webster 1996, http://www.mass.gov/dep/cleanup/sites/nlihstry.htm).

When high explosive munitions ceased to be used in the early 1950's, a number of inert munitions were substituted. Target manuals from 1955 and 1967 list a variety of munitions used including rockets with inert heads, water or sand filled practice bombs, practice shapes, and tracer and other authorized ammunition. They were delivered by glide, dive, toss, masthead, horizontal, rocket, low level and radar bombing, as well as photo and searchlight operations. It appears likely that the majority of these practice ordnance discharged a colored smoke plume to allow pilots to assess target precision (Foster Wheeler Environmental Corporation 2001). Nomans Land Island was used by the Naval Air Stations at Quonset Point (Rhode Island, up until the early 1970s) and South Weymouth (Massachusetts); both oversaw daily operations on the island. It was also used by the Navy Seals (Tetra Tech 2004).

In 1970, the eastern third of the island, approximately 200 acres, was set aside as a migratory bird and wildlife refuge although the Navy still used it for military purposes. The eastern third of the island became a no fire zone in 1982 and the Service began managing the area. In 1995, the Naval Air Station South Weymouth, including Nomans Land Island, was listed for closure under the 1990 Base Realignment and Closure Act. In 1996 all military operations were ceased on the island, and an extensive surface ordnance sweep was commenced to ready the island for transfer to the Service under the cleanup guidelines of that Act. The island was transferred from the Department of Defense to the Department of the Interior in 1998, under the Act Authorizing the Transfer of Certain Real Property for Wildlife (16 USC 667b). A transfer agreement was established by both parties to clearly delineate the terms of the transfer and the ongoing responsibilities of both parties in the future. These terms mandate that the Service keep the island closed to the public due to safety and liability hazards, and that the Navy continue surface ordnance clearing operations to a level commensurate with only minimal access by Service staff for management needs. This will require continued periodic surveillance and surface ordnance clearing as necessary by the Navy in the future, as frost heave and erosion may continue to expose sub-surface ordnance over time.


Erin Victory/TCI

Exposed surface UXO

The Navy retains responsibility for contaminants and MEC that remain on Nomans Land Island as a result of past military operations. The Navy's current management of residual MEC is based on the Services designation of Nomans Land Island as an unstaffed wildlife refuge. Any change to this designation that would result in increased exposure to MEC would require additional cleanup at the Service's expense.

As noted elsewhere in this document, the Navy has been working with the Service and the Massachusetts Department of Environmental Protection on the cleanup of the site since the mid-1990's. Contaminant remediation has taken place and extensive clearance operations were conducted in 1998. In addition there have been two limited follow-up MEC surface clearances, in 2003 and 2008, to address MEC that was exposed by erosion.

A draft Phase III/Feasibility Study Report has been prepared for the Navy which identifies and evaluates appropriate RAAs to address the risk to safety for Nomans Land Island. Risks to the environment, human health, and public welfare have been previously addressed and closure attained. The feasibility of alternatives for remedial actions is evaluated according to criteria set forth in CERCLA and the 2004 Naval Facilities Engineering Command - Guidance for Optimizing Remedy Evaluation, Selection, and Design, and is consistent with the guidance and regulations from the Massachusetts Contingency Plan. The public will be provided an opportunity to comment on the Phase III/Feasibility Study Report in 2010. Once that report is finalized, the Navy will prepare a Proposed Plan to indicate the preferred remedy.

Refuge staff will develop habitat management and inventory and monitoring plans that comply with final Navy Operations and Maintenance plans. We do not anticipate any conflicts with our proposed management of the Refuge as a result of these final Navy plans.

Current Conditions

General Climate Description

"It is said that nowhere else at the same latitude in the northern hemisphere is it as cold as in the Northeast, except perhaps in northeastern China and Hokkaido, Japan" (Marchand 1987). The reason for the region's cold climate is partly a result of the pattern of atmospheric circulation in this hemisphere. Low-pressure systems all converge on New England regardless of their origin and pull cold Canadian air in behind as they pass over the northeast (Marchand 1987). New England weather conditions are influenced more by the North American landmass than by the Atlantic Ocean except along the coastline (Taylor et al. 1996). Forty to forty-five inches of precipitation fall about evenly throughout the year, although drought periods occur in some years (Patterson and Sassaman 1988). According to the Crane daughters, when they lived part-time on the island, "The climate is very mild, there is practically no snow, the wind blows constantly, there is plenty of water, and crops can be sown twice a year" (Crane et al. 1970). The closest weather data station is in Edgartown, Martha's Vineyard (also in Dukes County). Average daily temperatures at this station from 1971 to 2000 were 30.7 °F in January, 46.0 °F in April, 70.5 °F in July, and 53.8 °F in October. The growing season ranges from 158 to 204 days. Average annual rainfall between 1971 and 2000 was 46.06 inches (http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl). Heavy winds and highs seas often accompany storms.

Global Climate Change

Global climate change is a significant concern to the Service and to our partners in the conservation community. Scientists are predicting changes in temperature, precipitation, soil moisture and sea level, all of which could adversely affect vegetation and ecological systems. We expect that species ranges will shift northward or toward higher elevations as temperatures rise, but responses likely will be highly variable and species-specific. Under those rapidly changing conditions, migration, not evolution, will determine which species are able to survive (USFWS 2006). Species that cannot migrate will suffer the most. For example, plants, mussels, and amphibians are more vulnerable to shifts in temperature that may affect their ability to survive, grow, and reproduce.

Climate change impacts in coastal regions include a higher frequency of intense hurricanes and storms, more severe impacts of lesser intensity storms, including nor'easters, warming ocean waters, and rising sea levels (Frumhoff et al. 2007). Sea-level rise is one of the most potentially serious consequences of global climate change for coastal ecosystems like Nomans Land Island. According to the USGS, sea levels have been steadily rising 1-2 mm (0.04 to 0.08 inches) per year since the 19th century (http://geochange.er.usgs.gov/poster/sealevel.html). This is a result of a reduction of ice caps, ice fields, and mountain glaciers, in combination with the thermal expansion of ocean waters. If sea level continues to rise, this could have serious impacts on coastal islands including Nomans Land Island NWR.

The IPCC's most recent climate change report offers a range of estimates of sea level rise over the next century based on model projections under different emissions scenarios. With no likelihood attributed to any of these scenarios, the lowest estimate is 0.18 to 0.38 meters (7 to 15 inches) under the B1 scenario, and the highest estimate is 0.26 to 0.59 meters (10 to 23 inches) under the A1FI scenario (IPCC 2007). It is important to note, however, that these upper bounds do not represent the upper limit of potential sea level rise, because of limitations in knowledge for all of the drivers of sea level change.

Local impacts would be determined by whether the land is subsiding (lowering in elevation due to underground changes, e.g., ground water pumping) or uplifting, topography, and the presence of sea walls and other anthropogenic factors (Galbraith et al. 2002). In the Northeast, sea level rise is higher than the global average because of land subsidence, and parts of both Nantucket and Martha's Vineyard have been classified as areas of high vulnerability to sea level rise by the USGS. Nantucket, for example, is currently eroding at a rate of 15 feet per year (Frumhoff et al. 2007). Coastal communities in Massachusetts such as Gloucester and Marshfield are predicted to lose more than five percent of their land area due to rising ocean waters by 2100 (TNC 2006b). By the mid 1990's, Boston had already seen an increase in mean sea level since 1950 by 5 to 6 inches, and was predicted to see another increase of 22 inches by 2100 (TNC 2006b, USEPA 1997).

These losses in coastal land area include intertidal, salt marsh, and drier coastal upland habitat, resulting in a decrease in feeding, resting and breeding habitat for many coastal fish and wildlife species. These include many marine and coastal bird species, commercial fish including menhaden, alewife and herring, and lobster and clams, among other species (Frumhoff et al. 2007). On Nomans Land, rising sea levels could mean that shoreline habitat for shorebirds and seabirds would migrate inland where elevation is low on the northern side of the island. This could affect the total land area of the Refuge, reduce a portion of the available upland habitat, and may even impact the marshes and ponds on the Refuge through inundation depending on how much ocean waters rise, and considering tidal fluctuations. In addition, erosion of the cliffs will likely accelerate due to increased wave action, and this too could result in a reduction of upland habitat.

In recognition of this, Nomans Land Island NWR is one of several coastal refuges in the northeast for which a formal analysis was completed in 2009. SLAMM (Clough and Larson 2009) is designed to project potential coastal habitat changes correlated with sea level rise by 2025, 2050 and 2100. They include the IPCC A1B Mean and Maximum scenarios, as well as 1.0 and 1.5 m projections. In particular, this analysis highlights the potential impacts of sea level rise on Nomans Land Island NWR, and will enable the Refuge manager to take steps if necessary to mitigate for any of the potential outcomes.

Habitat classifications for the model consisted of dry land (71.9%), swamp (10.5%), open ocean (6.0%), inland open water (5.9%), inland fresh marsh (3.6%), rocky intertidal (1.2%), and ocean beach (1.0%). The model indicates that under all four sea level rise scenarios, there will be minimal to no impact to much of the Refuge due to its higher elevation. Habitats classified as dry land, inland open water, rocky intertidal and ocean beach represented most of the losses in all scenarios, though with varying rates of severity across habitat types and scenarios (Table 3.1). Dry land was lost at rates between three and five percent, depending on the scenario, resulting in a loss of 14 to 22 acres of this habitat type. Inland open water was lost at rates between 5 and 6 percent, or a loss of approximately two acres. Rocky intertidal was lost at rates between 38 and 100 percent, or a loss of 3.5 to all 9.6 acres, and ocean beach was lost at rates between

56 and 98 percent, or a loss of six to almost all 11 acres. As this study was for losses in land area due to sea level rise only, it does not incorporate losses due to erosion or other factors.

Table 3.1. From Application of the Sea Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR report (Clough and Larson 2009). Indicates the losses in Refuge lands characterized as Dry Land, Swamp or Ocean Beach under the four different sea level rise scenarios by 2100.

Sea level rise by 2100 (m)	0.39	0.69	1.0	1.5
Dry Land	3.0%	4.0%	4.0%	5.0%
Swamp	1.0%	1.0%	2.0%	2.0%
Ocean Beach	56.0%	62.0%	98.0%	98.0%


Erin Victory/TCI

East Bend Pond; predicted to be inundated by ocean waters by 2100

Table 3.2. Modified from Application of the Sea Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR report (Clough and Larson 2009). Indicates initial acreage of Refuge lands by habitat classification, and the projected change in acreage in each category by 2100 according to the four sea level rise scenarios.

	Initial acreage	Sea level rise projections by 2100 (m)			
		0.39	0.69	1.0	1.5
Open Ocean	1106.9	1128.7	1134.8	1143.1	1148.4
Dry Land	449.0	435.6	432.4	430.3	426.8
Swamp	64.9	64.3	64.0	63.8	63.7
Inland Open Water	36.5	34.5	34.5	34.2	34.2
Inland Fresh Marsh	22.0	22.0	22.0	22.0	22.0
Ocean Beach	11.1	4.9	4.3	0.2	0.0
Rocky Intertidal	9.6	5.9	3.7	1.5	0.2
Estuarine Open Water	0.0	3.1	3.0	3.3	3.2
Tidal Flat	0.0	0.0	0.3	1.1	0.9
Estuarine Beach	0.0	1.0	1.1	0.4	0.5
Total (incl. water)	1700.0	1700.0	1700.0	1700.0	1700.0

In all scenarios, the cobble spit on the north end of the island is lost or much reduced by 2100, as are much of the lands classified as ocean beach around the northern and northwestern portions of the island. These areas are the lowest in elevation and are therefore most vulnerable to increases in sea level. The inland open water most affected is East Bend Pond at the northern tip, which is already influenced by storm tides, and is likely to be inundated with rising ocean waters and particularly by tidal fluctuations without the buffer of the cobble spit and ocean beaches present today. The only habitat type predicted to remain unchanged is inland fresh marsh under all scenarios (Table 3.2). On the other hand, additional habitat types are predicted to emerge, though on a small scale. Though there are currently no habitats classified as estuarine open water, tidal flat or estuarine beach, these three habitat types are predicted to occur as a result of the rising ocean water and losses of the present shoreline buffer, though to varying extents depending upon the scenario.

When using models, there can always be uncertainties in the results due to limitations in input data and knowledge of all of the components of an ecosystem. However, this does not mean that the use of models is uninformative, nor does it undercut their importance as tools to help with management decisions. It simply highlights the need to place the results in the appropriate context for decision making. In setting up the model for Nomans Land Island NWR, there was a slight mismatch between the National Wetlands Inventory map and the digital elevation map used to create input data for the model, and this was most evident at a small portion of the southern end of the island. In addition, there was some known uncertainty because of poor resolution from a lack of accurate elevation data. Since no LiDAR elevation data was available for the Refuge, National Elevation Data (NED) was used instead which was based on a survey conducted in 1942. Therefore elevational data for the island were extremely out of date and were of poor resolution. The uncertainty within NED means that the predictions in the losses of dry land and ocean beaches could be refined with more accurate elevational input data, though this is more relevant along the shoreline. The interior portion of the island is at a high enough elevation that the model predictions that it will remain largely unchanged by sea level rise are thought to be sound. See Appendix I for the report.

This analysis provides us with some picture of what to expect in the next century, and provides an opportunity to begin incorporating climate change monitoring and to consider our options for management and mitigation of these potential outcomes. The ocean beach and rocky intertidal habitats are particularly vulnerable to sea level rise on Nomans Land Island. These results indicate that in the absence of any mitigation, there will be some losses to overall Refuge acreage, which will result in losses to valuable wildlife habitat for beachnesting birds of conservation concern. As climate change becomes better understood, our ability to model climate change impacts increases; therefore the Refuge will continue to look for opportunities to take advantage of latest scientific advancements to aid in Refuge management.

Air Quality

The Massachusetts Department of Environmental Protection (MA DEP) monitors levels of ozone and particle pollution from several stations in Massachusetts for attainment or exceedance of the National Ambient Air Quality Standards (NAAQS) set by the USEPA. These standards are reviewed every five years by the USEPA and may be changed due to new scientific information. It is incumbent upon each state to ensure these standards are met and maintained. In the case of an exceedance of these standards, pollution control strategies are implemented, and once the standards are attained, a plan is developed to maintain that standard in such a way that incorporates future economic and emissions growth.

In 2008, Massachusetts was in attainment of the air quality standards for all pollutants except ozone. Ozone at ground level is a respiratory irritant that can reduce the overall function of the lungs, cause asthma attacks, and aggravate chronic lung diseases. It also inhibits vegetation growth, and is often found in higher concentrations far downwind from the origination of the precursors that react to form it, which is why it is applicable for Nomans Land Island despite the islands' uninhabited status (MA DEP 2009). Over the last decade, the State of Massachusetts has made progress in reducing the number and severity of ozone exceedances, and in January 2008 submitted a State Implementation Plan to the USEPA that describes strategies to attain the 8-hour ozone standard by 2010 (MA DEP 2008a).

There are a total of 14 air quality monitoring stations across Massachusetts. Based on information collected from these sites, there were a total of 49 exceedances of NAAQS for ozone over 15 days in 2008. The closest two monitoring stations to the Refuge are included in those that registered exceedances: Fairhaven, MA (4 days) and Truro, MA (3 days). Exceedances at a station averaged over three years can lead to a violation of NAAQS. Based on data from 2006 to 2008, both of these stations were in violation of the 8-hour ozone standard (MA DEP 2009).

Water Quality

Summary of the General Condition of Nomans Land Island

Nomans Land Island is surrounded by the Atlantic Ocean. Average tidal rise and fall is 8.5 feet, with extremes from 8.0 to 14.0 feet in storm or hurricane induced tides. Tides generally do not reach inland, except occasionally on the north shore (French 1973c). Wetland types range from persistent emergent wetlands to permanently flooded-open water. All inland wetlands are classified as palustrine (Wray and Ladd 1985). These wetlands supply water to the ponds, as water flow is generally from emergent wetlands to open wetlands to the larger ponds. The ponds exist in low-lying portions of the island and are primarily spring-fed, and water levels of some fluctuate according to seasonal changes in groundwater elevation. Perched conditions exist where clay deposits act as barriers to vertical groundwater flow, and because of multiple clay layers, it is possible for several discrete aquifers to exist on the island. This may explain the presence of wetlands at higher elevations on the island, as these perched aquifers impede the movement of groundwater (Foster Wheeler Environmental Corporation 2001). The freshwater ponds are shallow and are succeeding rapidly toward a marshy condition with emergent vegetation beginning to dominate. The water is tannic and has low dissolved oxygen content (G. Ben David, personal communication).

Two large ponds are present on the island. Ben's Pond lies just west of the center of the island and is 1,000 feet by 500 feet. Rainbow Pond lies on the east end of the island. It is about 625 feet long and has two arms extending from it (Stone and Webster 1996). Adjacent to Rainbow Pond is a small pond with a vitreous clay pipe outlet, which failed in 1998 during a heavy rainstorm. The resultant water flow was causing severe erosion on the cliff side of the island and a new water control structure consisting of a corrugated metal pipe was installed that same year (Prior 1998). Water levels have been maintained at the same elevation as they were prior to the clay pipe outlet failure. In addition, there is one natural pond at the north end, which is subjected to salt-intrusion during storm tides (French 1973c).

Early settlers created artificial ponds on the island, largely on the western portion, by diking the outflow of bogs or digging below the water table and mounding the excavated dirt in a horseshoe shape to retain the water. In total, there are approximately 40 surface acres of spring-fed and runoff-fed waterbodies. In addition, sphagnum-cranberry-type bogs meander over about 200 acres of the island (French 1973c).

Erin Victory/TCI

One of the Refuge's ponds

Long-Term Trends and Status of Water Quality

State-reported Impaired Waters

In 2008, the DEP released the 305(b)/303(d) Integrated List of Waters (report; MA DEP 2008b). It combines both the 305(b) Water Quality Assessment and the 303(d) Report on Impaired Waters for each river basin. The DEP compiled those reports and submitted them to the USEPA and Congress, to satisfy the federal reporting requirements under section 305(b) of the Clean Water Act.

Much of the data in this report comes from a number of different third party sources including federal, state, and non-governmental agencies, as well as projects with state, local or federal funding that submit individual watershed reports. Though the sources of data are varied, they must all have a Quality

Assurance Project Plan, use of a state certified lab, QA/QC for data management, and documentation in a citable report. This ensures they are all subject to the same documentation and validation procedures.

The report on impaired waters in the state describes segments of streams, lakes, and estuaries that exhibit violations of water quality standards, details the pollutant responsible for the violation(s) and the cause and source of the pollutant, if known. In the Islands Watershed (Martha's Vineyard, The Elizabeth Islands and Nantucket), there were 18 waterbodies listed as impaired. Pathogens were the primary cause for impairment, but other impairments included nutrients, organic enrichment/low dissolved oxygen, other habitat alterations, turbidity, and noxious aquatic plants. Waterbodies on Nomans Land Island are not monitored, and therefore the island is not included in this report.

For more specific water quality information pertaining to Nomans Land Island, see the Influences on Water Quality, and Comprehensive Site Assessment sections below.

Submerged Aquatic Vegetation (SAV) as an indicator of water quality

SAV is a critically important component of the aquatic environment in shallow coastal ecosystems, and its presence and robustness are indicators of good water quality. SAV can only thrive in shallow depths where light reaches the benthic zone. The rooted aquatic beds provide shelter and food for numerous aquatic invertebrates. SAV also recycles nutrients, helps to stabilize sediment, and oxygenates the water (http://www.mass.gov/dep/water/resources/maps/eelgrass/eelgrass.htm).

SAV composition varies with salinity. In Massachusetts, the most common species is eelgrass (*Zostera marina*) along the coastline. The MA DEP began a program in 1995 to track and monitor changes in existing eelgrass beds to provide an indicator of water quality. Eelgrass is an ideal species because it is sensitive to nitrogen loading and to physical disturbance, and can be documented using aerial photos.

The state has no SAV monitoring site immediately adjacent to Nomans Land Island. Two sites exist on the westernmost part of Martha's Vineyard, however, and these both indicate a reduction in eelgrass area in acres. Menemsha Pond showed a decrease of 73.9 acres, or 17.3% between 1995 and 2001, and Lobsterville showed a decrease in 2.0 acres, or 2.1% over the same time period (http://www.mass.gov/dep/water/resources/maps/eelgrass/eelgrass.htm).

Influences on Water Quality

Beginning in 1943, the U.S. Navy leased Nomans Land Island as a target range to train military pilots. Its use for over 50 years resulted in varying degrees of impact to water quality, soils, vegetation, and wildlife. As a result of their use, the U.S. Navy has subsequently conducted extensive environmental monitoring on Nomans Land Island. A Supplemental Environmental Baseline Survey (SEBS) Completion Report written by TetraTech FW in 2004 provides information about surface and groundwater quality in Ben's Pond, Rainbow Pond, and other areas of potential concern. Surface water samples were collected for chemical analysis (explosives, metals and perchlorate) in conformance with state and federal guidelines. Even though some benchmarks were exceeded, quantitative risk assessment conducted in conformance with MA DEP and CERCLA guidelines demonstrated no unacceptable ecological or human health risks. See Appendix H for more detailed information.

Contaminants and Unexploded Ordnance

At the conclusion of World War II, the island contained large numbers of unexploded bombs and craters. The Navy continued training exercises substituting inert dummy bombs for the live bombs used during the war and continued to use the island for aerial gunnery and bombardment until 1996. In a Notice of Responsibility letter to the Navy dated September 26, 1997, Nomans Land Island was listed as a disposal site by the MA DEP for the reported release of hazardous materials due to the historical use of the island. Reports supporting this action include: the Base Re-Alignment and Closure Cleanup Plan (September 13, 1996), the Environmental Baseline Survey - Phase I Report (November 18, 1996), and the Prescribed Burn Prescription (January 7, 1997). Under the Defense Base Closure and Realignment Act of 1990, the island was transferred from the Department of Defense to the Department of the Interior's Fish and Wildlife Service on June 26, 1998. There were three contaminant issues involved in the transfer of the island to the Service: (1) unexploded ordnance removal, (2) underground storage tank removal, and (3) comprehensive site assessment.

Ordnance Debris Removal

Ordnance debris removal is one of the largest tasks involved in the transfer agreement between U.S. Navy and the Service. In 1997 and 1998, to prepare the island for transfer under the conditions stipulated in the Base Realignment and Closure Act of 1990 and the transfer agreement, UXO clearance operations were initiated. They included site preparation (including a controlled burn to reduce the vegetation cover), surface clearance of ordnance debris and residual target materials, neutralizing suspected explosive ordnance, consolidation of ordnance related material, marking of inert ordnance, screening for potential depleted uranium, data compilation and reporting, and off-site transport and recycling of ordnance related materials (Foster Wheeler Environmental Corporation 1998a). Since 1998, the Navy has continued surface MEC surveillance operations every five years, returning in both 2003 and 2008 to locate and remove exposed surface ordnance, and they will continue to do so. See Appendix H for more detail of all Navy UXO clearance operations.

Closure of Underground Storage Tanks

In the removal of one underground storage tank (UST) and associated pipelines as part of the preparation for the transfer, additional underground storage tanks were identified, along with petroleum-contaminated soil. This resulted in the removal and off-site transport and disposal of petroleum product from two tanks, removal of the USTs and associated piping, cleaning tanks, removal of approximately one half cubic yard and 25 cubic yards of petroleum-impacted soil from two tank excavations, post-excavation soil sampling and screening, re-grading and site restoration, off-site transport and disposal of USTs and piping to an approved tank yard, and off-site transport and recycling of petroleum-impacted soil (Foster Wheeler Environmental Corporation 1998b). For more detailed information see Appendix H.

Comprehensive Site Assessment

The Comprehensive Site Assessment of the island consisted of several phases. Phase I was completed to document site conditions and to assess potential site contamination, and Phase II was completed to evaluate the levels of risk associated with the contaminants detected during Phase I. Phase II addressed the contaminated media (soil, sediment, groundwater and surface water on the island), and assessed the risks to human health, environment, public welfare, and public safety (Foster Wheeler Environmental Corporation 2001). These risk characterizations were cumulative assessments of the identified hazards, dose-response assessments, and exposure assessments for USFWS workers, authorized visitors, and adult and child trespassers. They were based on estimates of future use of the island including type and extent of activities in a given habitat, duration of visits, seasonality of visits, and total annual number of visits. Estimates of age, weight and amount of exposed skin (i.e., short sleeves vs. long sleeves) were also taken into account.

The findings related to human health and public welfare were established as "No Significant Risk" and "No Significant Finding," respectively. This is because the risks to human health, including USFWS staff, other authorized visitors and trespassers were assessed based on current and future use of the island as an unmanned national wildlife refuge. The evaluation for public welfare was based on the contaminant levels and the associated nuisance conditions and community effects, and no significant risk was identified. Risks to public safety, on the other hand, were evaluated based on the presence of UXO. Despite the fact that the Navy will continue their efforts to remove ordnance that may be exposed or observed over time, the island will always pose a potential risk. In addition, despite the joint efforts of the Navy, Coast Guard and Service to deter public trespass through warning signs and monitoring patrols, there is no guarantee that trespass will be prevented. Therefore, a finding of "No Significant Risk" was not established for public safety. See Appendix H for more information.

The Regional Socio-Economic Setting

Socio-economic Factors: Regional Economic Setting

Nomans Land Island is part of the Town of Chilmark. Chilmark is a rural community located toward the western end of Martha's Vineyard. It is bordered by the Atlantic Ocean on the north, northeast, and south; West Tisbury on the west; and Aquinnah to the southwest. In 2007, the population was 963 people, compared to 650 in 1990 and 843 in 2000 (U.S. Census Bureau, http://www.census.gov/popest/archives/). The total area of Chilmark is 34.70 square miles of which 19.14 square miles is land area (http://www.state.ma.us/dhcd/iprofile/062.htm#NARRATIVE). Per capita income in 1999 was $30,029 (Department of Revenue 2000).

Most of Chilmark's acres are residential or agricultural. The center of town contains an elementary school (one room school built circa 1850), a public library (built in 1790), a town hall (built circa 1897), and a church (built in 1843). Chilmark also contains a small fishing village, Menemsha, which includes a U.S. Coast Guard Station, commercial pier and small marina (http://www.state.ma.us/dhcd/iprofile/062.htm#NARRATIVE). Ferry service is the vital link to and from Martha's Vineyard. The Wood's Hole, Martha's Vineyard and Nantucket Steamship Authority provide year-round ferry service.

Refuge Revenue Sharing Payments

The Refuge Revenue Sharing Act of 1935 (16 USC 715s), as amended, provides annual payments to taxing authorities, based on acreage and value of refuge lands. We have contributed refuge revenue sharing payments to the Town of Chilmark for Nomans Land Island since the Refuge was established in 1998 (see Table 3.3). Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources and from Congressional appropriations. The actual Refuge Revenue Sharing Payment does vary from year to year because Congress may or may not appropriate sufficient funds to make full payment. Payments are based on one of several different formulas, whichever results in the highest payment to the local taxing authority. In Massachusetts, the payments are based on three-quarters of one percent of the appraised market value. The purchase price of a property is considered its market value until the property is reappraised. The Service reappraises their properties every five years.

Table 3.3. Annual Refuge Revenue Payments for Nomans Land Island NWR.

Year	Refuge Revenue Sharing Payment for Nomans Land Island NWR
1999	$41,276
2000	$38,631
2001	$33,711
2002	$37,756
2003	$35,271
2004	$33,900
2005	$29,984
2006	$33,863
2007	$31,341
2008	$30,306
Total	$346,039

Refuge Administration

Refuge Establishment and Land Acquisition

Nomans Land Island was used for aerial gunnery and bombardment by the U.S. Navy from 1942 to 1996. In 1970, we began managing an "overlay" Refuge on the eastern third of the island under a Joint Management Agreement between the Department of the Interior and Department of Defense. Following an extensive surface clearance of ordnance in 1997 and 1998, the island was transferred to the USFWS to become Nomans Land Island National Wildlife Refuge. It was established " ...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" [16 USC § 715d (Migratory Bird Conservation Act)].

The Federal-to-Federal Real Property Transfer Agreement (Appendix G) with the Navy is subject to certain conditions, covenants, and reservations including (1) the Navy's reservation of right to access the property for the purpose of conducting ongoing investigations, studies, and required remedial action related to environmental clean-up and (2) the Navy's responsibility of liability as long as the Service administratively closes the island to all public access and maintains appropriate and adequate warning devices. In addition, waters surrounding Nomans Land Island are restricted to all unauthorized vessels (see the Law Enforcement section below).

The Eastern Massachusetts NWR Complex and Staffing

Since the Refuge was established, it has been administered as a satellite of the Eastern Massachusetts NWR Complex located in Sudbury, MA. We use the term "refuge complex" to describe two or more individual refuges, typically in the same region of a state or adjoining states, administratively combined under a single refuge manager's responsibility. Present staffing for the complex include sixteen permanent positions, thirteen located at the complex headquarters in Sudbury and three located on Monomoy NWR, three yearly term biologists, and several seasonal interns and volunteers. There is no staff stationed on Nomans Land Island NWR, however, complex biologists conduct site visits several times a year. The Refuge Manager is responsible for determining how to distribute staff time to accomplish priority work.

Funding

The funding for Nomans Land Island NWR is embedded in the budget for the entire refuge complex. Operational funding includes salaries, supplies, travel, and all other operational activities (wildlife and habitat surveys and management) that are not funded by special projects. Our annual funding fluctuates according to the number and size of the projects funded each year (e.g., vehicle or equipment replacement, visitor service enhancements, and facility improvements). Table 3.4 below summarizes the levels of funding for the entire Eastern Massachusetts NWR Complex, including Nomans Land Island, in fiscal year 2007, 2008 and 2009.

Table 3.4. Fiscal year funding for the Eastern Massachusetts NWR Complex for 2007 to 2010 by type.

	2007	2008	2009	2010
Operations	$2,070,809	$2,181,898	$1.919,275	$2,124,247
Supplemental			$327,500	$330,975
Construction	$2,898,619	$497,465	$4,560,000	$2,030,071
Total Fiscal Year Budget	$4,969,428	$2,679,363	$6,806,775	$4,485,293

Refuge Facilities and Maintenance

Currently, there are no existing intact structures on Nomans Land Island that would serve as a Refuge facility. The last inhabitation of the island was by Navy personnel in the 1950's, and public access is restricted due to the presence of unexploded ordnance. All of the buildings associated with the use of the island before the Navy acquired the island, and all the buildings associated with the Navy's use of the island, have been demolished or lost due to time and weather. There are a total of 4.6 miles of old farm and military roads on the island that are maintained by Refuge staff for access to the island. In addition, there are eight large warning signs erected around the edge of the island which must be maintained by Refuge staff as well as two brown USFWS signs. Three steel Conex storage structures hold equipment needed by staff to conduct Refuge operations. In 2008, two moorings were installed by the Navy offshore the island. These are now property of the Service. Depending on the alternative chosen, the water control structure for the wetland near Rainbow Pond may require periodic maintenance. Also, additional clearing of old roads may be necessary, depending on the alternative chosen.

Refuge Step-down Plans

The following step-down plans have been completed, and apply to all eight refuges in the Eastern Massachusetts NWR Complex:

- Fire Management Plan—completed in 2003
- Avian Influenza Surveillance and Contingency Plan—completed in 2007; updated annually
- Hurricane Action Plan—completed in 2009; updated annually

Additionally, each year an annual work plan, known as the Refuge Annual Performance Plan, is prepared for the Refuge. While this is not considered a step-down plan, it is a plan that is developed annually and guides the work completed by staff each year on the Refuge.

We plan to complete the following step-down plans after completion of the CCP (see Chapter 2). Additional plans may be required depending on the alternative selected for the final CCP. An updated Fire Management Plan is scheduled to be completed in 2010. Please see Appendix F for general fire program direction.

- Annual Habitat Work Plan
- Safety Management Plan, which includes UXO Inspection Logs
- Habitat Management Plan
- Inventory and Monitoring Plan
- Law Enforcement Management Plan
- Cultural Resources Management Plan

The Navy is completing an UXO Safety Operations and Maintenance Plan for the island. That plan contains a field observation log for recording the presence of MEC which has been exposed due to erosion or the freeze-thaw cycle. The requirements of this plan will be incorporated into the Refuge Safety Plan.

Findings of Appropriateness and Compatibility Determinations

Chapter 1 describes these two decision processes in detail. To date, no compatibility determinations or appropriateness evaluations have been completed for Nomans Land Island NWR because of its closure to the public. See also the discussion below for Special Use permits.

Government-to-Government Relationship with Wampanoag Tribe of Gay Head (Aquinnah)

In 1987, the Wampanoag Tribe of Gay Head (Aquinnah) received federal recognition through a Congressional act (Wampanoag Tribe of Gay Head, Inc. Indian Claims Settlement Act - PL 100-95, August 18, 1987). In 1999, the Tribe received Tribal Historic Preservation authority by the National Park Service which oversees the National Historic Preservation Act. Under this action, an ancestral territory map was created, which includes Nomans Land Island, for purposes of consultation with issues related to Section 106 of the National Historic Preservation Act (http://www.wampanoagtribe.net).

Because the Wampanoag Tribe of Gay Head (Aquinnah) is federally recognized, a government-to-government relationship exists with the Service. The Service consults with the Wampanoag Tribe regarding compliance with Native American Policy. This policy commits the Service to involving the Wampanoag Tribe in all Service actions that may affect its cultural and religious interests, cooperating with the Tribe in the administration of fish and wildlife conservation, and the identification of funding sources for fish and wildlife resource management. The Tribe is a member of the core planning team for the development of this CCP. We have a good working relationship with the Tribe on fish and wildlife funding projects. A partnership agreement is underway to further define our working relationship as it relates to biological and cultural issues on Nomans Land Island. This agreement will address issues such as providing access to the Wampanoag Tribe for occasional ceremonial purposes, the collection of vegetation in certain areas for ceremonial purposes, the potential repatriation of Wampanoag remains in a designated area on the Refuge, cooperative outreach efforts to inform the public about the value of Nomans Land Island to the Tribe, and potential for collaboration on biological and law enforcement activities.

Nomans Land Island is very important to the Wampanoag Tribe, many of whom reside within sight of the island in Aquinnah on Martha's Vineyard. The Tribe occupied the area before European settlement, and according to their history, the island was used by the Tribe for millennia. The island is an important component of their oral traditions (http://www.wampanoagtribe.net).

Partnerships

Though the Refuge is administratively closed to the public, we have relied on partnerships to assist Refuge staff in documenting and monitoring species on the island. Some partners have joined us to complete a single project or provided funding, technical support, and on-the ground help. Our most enduring partnerships involve several regional, state, and national organizations who have contributed additional information about the habitat and species on the Refuge through independent surveys of their own in conjunction with Refuge endeavors. These include the Massachusetts Audubon Society, Edey Foundation, Polly Hill Arboretum, and New England Wildflower Society. In addition, we have strong ties to state agencies and universities in achieving mutual conservation objectives. Much of what we know about the floristic species on the Refuge, as well as help with avian monitoring and management, is through the work done by these partners. These include the Massachusetts Natural Heritage and Endangered Species Program, University of Massachusetts Dartmouth, New York State Museum, and Harvard University Herbaria.

Community Outreach

Maintaining effective relationships and outreach with the residents and officials from Chilmark and Aquinnah is important and needs to be improved, particularly since public access is not allowed on the Refuge. The Service has compensated for this through the development of a virtual tour which is available on the Refuge web site (http://www.fws.gov/northeast/nomanslandisland). The virtual tour has narrated videos which provide an overview of the Refuge, island features, and descriptions of wildlife and habitats.

In the future, as described in Alternatives B and C, public outreach efforts would be expanded to include kiosks, displays, and brochures available on Martha's Vineyard and at the refuge complex headquarters and visitor center. School programs could potentially be developed around the importance of island ecosystems. Refuge staff would make an effort to occasionally participate in special events on Martha's Vineyard.

Volunteer Program

The refuge complex has an active volunteer program with 10,468 hours contributed by volunteers in Fiscal Year 2009. Most volunteer work is conducted at four of the eight refuges in the refuge complex. Volunteer contributions at Nomans Land Island NWR are limited due to the restricted access on the Refuge and the limited number of visits conducted by staff annually. All volunteers are accompanied by staff, and undergo safety training. They assist in biological and maintenance activities, such as conducting biological surveys, wildlife inventories, invasive species control, trail clearing and sign maintenance. The number of volunteer hours donated each year varies from zero to 350, but generally averages about 100 hours per year. Most volunteers are biological interns working at the complex headquarters in Sudbury or former Service employees who continue to provide volunteer service to the refuge complex.

Special Use Permits, including Research

Special use permits are issued to individuals, organizations, and agencies that request the use of Refuge facilities or resources beyond what is available to the public. In order to ensure that wildlife disturbance is minimized, special conditions and restrictions are identified for each request.

We support research activities on the Refuge, when they are compatible with the Refuge purposes, and help us gain knowledge and understanding to benefit our management goals and objectives. Because of the unusual circumstances for this Refuge regarding access and the presence of UXO, opportunities for research typical on other refuges may be more limited on Nomans Land Island. However, we evaluate each request individually. Refuge staff, university researchers, conservation organizations, and others have conducted research projects and surveys on the Refuge. Table 3.5 identifies some of the permits we have issued for research in the last few years. You may obtain additional information on these studies from the refuge complex headquarters.

Table 3.5. Sample of special use permits for Nomans Island NWR since 2004.

Year Issued	Organization/ Permittee	Purpose
2004	Harvard University Herbaria	Lichen surveys
2004	University of Massachusetts, Dartmouth	Marine algae (seaweed) surveys
2005	New England Wildflower Society	Plant surveys
2005-2007	Gordon Waring	Aerial surveys-pupping areas for gray seals
2007	New York State University	Moss and liverwort surveys
2008	U.S. Navy	Ordnance clearing

Refuge Natural Resources

Soils—General Description

The classification of Nomans Land Island NWR as a U.S. Navy Restricted Area has prevented the surveying of its soils. However, the generalized geologic map of Dukes County identifies the island as Squibnocket Moraine and Beach Deposits. Squibnocket Point of south Aquinnah, Martha's Vineyard, is also identified as Squibnocket Moraine. The soils of Aquinnah have been surveyed, and it is assumed that the soils of Nomans Land Island NWR would be similar because of its similar geological origin. The geological deposits that make up Dukes County consist of recent beach and marsh sediments, glacial deposits, interglacial deposits, and glacially deformed ancient coastal plain sediments. The Squibnocket Moraine is made up of the oldest deposit, a compact, pink and purple-gray till. This moraine is covered by a Wisconsin-age veneer consisting of stony till and outwash that also covers the Gay Head moraine and which forms a ridge and valley topography extending from Aquinnah to Chilmark and West Tisbury, Martha's Vineyard (Fletcher and Roffinoli 1982).

The Gay Head Moraine consists of folded and faulted older Pleistocene deposits, coastal plain sand silt, and clay of Cretaceous and Tertiary Age. The common soils in this moraine are the Eastchop, Chilmark, and Nantucket soils. The Eastchop-Chilmark-Nantucket soil type is nearly level to steep, very deep excessively drained and well drained, sandy and loamy soils formed in reworked glacial outwash, ice-thrusted coastal plain sediments, or glacial till on moraines. The poorer drained soils of Aquinnah are the Ridgebury Variant and Whitman Variant soils, and it is assumed that these would be the soil types of Nomans Land Island NWR's wetland areas. Whitman soils are associated with cranberry bogs on Martha's Vineyard and Nomans Land Island (Fletcher and Roffinoli 1982).

During the Navy's cleanup operations, soil cores were taken. These indicated a well developed soil profile over coarse to fine sands with interspersed with cobbles and boulders. Five soil horizons (Oe, A, E, B, C) were present, indicating successive stages of breakdown from a rich organic layer at the surface down to weathered "parent material", which in this case is glacial till. Some glacial erratics exist around the island, but no bedrock outcrops were located (Foster Wheeler Environmental Corporation 2001).

Refuge Habitat Type and Vegetation

In 1985, a survey of vegetation types was conducted on Nomans Land Island NWR by the Service. In 2000, a vegetation cover type map was created by the Service based on aerial photography dated September 20, 1984, and ground-truthed (checked on the ground) in 1985. In 2010, we will be making efforts to delineate wetland vegetation and will endeavor to produce a cover type map that will more accurately reflect Refuge habitats, and provide better resolution than previous maps.

Nomans Land Island NWR was well forested in the 17th century, but was cleared almost completely during the 1800's for farming and sheep-raising. Current vegetation is indicative of a previously forested area. Greenbrier (Smilax rotundifolia), a major component of pine-oak-maple woods and shrub thickets elsewhere in southeastern Massachusetts, is abundant on the eastern half of the island. Plants typically found in the shaded woodland such as Indian cucumber root (Medeola virginiana), Canada mayflower (Maianthemum canadense), grove sandwort (Moehringia lateriflora), swamp prickly sedge (Carex seorsa) and skunk cabbage (Symplocarpus foetidus) are all fully exposed to the sun on Nomans Land Island NWR. It is likely that these species first established on the island in shaded, forest habitat (Sorrie et al. 1988).

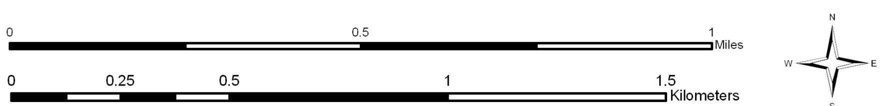
Map 3-4

Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan

Nomans Land Island National Wildlife Refuge

Habitat Classes

Sources:
Orthophoto from MassGIS.
Vegetation classification by
James W. Sewall Co. 2004



Habitat Type

Maritime Shrub Habitat

Harsh oceanic winds, salt spray, and lack of shelter have since created a brush, forb, grass, and sedge vegetative complex across 400 acres of the island. Although a few dwarf willows (Salix spp.), pitch pine (Pinus rigida), and eastern red cedar (Juniperus virginiana) are present, natural reseeding is inhibited by the absence of seed trees. Dominant upland vegetation includes rose (Rosa species), poison ivy, (Rhus radicans), bayberry (Myrica pensylvanica), and arrowwood (Viburnum dentatum). Openings created by recent past fires support grasses and forbs including poverty grass (Danthonia spicata), timothy grass (Phleum pretense), blue joint grass (Calamagrostis canadensis), little bluestem (Schizachyrium scoparium) and yellow thistle (Cirsium horridulum).

Dune Habitat

It is estimated that there is approximately 15 acres of vegetated dune habitat on the island. Sand dune-beach plant communities along the northern shore are comprised of beach grass (Ammophila breviligulata), switchgrass (Panicum virgatum), beardgrass (Andropogon species), seaside goldenrod (Solidago sempervirens) and beach pea (Lathyrus maritimus) (Wray and Ladd 1985). This habitat grades into a gravel-sand beach that, together with the vegetated dune, provides habitat for beachnesting species including terns and American oystercatchers.

Emergent Marsh Wetlands, Bogs, and Open Water

Wetland types range from persistent emergent wetlands to permanently flooded-open water. All inland wetlands occupy a total of 100 to 150 acres of the island, and are classified as palustrine (Wray and Ladd 1985). A diversity of wetland types support varied plant communities. Virginia chain fern (Woodwardia virginica), cranberry (Vaccinium macrocarpon), and sphagnum mosses (Sphagnum species) represent a common wetland plant community. Other associated wetland plant species include broad-leaved cattail (Typha latifolia), sweetflag (Acorus calamus), blueberry (V. Corymbosurn), sheep laurel (Kalmia augustifolia), common reed (Phragmites australis), soft rush (Juncus effusus), and marsh fern (Thelypteris dryopteris) (Organ 1985, Wray and Ladd 1985).

Early settlers created four artificial ponds by installing dikes at the outflow of bogs. Other man-made ponds were created by digging below the water table and depositing the excavated soil in a horseshoe shape around the site to retain the water. In addition, two large freshwater ponds and a number of smaller ponds dot the island. The smaller ponds are spring-fed and runoff-fed that total 40 acres, and are a result of kettle holes. These are areas where blocks of glacial ice were deposited and left to melt. Of the two larger ponds, Ben's Pond lies just west of the center of the island and is 1,000 feet by 500 feet. The 625 foot long Rainbow Pond lies on the east end of the island. A wetland associated with this pond historically had a vitreous clay pipe outlet that failed in 1998 during a heavy rainstorm. The resultant water flow was causing severe erosion on the cliff side of the island and a new water control structure consisting of a corrugated metal pipe was installed that same year (Prior 1998). Water levels are maintained at the same elevation as they were prior to the clay pipe outlet failure. The freshwater ponds are shallow and are succeeding rapidly toward a marshy condition with emergent vegetation beginning to dominate. The water is tannic and has a low dissolved oxygen content (G. Ben David, personal communication). Sphagnum-cranberry bogs occur on over 200 acres of the island. In addition, there is one natural pond at the north end that is subjected to salt-intrusion during storm tides (French 1973c).

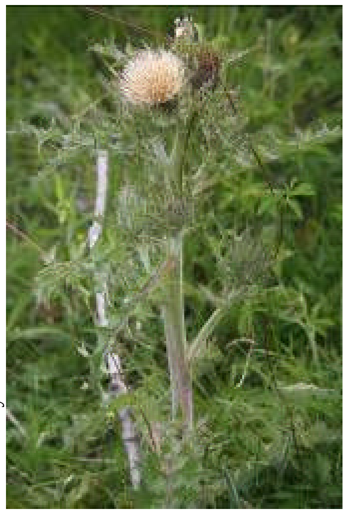
Marine Intertidal Beach and Rocky Shore

A majority of the perimeter of the island is characterized by 50-foot bluffs, and a narrow band of coarse gravel, cobble and boulders. The exception to this on the north-side of the island, which is more characteristic of a sand-gravel beach (see Dune Habitat above). There is approximately 100 acres of marine intertidal beach and rocky shore on the island, including a cobble spit. This habitat provides the interface between land and ocean. Intertidal habitat consists of a rich invertebrate community that is constantly replenished by the ocean. These are important areas for foraging shorebird species. The shoreline provides important nesting habitat for bird species, including the double-crested cormorant and American oystercatchers. Harbor and gray seals also use the island's beaches as a haul-out site throughout the summer months as well (See Refuge Biological Resources below).

Comprehensive Floristic Surveys

Vascular plants

In 1988, a comprehensive floristic survey was conducted on Nomans Land Island NWR by Massachusetts Natural Heritage and Endangered Species Program and the Service (Sorrie et al. 1988). A complete list of plant species found during this survey is in Appendix B. During the inventory, three state-listed plant species were found: dragon's mouth (Arethusa bulbosa, state threatened), shore pygmy weed (Crassula aquatica, state threatened), and sandplain blue-eyed grass (Sisyrinchium arenicola, state species of special concern). Dragon's mouth (Arethusa) was first seen on the island in 1985 (Andrews 1985) and was last seen in 1998 (Oliveira 1998b). Sandplain blue-eyed grass and shore pygmy weed have not been seen on the island since, but sandplain blue-eyed grass has been seen in Dukes County as recently as 1998 and may still be occurring on the island.


Erin Victory/TCI

Yellow thistle

In 2005, another floristic survey was conducted by the New England Wildflower Society (Haines 2005) in conjunction with the Edey Foundation and the Polly Hill Arboretum. A complete list of plant species found during this survey is in Appendix B. During the inventory, Dr. Arthur Haines was primarily looking for rare species, but he also attempted to verify many species from the survey conducted in 1988. About 50 additional plant species not documented in 1988 were documented in 2005. Five rare plants were also documented: saltmarsh toad rush (Juncus ambiguus Guss.), whorled marsh-pennywort (Hydrocotyle verticillata Thunb.), yellow thistle (Cirsium horridulum Michx. var. horridulum), sickle-leaved golden-aster (Pityopsis falcata (Pursh) Nutt.), and seaside knotweed (Polygonum glaucum Nutt.).

Lichens

In June 2004, a survey of lichens was conducted by the Harvard University Herbaria and the New England Botanical Club with support from the Edey Foundation and the Polly Hill Arboretum (Kneiper 2004). Sixty-eight species of lichens were documented and listed in Appendix B.

Mosses and Liverworts

In August 2007, a survey of bryophytes conducted by the New York State Museum (Miller 2008) resulted in 36 species of moss and six species of liverworts (Appendix B) including five mosses and two liverworts which are not currently known from Martha's Vineyard (though they may occur there). Additionally, Isopterygium tenerum (also found on Martha's Vineyard), is at its northern range limit, and is not otherwise reported for Massachusetts. There were four species identified that are not often encountered: Plagiothecium latibricola, Sphagnum henryense, Calypogeia sullivantii, and Nardia insecta. Otherwise, all other species encountered were common. Though much of the island was difficult to traverse given the dense shrubs, there were several pockets of bryophytes identified throughout the accessible portions of the island. Those portions of the wetland areas that were accessible contained a number of peat moss species, and the willow thickets were another bryophyte-rich area due to their proximity to intermittent streams. The short visit timeframe, lack of extensive trails, and thick shrubby vegetation prevented more of the island being searched and there are likely additional species that were undetected due to these reasons.

Algae

In July 2004 a survey of nearshore macroalgae (seaweed) was conducted by the University of Massachusetts Dartmouth with support from the Edey Foundation and the Polly Hill Arboretum (Sears 2005). Sixty-eight species of lichens were documented and listed in Appendix B. Fifty-seven species of macroalgae were documented along the shoreline.

Federal- and State-Listed Plants

There are no known federal-listed plants on the Refuge. State-listed plants that have been found to date on the Refuge are listed below (Table 3.6). According to the Massachusetts Natural Heritage BioMap Core Habitats Program, one of the state's best populations of the purple needlegrass (Aristida purpurascens, state threatened) is also found on the island.

Table 3.6. State-Listed Plants on Nomans Land Island.

Common Name	Scientific Name	Status
Saltmarsh toad rush	Juncus ambiguus	Rediscovered in New England on Nomans in 2005 , but currently without formal status
Sandplain blue-eyed-grass	Sisyrinchium arenicola	State Special Concern
Dragon's mouth	Arethusa bulbosa	State Threatened
Seaside knotweed	Polygonum glaucum	State Watch List
Shore pygmy-weed	Tillaea (Crassula) aquatica	State Threatened
Whorled marsh-pennywort	Hydrocotyle verticillata	State Special Concern
Yellow thistle	Cirsium horridulum	State Watch List
Sickle-leaved golden-aster	Pityopsis falcate	New England Division 1 species

Unique and Significant Natural Plant Community Types

Much of the habitat on the Refuge is Maritime Shrubland, which is ranked S3 for rare species in the state of Massachusetts. These are found in coastal areas characterized by patches of dense shrubs with scattered more open areas of low growth or bare ground. State rankings range from S1 to S3 (most rare to least rare) and indicate the rarity of a species based on the number of occurrences or remaining individuals or unit area. For this habitat type on the Refuge, the S3 rank indicates that there are either 21 to 100 occurrences or limited acreage in the state.

Also on the Refuge is a small amount of Maritime Beach Strand Community (S3) and a small amount of Maritime Dune Community (S2).

Invasive Plants

The presence of invasive plants can have a major adverse impact on the biological integrity, diversity and environmental health of refuges and other natural areas. Currently, at least 14 invasive plant species occur on Nomans Land Island. They are:

Table 3.7. Invasive species documented on Nomans Land Island NWR.

Common Name	Scientific Name
European privet	Ligustrum vulgare
Black swallow-wort	Cynanchum louiseae
Silver poplar	Populus alba
Purple loosestrife	Lythrum salicaria
Glossy buckthorn	Rhamnus frangula
Gray willow	Salix cinerea
Common reed	Phragmites australis
Autumn olive	Elaeagnus umbellata
Asiatic bittersweet	Celastrus orbiculatus
Yellow iris	Iris pseudacorus
Japanese honeysuckle	Lonicera japonica
Spotted knapweed	Centaurea biebersteinii
Japanese rose	Rosa rugosa
Cypress spurge	Euphorbia cyparissias

Locations of these non-native species have been documented and mapped since 2002. Other potential invasive plants include: drooping brome-grass (Bromus tectorum), and sheep sorrel (Rumex acetosella) (Sorrie and Somers 1999).

Efforts to control these species began in 2004. Methods of control include hand pulling and herbicide application. In 2004 and 2005 Phragmites was aerially treated with glyphosate. Backpack sprayers with either glyphosate or triclopyr have been used to treat Japanese honeysuckle, Asiatic bittersweet, black swallow-wort, Phragmites, autumn olive and silver poplar. Poplar and autumn olive are also cut and the stumps treated with glyphosate. Purple loosestrife and spotted knapweed have been pulled by hand. Treatment has varied each year based on the timing of trips to the island, weather and staffing.

Refuge Biological Resources

Federal-listed endangered or threatened species

Although Nomans Land Island currently does not host any resident or nesting federal-listed species, it is one of the most important migratory stop over sites for peregrine falcons (T. French, personal communication), a state-listed endangered species. In addition, one pair of piping plovers (federal threatened) nested on the island in 1980 (Andrews 1980) and roseate terns (federal endangered) nested most years from 1970 to 1985, with a high of 400 nesting pairs in 1972 (Blodget undated, Nisbet 1976, Erwin and Korschgen 1979, Andrews 1980, Ladd 1982b, Ladd 1983c, Andrews 1985, USFWS 1985, Andrews 1990, USFWS 1998). Because comprehensive formal surveys have not been conducted for many taxa, it is possible that other endangered or threatened species use Nomans Land Island NWR for nesting, resting, and feeding. No critical habitat for any federal-listed species occurs within the Refuge.

Birds

Comprehensive surveys of breeding birds have been consistently conducted (in most years) on Nomans Land Island NWR since 2001. Specifically, we have conducted secretive breeding marshbird surveys, BBSs, and inventories of nesting common terns, double crested cormorants and American oystercatchers. Survey points have been limited, however, due to access restrictions on the island because of remaining UXO. In addition to these formal surveys, there is some historical census information and many casual observations by Refuge staff and partners of species that nest, rest, and feed on the island. Please see Appendix A for a list of Refuge bird species of concern, and their respective national, regional, federal and state conservation status. A complete list of avian species observed on and around Nomans Land Island NWR is in Appendix B.

Songbirds

Refuge staff conducted annual breeding bird surveys using region-wide survey methods from 2001 to 2007. Over 25 species of landbirds have been documented during these surveys. The most common songbirds recorded are song sparrow, common yellowthroat, eastern towhee, red-winged blackbird and gray catbird. Grassland species including savannah sparrow nest on the island and have been recorded during breeding bird surveys since 2001.

Raptors

Nomans Land Island NWR is the most important peregrine falcon (state endangered) stopover site in Massachusetts during the fall migration (T. French personal communication). Northern harriers (state threatened) are seen frequently on the island, and are suspected to be nesting on the Refuge, though no nest has been found (Ladd 1982c, Smith 1998). In addition, bald eagles (federal threatened), Cooper's hawks (state species of special concern), kestrel, and merlin have occasionally been seen on the island (Ladd 1982c, Smith 1998).

In October 2003 and 2004, we partnered with the Massachusetts Audubon Society to band migrating raptors. As a result, two Cooper's hawks, one northern harrier, and five peregrine falcons were banded in total. These efforts have resulted in counts of migrating raptors of over fifty peregrine falcons in a given year, as well as observations of red-tailed hawks, sharp-shinned hawks, osprey (Pandion haliaetus), and short-eared owls (Asio flammeus) in addition to those mentioned above.

Waterfowl

Nomans Land Island hosts a variety of nesting and resting waterfowl including: Canada goose, American black ducks, mallards, and green-winged teal (Atwell 1986, Atwell 1987a, Ladd 1983a, Oliveira 1998b, Prior 2000a, Prior 2000b). It is likely that other species such as blue-winged teal, northern shovelers and northern pintails also occur and may nest on the island, but no formal waterfowl brood surveys have been conducted.

Sea ducks may also rest along the Refuge shore, and use nearshore waters to feed during migration and winter months. These waterfowl will aggregate in large numbers in the waters off of Massachusetts throughout winter. Mid-winter waterfowl surveys are conducted by state wildlife agencies, and are a nationwide effort to estimate population trends for these species that are not counted in other avian surveys because of their life history characteristics. In Massachusetts, these surveys are carried out by the MA DFG along the coast and islands. Seaducks found in waters off of Martha's Vineyard include mallard, American black duck, scaup species, common goldeneye, bufflehead, long-tailed duck, scoter species, common eider, merganser species, Canada geese, Atlantic brant, and swan species.

Occasionally, seaduck carcasses will wash up onshore of the Refuge, sometimes in large numbers. When possible, staff biologists record these mortality events when they are observed during site visits and report them to SEANET. This is a collaborative program reliant upon volunteers that endeavors to track mortality events in seaducks and other coastal and marine birds to investigate causes of mortality and threats to these species.

Shorebirds

Few shorebird species nest on Nomans Land Island. One pair of nesting piping plovers was recorded in 1980 (Andrews 1980), but none have been reported nesting since then. American oystercatchers have been nesting on the island since at least 2001 with one to four pairs generally confirmed nesting each year along the shoreline perimeter. In 2009, there were three nesting pairs (S. Koch, personal communication). Spotted sandpipers were recorded nesting in 1976 (Nisbet 1976) and may have nested in 1980 (Andrews 1980) and 1985 (Organ 1985). They were also likely nesting in 2008 and may have nested undetected previously in recent years. Killdeer have also been suspected nesting in some years. Although numbers are generally low, a variety of shorebird species also use the perimeter of the island (especially the wrack habitat) and some of the inland shallow wetlands during migration. Historically, upland sandpipers (Bartramia longicauda, state endangered) were seen on the island in the early 1900's (MA NHESP 1998).

Waterbirds and Marshbirds

A small rookery containing nesting black-crowned night-herons has been present on the island at least since the early 1980's (Atwell 1980, Ladd 1981, Ladd 1982b, Ladd 1983a), and at one time included snowy egrets. During surveys of coastal waterbird nesting colonies in 1984 (Andrews 1990) 60 pairs of black-crowned night-herons and 13 pairs of snowy egrets were counted. Comprehensive surveys of nesting pairs have not been conducted recently, due to difficulty and safety issues with accessing likely rookery areas. Since 2001, consistent staff visits to the island during the nesting season resulted in very few observations of these species, though a few black-crowned night-herons were frequently seen traveling north towards Martha's Vineyard from Nomans Land Island at dusk, presumably to feed. Nesting black-crowned night-herons were confirmed for the first time in recent years in 2008 when three nests with eggs were found in early May. A visit later in May confirmed successful hatching; one nest had three chicks. In addition, glossy ibis and green-backed heron (Butorides striatus) have been seen occasionally on the island (Ladd 1981, Ladd 1983a).

From 2003 to 2007, we annually conducted secretive marshbird callback surveys of the island's wetlands using a nationwide protocol (found at http://ag.arizona.edu/research/azfwru/NationalMarshBird/). Species included in this national protocol that are found in this area are American bittern (Botaurus lentiginosis), clapper rail (Rallus longirostris), least bittern, pied-billed grebe (Podilymbus podiceps), sora (Porzana carolina), and Virginia rail. With the exception of one least bittern recorded in 2007, only Virginia rails have responded to the call back tapes during the surveys. Because of access restrictions in these areas on the island, we are only able to sample a small area of the total available habitat, and therefore do not have an estimate of the Virginia rail population on the Refuge. In the absence of mammalian predators, they are suspected to be using upland habitats as well, which is unusual for this species. Based on the relative number of responses of birds during the surveys, it is likely a robust population.

Seabirds

Nomans Land Island was historically an important nesting site for common terns (state species of special concern), arctic terns (state species of special concern) and roseate terns (federal endangered). This was the southernmost colony of arctic terns worldwide, and the largest breeding colony throughout Massachusetts (Nisbett 1976). Numbers of nesting common terns peaked in 1970 at 1200 pairs. Nesting roseate terns peaked at 400 pairs in 1972 and numbers of nesting arctic terns remained relatively stable at 20 to 35 pairs most years during the early 1970's. In 1976, an estimated 20 to 25 pairs of arctic terns nested, which was the largest colony in Massachusetts and the southernmost colony in the world (Nisbet 1976). However, during the second part of the 1970's, numbers of nesting common and roseate terns declined dramatically (Erwin 1979). Common terns declined to just a few hundred pairs in 1975 and 1976 and roseate terns declined to just three pairs in 1976 (Blodget, undated notes). During surveys of coastal waterbird nesting colonies from Maine to Virginia in 1977, only 40 pairs of common terns and five pairs of roseate terns were counted (Erwin and Korschgen 1979). During surveys of these same areas in 1984 (Andrews 1990), although 150 pairs of common terns nested, no nesting arctic terns, and only three pairs of roseate terns were counted. Least terns (Sterna antillarum, state species of special concern) began nesting on the island in 1978 (Blodget undated, Ladd 1982c), but only one pair was observed in 1984 (Andrews 1990), and this was the last year least terns were observed nesting on the island. Numbers of nesting common, roseate, and arctic terns never recovered from the high counts of the early 1970's, and arctic terns probably have not nested on the island since 1987 (Blodget undated, Atwell 1986, MA NHESP 1998). Roseate terns were last observed nesting on the island in 1985.

In recent years, common terns have returned to the Refuge to nest. Since 2001 when consistent site visits to the Refuge were undertaken, 2005 was the first year they were documented nesting again, with two nests and at least three chicks observed. They have nested each year since then with counts of four nesting pairs and the presence of older chicks observed in 2006, 20 nests observed in 2007, nine nests but no productivity in 2008, and one nest recorded in 2009.

Gulls have nested on the island for the last several decades. Their presence was coincident with the initial declines in tern numbers on the Refuge. The first records of nesting great black-backed (Larus marinus; one pair) and herring gulls (Larus argentatus; 30 to 40 pairs) were in 1976 (Nisbet 1976). During surveys of coastal waterbird colonies in 1977 (Erwin and Korschgen 1979), 10 pairs of great black-backed gulls and 60 pairs of herring gulls were noted nesting on Nomans Land Island NWR. During surveys of these same areas in 1984 (Andrews 1990), 200 pairs of great black-backed gulls and 1200 pairs of herring gulls were counted. Both species are still nesting on the island, and although a formal census has not been conducted recently, it is likely that nesting numbers are much lower than the high counts of the mid 1980's.

In 1989, the first evidence of breeding double-crested cormorants in recent history was recorded when three nests were discovered (French 1989). Between that time and 2001, no formal counts of nesting pairs were conducted, but over 350 pairs were counted in 1998 (Oliveira 1998b) and 2000 (USFWS 2000a). When regular site visits to the Refuge began again in 2001, counts of nesting double crested cormorants took place each year, with the exception of 2007 and 2008 when Navy restrictions precluded it. From 2001 to 2006, there were 510, 550 to 595, 569, 631, 489, and 630 nests in each respective year. In 2009, there were 544 nesting pairs (S. Koch, personal communication).

It was suspected for some time that Leach's storm-petrels (state endangered) historically nested on Nomans Land Island NWR. This was due to the presence of "mystery" burrows (potential nesting burrows) and an emaciated carcass of a Leach's storm-petrel found near the shore in June 1980 (Andrews 1980). In 2002, however, nesting was confirmed when 10 birds were heard calling from burrows, and one burrow was dug up carefully to confirm the presence of eggs. The actual number of nesting birds is not known, as a comprehensive survey was not undertaken.

Fish and other Aquatic Species

Aquatic resources of Nomans Land Island NWR include several freshwater ponds, one brackish pond located on the east side of the island, and the surrounding Atlantic Ocean. The freshwater ponds are shallow and succeeding rapidly toward a marshy condition with emergent vegetation beginning to dominate. The water is tannic and has low dissolved oxygen content (G. Ben David, personal communication). There is very little information available for the fisheries in the ponds on the island. No formal comprehensive surveys of fish on the island have been conducted. Gill netting and angling in 1974 turned up only one ninespine stickleback (Pungitius pungitius, Knight 1974) and in 2001, 11 American eels were found dead in a dried up wetland on the Refuge.

Marine species found in the surrounding waters of the Atlantic Ocean include many of the same species as found off Nantucket and Monomoy National Wildlife Refuges, and are included in Appendix B. Offers from MA DFG to conduct fisheries surveys in the Refuge's ponds have been declined by the Service due to the presence of UXO in the ponds. The safety of the Refuge staff and other researchers cannot be guaranteed, so no access into the ponds is allowed. Please see Appendix A for a list of Refuge aquatic species of concern, and their respective national, regional, federal and state conservation status. A complete list of fish and other aquatic species observed on and around Nomans Land Island NWR is in Appendix B.

Mammals

Marine Mammals

Nomans Land Island beaches are frequently used by harbor seals and gray seals (state species of special concern) in the fall and winter (USFWS 1992). In recent years, the National Marine Fisheries Service seal monitoring surveys have documented the occasional presence of a female gray seal and pup on the island (Waring et al. 2009). In 1989, a dolphin (Delphinidae spp.) vertebra was found on the northeast gravel spit (French 1989), and one dead dolphin (Delphinidae spp.) was found on the shore in 1998 (Oliveira 1998a).

Erin Victory/TCI

Harbor seal entangled with netting on the Refuge

Terrestrial Mammals

As previously mentioned, Joshua Crane imported several mammal species to the island for profitable enterprises. Among these were Belgian hare and muskrat for hunting and trapping. A small mammal survey conducted in 1974 revealed evidence only of muskrats (USFWS 1974). No comprehensive formal surveys of mammals have been conducted since then and there is little evidence of any other mammals inhabiting the island. Evidence of small rodents (Microtus species) was also reported in 1987 during a site visit to the island (Atwell 1987b). However, attempts to trap small mammals in recent years have resulted in no evidence of small rodent presence. Finally, sheep historically occupied the island, and Crane's trustees introduced a new variety of sheep to the island just prior to Navy management. In June 1998 two sheep were seen (Oliveira 1998b), however, the sheep were not seen on subsequent visits and their fate is unknown. Please see Appendix A for a list of Refuge mammal species of concern, and their respective national, regional, federal and state conservation status. A complete list of mammal species observed on and around Nomans Land Island NWR is in Appendix B.

Reptiles and Amphibians

No formal comprehensive surveys of reptiles or amphibians have been conducted on Nomans Land Island NWR. There are records and sightings of reptiles, but not amphibians. Snapping turtles (Chelydra serpentina) and eastern painted turtles (Chrysemys picta picta) have been seen periodically on Nomans Land Island since the 1970's and 1980's, respectively, and up to and including present time (French 1973a, Oliveira 1998b, Andrews 1980). In addition, spotted turtles were seen on the island in 1981, 1985, 1989, and 1998 (Organ 1985, Wray and Ladd 1985, French 1989, Oliveira 1998b). Eastern garter snakes (Thamnophis sirtalis sirtalis) have been seen on the island regularly since the early 1970's (French 1973a) and as recent as in 2008 (S. Koch, personal communication). A leatherback turtle scapula was found on the northeast gravel spit (French 1989). Please see Appendix A for a list of Refuge reptile and amphibian species of concern, and their respective national, regional, federal and state conservation status. A complete list of reptile and amphibian species observed on and around Nomans Land Island NWR is in Appendix B.

Invertebrates

A wide variety and number of invertebrates (both terrestrial and aquatic) are of biological importance. Unfortunately, no comprehensive formal invertebrate surveys have been conducted on Nomans Land Island. Marine invertebrates found in the surrounding waters are listed in Appendix B. Chain dot geometer (Cingilia catenaria, state species of special concern), was sighted in 1992 and Regal fritillary (Speyeria idalia, state endangered) was sighted in 1986 (MA NHESP 1998). Vast migrations of monarch butterflies headed for Mexico have been seen on the island. In October, monarchs forage and roost at night on the island. In addition, eight species of butterflies were seen on the island in 1989 (G. Ben David, personal communication). In total, 21 species of butterflies, seven species of moths, 20 species of dragon and damselflies, and five species of beetles have been documented on the Refuge.

Twenty-six species of invertebrates that are currently state listed have been identified in Dukes County and it is possible that some of these species occur on the island (http://www.state.ma.us/dfwele/dfw/nhesp/duke.htm). According to the Massachusetts BioMap Core Habitats, it is likely that the rare dune noctuid moth, drunk apamea moth and the spartina borer moth could be found on Nomans Land Island. Please see Appendix A for a list of Refuge invertebrate species of concern, and their respective national, regional, federal and state conservation status. A complete list of invertebrate species observed on and around Nomans Land Island NWR is in Appendix B.

Refuge Visitor Services Program

Nomans Land Island NWR is not open to the public because hazards associated with the unexploded ordnance still remain. The Refuge website contains interpretive information about the island and provides slideshows so that, despite its closure to the public, people can still experience the island's natural resources. Under Alternatives B and C, we will be proposing increased visitor services programs with additional staff that would include off-site interpretive programs and outreach activities on Martha's Vineyard.

Law Enforcement Concerns

The transfer document from the Navy commits the Service to enforcing the ban on public access to Nomans Land Island NWR. This is because unexploded ordnance is ubiquitous throughout the island and can pose a significant safety hazard that may include serious bodily injury or death. The waters surrounding the island are designated as a Restricted Waterway, and this is enforced by the U.S. Coast Guard. It is very important for the public to understand and obey this closure policy of the Refuge and surrounding waters, as this constitutes a major public safety concern. In addition, the airspace over the island is restricted to military use only, and is managed by the 104th Fighter Wing.

Trespassing by anglers does occur. The exact frequency of this type of trespass is unknown; however, evidence of angling and other types of shoreline trespass has been documented on the island. Other types of beach activity may include sun bathing, beach combing, swimming, and boat mooring. The potential for injury on the island is very high due primarily to the presence of remaining UXO throughout the island, but also the presence of slippery rocks along the remaining shoreline, and the dense vegetation, uneven terrain and poison ivy in the interior of the island. There is no immediate medical response to Nomans Land Island, therefore medical responses may take up to, or over, one hour.

In addition to safety hazards associated with trespassing, the activities mentioned above also have a negative impact on the cultural, natural and biological resources of the Refuge. Migratory birds that use the sandy beach and intertidal zone for nesting, staging, and feeding are disrupted from their normal behavior by the presence of trespassers, and this may have deleterious impacts including nest abandonment. During migration, birds are particularly susceptible to stress factors as they are using the island to rest and feed for short periods before continuing on their long journeys south to their wintering grounds. Seals also use this type of habitat for haul out sites and can be easily disturbed, and if approached, can become aggressive and cause injury.

The rich cultural history of the Refuge includes Native American and early Anglo settlers, and in more modern times, the U.S. Military. There is increased focus on the preservation of the cultural history of the island. The presence of these sites may induce curious or interested parties to search for items of antiquity, artifacts, and other items of cultural significance. Our concern for public safety is concomitant with our responsibility to protect these resources.

As the agency responsible for the administration and management of this Refuge, we are responsible for protecting the island's rich cultural history and uninhibited biological function. We will continue to enforce the federal acts that pertain to Nomans Land Island NWR, including The National Wildlife System Administration Act (16 USC 668dd), Native American Graves Protection and Repatriation Act (25 USC 3001), Archaeological Resources Protection Act (16 USC 470aa-mm), Migratory Bird protection Act (16 USC 703-712), Marine Mammal Protection Act (16 USC 1361-1407), and the Endangered Species Act (16 USC 1531-1544), as well as doing what is necessary to prevent unauthorized use of Nomans Land Island NWR.

Incident reporting and effective communication is another key issue for law enforcement. To further help achieve law enforcement goals we must strengthen communication and information sharing with other law enforcement agencies, local government agencies, and other interested parties. The reporting of incidents including boating accidents and mechanical failures that cause boats to be on the island, oil spills and other chemical spills, washed up debris of significance, and other incidents, is essential to achieving public safety and law enforcement goals.

Refuge Archaeological and Cultural Resources

There has been no professional cultural resource survey of Nomans Land Island. The possibility that there might be unexploded ordnance on Nomans Land Island means archaeology would need to be preceded by ordnance clearing. The Service would not conduct archaeology in the absence of some ground-disturbing proposal. Because the island is closed to the public, and no facility development or ground disturbing habitat management is anticipated, it is unlikely that there will be future investigation of sites at Nomans Land Island.

Five pre-Contact sites have been located from surface artifacts and reported to the Massachusetts Historical Commission. There is at least one historic ruin, also reported to the Commission, and plainly visible. In addition, the Service has inferred the locations of "Gulltown" (also referred to as Crow Town, a fishing village), the Jacob Norton house, and Joshua Crane's Lodge from historical accounts by Annie M. Woods and Pricilla C. Crane. The island also contains the Luce Cemetery, a small family burial ground. The locations of the cemetery and Gulltown have been confirmed in the field. None of these sites have undergone archaeological investigation. Several are likely to have been disturbed by the island's use as a target range. One large site with both pre-Contact and Historic Period deposits is exposed to erosion, as is the Luce Cemetery.

In 1926, the island's owner, Joshua Crane, claimed to have discovered a stone with runic characters carved on it. Edward Gray, then British Consul in Boston and "an authority on Icelandic legends" visited Nomans Land Island in 1927 and subsequently published references to the rock in his book, "Leif Eriksson, Discoverer of America" (Wood 1978). Gray correctly understood that Eriksson had spent two years on the North American coast. He believed it was possible that Nomans was the place, and identified "a low rock enclosure, just above the … rock" as a potential ruin from the time of Eriksson's visit. However, he was not certain that the stone was evidence that Nomans was the site of Eriksson's visit. Excavations at the "Viking Castle" (on the island) by the Peabody Museum at Andover in 1939 yielded "many Indian relics and arrowheads" (Crane et al. 1970) rather than the Viking artifacts the expedition sought. Eventually, Crane disclosed that he himself had cut the runic stone (Crane et al. 1970). All the same, some people still believe the stone is evidence of Viking occupation, and both the Service and State of Massachusetts, which has jurisdiction over sites in the water, receive occasional requests to remove it. Today, the Peabody Museum at Andover houses the "Indian relics and arrowhead" artifacts from Nomans Land Island. It is unclear, however, if these artifacts, dated to the Late Archaic/Early Woodland Periods, have been on display.

Refuge Wilderness Resources

Section 2(c) of the Wilderness Act defines wilderness as an area which:

- Has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition, or be capable of restoration to wilderness character through appropriate management at the time of review, or be a roadless island;
- Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation; and,
- May also contain ecological, geological, or other features of scientific, educational, scenic, or historical value. These features and values, though desirable, are not necessary for an area to qualify as a wilderness.

Nomans Land Island NWR is a roadless island. The effects of time, weather, erosion, and vegetative growth have rendered the evidence of past human habitation and use by the Navy substantially unnoticeable. The island provides outstanding opportunities for solitude and has ecological, scientific, historical, and cultural supplemental values. The wilderness resources and wilderness review are addressed in detail in Appendix C.

Chapter **4**

Erin Victory/TCI

Goldenrod

Environmental Consequences

- Introduction
- Effects on Air Quality
- Effects on Water Quality
- Effects on Soils
- Effects on Shrub Habitat – Breeding and Migratory Birds and Other Wildlife
- Effects on Vegetated Dune Habitat
- Effects on Marine Intertidal Beach and Rocky Shore
- Effects on Scrub Shrub and Emergent Wetlands, Bogs, and Open Water Habitat
- Effects on Public Access, Education, and Community Outreach
- Effects on Cultural and Archaeological Resources
- Wilderness Recommendations and Designation
- Effects on Socioeconomic Resources
- Cumulative Impacts
- Relationship between Short-term Uses of the Human Environment and Enhancement of Long-term Productivity
- Unavoidable Adverse Effects
- Potential Irreversible and Irretrievable Commitments of Resources
- Environmental Justice
- Matrix of Environmental Consequences by Alternative

Introduction

This chapter describes the environmental consequences that we predict from implementing the three management alternatives presented in Chapter 2. Where detailed information is available, we present a scientific and analytic comparison between alternatives and their anticipated consequences, which we describe as “impacts” or “effects.” In the absence of detailed information, we make comparisons based on our professional judgment and experience. Specifically, we predict the effects of implementing the management actions and strategies for each of the three alternatives: Alternative A (Current Management), which serves as the baseline for comparing Alternative B (Enhanced Wildlife Management and Visitor Services), and Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative)).

We organized this chapter by major resource headings. Under each heading, we discuss the beneficial and adverse effects likely to occur over the 15-year life span of the plan. Beyond the 15-year planning horizon, we give a more speculative description of the direct, indirect, and cumulative effects. At the end of this chapter, Table 4.1 summarizes the effects predicted for each alternative and allows for a side-by-side comparison. Finally, this chapter identifies the irreversible and irretrievable commitment of resources from our proposed actions, as well as the relationship between short-term uses of the environment and long-term productivity, their cumulative effects, and the relationship to environmental justice.

As required by CEQ and Service regulations implementing NEPA, we assessed the importance of the effects of the CCP alternatives based on their context and intensity. The context of the impacts ranges from local and site-specific to regional.

This chapter does not describe the consequences of certain types of the actions in Chapter 2, “Alternatives Considered, Including the Service-Preferred Alternative,” because they do not individually or cumulatively have any measurable environmental impacts and do not vary by alternative. Each could be categorically excluded if proposed as a stand-alone action. Those actions are:

- environmental education and interpretive programs (unless major construction is involved or significant increase in visitation is expected)
- research, resource inventories, and other resource information collection
- operations and maintenance of existing infrastructure and facilities (unless major renovation is involved)
- routine, recurring management activities and improvements
- small construction projects (e.g., kiosk, interpretive signs)
- native vegetation planting
- issuance of new or revised management plans when only minor changes are planned
- law enforcement activities

In Chapter 2, we propose changes to off-site priority public uses, specifically proposing to increase environmental education and interpretation programs and activities in cooperation with partners on Martha’s Vineyard (Alternatives B and C). Additionally all three alternatives include the provision for the ongoing or potential UXO surveillance and clearance operations by the U.S. Navy. Alternative C recognizes that Nomans Land Island meets certain criteria for a Wilderness Study Area and recommends the area suitable for wilderness designation. Since Congress has reserved the authority to make final decisions on wilderness designation, the wilderness recommendation is a preliminary administrative determination that would receive further review and possible modification by the Director, the Secretary of Interior, or the President. However, the analysis of environmental consequences is based on the assumption that Congress would accept the recommendation and designate Nomans Land Island NWR as wilderness. The information and analyses in the EA/draft CCP would be used to compile a wilderness study report and legislative EIS to accompany the wilderness recommendation.

Effects on Air Quality

Air Quality Impacts That Would Not Vary By Alternative

Massachusetts air quality is considered generally good, except for one pollutant – ozone. The nearest air quality monitoring stations to Nomans Land Island are located in Fairhaven and Truro, Massachusetts. Neither of these stations was in violation of ozone levels over a 3-year average (MA DEP 2009). Given the location of the island, the air quality immediately around the Refuge is good. Under all three alternatives, periodic prescribed burning by the U.S. Navy to clear and remove UXO, or by the Service to maintain shrubland habitat, would occur, though this would be dependent upon approval through MRA under Alternative C. This would cause some short-term, minor localized impacts to air quality. However, the episodic nature of these burns (Wise 2006) and the isolation of the island result in negligible impacts on Martha's Vineyard, the nearest land mass. Despite best efforts to prevent it, it is possible for wind direction to shift during a prescribed burn, and smoke can drift over parts of Martha's Vineyard, as was the case in 2008. When this happens, the air quality is temporarily impacted, usually for not more than a few hours.

Treatment of invasive plant species to maintain quality habitat conditions would occasionally incorporate mechanical, chemical or biological control as necessary by varying degrees, depending on the alternative. Under Alternative C, these actions would be subject to MRA. These actions may result in temporary site disturbance; however, any impacts to air quality would be localized and short-lived. No major ground-disturbing activities that would affect air quality are proposed under any of the alternatives.

Air Quality Effects of Alternative A (Current Management)

Air Quality Benefits and Impacts

Current management activities neither substantially benefit nor adversely affect local and regional air quality. There is a small amount of hydrocarbon emissions caused by Refuge activities including emissions from transportation to and from the Refuge and the occasional use of an all terrain vehicle (ATV) on the Refuge to conduct resource management operations. The vehicle fleet at the Refuge headquarters is becoming more efficient and cleaner as older vehicles are replaced by low emission hybrid cars and trucks. No air quality impacts would be associated with Refuge visitation other than by Refuge staff, since the Refuge is not open to the public, and is an island surrounded by restricted waters.

Any prescribed burns conducted by the Navy as part of their UXO clearance operations could cause a temporary decline in local air quality due to smoke particulates. Though the Navy is responsible for the planning and implementation of these burns, they conform to all local, state, and federal air quality laws and regulations.

Treatment of invasive plant species to maintain quality habitat conditions would occasionally incorporate mechanical, chemical or biological control as necessary under Alternative A. These actions may result in temporary site disturbance; however, any impacts to air quality would be localized and short-lived. Of the three, chemical application through both aerial and backpack sprayers have the greatest potential to impact a wider area than is targeted through spray drift (the movement of herbicides to non-target sites). Herbicides are chosen based on low LD-50s, very short soil persistency and the least potential to migrate in the soil or in water (T. Eagle, personal communication).

Backpack sprayers are used most often on the Refuge, and have optimal target specificity due to the close range of application. Aerial spraying occurs much less often, but does include a higher potential for drift. However, when aerial application is used on the Refuge, days with little or no wind are targeted. The Service effectively eliminates spray drift through careful calibration of spray nozzles to achieve the correct droplet size and rate of application (T. Eagle, personal communication). Products used are EPA approved and labeled for the appropriate use. All aerial herbicide applications are reviewed first by the Service's Regional Office, and then the Washington Office. These precautions result in a localized, temporary decrease in air quality at the Refuge, but any adverse impacts associated with drift beyond the Refuge are effectively prevented.

Air Quality Effects of Alternative B (Enhanced Wildlife Management and Visitor Services)

Air Quality Benefits and Impacts

Proposed management activities would neither substantially benefit nor adversely affect local and regional air quality. Under this alternative, invasive plant treatment would be more intensive compared to current management to incorporate a zero tolerance policy for species that are highly invasive and/or stand-replacing. This would be enacted through mechanical, chemical or biological control as necessary and feasible, and associated benefits and impacts would be similar to that described under Alternative A, though there may be a slight increase in frequency of application or area of application. We anticipate only short-term, minor, localized impacts to air quality from these increased management activities in the removal of invasive plants. While there would be more boat trips to the Refuge under this alternative, the total number of trips conducted annually would not likely exceed 20, resulting in a small increase in hydrocarbon emissions from transportation. The Refuge would remain closed to the public, and therefore no air quality impacts would be associated with Refuge visitation other than by Refuge staff.

Under this alternative, the Service would initiate a fire regime on the Refuge to perpetuate shrub habitat. Though these burns would not necessarily supplant burns conducted by the Navy, there would be opportunity to coordinate prescribed burning to maintain Refuge habitat with UXO surveillance. Prescription burns conducted by the Service would occur every 7 to12 years per habitat patch, with at least two habitat patches delineated. This would result in a fire being conducted on the Refuge approximately every three to six years. During prescribed fires, there is a short-term decrease in local air quality due to smoke and smoke particulates. According to the Eastern Massachusetts NWR Complex Fire Management Plan (USFWS 2003c), "The goals of smoke management on the refuges will follow goals enumerated by the National Wildfire Coordinating Group (1985): reduce fire emissions, enhance the dispersal of smoke plumes, steer smoke plumes away from smoke-sensitive areas, and coordinate the ignitions of prescribed burns. Smoke management practices will include maximizing combustion efficiency (to reduce particulate emissions)." These practices would further minimize impacts to air quality.

Post-fire vegetation monitoring would enable us to gauge the effectiveness of these management activities. In this alternative, we would have a greater capacity to use adaptive management to alter rates and mechanisms of these applications to better achieve habitat goals, or utilize to new technology that further minimizes any adverse impacts to air quality.

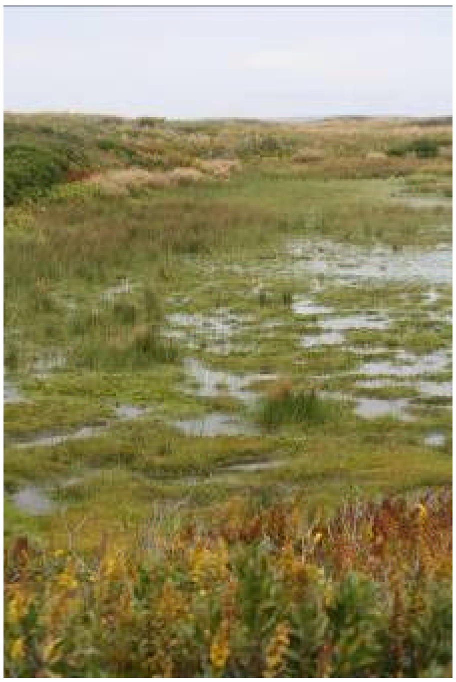
Air Quality Effects of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Air Quality Benefits and Impacts

The potential for wilderness designation under this alternative may provide a slight benefit to air quality, as management activities would need to conform to wilderness policy and guidelines. Use of ATV's, prescription fires and invasive species treatment would need to be evaluated within the context of wilderness policy and the minimum requirement and minimal tools analyses. In general, air quality benefits and impacts would be similar to Alternative A in terms of frequency of Refuge visitation by Refuge staff, and, if approved, method and frequency of herbicidal application. Prescription burns, if approved, would be carried out as described in Alternative B, but there would likely be fewer burns, so the benefits and impacts would be less than described in Alternative B. Wilderness policy may determine how these activities are prioritized. Less use of mechanized equipment in the wilderness area will result in less emissions and a lower carbon footprint.

Effects on Water Quality

Water Quality Impacts That Would Not Vary by Alternative


Erin Victory/TCI

Refuge wetland

Nomans Land Island is surrounded by the Atlantic Ocean. Tidal waters generally do not reach inland, except occasionally on the north shore. Island groundwater is contained by a saltwater intrusion at the periphery of the island, isolating it from aquifers at Martha's Vineyard (Foster Wheeler Corporation 2001). Island wetlands include emergent wetlands, bogs, and open water ponds, including four artificial ponds. Nomans Land Island has a long history of extensive human use, which likely has impacted water quality and hydrology to some degree. These uses included forest clearing, sheep-grazing, a fishing community, fish stocking, introductions of muskrats and other wildlife for hunting and trapping, and finally use as a military aerial bombardment and gunnery range with live and dummy bombs from 1943 to 1996. Studies conducted by the U.S. Navy in the 1990's have indicated that there are metals (copper, zinc and lead) present in the surface waters and sediments tested on the island (Foster Wheeler Corporation 2001; see Chapter 3 and Appendix H). These potential impacts have already occurred, regardless of which alternative is selected.

The impacts to water quality from public access and use are non-existent since the Refuge is closed to the public under all three alternatives. In addition, access around the island's wetlands is restricted due in large part to less ordnance clearing in these areas. Therefore, even the occasional staff visits are not likely to have much of an impact on the Refuge's water resources. None of our proposed management activities would violate federal or state standards for contributing pollutants to water sources; all three alternatives would comply with the Clean Water Act.

Water Quality Impacts of Alternative A (Current Management)

Benefits

Removal of aquatic invasive species including purple loosestrife and Phragmites in wetland habitats would potentially improve hydrology and associated water quality (Able et al. 2003). Monitoring of some wetland birds and rare plant surveys would provide some measure of wetland conditions.

Adverse Impacts

Some risks could occur to water quality from use of herbicides and mechanical methods by the Refuge to control invasive plant species, but these risks are low (Shepard et al. 2004). We would use Integrated Pest Management to prevent or minimize any impacts from use of herbicides, and would only use herbicides that are safe for aquatic habitats when working near water bodies or wetlands on the Refuge.

Water Quality Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Benefits

The presence of invasive plants can have a major adverse impact on the biological integrity, diversity, and environmental health of habitats (Ruiz et al. 1999, Silliman et al. 2004, Minchinton et al. 2006, Schooler et al. 2009). Environmental harm may include detrimental changes in ecological processes. For example, invasions by purple loosestrife, Phragmites or other invasive plants can displace native wetland vegetation (Albright et al. 2004, Silliman et al. 2004, Minchinton et al. 2006), which then may also adversely impact bird and other animal species that have certain habitat requirements (Able et al. 2003, Schooler et al. 2009). Alternative B would provide the greatest opportunity to control aquatic invasive species including purple loosestrife and Phragmites in wetland habitats. In addition, increased monitoring of invasive aquatic species, surveys of rare wetland plants and invertebrates, and monitoring of wetland birds would provide a measure of aquatic habitat conditions, including water quality. The presence of UXO precludes any attempt to directly measure water quality, however, we would use adaptive management to guide our management based on an improved understanding of these water bodies through these indirect methods.

Adverse Impacts

The potential risks to water quality could increase temporarily and slightly over Alternative A, due to increased invasive species control using chemical or mechanical methods. We would use Integrated Pest Management to determine best control based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target organisms and the Refuge environment. Herbicides would be used where physical and biological methods or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. They would be used primarily to supplement, rather than as a substitute for, practical and effective control measures of other types. Wherever possible, application will be by backpack instead of aerial application in order to better focus the application of the chemical. Any herbicide used near water or wetlands would be approved to be used in those habitats, no matter the application method employed.

Water Quality Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Benefits

Wetlands would be subject to natural processes, unless invasive species posed a direct threat to wetland integrity or became stand-replacing. Then, invasive species management would be similar to Alternative A, if approved through MRA.

Other invasive species treatment that would occur in habitats adjacent to wetlands would likely be addressed through mechanical or physical means, but would also be subject to MRA. If herbicide application was used, a backpack sprayer would be the likely method, reducing any impacts to non-target areas, including wetlands. We would use Integrated Pest Management to prevent or minimize any impacts from use of herbicides, and would only use herbicides that are safe for aquatic habitats when working near water bodies or wetlands on the Refuge. Thus, there would be minimal anticipated effects on water quality from chemical or mechanical treatments.

Adverse Impacts

Some risks could occur to water quality from use of herbicides and mechanical methods if employed by the Refuge to control invasive plant species, but these risks are low (Shepard et al. 2004). We would use Integrated Pest Management to prevent or minimize any impacts from use of herbicides, and would only use herbicides that are safe for aquatic habitats when working near water bodies or wetlands on the Refuge.

Effects on Soils

Soil Impacts That Would Not Vary By Alternative

Under all three alternatives some soil disturbance occurs from prescribed burning and invasive species management, though these actions would be subject to MRA under Alternative C. In addition, site reviews by the U.S. Navy would continue, which could include removal of unexploded ordnance over time. These reviews will occur every five years, but the nature of the review, and the degree of UXO removal or other warranted actions could vary depending on the Remedial Action Alternative chosen in the Navy's Phase III/Feasibility Study Report and NEPA process (see Chapters 2 and 3). UXO removal includes site preparation such as prescribed burning to clear vegetation and surface clearing of ordnance debris and residual materials.

Continuous wave action along the island's western and southern shores has created steep 50-foot high bluffs; this erosive action is likely ongoing and no specific actions will be undertaken by the Service to stop or address this erosion except in extreme circumstances where we are mandated to protect cultural resources. The ban on public access under all three alternatives significantly reduces risk of soil erosion from human recreational activities. There could be minimal contribution to soil compaction from staff use of ATV's used to traverse the established maintenance trails, though this occurs only a few times a year. There could be increased soil disturbance as a result of additional UXO removal in areas that need to be accessed by Refuge staff for management purposes or in a culturally sensitive area. This would be a short-term temporary impact.

Soil Impacts of Alternative A (Current Management)

Soil Benefits

Any prescribed fires conducted by the U.S. Navy should benefit soils in the short-term by releasing nutrients bound up in plant biomass back into the soil (Dudley and Lajtha 1993), the degree to which is dependent upon fire intensity (USFWS 2003c). Maintaining native shrubland habitat and reducing invasive plant species would likely improve soil condition.

Adverse Soil Impacts

Some soil compaction occurs from walking the existing maintenance trail network during Refuge management and monitoring visits and by U.S. Navy personnel. In addition, the Service uses ATVs to traverse the island, and Navy UXO clearance operations may include the use of larger pieces of equipment that would contribute to soil compaction. These activities are only occasional and short-term and as such, soil compaction is minimal overall as a result. The mechanical removal of invasive plant species has the potential to cause localized soil disturbance and erosion until new plant species establish.

Soil Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Soil Benefits

The benefits to the soils of Nomans Land Island from Alternative B are the same as those of Alternative A, whether prescribed fire is conducted by the Service or the Navy.

Adverse Soil Impacts

The adverse soil impacts from Alternative B are similar to Alternative A, although more frequent visits to the island could slightly increase soil compaction. There could be more soil disturbance associated with higher levels of invasive species control, but any soil disturbed by the physical removal of plants will be tamped down and compacted. This is a standard aspect of any mechanical removal operation. Efforts to restore the water control structure on the wetland near Rainbow Pond might create temporary soil impacts but will have long term benefits as the potential for this section of the trail to erode due to the failing water control structure will be reduced.

As a part of Alternative B, several cultural initiatives are proposed, which may result in additional short-term soil disturbance activities. These include dune restoration to protect cultural sites, addressing the impacts of cliff erosion on the Luce cemetery and maintaining the Luce cemetery, repatriation of Wampanoag Tribal remains, and documentation of the remnants of human habitation on the island. Protocols for these endeavors would vary, but all would include approval by and coordination with the U.S. Navy for safety compliance, and would seek to minimize soil disturbance. Any soil disturbance would be temporary, and would be replaced and/or tamped down and compacted when the project was complete.

There would be some soil disturbance on the interpretative trail from the installation of wayside exhibits and/or interpretive panels at the Aquinnah Cultural Center on Martha's Vineyard. Also there would be an increase in foot traffic which could lead to some erosion and soil compaction on the trail.

Soil Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Soil Benefits

Benefits to Refuge soils would be similar to that described in Alternative A. Prescribed fires conducted by the Service under this alternative would be subject to MRA, but if approved, should benefit soils in the short-term by releasing nutrients bound up in plant biomass back into the soil (Dudley and Lajtha 1993). Prescribed burn protocols would be evaluated through a MRA to identify the minimum impact methods and tools to accomplish necessary activities safely and with a minimal amount of impairment to wilderness character. In addition, Refuge staff visits would be less than in Alternative B, so any compaction as a result of staff activities would be minimal, and similar to Alternative A.

Adverse Soil Impacts

Adverse soil impacts would be similar to that described in Alternative A. Under this alternative, however, we are adapting a more targeted resource management approach, committing to management of the area to maintain and enhance the island's wilderness character. Under this scenario, some management actions and equipment may be altered or reprioritized to comply with wilderness policy guidelines, and would be subject to MRA.

There would be some soil disturbance on the interpretive trail from the installation of wayside exhibits and/or interpretive panels at the Aquinnah Cultural Center on Martha's Vineyard. Also there would be an increase in foot traffic which could lead to some erosion and soil compaction on the trail.

Effects on Shrub Habitat – Breeding and Migratory Birds and Other Wildlife

Shrub Habitat Impacts That Would Not Vary by Alternative

The 628-acre Nomans Land Island Refuge supports at least 400 acres of shrubland habitat. This habitat on the Refuge is one of the primary reasons the island is a regional landbird focus area in BCR 30 (Steinkamp 2008). Under all three alternatives, a primary goal is to maintain this shrubland habitat for breeding and/or migratory birds and other flora and fauna. Alternative A relies on UXO clearance operations by the U.S. Navy to maintain shrub habitat, while in Alternatives B and C the Service will take the initiative to perform prescribed burns so they are conducted in a biologically meaningful way; however, prescribed burns would be subject to MRA in Alternative C. Similarly, these alternatives involve differing levels of wildlife and plant inventories and monitoring and the use of adaptive management to guide management of shrub habitat and associated species, including the possible release of New England cottontail on the Refuge in Alternatives B and C.

Shrub Habitat Impacts of Alternative A (Current Management)

Under current management, we would continue to minimally manage shrub habitats. The island location of the Refuge and the distance to the Refuge headquarters allows for only limited management and monitoring activities by Refuge staff. Under this alternative, therefore, the only active shrub habitat management or alterations would be as a result of continuing removal of UXO by the U.S. Navy. The prescribed burns by the Navy as part of their clearance operations would benefit shrub-dependent focal bird species, but the management regimes would not be biologically-based.

Fourteen species of invasive plant species are known to occur on the island, and many of these are found throughout the shrub habitat. Under Alternative A, the control of invasive species only along existing maintenance pathways would potentially degrade the quality of native shrub habitat for focal species in areas where invasive plants are left untreated.

Under current management, the Service conducts basic surveys and monitoring of Refuge wildlife in shrub habitat, including breeding bird surveys and occasional migratory raptor banding with partners. These baseline surveys would provide some measure of bird response to ongoing management activities, although not on an annual basis.

Shrub Habitat Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Under Alternative B, we would engage in more active management of 400+ acres of shrub habitat, which would likely result in greater control of habitat conditions that benefit focal shrub species. For example, gray catbird and eastern towhee are shrubland breeders on the Refuge, and both require slightly different structural complexity and density for their breeding habitat. To this end, we would distinguish at least two habitat patches and conduct prescription burns on a rotational basis so that each patch would burn every 7 to 12 years. Having at least two habitat patches that are alternately burned would also ensure habitat availability for shrubland wildlife and other taxa during and immediately following a fire.

Under this alternative, the Service would be responsible for any prescribed burns on the Refuge. Periodic burns would ensure the perpetuation of shrubland habitat; despite the influences of salt-spray and wind that delay succession, it is not certain that high-quality shrubland habitat would persist on the Refuge without enacting a regular disturbance regime. The biologically-based fire regime proposed under this alternative would better target habitat needs and would have minimal impact on nesting and migrating birds and invertebrates (Vickery et al. 2005). Dormant season burns would occur after avian migration, and would reduce impacts to pollinators on the Refuge; those that are mobile have already left, and the remaining species are likely hibernating or aestivating in the soil (St. Sauver 2009).

Dormant season burns would also be beneficial for shrub species which are physiologically inactive during this time and thus suffer no major setbacks. Species such as northern bayberry, found on the Refuge, are typically top-killed, and begin resprouting through seeds and rhizomes following a fire. Resprouting and stem density of shrubs can be higher following dormant season burns, compared to growing season burns (Drewa et al. 2002). Vegetation response to fire is species-specific, and is ultimately dependent upon fire duration, intensity, fuel load, and moisture levels. Post-fire effects on vegetation would be measured in established plots. Adaptive management would be used to alter the fire regime as necessary based on these differences in vegetation response to achieve our target habitat conditions for wildlife.

Current estimates based on aerial photography are that invasive species account for approximately 10 percent of the shrubland habitat. Because of access issues in this habitat, 10 percent would continue to be our tolerance threshold under this alternative, and any increase beyond that number would be immediately treated. We would have a zero tolerance policy for any invasive species that became stand-replacing, or that posed a direct and immediate threat to habitat integrity. Through greater vigilance, a more concerted effort island-wide to control invasive plant species would enhance native shrub habitat and provide greater benefit to shrub-dependent focal species.

Additional trails would be cleared on the Refuge to provide access for monitoring and management, including invasive species control. There would be a small amount of shrubland habitat lost as a result of this additional clearance activity.

Under this alternative, we would further evaluate the potential for releasing New England cottontail in the Refuge's shrubland habitat. This species is the only cottontail endemic to the Northeast, yet only five disjunct populations remain in 14 percent of its historic range (Litvaitis et al. 2006). To date, only three national wildlife refuges in the Northeast have documented the presence of this species: Rachel Carson (Maine), Mashpee (Massachusetts) and the Rhode Island Complex. Habitat fragmentation and maturation continue to be primary threats to the survival of this species, and the maintenance and availability of large habitat patches are required for this species to persist (Barbour and Litvaitis 1993). It is currently a candidate for federal listing under the ESA.

New England cottontail specimens have been documented from both Martha's Vineyard and Nantucket Islands (Godin 1977), and this species was present on Tuckernuck Island (Nantucket) prior to the release of eastern cottontails in the early 20th century (T. French, personal communication). New England cottontails are currently present on Cape Cod. These islands were at one time connected with Cape Cod when sea levels were low following the last glacial maximum, and Martha's Vineyard and Nomans Land Island are thought to have been connected until approximately 1,000 years ago (LaFarge 1933). Though it is not yet certain that this species was historically present on Nomans Land Island, given its prevalence on neighboring islands and the historical connectivity between them, it is likely to have been there at one time.

Successfully releasing rabbits on coastal islands has occurred for over a century. Nantucket was the first of Massachusetts' coastal islands to be stocked with eastern cottontails prior to 1900 (Johnston 1972). Nantucket then became a stocking source for other coastal islands including Martha's Vineyard, beginning in 1920. Approximately 79 individuals from Vermont, "out-of-state," and the mainland were translocated to Penikese Island in 1925, with no prior record of rabbits present; the individuals from Vermont were likely New England cottontail while the others were likely eastern cottontail (Johnston 1972, T. French, personal communication). This became the source population of a stocking program by the state, and over 4,600 rabbits were transferred to the mainland over the next 15 years.

Recently, the State of Massachusetts has established an objective "to establish self-sustaining refuge populations of New England cottontails on selected coastal islands of Massachusetts" (MA DFG 2005). To date, New England cottontail was released on Grape Island in Massachusetts in 1985, and by 1996 over 40 individuals were estimated (Cardoza 1998). Collaboration with the MA DFG to release New England cottontails on Nomans Land Island would help fulfill this objective for the state, and provide partner support for ongoing monitoring and management on the Refuge.

State and federal experts agree that Nomans Land Island provides a unique habitat alternative for this species due to its isolation from anthropogenic disturbances, lack of mammalian predators, and the absence of eastern cottontail. According to Litvaitis et al. (2007), "Initially, management efforts should be directed at expanding existing populations that occupy habitats where eastern cottontails are absent." Barbour and Litvaitis (1993) found that small habitat patches (2.5 hectares, or approximately 6 acres) served as sinks for dispersing juveniles, where resource availability and thus survival rates were low. Patches of at least 25 acres in size are recommended as suitable (Arbuthnot 2008); with approximately 400 acres of shrub habitat, Nomans Land Island more than meets this criterion. It would, however, be an isolated population without any connectivity to other habitat patches or populations. The long term genetic viability of an isolated population such as this is uncertain, however, given the rapid range contraction of this species, it may be critical to leverage opportunities for translocation in the short term wherever possible (J. Litvaitis, personal communication).

Due to its behavioral adaptations and predator avoidance strategies, New England cottontail requires dense habitat for cover, approximately 20,000 woody stems per acre (Arbuthnot 2008). Initial evaluation of Nomans Land Island's shrub habitat indicates good potential for New England cottontail, with regard to vegetation thickness and forage diversity (A. Tur, personal communication). Structural complexity and not species composition has been used to describe suitable habitat for New England cottontail (Eabry as cited in Litvaitis et al. 2007). The proposed rotational fire regime under this alternative would ensure the continuation of early successional habitat, dense cover, and habitat availability during and immediately following a burn.

Erin Victory/TCI

Dense Refuge vegetation

The presence of a New England cottontail population on the Refuge would undoubtedly have some impact on the habitat and other wildlife species present. In spring and summer, cottontails have a primarily herbaceous diet, eating what fresh leaves, flowers, grasses, sedges and rushes become available. In fall and winter, their diet shifts to include fruits and ultimately buds, bark, and twigs (Dalke and Sime 1941). Observations over the course of one winter showed that cottontails could consume nearly all of the previous year's growth in a blackberry stand, and girdle a stand of sumac, though this initiated sucker sprouting and increased the number of plants (Dalke and Sime 1941).

Changes in species composition and distribution throughout the Refuge's upland habitat, including the spread of invasive species beyond where they presently occur, are potential impacts associated with a New England cottontail release. Consumption of sensitive plant species is another facet that needs to be explored further. Despite several plant surveys over the last several decades, access restrictions around upland areas and limited opportunities mean that there may be plant species present on the island that are unaccounted for. Impacts cannot be fully assessed without thorough knowledge of this ecosystem. However, according to the MA DFG, the presence of the cottontail should not pose an undue threat to sensitive plant species, such as Arethusa, on the Refuge (T. French and B. Connolly, personal communication).

Typically, New England cottontails seek refuge in burrows created by other species or rock walls when frightened (Litvaitis et al. 2007). Species creating and/or utilizing burrows on the Refuge include painted, snapping and spotted turtles, muskrat, and Leach's storm petrel. Rock walls still remain intact in some areas of the Refuge, particularly on the western side of the island, and are also used by Leach's storm petrels. This could lead to some competition for sites between these species.

Further research and consideration is needed to determine if a genetically viable New England cottontail population could be perpetuated on the Refuge, its potential impacts on other species and communities, and how feasible a long term cottontail management program would be. However, given the likelihood of its historical presence on the Refuge, minimal concern regarding impacts to sensitive species, and similar release efforts on coastal Massachusetts islands by MA DFG, it appears to be a viable option for the Refuge.

Shrub Habitat Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Impacts to shrub habitat under Alternative C would be similar to Alternative B in habitat management, but with no focus on breeding landbirds or pollinators other than butterflies. Instead, management efforts on migrating landbirds including raptors would be emphasized. New England cottontail would be considered for release under this alternative as well, with the same potential impacts described in Alternative B if introduced. However, wilderness stewardship policy indicates that we generally will not transplant species into wilderness areas if the species is not native to that area. If the prior inhabitation of Nomans Land Island by the New England cottontail cannot be confirmed or strongly indicated, then this species may not be introduced, resulting in the same potential impacts as Alternative A.

Under this alternative, we are recommending Nomans Land Island suitable for wilderness designation and committing to management of the area to maintain and enhance wilderness character. Some Refuge management actions (e.g., prescribed burns, control of invasive species and release of New England cottontail) may be modified or reprioritized to comply with wilderness policy guidelines. Though prescribed burns, if approved, are not scheduled according to a periodic cycle in Alternative C, but rather are implemented as needed according to habitat condition, regular vegetation monitoring would remain the same as in Alternative B.

As in Alternative B, additional trails would be cleared on the Refuge to provide access for monitoring and management, including invasive species control. There would be a small amount of shrubland habitat lost as a result of this additional clearance activity. These proposed actions and protocols would be evaluated through MRA to identify the minimum impact methods and tools to accomplish necessary activities with a minimal amount of impairment to wilderness character.

Effects on Vegetated Dune Habitat

Vegetated Dune Habitat Impacts That Would Not Vary by Alternative

Coastal beach and dune habitat continues to be some of the most threatened habitats in the U.S. (Brown et al. 2001). They are naturally unstable, dynamic ecosystems that are subject to erosion and accretion processes due to wind and wave action (MA DFG 2006). The Refuge has 15 acres of vegetated dunes that provide habitat for nesting terns and shorebirds including American oystercatcher. All three alternatives utilize varying levels of active management to maintain the dune habitat. Similarly, the alternatives involve differing levels of wildlife and plant inventories and monitoring and the use of adaptive management to guide management of dune habitat and associated species. All alternatives would incorporate actions, where possible and as funding allows, that monitor for any impacts to the Refuge due to sea level rise under the SLAMM model. Unless some management action is undertaken, this habitat is predicted to be lost or largely reduced by 2100 (Clough and Larson 2009). Because the life of this CCP is relatively short by comparison, we would focus on establishing a baseline from which to continue long term monitoring efforts to determine the best mitigation strategies in the future.

Vegetated Dune Habitat Impacts of Alternative A (Current Management)

Under Alternative A we would continue to minimally manage up to 15 acres of vegetated dune habitat that provides habitat for shorebirds and terns. Some of the dune habitat is already succeeding to woody vegetation; that trend would continue under this alternative. Annual inventories of nesting terns and limited vegetation surveys would provide some measure of habitat suitability for dune species, but would not provide information on bird productivity.

The control of invasive species only along existing maintenance pathways or easily accessible areas would potentially degrade the quality of the vegetated dune habitat for focal species, where invasive plants are left untreated. Invasive plants may adversely impact native dune plants through direct resource competition and can contribute to the decline of threatened or rare native plant species (Thomson 2005).

It is well documented that gulls are nest predators of tern and other coastal bird species, and also compete with terns and other species for nesting habitat (O'Connell and Beck 2003, Donehower et al. 2007). These are likely factors for the decline in tern abundance on the Refuge. Under Alternative A limited predator control would be used only as deemed necessary, and would provide some benefit to nesting terns, but might not be sufficient to allow terns to fully recover or re-colonize on the island.

Vegetated Dune Habitat Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Under Alternative B we would actively manage up to 15 acres of vegetated dune habitat that provides habitat for nesting terns and shorebirds. This would include a more concerted effort to control invasive plant species that would provide greater benefit to dune focal species. To maintain the herbaceous dune habitat and prevent succession to woody growth, we would remove woody vegetation as needed by hand pulling or mechanical means. We would also evaluate the need for dune restoration to protect cultural resources.

Annual inventory of nesting oystercatchers and terns and monitoring of productivity for these species would provide feedback on effectiveness of management efforts. Habitat management would include creating areas of this vegetated dune habitat that have 30 to 70 percent cover to benefit common and roseate terns, respectively, if a colony of at least 50 pairs is present. Once this threshold is met, more comprehensive predator monitoring and control would provide greater protection to nesting terns. This would include maintaining a five acre gull-free zone which would be accomplished by habitat management and harassment to prevent nesting, nest removal, egg destruction and/or lethal removal.

It is unlikely that the potential release of New England cottontail under this alternative would have some impacts on this habitat and/or on tern species. European hares on Falkner Island in Connecticut were known to inadvertently destroy tern nests and eggs through nocturnal activity along the beaches and by utilizing burrows with established roseate tern nests (J. Spendelow, personal communication). This may not be an issue on Nomans Land Island, however. With over 400 acres of shrubland, there would be adequate habitat available to meet the food and cover requirements for a released population of cottontails. In addition, studies done by Smith and Litvaitis (2000) demonstrated that New England cottontails were reluctant to leave areas of thick cover, even to gain access to higher quality food sources. Given this reluctance, it is unlikely that a New England cottontail population on the Refuge would leave shrubland habitat for the more open vegetated dunes for forage or nesting sites. Should interspecific conflicts over sheltered sites ever emerge, management intervention for both species, by providing artificial nesting structures, has proven successful (Arbuthnot 2008, Spendelow 1982).

Vegetated Dune Habitat Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Under Alternative C we would rely on monitoring efforts every three to five years to assess habitat condition for terns and nesting shorebirds. In the case that a common tern colony establishes on the Refuge in excess of 50 pairs, we would evaluate the need for predator control and habitat management measures. In the absence of this scenario, natural processes would prevail in this habitat.

Annual oystercatcher and tern surveys would provide some feedback on habitat conditions as well. New England cottontail would be considered for release under this alternative as well, and would have the same potential impacts as under Alternative B.

Under this alternative, we are recommending Nomans Land Island suitable for wilderness designation and committing to management of the area to maintain and enhance wilderness character. Some Refuge management actions (dune vegetation and maintenance measures, control of invasive species, predator control for gulls, and artificial nesting structures for tern species) may be modified or reprioritized to comply with wilderness policy guidelines. Proposed actions and protocols would be evaluated through a MRA to identify the minimum impact methods and tools to accomplish necessary activities with a minimal amount of impairment to wilderness character.

Effects on Marine Intertidal Beach and Rocky Shore

Marine Intertidal Beach and Rocky Shore Habitat Impacts That Would Not Vary by Alternative

The intertidal beach and rocky shores of Nomans Land Island provide important nesting, resting and foraging habitat for many priority species of conservation concern, and are regionally important because of the island's land protection status. Throughout the Atlantic coast, quality beach habitat is imperiled due to increases in human uses and development (MA DFG 2006). The approximately 100 acres of this habitat on the island benefits marine mammals, nesting waterbirds such as the double-crested cormorant, and migrating shorebirds.

All of the alternatives utilize varying levels of active management to maintain the intertidal and rocky shore habitat, including monitoring for invasive species. Similarly, the alternatives involve differing levels of wildlife and plant inventories and monitoring and the use of adaptive management to guide management of rocky beach habitat and associated species. All alternatives would incorporate actions, where possible and as funding allows, monitoring the predicted habitat losses due to sea level rise under the SLAMM 5.0 model. Unless some management action is undertaken, this habitat is predicted to be lost or largely reduced by 2100 (Clough and Larson 2009). Given the relatively short time frame of this CCP, the next 15 years will provide us with baseline information and a systematic monitoring regime from which to base future climate change mitigation decisions for the Refuge.

Stephanie Koch/USFWS

Refuge rocky shoreline and cobble spit

Marine Intertidal Beach and Rocky Shore Habitat Impacts of Alternative A (Current Management)

Under Alternative A we would continue to minimally manage up to 100 acres of marine intertidal beach and rocky shore habitat to benefit marine mammals such as seals, nesting waterbirds, and migrating shorebirds. Any shoreline changes would be noted as discovered during Refuge visits. Habitat conditions would largely be evaluated through indirect monitoring and surveys of nesting cormorants, American oystercatchers that sometimes nest among the cobble, and records of seal presence.

Marine Intertidal Beach and Rocky Shore Habitat Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Under Alternative B we would actively protect up to 100 acres of marine intertidal beach and rocky shore habitat that benefit marine mammals such as seals, nesting waterbirds, and migrating shorebirds. Protection of this habitat under Alternative B would involve monitoring shoreline erosion rates and changes associated with climate change, and working with partners to monitor and control invasive species such as sea cucumbers and macroalgae.

Marine Intertidal Beach and Rocky Shore Habitat Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Under Alternative C we would protect the existing 100 acres of marine intertidal beach and rocky shore habitat that benefit marine mammals, nesting waterbirds and migrating shorebirds in much the same way as in Alternative B.

Under this alternative, we are recommending Nomans Land Island suitable for wilderness designation and committing to management of the area to maintain and enhance wilderness character. Management actions on the Refuge would be evaluated through a MRA and modified to comply with wilderness policy guidelines. However, no changes are anticipated to actions proposed under this alternative, as surveys would likely continue under a wilderness scenario.

Effects on Scrub Shrub and Emergent Wetlands, Bogs, and Open Water Habitat

Wetland Habitat Impacts That Would Not Vary by Alternative

Refuge wetlands include ponds, permanently flooded marshes and seasonally flooded marshes. They support a small black-crowned night heron rookery, and species including American black duck and Virginia rail. Though no comprehensive surveys have been done of these wetland habitats beyond secretive marshbird surveys due to access restrictions, they do support the spotted turtle (previously listed in the state as special concern), and muskrat which are experiencing unexplained regional population declines (CT DEP 2008, VT FWD 2006). Refuge wetlands are the least well-known habitat type on the Refuge. Unexploded ordnance clearance has never been conducted in any of the ponds, precluding any attempt to inventory fish and invertebrate species. Access restrictions around the island due to the presence of ordnance limits our abilities to traverse wetland areas.

Alternatives A and B utilize varying levels of active management to maintain the 100 to 150 acres of wetland habitats. Similarly, Alternatives A and B involve differing levels of wildlife and plant inventories and monitoring and the use of adaptive management to guide management of wetland habitats and associated species. Alternative C would be similar to Alternative A, though actions therein would be subject to evaluation through a MRA.

Wetland Habitat Impacts of Alternative A (Current Management)

Under Alternative A we would continue to minimally manage the 100-150 acres of freshwater wetland habitat to support breeding marshbirds and native plant communities. The removal of aquatic invasive species including purple loosestrife and Phragmites would benefit wetland habitats and associated species (Able et al. 2003, Chambers et al. 2003, Albright et al. 2004).

Monitoring of secretive nesting marshbirds, surveys of rare wetland plants, and anecdotal observations of invertebrates would provide some measure of wetland habitat conditions.

Wetland Habitat Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Under Alternative B we would actively protect and manage the 100-150 acres of freshwater wetland habitat to support breeding marshbirds and native plants and animal communities. Similar to Alternative A we would treat aquatic invasive species including purple loosestrife and Phragmites to benefit wetland habitats and associated species. In addition, we would initiate a zero tolerance policy toward highly invasive, stand-replacing species.

If approved, the release of New England cottontail would have some impact on wetland flora. Suitable habitat for this species includes shrub swamps (Arbuthnot 2008). During spring and summer, cottontails preferentially consume grasses and sedges, and species including loosestrife (Lysimachia quadrifolia) and cranberry (Vaccinium oxycoccus) were noted during feeding observations (Dalke and Sime 1941). New England cottontail would utilize shrub habitats for foraging and breeding habitat, and would also aid in seed dispersal. It is not likely that sensitive plant species, including Arethusa, would be at risk due to the presence of New England cottontail (T. French and B. Connolly, personal communication).

Alternative B would involve more expanded annual surveys and baseline studies that would provide better guidance on the status of plant and animal populations and wetland habitat conditions. Specifically, these would include annual marshbird surveys and comprehensive rare plant and invertebrate surveys with partners. Increasing access through these wetland areas would allow for more complete surveys and better data collection. These surveys would provide more information about the habitat quality of these wetlands. We can then use adaptive management to adjust changing conditions to benefit focal species of concern where possible, though there may be some limitations given the presence of UXO.

Wetland Habitat Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Under Alternative C, wetland impacts from management actions would be similar to Alternative A, but would be evaluated through a MRA and modified if necessary to comply with wilderness policy guidelines. New England cottontail is also under consideration for release under this alternative, and impacts would be similar to that described under Alternative B.

Effects on Public Access, Education, and Community Outreach

Public Access, Education, and Community Outreach Impacts That Would Not Vary by Alternative

Under all three alternatives none of the six priority wildlife-dependent uses are allowed on the Refuge, as we are obligated to maintain and enforce the ban on public access for safety reasons on Nomans Land Island. Although the distance of the Refuge from Sudbury headquarters limits our capabilities, some level of off-site environmental education and interpretation related to the Refuge occurs for all three alternatives.

Public Access, Education, and Community Outreach Impacts of Alternative A (Current Management)

Alternative A would maintain the current level of interpretation and outreach. Given the closure of the Refuge to public access, this entails maintaining the virtual tour of the Refuge that is available on the Refuge website. This provides some level of interpretation of Refuge resources, however, it is reliant on general knowledge and awareness of its existence. Outreach consists of news releases to announce large-scale management activities on the Refuge. To help maintain the closure policy we would maintain at least eight regulatory signs on the Refuge and work with partners to ensure compliance with the ban on public access.

Public Access, Education, and Community Outreach Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Alternative B would offer the greatest expansion of our environmental education and interpretive programs on Martha's Vineyard, specifically in partnership with the Wampanoag Tribe and the Aquinnah Cultural Center. Expanded programs would include an interpretive trail and associated kiosk and viewing area including a spotting scope focused on the island, brochures and materials to be distributed at the Center and other sites, and educational materials to be used in local classrooms. These would focus on the importance of coastal resources, the history of and ecosystems present on Nomans Land Island, environmental stewardship, and the role of Nomans Land Island in the Refuge System. These increases in opportunities for environmental education and interpretation would allow us to reach a broader audience than under Alternative A, and would increase the visibility of the Service locally. It would also have the benefit of creating a connection between visitors to western Martha's Vineyard and Nomans Land Island, which is visible from the Aquinnah Cliffs and Cultural Center.

Community partnerships would be strengthened under Alternative B, especially with the Wampanoag Tribe, and would open up additional opportunities for new partnerships and cooperative ventures. Outreach would be expanded to include press releases, public notices of Refuge management, and alerts about Refuge restrictions distributed in the local communities. We would prioritize involvement in local events under this alternative, as well. This alternative would enable us to become more integrated into the communities nearest the Refuge.

The Refuge website would be enhanced by possible use of professional photographers and videographers to document Refuge species and habitat as part of the virtual tour. Interviews with members of the Tribe about the importance of Nomans Land Island to their culture, and about coastal resources in general would also enhance the Refuge website. The expanded outreach under Alternative B would provide an opportunity to use the Refuge as a vehicle to illustrate the impact of climate change on island conditions.

Alternative B also provides greater law enforcement presence and patrol to enforce the ban on public access, and enhances communication with partners to disseminate timely information. We would continue to maintain eight regulatory signs around the island.

Public Access, Education, and Community Outreach Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Alternative C would expand our environmental education and interpretive programs beyond Alternative A, but would be more focused than under Alternative B. Specifically, we would work with the Aquinnah Cultural Center to complete an interpretive trail with panels and a spotting scope, as well as associated brochures and materials for distribution. We would also develop a display for the Tribe's interactive kiosk at the Aquinnah Cliffs. These increases in interpretation beyond Alternative A would allow us to reach a broader audience, create a connection between visitors to western Martha's Vineyard and Nomans Land Island, highlight the Refuge's role in coastal resource conservation and the Refuge System, and educate the public about the values of wilderness and the National Wilderness Preservation System.

Steve Hillebrand/USFWS

A spotting scope at the ACC would allow visitors to view the Refuge

As with Alternatives A and B, community partnerships would continue to be important under Alternative C, especially with the Wampanoag Tribe. We would also continue to use news releases for important Refuge events and initiatives, and would participate in local community events at least once every five years. These efforts would allow us to better communicate with local communities, strengthen partnerships, and open the possibility of cooperative ventures.

Similar to Alternative A, we would maintain the eight regulatory signs on the Refuge and work with partners to ensure compliance with the ban on public access on the Refuge. In addition to Alternative A, we would enhance communication with partners to disseminate timely information about emergency response.

Effects on Cultural and Archaeological Resources

Cultural and Archeological Resources Impacts That Would Not Vary by Alternative

Despite five known archaeological sites, there has been no comprehensive, professional cultural resources survey of Nomans Land Island. Because the island is closed to the public, and no facility development or major ground disturbing activities are anticipated, it is unlikely that there would be any impacts to known or unknown cultural sites under any of the three alternatives. Erosion, however, is a potential issue, especially along the cliffs and dune beaches. The Service is concerned about protecting and maintaining known cultural and archaeological resources under all three alternatives. Pursuing a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) is common to all alternatives.

Cultural and Archaeological Resources Impacts of Alternative A (Current Management)

Under Alternative A we would follow Service protocol to prevent the loss of cultural and archaeological resources, record items or sites as they are encountered, and coordinate with the Navy on compliance with the National Historic Preservation Act. We would also maintain the historic Luce cemetery using volunteers and Service staff to remove vegetation when feasible. This alternative would not increase our knowledge of the history of the island per se; however, it would minimally ensure some action is taken to preserve what cultural resources exist on the Refuge in compliance with federal mandates.

We would consult with the Wampanoag Tribe on biological and cultural issues, and continue to strengthen our partnership through a partnership agreement.

Cultural and Archaeological Resources Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Similar to Alternative A we would follow Service protocol and federal mandates to prevent the loss of cultural and archaeological resources, record sites as they are encountered, and coordinate with the Navy on compliance with the National Historic Preservation Act. We would also maintain the historic Luce cemetery using volunteers and Service staff to remove vegetation when possible and we would consult with the Chilmark Historical Commission to learn more about the cemetery and those buried there. We would also work with the Chilmark Historical Commission to conduct a remote sensing survey for unmarked graves, if approved by the Navy.

We would initiate a cultural resources overview, maintain an inventory of known and newly found sites and structures, provide cultural resource training to Refuge staff, and work with the Wampanoag Tribe and the Chilmark Historical Commission with an oral history project. These endeavors combined would greatly increase our knowledge about the history of the island, contribute to the collective archaeological knowledge base of the region, and would offer opportunities to increase education and historical interpretation of the island. Alternative B offers greater opportunities to protect and interpret cultural and archaeological resources, particularly in partnership with the Wampanoag Tribe and the Chilmark Historical Commission. Enhanced interpretive materials would be available at the Aquinnah Cultural Center, in the Town of Chilmark, and on the Refuge website.

Under Alternative B we would continue to consult with the Wampanoag Tribe on biological and cultural issues, including coordination for research efforts related to cormorants, seals, and other areas of interest to the Tribe. Biological work would be enhanced by any archaeological and cultural knowledge gained in this alternative, as clues to past land use and evidence of animal species provide context to Refuge management. We would work to build a strong and mutually beneficial relationship with the Tribe.

Archaeological resources are best protected under this alternative and cultural resources and history are best preserved and understood under this alternative.

Cultural and Archaeological Resources Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Cultural and archaeological efforts are increased in this alternative from Alternative A, but are less than in Alternative B. In addition to actions mentioned in Alternative A, this alternative provides a moderate level of cultural resource protection, beyond compliance with Service policy and federal mandates, and does increase our knowledge base of the cultural and archaeological value of the island. This would be accomplished through completion of a cultural resources overview, establishing a protocol for when cultural and archaeological items, or human remains, are found, and addressing issues concerning Luce cemetery erosion. Under this alternative, we are recommending Nomans Land Island suitable for wilderness designation and committing to management of the area to maintain and enhance wilderness character. Proposed actions and protocols would be evaluated through a MRA to identify the minimum impact methods and tools to accomplish necessary activities with a minimal amount of impairment to wilderness character. Though not as comprehensive as Alternative B, this alternative does offer opportunities for education and historical interpretation. Moreover, through these efforts we anticipate a stronger partnership with the Tribe.

Wilderness Recommendations and Designation

Wilderness Recommendations and Designation Impacts of Alternative A (Current Management)

Under this alternative no wilderness would be proposed for the Nomans Land Island NWR. There are no current management activities or uses under Alternative A that would directly or indirectly jeopardize the roadless character, size, naturalness, or supplemental ecological and cultural features of the WSA in the short-term. There would be no changes in land use or land ownership and no new or expanded Refuge management activities or Refuge uses that would significantly alter the existing physical landscape of the island. At least for the short-term, the Nomans Land Island WSA would continue to be impacted primarily by natural forces.

The Nomans Land Island NWR would not be afforded the benefit of long-term legislative protection under Alternative A. In the long-term it is possible that management direction could be a departure from how the Service has managed the Refuge in the past. When the CCP is revised or a new CCP prepared, the management direction could change which may result in less protection for wilderness resources in parts of the Refuge.

Wilderness Recommendations and Designation Impacts of Alternative B (Enhanced Wildlife Management and Visitor Services)

Under Alternative B, no wilderness would be proposed for the Nomans Land Island NWR. Similar to Alternative A, there are no proposed Refuge management activities or uses under Alternative B that would directly or indirectly jeopardize the roadless character, size, naturalness, or supplemental ecological and cultural features of the Nomans Land WSA. At least for the short-term, the Nomans Land Island WSA would continue to be impacted primarily by natural forces.

This alternative would involve the most active management of habitats and natural and cultural resources of the three alternatives evaluated for the CCP. Refuge management activities and Refuge uses would not be designed to minimize impacts to wilderness character. There would be no restrictions or limitations on the use of motorized vehicles, motorized equipment and mechanical transport. This alternative would provide the maximum management flexibility. Negligible to moderate, short and long-term impacts on natural resources and wilderness character could occur in localized areas of the Refuge depending on the methods and tools utilized to carry out the management activity.

The Nomans Land Island NWR would not be afforded the benefit of long-term legislative protection under Alternative B. In the long-term it is possible that management direction could be a departure from how the Service has managed the Refuge in the past. When the CCP is revised or a new CCP prepared, the management direction could change which may result in less protection for wilderness resources in parts of the Refuge.

Wilderness Recommendations and Designation Impacts of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Under this alternative, all of the 628-acre Nomans Land Island WSA would be recommended suitable for designation and inclusion in the National Wilderness Preservation System. Since Congress has reserved the authority to make final decisions on wilderness designation, the wilderness recommendation is a preliminary administrative determination that would receive further review and possible modification by the Director, the Secretary of Interior, or the President. The WSA would be managed as "de-facto" wilderness pending designation.

Refuge management strategies and techniques would be chosen to comply with wilderness stewardship principles and prevent degradation of wilderness character. All Refuge management activities and uses that would require use of motorized vehicles, motorized equipment, and mechanical transport would be evaluated through a MRA, either on a programmatic or case-by-case basis, to determine if the activities are necessary and to identify measures to mitigate impacts to wilderness character. We would conduct or authorize such an activity only if we demonstrate that it is necessary to meet the minimum requirement for administering the area as wilderness and necessary to accomplish Refuge purposes.

Pending evaluation through a MRA, the Refuge would likely continue to utilize an ATV with attached mowing unit to maintain existing access trails, maintain the usage of the Conex storage structures, and maintain existing signage on the island. The trails have been cleared of surface ordnance and are necessary to ensure safe access around and across the island for Refuge management activities. The Conex storage structures are presently utilized for storage of the ATV and field camp supplies and equipment, and this would continue to be a necessity for future management of the Refuge. The structures are also necessary to provide emergency shelter for Refuge staff in the event of storm or hurricane activity. Existing signage would likely be maintained or replaced; the signs are required to inform the public of access restrictions and safety hazards.


Erin Victory/TCI

"Wilderness character"

Proposed management activities and protocols for invasive species control, prescribed burning, predator control, and maintenance or stabilization of cultural sites and the Luce cemetery would be evaluated through MRA, and if approved, would be carried out using the minimum impact methods and tools to accomplish the work safely and with a minimal amount of impairment to wilderness character.

Wilderness designation establishes an additional Refuge purpose of protecting wilderness character and values. The wilderness area would be managed to accomplish Refuge purposes, including wilderness purposes, and the Refuge System mission, while also preserving wilderness character and natural values for future generations.

Under Alternative C, wilderness designation would directly support the following CCP goals:

- Perpetuate the biological integrity and diversity of coastal island habitats to support native wildlife and plant communities, including species of conservation concern; and,
- Protect, maintain, enhance, and preserve the wilderness character of Nomans Land Island.

Designation of the Nomans Land Island NWR as wilderness would contribute to the diversity in the National Wilderness Preservation System. The only designated wilderness island on the East Coast north of North Carolina within the current NWPS is the Monomoy Wilderness Area managed by the Service.

This alternative is intended to permanently protect the natural, cultural, and wilderness resources of the Nomans Land Island WSA. Congressional designation would ensure that the Refuge would retain these values in perpetuity.

Effects on Socioeconomic Resources

In analyzing the socioeconomic consequences of the actions under the three alternatives, we evaluated our refuge revenue sharing, Refuge visitor expenditures in the local economy, and Refuge staff and work-related expenditures in the local economy.

Socioeconomic Impacts That Would Not Vary By Alternative

Under provisions of the Refuge Revenue Sharing Act local towns receive an annual payment for lands that have been purchased in full fee simple acquisition by the Service. Payments are based on the greater of 75 cents per acre or 0.75 percent of the market value of lands acquired by the Service. The exact amount of the annual payment depends on the Congressional appropriation, which in recent years have tended to be less than the amount to fully fund the authorized level of payments. In 2008, the payment to the Town of Chilmark was $30,306 which is at least 50 percent of authorized levels (see Chapter 3). The Service is not proposing any new fee simple acquisition; therefore, the level of refuge revenue sharing will be the same for all three alternatives. We do not expect any major changes in the level of revenue sharing payments, unless Congress changes its annual appropriation for revenue sharing.

Under all three alternatives the Nomans Land Island Refuge remains as a satellite station of the Eastern Massachusetts NWR Complex, headquartered in Sudbury, Massachusetts, with no on-site staffing. In addition, we will continue to maintain eight regulatory signs, two brown USFWS signs, and two moorings on the Refuge, though under Alternative C the methods employed would be subject to MRA. Expenditures related to Refuge staff and other administrative costs will largely accrue to the communities around Sudbury, but may also to some extent in Falmouth on Cape Cod. Falmouth Harbor is the departure point to get to the island, and some staff expenditures for meals and gas associated with trips to the Refuge may accrue in this community over time. On occasion, staff meet with conservation partners on Martha’s Vineyard, so additional staff expenditures for meals, gas and lodging there will also occur.

As stated in the transfer agreement between the U.S. Navy and the U.S. Fish and Wildlife Service, the continued presence of UXO throughout the island requires that the Service enforce the ban on public access to Nomans Land Island NWR. In addition, waters surrounding the island are restricted to unauthorized vessels, enforced by the U.S. Coast Guard. Therefore, most socioeconomic impacts associated with proposed actions relating to Nomans Land Island Refuge would occur on Martha’s Vineyard, particularly in the Towns of Chilmark and Aquinnah at the western end of the island. These towns, the Aquinnah Cultural Center, and the shops operated by members of the Wampanoag Tribe of Gay Head (Aquinnah) at the Aquinnah cliffs could receive more visitation and tourist trade if an interpretive trail and spotting scope is located at the Aquinnah Cultural Center as proposed. This will be addressed separately.

Socioeconomic Effects of Alternative A (Current Management)

Refuge Visitor Expenditures

Under Alternative A, there is minimal opportunity for the public to interact with the Refuge on Martha’s Vineyard; therefore there are no visitor expenditures or benefits to the local communities of Chilmark or Aquinnah that can be attributed to the Refuge.

Impacts from Refuge Administration

Administratively, Nomans Land Island NWR is an unstaffed satellite station of the Eastern Massachusetts NWR Complex, headquartered in Sudbury, Massachusetts. There are no staff stationed on Nomans Land Island, however, Complex biologists conduct site visits several times a year. The Refuge utilizes three Conex storage containers, and is responsible for the maintenance of eight regulatory signs, two brown USFWS signs, and two moorings, but otherwise maintains no facilities on the island. Since there are no on-site staff and only minor active management activities, we contribute negligibly to the local economy on Martha's Vineyard in terms of Refuge staff jobs, income, expenditures, and purchases of goods and services for Refuge activities. Any such expenditures would likely accrue in Sudbury, or Falmouth, where occasional staff expenditures for food or gas associated with trips to the Refuge take place. On occasion, staff meet with conservation partners on Martha's Vineyard, so additional staff expenditures for meals, gas and lodging there will also occur.

Socioeconomic Effects of Alternative B (Enhanced Wildlife Management and Visitor Services)

Refuge Visitor Expenditures

Under all three alternatives the Refuge will remain closed to visitors, so there are no Refuge-specific visitor expenditures. Under Alternative B we propose an expanded off-site outreach, environmental education and interpretation program, especially in association with the Aquinnah Cultural Center. We anticipate that these changes, including an interpretive trail, spotting scope and kiosk at the Aquinnah Cultural Center will benefit the Center itself, the Wampanoag Tribe and the communities of Chilmark and Aquinnah through increased tourist visitation and trade.

Impacts from Refuge Administration

Under Alternative B, Nomans Land Island Refuge would remain as a satellite station of the Eastern Massachusetts NWR Complex, headquartered in Sudbury, Massachusetts, though site visits would increase annually under this alternative. Expenditures related to Refuge staff and other administrative costs will largely accrue to the communities around Sudbury, though there may be some incremental increase in expenditures in Falmouth for gas and meals associated with trips to the Refuge. On occasion, staff meet with conservation partners on Martha's Vineyard, so additional staff expenditures for meals, gas and lodging there will also occur.

The creation of off-site environmental education and interpretive materials and programs, more visits to the Vineyard by Refuge staff, and a dedicated effort to participate in local community events would increase expenditures and purchases of goods and services in the local communities on the Vineyard.

Socioeconomic Effects of Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative))

Refuge Visitor Expenditures

Under all three alternatives the Refuge will remain closed to visitors, so there are no Refuge-specific visitor expenditures. Off-site environmental education and interpretation would be increased from current levels under Alternative A, but would be less than levels proposed in Alternative B. In partnership with the Aquinnah Cultural Center, we would complete an interpretive trail and associated outreach materials for Nomans Land Island NWR, benefiting the Center itself, the Wampanoag Tribe and the local communities of Chilmark and Aquinnah. We anticipate that this expanded outreach would likely increase visitation above current levels to these Vineyard communities.

Impacts from Refuge Administration

Socioeconomic impacts from Refuge Administration under Alternative C would be slightly increased from Alternative A, but less than Alternative B. Under Alternative C, Nomans Land Island Refuge would remain as a satellite station of the Eastern Massachusetts NWR Complex, headquartered in Sudbury, Massachusetts, with no on-site staffing. Therefore, expenditures related to Refuge staff and other administrative costs will largely accrue to the communities around Sudbury, though there may be some incremental benefit to Falmouth for gas and meals associated with trips to the Refuge over time. On occasion, staff meet with conservation partners on Martha's Vineyard, so additional staff expenditures for meals, gas and lodging there will also occur. These would be essentially commensurate with levels described in Alternative A.

The slight increase in off-site interpretation and outreach under Alternative C would result in more visits to the Vineyard by Refuge staff compared to current. Therefore, our contribution to the local economy in terms of expenditures and purchases of goods and services would not be as great as Alternative B, but would increase slightly from Alternative A.

Nomans Land Island would be recommended for wilderness designation under this alternative; however, it is not anticipated to have any positive or negative socioeconomic impacts to local communities.

Cumulative Impacts

Cumulative impacts on the physical, biological, and human environment result from the combined effects of the proposed actions added to those of other past, present, and reasonably foreseeable future actions. They can result from individually minor but collectively significant actions taking place over a period of time.

This assessment of cumulative impacts includes other agencies' or organizations' actions if they are interrelated and influence the same environment. Thus, it considers the interaction of activities at the Refuge with others occurring in a larger spatial and temporal frame of reference.

Air Quality

Air quality is generally good in the region. Some areas in Massachusetts periodically experience high ozone levels (MA DEP 2009); however, the island location of the Refuge ensures relatively good air quality. We would expect short-term, localized effects on air quality from the prescribed burns conducted by the U.S. Navy during clearance of unexploded ordnances, or by the Service for maintenance of shrubland habitat. If the Service initiates prescribed burns, as in Alternatives B and C, it would replace the Navy's burn regime to achieve Refuge habitat objectives. The cumulative impacts of prescribed burning throughout a region may be short-term and moderate (Zeng et al. 2008), but the temporary and periodic nature of the proposed fire regime on Nomans Land Island, and its isolated location, minimizes any contribution to potential cumulative effects in the region.

Similarly, occasional herbicidal applications to Refuge habitats are for the most part applied through backpack sprayers and are very target-specific. This type of application would not be anticipated to have any impacts to air quality, as they would be directly applied to the target plants. Aerial herbicide application may have some short-term, localized air quality impacts at the Refuge, but would comply with EPA guidelines that are established to minimize any potential adverse impacts. As with prescribed burning, the limited use of aerial herbicide application on Nomans Land Island, and its isolated location, minimizes any contribution to potential cumulative effects in the region.

While wilderness designation may not essentially alter habitat management activities, it could potentially reprioritize management methods. This designation would create no adverse impacts, and may in fact provide slight benefits to local and regional air quality through wilderness policy compliance.

We expect none of the activities on the Refuge to contribute to any measurable incremental increase in ozone levels or other negative air quality parameters. We expect none of the alternatives to cause any greater than negligible cumulative adverse impacts on air quality locally or regionally.

Water Quality and Soils

There would be no significant cumulative adverse effects to water quality or soils under any of the alternatives. Past land uses have likely had the greatest impact on water quality, and studies conducted by the Navy have shown that surface waters and sediments on the Refuge contain metals (lead, copper, zinc). All three alternatives propose no actions that would further impact water quality. Herbicides used in or near wetlands on the Refuge are approved for use in aquatic habitats, and would be in compliance with product usage and EPA guidelines established for minimal impacts. Invasive species treatments would improve water and habitat quality.

There are no anticipated soil impacts under any of the three alternatives, as there are no proposed activities that would involve any large-scale digging or ground alterations. Any invasive species treatments, erosion control mitigation activities, or archaeological sites would conform to best management practices and Integrated Pest Management to minimize any adverse effects from these treatments.

While wilderness designation may not essentially alter habitat management activities, it would potentially reprioritize management methods. This designation would create no adverse impacts, and may in fact provide slight benefits to Refuge water quality and soil through wilderness policy compliance.

Biological Resources

All alternatives would strive to maintain or improve biological resources on the Refuge. Given the prohibition of public access to the Refuge, including for all six priority public uses, the island's flora and fauna are afforded a high level of protection from human disturbance, or predators associated with human disturbance. There would be no significant cumulative adverse effects to biological resources under any of the alternatives. We would utilize adaptive management to varying degrees under all the alternatives to maintain habitat conditions for focal species. Biological resources, such as invasive plant species, that we would manage to prevent introduction, limit, or eliminate, are not natural components of the Refuge; their losses where they occur would not be considered adverse. If 50 pairs of terns establish a colony on the Refuge, then predator management actions will be taken to maintain a 5-acre gull-free zone. This could result in a small decrease in the number of gulls on the island and a reduction in the number of young produced on the Refuge. The potential establishment of a New England cottontail population on the Refuge would help secure the population in the northeast by providing a large patch of suitable habitat without any anthropogenic disturbances, mammalian predators, eastern cottontails, or interspecific competition for forage resources.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Blue flag Iris

While wilderness designation may not essentially alter habitat management activities, it would potentially reprioritize or pose more specific guidelines on management methods. This designation would pose no threat to any biological resources, and would at least provide the potential to indirectly benefit these resources at the Refuge.

The Commonwealth of Massachusetts released an Ocean Management Plan in 2009, which identified two locations off the Massachusetts coast where large scale (150+ turbines) would be encouraged. One of these locations is in state waters off the south side of Nomans Land Island. In early 2010, the Service learned that developers were interested in siting wind farms in federal waters adjacent to the state waters off Nomans Land Island as well. Refuge staff will work with other Service staff to recommend environmental studies to fill known data gaps. Of particular concern is the impact that offshore wind turbines will have on bats and birds, as well as the proposed wilderness designation of the Refuge.

Socioeconomic Environment

We expect none of the three proposed alternatives to have a significant adverse cumulative impact on the economy of the town or county in which the Refuge lies. We would expect none of the alternatives to alter the demographic or economic characteristics of the local community. The actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. Implementing any of the alternatives would result in minor beneficial impacts on the communities nearest the Refuge. We would expect the greatest contribution to accrue to the Aquinnah Cultural Center, the Wampanoag Tribe, the Town of Aquinnah, and the Town of Chilmark, particularly under Alternative B, but also to some extent under Alternative C.

More emphasis on education and outreach in Alternatives B and C should foster more understanding and appreciation of resource issues and needs, and could lead to increased political support and funding, which could positively affect fish and wildlife resources on the Refuge and on Martha's Vineyard.

Cultural and Archaeological Resources

We expect none of the alternatives to have significant adverse cumulative impact on cultural resources in the region. Under all three alternatives we would work to prevent the loss of cultural and archaeological resources and work collaboratively with the U.S. Navy to prevent such loss during their ordnance clearing procedures. Our partnership with the Wampanoag Tribe of Gay Head (Aquinnah) is of great importance and would be strengthened under all three alternatives.

Global Climate Change

Department of the Interior Secretarial Order 3226 states that "there is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision making…This Order ensures that climate change impacts are taken into account in connection with Departmental planning and decision making." Additionally, it calls for the incorporation of climate change considerations into long-term planning documents such as the CCP.

The Wildlife Society published an informative technical review report in 2004 titled "Global Climate Change and Wildlife in North America" (Inkley et al. 2004). It interprets results and details from such publications as the IPCC reports (1996-2002) and describes the potential impacts and implications on wildlife and habitats. It mentions that projecting the impacts of climate change is hugely complex because not only is it important to predict changing precipitation and temperature patterns, but more importantly, to predict their rate of change, as well as the exacerbated effects of other stressors on the ecosystems. Those stressors include loss of wildlife habitat to urban sprawl and other developed land uses, pollution, ozone depletion, exotic species, disease, and other factors.

The effects of climate change on populations and range distributions of wildlife are expected to be species specific and highly variable, with some effects considered negative and others considered positive. Generally, the prediction in North America is that the ranges of habitats and wildlife will generally move upwards in elevation and northward as temperature rises (Inkley et al. 2004). The TWS report, however, emphasizes that developing precise predictions for local areas is not possible due to the scale and accuracy of current climate models, which is further confounded by the lack of information concerning species-level responses and to ecosystem changes, their interactions with other species, and the impacts from other stressors in the environment. In other words, only imprecise generalizations can be made about the implications of our Refuge management on regional climate change.

Our review of proposed actions in this CCP suggest that only two activities may contribute negligibly, but incrementally, to stressors affecting regional climate change: the prescribed burn program carried out by the U.S. Navy or the Service and travel to the Refuge from the complex headquarters in Sudbury, Massachusetts. We discuss the direct and indirect impacts of those activities elsewhere in Chapter 4. With regards to our travel logistics, we are trying to reduce our carbon footprint wherever possible by driving hybrid vehicles, and using recycled or recyclable materials, along with reduced travel and other conservation measures. In addition, Nomans Land Island is one of several coastal refuges in the northeast that underwent SLAMM analysis designed to project coastal potential coastal habitat changes correlated with sea-level rise. Based on the SLAMM analysis, we would incorporate actions to mitigate potential outcomes resulting from global climate change and rises in sea level as deemed necessary and appropriate.

In our professional judgment, most of the management actions we propose would not exacerbate climate change in the region or project area, and in fact, some might incrementally prevent or slow down local impacts. The TWS report provides 18 recommendations to assist land and resource managers in meeting the challenges of climate change when working to conserve wildlife resources (Inkley et al. 2004). This position states that if land and resource managers collectively implement these recommendations, then cumulatively there would be a positive impact of addressing climate change. We discuss our actions relative to addressing some of these recommendations:

- Recognize climate change as a factor in wildlife conservation
  The Service is taking a major role among federal agencies in distributing and interpreting information on climate change. There is a dedicated webpage to this issue at www.fws.gov/home/climatechange/. Actions that can be implemented at the local level are being developed by Service managers.

- Manage for diverse conditions
  Our proposed habitat management actions described in Chapter 2 is intended to promote healthy, functioning shrub, wetland, and beach communities. We will implement an adaptive management approach as new information becomes available.

- Do not rely solely on historical weather and species data for future projections without taking into account climate change
  This recommendation relates to the point that historical climate, habitat and wildlife conditions are less reliable predictors as climate changes. For example, there may be a need to adjust breeding bird survey dates if migratory birds are returning earlier to breed than occurred historically. A three-week difference in timing has already been documented by some bird researchers. We are aware of these implications and plan to build these considerations into our inventory and monitoring plan so that we can make adjustments accordingly. Our results and reports, and those of other researchers on the Refuge, will be shared within the conservation community.

- Expect surprises, including extreme events
  Refuge managers have flexibility within their operations funds to deal with emergencies. Other Regional operations funds would also be re-directed as needed to deal with an emergency.

- Prevent and control invasive species
  This recommendation emphasizes the increased opportunities for invasive species to spread because of their adaptability to disturbance. Invasive species control will be essential, including extensive monitoring and control to preclude larger impacts. Invasive species control is a major initiative within the Service and on Nomans Land Island. The Northeast Region, in particular, has taken a very active stand. In Chapter 2, we describe our plans on the Refuge to control invasive plants.

- Ensure ecosystem processes
  This recommendation suggests that managers may need to enhance or replace diminished or lost ecosystem processes. Manually dispersing seed, reintroducing pollinators, treating invasive plants and pests, are examples used. We will monitor invasive species and implement actions to reduce their abundance and impact on native plants and wildlife, and our proposed prescribed burn program creates a disturbance regime that will perpetuate shrubland habitat. Beyond these actions, we do not believe at this time there is any need to enhance or replace ecosystem processes.

Further, none of our proposed management actions will diminish natural ecosystems processes. Should our monitoring results reveal that we should take a more or less active role in enhancing or replacing those processes, we will reevaluate and/or refine our management objectives and strategies accordingly.

- Employ monitoring and adaptive management
  This recommendation states that we should monitor climate and its effects on wildlife and their habitats and use this information to adjust management techniques and strategies. Given the uncertainty with climate change and its impacts on the environment, relying on traditional methods of management may become less effective. We agree that an effective and well-planned monitoring program, coupled with an adaptive management approach, is essential to dealing with the future uncertainty of climate change. We have built both actions into our CCP. We will develop a detailed step-down inventory and monitoring plan designed to test our assumptions and management effectiveness in light of on-going changes. With that information in hand, we will either adapt our management techniques, or re-evaluate or refine our objectives as needed.

Relationship between Short-term Uses of the Human Environment and Enhancement of Long-term Productivity

All of the alternatives strive to maintain or enhance the long-term productivity and sustainability of natural resources on the Refuge and in the region, and migratory birds across all landscape scales. The alternatives strive to conserve our federal trust species and the habitats they depend on. Outreach and environmental education are a priority in each alternative to encourage visitors to be better stewards of our environment. In summary, we predict that all alternatives would contribute positively to maintaining or enhancing the long-term productivity of the environment.

Unavoidable Adverse Effects

Unavoidable adverse effects are the effects of those actions that could cause significant harm to the human environment and that cannot be avoided, even with mitigation measures. There would be some minor, localized unavoidable adverse effects under all the alternatives. For example, there would be minor, localized adverse effects from prescribed burns and controlling invasive plants. All would be enacted using accepted protocols, safety measures and according to federal guidelines, so there would in fact be no significant unavoidable adverse impacts under any of the alternatives.

Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those which cannot be reversed, except perhaps in the extreme long term or under unpredictable circumstances. An example of an irreversible commitment is an action which contributes to a species' extinction. Once extinct, it can never be replaced. We would anticipate no irreversible commitments of resources under any of the alternatives.

In comparison, irretrievable commitments of resources are those which can be reversed, given sufficient time and resources, but represent a loss in production or use for a period of time. An example of an irretrievable commitment is the maintenance of shrub habitat. If for some reason shrub habitat were no longer an objective, Refuge shrubland would gradually convert to a different habitat type, and over a very long time revert to a more forested condition.

We do not consider small visitor facilities, such as kiosks and educational signs built in collaboration with the Aquinnah Cultural Center, as an irretrievable commitment of resources. We can dismantle those facilities and restore the sites if resource damage is occurring.

Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (February 11, 1994), requires that federal agencies consider as part of their action, any disproportionately high and adverse human health or environmental effects to minority and low income populations. Agencies are required to ensure that these potential effects are identified and addressed.

The EPA defines environmental justice as; "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." In this context, fair treatment means that no group of people should bear a disproportionate share of negative environmental consequences resulting from the action.

Overall, we expect none of the alternatives to place disproportionately high, adverse environmental, economic, social, or health effects on minority or low-income persons. The Refuge itself is closed to all public access, is surrounded by the Atlantic Ocean, and is approximately three miles from Martha's Vineyard, the nearest inhabited landmass.

Table 4.1. Matrix of Environmental Consequences by Alternative.

Nomans NWR Resources	Alternative A: Current Management	Alternative B: Enhanced Wildlife Management and Visitor Services	Alternative C: Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative)
Socioeconomic	Under Alternative A, there is minimal opportunity for the public to interact with the Refuge from Martha's Vineyard; therefore there are no visitor expenditures or economic benefits to the local community of Chilmark that can be attributed to the Refuge. The Refuge maintains no facilities on the island. Since there are no on-site staff and only minor active management activities, we contribute negligibly to the local economy in terms of Refuge staff jobs, income, expenditures, and purchases of goods and services for Refuge activities. The Refuge remains closed to the public and access is restricted to minimal authorized personnel only.	Under Alternative B we propose an expanded environmental education and interpretation program, especially in association with the Aquinnah Cultural Center and Wampanoag Tribe, benefiting the Wampanoag Tribe and the local communities of Aquinnah and Chilmark. The proposed expansion of habitat management, creation of environmental education and interpretive materials, and an increase in island visitation by Refuge staff will increase expenditures and purchases of goods and services in the local communities.	We propose an expanded interpretation program from current, including partnering with the Aquinnah Cultural Center, benefiting the local communities of Aquinnah and Chilmark. Alternative C proposes habitat management and inventory and monitoring similar to levels in Alternative A. Therefore, our contribution to the local economy from Refuge expenditures under Alternative C is similar to that described in Alternative A. If wilderness is designated, the type of management conducted would likely change, though frequency of staff visits should remain the same. Therefore, even under a wilderness designation, Refuge expenditures should remain similar to that described in Alternative A.
	Service land ownership would remain the same under all three alternatives; Refuge revenue sharing payments and impacts on property taxes are not affected. Under the transfer agreement with the U.S. Navy, the island remains closed to public access under all three alternatives.		

Water Quality	Minimal risks to water quality are possible from use of herbicides by the Refuge to control invasive plant species. We would use Integrated Pest Management to prevent or minimize any impacts from use of herbicides, and would only use herbicides that are safe for aquatic habitats when working near water bodies or wetlands on the Refuge. Removal of aquatic invasive species including purple loosestrife and Phragmites in wetland habitats would potentially improve hydrology and associated water quality. Monitoring of some wetland birds and rare plant surveys would provide some measure of wetland conditions including water quality.	The potential risks to water quality would increase slightly over Alternative A, due to increased invasive species control using chemical or mechanical methods. We would use Integrated Pest Management to prevent or minimize any impacts from use of herbicides. Wherever possible, application will be by backpack instead of aerial application in order to better focus the application of the chemical. Any herbicide used near water or wetlands would be approved to be used in those habitats, no matter the application method employed. Removal of aquatic invasive species including purple loosestrife and Phragmites in wetland habitats and increased monitoring of invasive aquatic species would potentially improve hydrology and associated water quality.	The potential risks to water quality are similar to Alternative A, as are the steps taken to minimize these risks. Alternative C would provide no opportunity to monitor water indirectly through monitoring of habitat conditions or wildlife populations. Removal of aquatic invasive species including purple loosestrife and Phragmites in wetland habitats would potentially improve hydrology and associated water quality. Wilderness designation is anticipated to have positive impacts on the islands' water quality.
	Under all three alternatives, minimal risk to water quality from potential prescribed fire used by U.S. Navy to remove unexploded ordnance, or by the Service to achieve habitat objectives, by increasing the potential for soil erosion and sedimentation. The impacts to water quality from public access and use are non-existent since the Refuge is closed to all public use under all three alternatives. None of our proposed management activities would violate federal or state standards for contributing pollutants to water sources; all three would comply with the Clean Water Act.		
Air Quality	Current management activities neither	Similar to A, with the potential for only	Slightly less than as in Alternative A as there

	substantially benefit nor adversely affect local and regional air quality. There is a very small amount of hydrocarbon emissions caused by Refuge activities including emissions from transportation to/from the Refuge and the occasional use of an all terrain vehicle on the Refuge to conduct resource management operations. The vehicle fleet at the Refuge headquarters is becoming more efficient and cleaner as older vehicles are replaced by low emission hybrid cars and trucks.	short-term, minor localized impacts to air quality from increased management activities such as mechanical or chemical removal of invasive plants. While there would be more boat trips to the Refuge under this alternative, the total number of trips conducted annually would not likely exceed 20, resulting in a small increase in hydrocarbon emissions from transportation.	would likely be fewer boat trips to the Refuge and less work done on the Refuge than either Alternative A or B. Wilderness designation is anticipated to have positive impacts on the islands' air quality.
	Under all three alternatives, the U.S. Navy or the Service would potentially continue to use prescribed fire which would cause some short-term, minor localized impacts to air quality, as would the occasional use of aerial herbicide application. No major ground-disturbing activities that would affect air quality are proposed under any of the alternatives. None of our proposed management activities should adversely affect regional air quality. None would violate EPA standards for criteria air pollutants; each would comply with the Clean Air Act.		
Soils	Some soil compaction would occur by walking or using ATV's on the existing maintenance trail network during Refuge management and monitoring visits and by U.S. Navy personnel. No major ground disturbing activities would occur under Alternative A; the mechanical removal of invasive plants has the potential to cause minimal adverse impacts to soils.	In addition to Alternative A: There could be more soil disturbance associated with higher levels of invasive species control, but any soil disturbed by the physical removal of plants would be tamped down and compacted. This is a standard aspect of any mechanical removal operation. Efforts to restore the water control structure on the wetland near Rainbow Pond might create temporary soil	Under Alternative C Refuge visits would be decreased commensurate with the decrease in monitoring and management, so soil compaction will be the least under this alternative. Wilderness designation is anticipated to have positive impacts on the islands' soils. There would be some soil disturbance on the interpretative trail from the installation of wayside exhibits and/or interpretive panels at the Aquinnah Cultural Center on Martha's Vineyard.

		impacts but will have long term benefits as the potential for this section of the trail to erode due to the failing water control structure will be reduced. There would be some soil disturbance on the interpretative trail from the installation of wayside exhibits and/or interpretive panels at the Aquinnah Cultural Center on Martha's Vineyard. Also there would be an increase in foot traffic which could lead to some erosion and soil compaction on the trail.	Also there would be an increase in foot traffic which could lead to some erosion and soil compaction on the trail.
	Under all three alternatives some soil disturbance occurs from continued removal by the U.S. Navy of unexploded ordnances as discovered and from the continuous wave action eroding the western and southern shores creating steep 50-foot high bluffs. The lack of public access under all three alternatives significantly reduces risk of soil erosion from human recreational activities.		
Shrub Habitat-Breeding and Migratory Birds and other Wildlife	The maintenance of 400+ acres of shrub habitat through the use of prescribed fire by the U.S. Navy during ordnance removal would benefit shrub-dependent focal bird species by perpetuating shrub habitat, although the management regimes would not be biologically-based. The control of invasive species only along existing maintenance pathways would potentially degrade the quality of native shrub habitat for focal species,	More active management of 400+ acres of shrub habitat would ensure greater control of habitat conditions that benefit focal shrub species. A 7-12 year biologically-based fire regime on a rotational basis for each of two habitat patches would better target habitat needs and would have minimal impact on nesting and migrating birds and invertebrates. This is because burns would take place during the dormant season, when	Alternative C relies on natural processes, including succession, to influence and guide habitat conditions for the 400 acres of existing shrub on the Refuge. Prescribed fire would only be used as habitat conditions warrant to achieve habitat objectives for focal species of concern on the Refuge. This would likely result in lower frequency of prescribed fire on the island. As in Alternative B, prescribed fires would take place during the dormant season to have minimal impact on birds

	where invasive plants are left untreated.	birds are no longer nesting and when most species are less active. A more concerted effort island-wide to control invasive plant species would provide additional benefit to shrub-dependent focal species and natural habitats by promoting native shrubs to persist, which offer temporally critical food resources. The use of herbicides and other treatment methods would conform to Integrated Pest Management guidelines to minimize any impacts. The potential introduction of New England cottontail would likely have minimal impact on the abundant shrubland habitat through browsing on shrub foliage, buds, stems, and bark. This species could serve as a vector for invasive shrub dispersal on the Refuge.	and other species. Control of invasive species would be similar to Alternative A, unless invasive species exceed 10 percent of the shrubland habitat. More aggressive invasive control would then be used and would benefit natural habitat and species that depend upon it. The use of herbicides and other treatment methods would conform to Integrated Pest Management guidelines to minimize any impacts. The potential introduction of New England cottontail would likely have minimal impact on the abundant shrubland habitat through browsing on shrub foliage, buds, stems, and bark. This species could serve as a vector for invasive shrubland species dispersal on the Refuge. Wilderness designation is anticipated to have positive impacts on the islands' wildlife and habitats.
Vegetated Dune Habitat	Alternative A would involve minimal management of up to 15 acres of vegetated dune habitat that provides habitat for shorebirds and terns. This would result in some dune habitat succeeding to woody vegetation. The control of invasive species only along	Alternative B would involve more active protection and management of up to 15 acres of vegetated dune habitat that provides habitat for shorebirds and terns. A more concerted effort island-wide to control invasive plant species would provide	Alternative C relies on natural processes to shape the existing 15 acres of vegetated dune habitat that provides habitat for shorebirds and terns. This would result in some dune habitat succeeding to woody vegetation. Invasive species control would occur only if dune

	existing maintenance pathways would potentially degrade the quality of the vegetated dune habitat for focal species, where invasive plants are left untreated. Limited predator control would provide some benefit to nesting terns, but would result in some negative impacts to the individuals targeted for control. Limited analysis of potential impacts of sea-level rise offers minimal opportunity for monitoring and adaptive management to minimize impacts by implementing mitigation measures is less than under Alternative B.	greater benefit to dune focal species and natural habitat by promoting the persistence of native plant species. Treatment could include physical, mechanical or chemical methods, but would conform to Integrated Pest Management guidelines. The opportunity to implement adaptive management is greatest under Alternative B, given concerted efforts to manage vegetation using different techniques as needed. More active predator monitoring and control would provide greater protection to nesting terns, but would have some negative impacts on the individuals targeted for control. An analysis of potential impacts of sea-level rise offers more opportunity for evaluation, monitoring, and adaptive management, to minimize impacts of sea level rise by implementing mitigation measures.	habitat quality was being compromised and therefore would have less impacts than Alternative B. The presence of any federal-listed breeding bird species would potentially trigger habitat management and predator control actions. This would benefit rare species and negatively impact the few predator individuals targeted as necessary. Wilderness designation is anticipated to have positive impacts on the islands' wildlife and habitats. Analysis of potential impacts of sea-level rise offers minimal opportunity for evaluation, monitoring, and adaptive management to implement mitigation measures to minimize impacts form sea-level rise.
Marine Intertidal Beach and Rocky Shore	Alternative A would involve minimal management of up to 100 acres of marine intertidal beach and rocky shore habitat that benefit	Alternative B would protect up to 100 acres of marine intertidal beach and rocky shore habitat that benefit marine mammals and	Alternative C would allow natural processes to shape the existing 100 acres of marine intertidal beach and rocky shore habitat that benefit

	marine mammals and nesting and migrating shorebirds. An analysis of potential impacts of sea-level rise offers some opportunity for adaptive management, although ability to implement mitigation measures is less than under Alternative B.	nesting and migrating shorebirds. Protection of this habitat under Alternative B would involve adaptive management to mitigate for potential impacts of climate change and working with partners to monitor and control invasive species such as sea cucumbers, and macroalgae. This would ultimately promote the persistence of native species, and further support migrating and nesting shorebirds and waterbirds reliant upon this habitat. More active predator monitoring and control would provide greater protection to nesting cormorants and oystercatchers and migrating shorebirds while potentially impacting few targeted predator individuals as necessary.	marine mammals and nesting and migrating shorebirds. An analysis of potential impacts of sea-level rise offers some opportunity for adaptive management, although ability to implement mitigation measures is less than under Alternatives A and B. Wilderness designation is anticipated to have positive impacts on the islands' wildlife and habitats.
Scrub Shrub and Emergent Wetlands, Bogs, and Open Water	Alternative A would involve minimal management of the 100-150 acres of freshwater wetland habitat to support breeding marshbirds. Treatment and/or removal of aquatic invasive species including purple loosestrife and Phragmites would improve wetland habitats by promoting the	Alternative B would involve protection and management of the 100-150 acres of freshwater wetland habitat to support breeding marshbirds and native plants and animal communities. As in Alternative A, treatment and/or removal of aquatic invasive species including purple	Alternative C would rely on natural processes to influence the 100-150 acres of freshwater wetland habitat that support breeding marshbirds and native plants and animal communities. Treatment and/or removal of aquatic invasive species including purple loosestrife and Phragmites would

	persistence of native plant species, and promote species diversity (both plant and wildlife) by removing monotypic stands. Herbicidal application would have some limited impacts to wetlands, but would be approved for use in wetlands, and would be used according to Integrated Pest Management guidelines to minimize these impacts.	loosestrife and Phragmites would improve wetland habitats by promoting the persistence of native plant species, and promote species diversity (both plant and wildlife) by removing monotypic stands. Herbicidal application would have some limited impacts to wetlands, but would be approved for use in wetlands, and would be used according to Integrated Pest Management guidelines to minimize these impacts.	improve wetland habitats by promoting the persistence of native plant species, and promote species diversity (both plant and wildlife) by removing monotypic stands. Herbicidal application would have some limited impacts to wetlands, but would be approved for use in wetlands, and would be used according to Integrated Pest Management guidelines to minimize these impacts. Wilderness designation is anticipated to have positive impacts on the islands' wildlife and habitats.
Education, and Community Outreach	Alternative A would maintain the current level of interpretation through the Refuge website virtual tour. This would rely on general knowledge of the website and virtual tour to be effective. The ability to engage the public, interpret Nomans Land Island resources, or promote the Refuge System mission is less than in Alternative B or C. Community partnerships would continue to be important under Alternative A, especially with the Wampanoag Tribe. The infrequent trips to Martha's Vineyard by staff under this alternative would likely hamper the creation of new partner initiatives,	Alternative B would offer the greatest expansion of our environmental education and interpretive programs on Martha's Vineyard, specifically in partnership with the Aquinnah Cultural Center and the Wampanoag Tribe. Expanded programs would include alternative ways to bring an experience of the Refuge to visitors and residents of Martha's Vineyard. This would aid in creating a connection with this inaccessible island, as well as providing a more in-depth experience of Refuge habitats and wildlife and their role	Alternative C would expand our interpretive programs beyond Alternative A, but less than Alternative B. This increase in interpretation from present would allow us to reach a broader audience, bring an experience of the island to residents of and visitors to Martha's Vineyard, interpret Refuge resources and management activities, and illustrate how the Refuge fits into the Refuge System. Community partnerships would continue to be important under Alternative C, especially with the Wampanoag Tribe, and we would continue to strengthen existing partnerships and

	and would have less potential for strengthening community ties or reaching a broader audience than in Alternatives B and C.	in coastal ecosystems. An increase in programs and expanded outreach under Alternative B would enable us to reach a broader audience, interpret Refuge resources and management activities, highlight the role of this island in Wampanoag history and culture, educate the public about the importance of dynamic coastal resources and how the Refuge fits into the Refuge System, and to illustrate the impact of climate change on island conditions. Community partnerships would continue to be important under Alternative B, especially with the Wampanoag Tribe, and strengthening existing partnerships and creating new ones would be a Refuge priority. This would be facilitated by increased staff visits to Martha's Vineyard. These partnerships would assist in the ability to expand public programs.	create new ones. This would be facilitated by a more concerted effort by staff to participate in occasional community events, and to establish a presence on Martha's Vineyard with the interpretive trail. These partnerships would assist in the ability to expand public programs. Wilderness designation is not anticipated to impact the islands' access or interpretation potential since access will continue to be closed to the public.
	Under all three alternatives none of the six priority wildlife-dependent uses are allowed on the Refuge, as we are obligated to maintain and enforce a ban on public access for safety reasons on Nomans Land Island. Although the distance of the Refuge from Sudbury headquarters limits our capabilities, some level of interpretation related to the Refuge occurs on Martha's Vineyard for all three alternatives.		
Cultural and	Under Alternative A, we	In addition to	Same as Alternative A in

Archaeological Resources	would follow Service protocol to prevent the loss of cultural and archaeological resources, record sites as they are encountered, and coordinate with the Navy on compliance with the National Historic Preservation Act. This would ensure that archaeological and cultural items are preserved and protected. Interpretation of cultural resources on the Refuge website virtual tour provides only basic interpretation about relatively recent human history of the island, and relies on general knowledge of the website and the existence of the virtual tour. Under Alternative A we would continue to consult with the Tribe on cultural and biological issues, and to build a strong partnership.	Alternative A in relation to archeological resources, we would initiate a cultural resources overview, maintain inventory of known and newly found sites and structures, provide cultural resource training to Refuge staff, work with the Wampanoag Tribe with an oral history project, assist with research into historic land uses, and prepare a narrative prehistory and history of Nomans Land Island. Alternative B offers greater opportunities to protect and interpret these resources. These efforts, in cooperation with our partners, would increase our knowledge about the history of the island and contribute to the archaeological knowledge base of the region, and would offer opportunities to increase education and historical interpretation of the island, while reaching a broader audience. In addition to Alternative A in relation to the Luce Cemetery, we would work with the Chilmark Historical Commission to identify those buried in the Luce cemetery. This too would	relation to archaeological resources. Same as Alternate A in relation to the Luce Cemetery. Under Alternative C there would be a modest increase in interpretation of cultural and archaeological resources from present, but would be less than Alternative B. Same as Alternate A in relation to consultation and building a strong partnership with the Wampanoag Tribe. Wilderness designation is not anticipated to impact the islands' cultural, historic, or archaeological resources.

		increase our knowledge base of the history of the island. Under Alternative B we would continue to consult with the Tribe on cultural and biological issues, and to build a strong partnership.	
Under all three alternatives we would pursue a partnership agreement with the Wampanoag Tribe of Gay Head (Aquinnah) to improve coordination and address tribal concerns regarding repatriation and access for ceremonial purposes. In addition, none of the six priority wildlife-dependent uses are allowed on the Refuge, as we are obligated to maintain and enforce the ban on public access for safety reasons on Nomans Land Island. Although the distance of the Refuge from Sudbury headquarters limits our capabilities, some level of interpretation related to the Refuge occurs for all three alternatives.			

Chapter **5**


Erin Victory/TCI

Double-crested cormorant colony

Consultation and Coordination with Others

- Introduction
- Planning to Protect Land and Resources
- Partners Involved in Refuge Planning
- Contact Information
- Planning Team
- Other Service Program Involvement
- Assistance from Others
- List of Preparers

Introduction

This chapter describes how we engaged others in developing this EA/draft CCP. In chronological order, it details our efforts to encourage the involvement of the public and conservation partners: other federal and state agencies, county officials, civic groups, non-government conservation and education organizations, and user groups. It also identifies who contributed in writing the plan or significantly contributed to its contents.

It does not detail the dozens of informal discussions Refuge staff have had over the last ten years where the CCP was a topic of conversation. Those involved a wide range of audiences, including congressional representatives or their staffs, local community leaders and other residents, Refuge neighbors, Refuge visitors, and other interested individuals. During those discussions, the Refuge manager and staff often would provide an update on our progress and encourage comments and other participation.

A 30-day period for public review follows our release of this EA/draft CCP. We encourage you to respond with your ideas about the plan. During that period, we will host open-house public meetings at locations near the Refuge to gather your opinions and answer your questions about our proposals. We will weigh your responses carefully before we write the final CCP.

According to Service policy, we must review and update our final CCP at least once every 15 years, or sooner, in response to important new information that would markedly change management direction or, our Director or Regional Director deem it necessary. If so, we will once again announce our revised planning and encourage your participation.

Planning to Protect Land and Resources

Our Refuge planning began in 1999 when we initiated a CCP that would encompass all of the refuges in the Eastern Massachusetts NWR Complex. We published a Notice of Intent in the Federal Register, and began public scoping. By 2001, we determined that writing a plan for eight refuges was too cumbersome, and to focus on CCPs for the three northernmost refuges in the complex. The efforts for Nomans Land Island NWR were halted at that time.

In 2004, we decided to prepare a joint CCP for Nomans Land and Monomoy refuges, and subsequently convened a new core planning team. A Notice of Intent was published in the Federal Register on December 13, 2004. Public scoping meetings were held in April 2005 in Chilmark, Massachusetts. Most of the planning effort during this period was focused on the CCP for Monomoy Refuge. We drafted a vision statement and goals and objectives for Nomans Land Island Refuge, and also initiated a wilderness review. However, work on the CCP stalled due in part to the transfer of refuge complex personnel. In resuming the CCP process, it was decided to conduct separate CCPs for Nomans Land Island and Monomoy refuges, with the intention to complete the Nomans Land Island Refuge CCP first.

Our refuge planning for Nomans Land Island resumed informally in July 2008 at an initial strategy meeting between the Refuge staff and regional planning staff. One major outcome of that first meeting was a timetable for accomplishing the major steps in the planning process and determining when and how we should involve others. Please contact the Refuge manager for additional details.

August 13, 2008: Letters are sent out to representatives from the Wampanoag Tribe of Gay Head (Aquinnah) and MA DFG to reconvene the planning team. Invitations to participate in the planning team are also extended to U.S. Fish and Wildlife Service staff from the Division of Migratory Birds, and Ecological Services.

September 3, 2008: The core planning team, consisting of Refuge and regional staff from Migratory Birds, and a representative from MA DFG, met at the complex headquarters in Sudbury. The other member of the core planning team, a representative from the Wampanoag Tribe of Gay Head (Aquinnah) did not participate. We reworked a vision statement, revisited previously drafted goals and objectives, identified new issues and issues from previous scoping efforts, determined what additional resource information we needed to collect and summarize, and discussed what other experts we should consult to help us address planning issues. Partner and public scoping meetings were scheduled for October 2008.

September 2008: We distributed a one page newsletter to over 530 people, organizations and agencies to announce formally the reinitiation of the planning process and the upcoming public meeting in October, and sent out press releases to the Martha's Vineyard Gazette, and Martha's Vineyard Times to announce the public meeting. Invitation letters are sent to twenty people representing seventeen local, state, and national agencies and organizations of potential interest to the upcoming partner meeting in October.

October 14, 2008: We hosted both the partner and public meetings at the Chilmark Library, having published notices about the public meeting in two local newspapers, and in the newsletter. Twelve people representing seven organizations attended the partner meeting, and twenty-three people signed in at the public meeting.

At each meeting, the draft vision, and goals and objectives were posted around the room, as well as the issues identified by previous scoping efforts and the core planning team. A summary of the planning process was presented, and people were encouraged to provide feedback and identify general concerns or issues they have about the Refuge. Comment forms were provided, and staff recorded comments on flip charts. People were notified that there was a one-month comment period, closing on November 14, 2008. Written comments were received from seven individuals and organizations.

December 10, 2008: The core planning team met again at the complex headquarters in Sudbury to identify key issues, and develop the strategies and alternatives for the document.

January 2009 to January 2010: We wrote the EA/draft CCP, including five chapters, nine appendices, and a bibliography and glossary and acronyms. We prepared the EA/draft CCP for internal review.

April/May 2010: The EA/draft CCP was approved by the regional solicitor, and the NOA was sent to the Washington Office for approval and publication in the Federal Register.

Partners Involved in Refuge Planning

Refuge programs enjoy a great deal of support from outside the Service in many arenas: conducting biological surveys, facilitating off-site public use and Refuge programs, restoring habitat, and protecting land. Our partnerships will continue to expand under the increasing interest in conserving Refuge resources. Throughout the CCP planning process, the following partners have been kept apprised of the planning process and their continued involvement has been encouraged.

Wampanoag Tribe of Gay Head (Aquinnah): Natural Resources staff Bret Stearns, Tribal Historic Officer Bettina Washington, Tribal Historic staff Jonathon Perry and Elizabeth Perry

U.S. Navy: Brian Helland, Dave Barney, and their contractor Brian Corbett of Tetra Tech EC (formerly Foster-Wheeler)

U.S. Coast Guard

Massachusetts Department of Fish and Game: Jason Zimmer, Steve Hurley

Massachusetts Department of Environmental Protection: Anne Malewicz, Bob Campbell

Town of Chilmark: Tim Carroll

Chilmark Historical Commission: Jane Slater

The Trustees of Reservations: Chris Kennedy

Massachusetts Audubon Society: Suzan Bellincampi

The Sheriff’s Meadow Foundation: Adam R. Moore

Chilmark Library: Ebba Hierta

Town of Aquinnah

The Nature Conservancy: Matt Pelikan

Martha’s Vineyard Commission

The Vineyard Open Land Foundation

The Vineyard Conservation Society, Inc.

The Martha’s Vineyard Land Bank Commission

Massachusetts Historical Commission

Polly Hill Arboretum

Allan Keith

Contact Information

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Planning Team

Libby Herland, Project Leader, Eastern Massachusetts NWR Complex

Tom Eagle, Deputy Project Leader, Eastern Massachusetts NWR Complex

Carl Melberg, Regional Natural Resource Planner, Planning Team Leader, USFWS Refuge System

Stephanie Koch, Refuge Complex Biologist, Eastern Massachusetts NWR Complex

Eileen McGourty, Refuge Complex Biologist, Eastern Massachusetts NWR Complex

Susan J. Russo, Refuge Complex Visitor Services Manager, Eastern Massachusetts NWR Complex

Brian Willard, Supervisory Law Enforcement Officer, Eastern Massachusetts NWR Complex

Shelley Small, Cultural Resources Specialist, USFWS Refuge System

D.J. Monette, Native American Liason, USFWS Refuge System

Bret Stearns, Wampanoag Tribe of Gay Head (Aquinnah)

Bettina Washington, Wampanoag Tribe of Gay Head (Aquinnah)

Jason Zimmer, District Manager, MA Division of Fisheries and Wildlife

Steve Hurley, District Fisheries Manager, MA Division of Fisheries and Wildlife

Other Service Program Involvement

Nancy McGarigal, Regional Natural Resource Planner, USFWS Refuge System

Rick Schauffler, Biologist/GIS Specialist, USFWS Refuge System

Jan Taylor, Regional Refuge Biologist, USFWS Refuge System

Randy Dettmers, Migratory Bird Biologist, USFWS Division of Migratory Birds

Anthony Tur, Endangered Species Biologist, USFWS Ecological Services

Peggy Hobbs, Administrative Officer, Eastern Massachusetts NWR Complex

Chris Kelly, Refuge Complex Law Enforcement, Eastern Massachusetts NWR Complex

Assistance from Others

Terwilliger Consulting, Inc.
Tracy Monegan Rice, Marine Geologist

Ellen Snyder, Consulting Wildlife Biologist, Ibis Wildlife Consulting

List of Preparers

Terwilliger Consulting, Inc.
Erin R. Victory, LLC, Consulting Wildlife Biologist

Karen Terwilliger, President and Natural Resource Consultant


Erin Victory/TCI

Refuge pond

Acronyms and Glossary

ACRONYMS

ACC	Aquinnah Cultural Center
ACJV	Atlantic Coast Joint Venture
AHWP	Annual Habitat Work Plan
ARPA	Archaeological Resources Protection Act
BBS	Breeding Bird Survey
BCR	Bird Conservation Region
BMP	best management practice
BP	before present
BWSC	Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DDT	dichlorodiphenyltrichloroethane
DOD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FONSI	Finding of No Significant Impact
HMP	Habitat Management Plan
IMP	inventory and monitoring plan
IPCC	Intergovernmental Panel on Climate Change
IPM	integrated pest management
LGM	last glacial maximum
LIDAR	Light Detection and Ranging
MA	Massachusetts
MA CWCS	Massachusetts Comprhensive Wildlife Conservation Strategy
MA DEP	Massachusetts Department of Environmental Protection
MA DFG	Massachusetts Department of Fish and Game
MA DFW	Massachusetts Division of Fisheries and Wildlife
MA SHPO	Massachusetts State Historical Preservation Office
MANEM	Mid-Atlantic / New England / Maritimes
MassWildlife	Massachusetts Division of Fisheries and Wildlife
MEC	Munitions and Explosives of Concern
MHC	Massachusetts Historical Commission
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NABCI	North American Bird Conservation Initiative
NAC	North Atlantic Coast
NAWCP	North American Waterbird Conservation Plan

NAWMP	North American Waterfowl Management Plan
NECIA	Northeast Climate Impacts Assessment
NED	National Elevation Data
NEPA	National Environmental Policy Act
NHRC	National State Agency Herpetological Conservation Report
NMFS	National Marine Fisheries Service
NWPS	National Wilderness Preservaiton System
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
PARC	Partners in Amphibian and Reptile Conservation
PIF	Partners in Flight
PL	Public Law
QA/QC	quality assurance / quality control
RONS	Refuge Operating Needs
SAV	submerged aquatic vegetation
SEANet	Seabird Ecological Assessment Network
SEBS	Supplemental Environmental Baseline Survey
SGCN	species of greatest conservation need
SLAMM	Sea Level Affecting Marshes Model
SWG	State Wildlife Grant Program
TNC	The Nature Conservancy
TTOR	The Trustees of Reservations
TWS	The Wildlife Society
USC	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
WIA	Wilderness Inventory Area
WSA	Wilderness Study Area

Glossary

accessibility	the state or quality of being easily approached or entered, particularly as it relates to complying with the Americans With Disabilities Act
adaptive resource management	A process in which projects are implemented within a framework of scientifically driven experiments to test predictions and assumptions outlined within the comprehensive conservation plan. The analysis of the outcome of project implementation helps managers determine whether current management should continue as is, or whether they should modify it to achieve the desired conditions.
agricultural land	nonforested land that is now or recently in orchards, pastures, crops, or other farm products
alternative	a reasonable way to fix an identified problem or satisfy a stated need [40 CFR 1500.2]
anadromous fish	from the Greek, literally "up-running"; fish that spend a large portion of their life cycle in the ocean and return to freshwater to breed
appropriate use	a proposed or existing use on a refuge that meets at least one of the following three conditions: 1. the use is a wildlife-dependent one; 2. the use contributes to fulfilling the refuge purpose(s), the System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act was signed into law; or 3. the use has been determined to be appropriate as specified in section 1.11 of the act. 4.
aquatic	growing in, living in, or dependent upon water
barrens	a colloquial name given to habitats with sparse vegetation or low agricultural productivity
basin	the land surrounding and draining into a water body
benthic	living at, in, or associated with structures on the bottom of a body of water
best management practices	land management practices that produce desired results; usually describing forestry or agricultural practices effective in reducing non-point source pollution, like reseeding skidder trails or not storing manure in a flood plain
biological diversity or biodiversity	the variety of life and its processes and includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur

biological integrity	biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms and communities
bird conservation region	regions that encompass landscapes having similar bird communities, habitats, and resource issues; used as an administrative tool to aid in the conservation of birds and their habitats
bog	a poorly drained area rich in plant residues, usually surrounded by an area of open water, and having characteristic flora; a type of peatland
breeding habitat	habitat used by migratory birds or other animals during the breeding season
candidate species	species for which we have sufficient information on file about their biological vulnerability and threats to propose listing them as threatened or endangered
categorical exclusion [CE, CX, CATEX, CATX]	pursuant to the National Environmental Policy Act (NEPA), a category of Federal agency actions that do not individually or cumulatively have a significant effect on the human environment [40 CFR 1508.4]
CFR	the Code of Federal Regulations
community	the locality in which a group of people resides and shares the same government
community type	a particular assemblage of plants and animals, named for its dominant characteristic
compatible use	"The term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge."—National Wildlife Refuge System Improvement Act of 1997 [Public Law 105-57; 111 Stat. 1253]
compatibility determination	a required determination for wildlife-dependent recreational uses or any other public uses of a refuge
Comprehensive Conservation Plan	mandated by the Improvement Act, a document that provides a description of the desired future conditions and long-range guidance for the project leader to accomplish purposes of the refuge system and the refuge. CCPs establish management direction to achieve refuge purposes. [P.L. 105-57; FWS Manual 602 FW 1.4]
conifer	a tree or shrub in the phylum Gymnospermae whose seeds are borne in woody cones. There are 500–600 species of living conifers
conservation	managing natural resources to prevent loss or degradation; includes preservation, restoration, and enhancement
critical habitat	according to U.S. Federal law, the ecosystems upon which endangered and

	threatened species depend
database	a collection of data arranged for ease and speed of analysis and retrieval, usually computerized
degradation	the loss of native species and processes due to human activities such that only certain components of the original biodiversity persist, often including significantly altered natural communities
disturbance	any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment
division	an administrative unit of the refuge defined by a geographic feature, usually a river or other body of water see biological integrity
early successional	species, assemblages, structures, and processes associated with pioneering natural communities that have recently experienced significant disturbance
ecological integrity	see biological integrity
ecological processes	a complex mix of interactions among animals, plants, and their environment that ensures maintenance of an ecosystem’s full range of biodiversity. Examples include population and predator-prey dynamics, pollination and seed dispersal, nutrient cycling, migration, and dispersal
ecoregion	a territory defined by a combination of biological, social, and geographic criteria, rather than geopolitical considerations; generally, a system of related, interconnected ecosystems
ecosystem	a natural community of organisms interacting with its physical environment, regarded as a unit
emergent wetland	wetlands dominated by erect, rooted, herbaceous plants
endangered species	a Federal- or State-listed protected species in danger of extinction throughout all or a significant portion of its range
endemic	a species or race native to a particular place and found only there
Environmental Assessment	(EA) a public document that discusses the purpose and need for an action, its alternatives, and provides sufficient evidence and analysis of its impacts to determine whether to prepare an environmental impact statement or a finding of no significant impact [40 CFR 1508.9]
environmental education	curriculum-based education aimed at producing a citizenry that is knowledgeable about the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward solving them

environmental health	the composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment
Environmental Impact Statement	(EIS) a detailed, written analysis of the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources [40 CFR 1508.11]
estuaries	deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land
extinction	the termination of any lineage of organisms, from subspecies to species and higher taxonomic categories from genera to phyla. Extinction can be local, in which one or more populations of a species or other unit vanish but others survive elsewhere, or total (global), in which all the populations vanish
exotic species	a species that is not native to an area and has been introduced intentionally or unintentionally by humans; not all exotics become successfully established
extirpated	status of a species or population that has completely vanished from a given area but that continues to exist in some other location
Federal land	public land owned by the Federal Government, including national forests, national parks, and national wildlife refuges
Federal-listed species	a species listed either as endangered, threatened, or a species at risk (formerly, a “candidate species”) under the Endangered Species Act of 1973, as amended
Federal-recognized Native American tribe	A group of Native American Indians recognized by the United States as an Indian Tribe. This recognition establishes a tribe as an entity with the capacity to engage in government-to-government relations with the United States, or individual states, and also as one eligible to receive federal services. Federal recognition is established as a result of historical and continued existence of a tribal government; by Executive Order or Legislation; and through the federal recognition process established by Congress.
Finding of No Significant Impact	(FONSI) supported by an environmental assessment, a document that briefly presents why a Federal action will have no significant effect on the human environment, and for which an environmental impact statement, therefore, will not be prepared [40 CFR 1508.13]
fire regime	the characteristic frequency, intensity, and spatial distribution of natural fires within a given ecoregion or habitat
floodplain	flat or nearly fl at land that may be submerged by floodwaters; a plain built up or

	in the process of being built up by stream deposition
forbs	flowering plants (excluding grasses, sedges, and rushes) that do not have a woody stem and die back to the ground at the end of the growing season
forest	land dominated by trees
fragmentation	the disruption of extensive habitats into isolated and small patches. Fragmentation has two negative components for biota: the loss of total habitat area; and, the creation of smaller, more isolated patches of habitat remaining.
glacial till	unsorted sediments directly deposited by a glacier, typically containing a mixture of clay, sand, gravel and boulders
grassland	a habitat type with landscapes dominated by grasses
groundwater	water in the ground that is in the zone of saturation, from which wells and springs and groundwater runoff are supplied
habitat fragmentation	the breaking up of a specific habitat into smaller, unconnected areas. A habitat area that is too small may not provide enough space to maintain a breeding population of the species in question.
habitat conservation	protecting an animal or plant habitat to ensure that the use of that habitat by the animal or plant is not altered or reduced
habitat	the place where a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life, and should be free of harmful contaminants.
herpetofauna / herpetological	reptiles and amphibians; relating to reptiles and/or amphibians
historic conditions	the composition, structure and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human-related changes to the landscape
hydrology	the science of waters of the earth: their occurrences, distributions, and circulations; their physical and chemical properties; and their reactions with the environment, including living beings
impoundment	a body of water, such as a pond, confined by a dam, dike, floodgate, or other barrier, that is used to collect and store water for future use
indigenous	native to an area
indigenous species	a species that, other than as a result of an introduction, historically occurred or currently occurs in a particular ecosystem

integrated pest management	(IPM) sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.
interpretive facilities	structures that provide information about an event, place, or thing by a variety of means, including printed, audiovisual, or multimedia materials [e.g., kiosks that offer printed materials and audiovisuals, signs, and trail heads.]
interpretive materials	any tool used to provide or clarify information, explain events or things, or increase awareness and understanding of the events or things [e.g., printed materials like brochures, maps or curriculum materials; audio/visual materials like video and audio tapes, films, or slides; and, interactive multimedia materials, CD-ROM or other computer technology.]
intertidal	the area of land along a shoreline that is exposed to air during low tide but covered by water during high tide
invasive species	an alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health
invertebrate	any animal lacking a backbone or bony segment that encloses the central nerve cord
issue	any unsettled matter that requires a management decision [e.g., a Service initiative, an opportunity, a management problem, a threat to the resources of the unit, a conflict in uses, a public concern, or the presence of an undesirable resource condition]. A CCP should document, describe, and analyze issues even if they cannot be resolved during the planning process (FWS Manual 602 FW 1.4).]
kettle hole	a generally circular hollow or depression in an outwash plain or moraine, believed to have formed where a large block of subsurface ice has melted
landform	the physical shape of the land reflecting geologic structure and processes of geomorphology that have sculpted the structure
landscape	an aggregate of landforms, together with its biological communities
local agencies	generally, municipal governments, regional planning commissions, or conservation groups
management alternative	a set of objectives and the strategies needed to accomplish each objective [FWS Manual 602 FW 1.4]
management plan	a plan that guides future land management practices on a tract
management strategy	a general approach to meeting unit objectives. A strategy may be broad, or it may be detailed enough to guide implementation through specific actions, tasks, and

	projects (FWS Manual 602 FW 1.4).
maritime	relating to the ocean
Memorandum of Understanding	(MOU) a document that describes an agreement between partners where a set of expectations, actions or commitments are agreed upon
migratory birds	species that generally migrate south each fall from breeding grounds to their wintering grounds and vice versa in the spring
mission statement	a succinct statement of the purpose for which the unit was established; its reason for being
mitigation	actions to compensate for the negative effects of a particular project [e.g., wetland mitigation usually restores or enhances a previously damaged wetland or creates a new wetland.]
monitoring	the process of collecting information to track changes of selected parameters over time
moraine	a mass or ridge of earth scraped up by ice and deposited at the edge or end of a glacier
National Environmental Policy Act of 1969	(NEPA) requires all Federal agencies to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in planning and implementing environmental actions [Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (40 CFR 1500).]
National Wildlife Refuge Complex (Complex)	an internal Service administrative linking of refuge units closely related by their purposes, goals, ecosystem, or geopolitical boundaries
National Wildlife Refuge System (System)	all lands and waters and interests therein administered by the Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish and wildlife, including those that are threatened with extinction
native	a species that, other than as a result of an introduction, historically occurred or currently occurs in a particular ecosystem
native plant	a plant that has grown in the region since the last glaciation, and occurred before European settlement
natural disturbance event	any natural event that significantly alters the structure, composition, or dynamics of a natural community: e.g., floods, fires, and storms
non-native species	see exotic species
Notice of Intent	(NOI) an announcement we publish in the Federal Register that we will prepare and review an environmental impact statement [40 CFR 1508.22]

objective	A concise, quantitative (where possible) target statement of what a plan will achieve. The planners derive objectives from goals and they provide the basis for determining management strategies. Objectives should be attainable and time-specific.
obligate species	a species that must have access to a particular habitat type to persist
outwash plain	the plain formed by deposits from a stream or river originating from the melting of glacial ice that are distributed over a considerable area; generally coarser, heavier material is deposited nearer the ice and finer material carried further away
palustrine wetlands	includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts less than 0.5 ppt (parts per thousand)
partnership	a contract or agreement among two or more individuals, groups of individuals, organizations, or agencies, in which each agrees to furnish a part of the capital or some service in kind (e.g., labor) for a mutually beneficial enterprise
payment in lieu of taxes	see Revenue Sharing Act of 1935, Chapter One, Legal Context
plant community	a distinct assemblage of plants that develops on sites characterized by particular climates and soils
preferred alternative	The alternative determined by the decision-maker that best achieves the refuge's purpose, vision, and goals; contributes to the Refuge System mission; addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
prescribed fire or burns	the application of fire to wildland fuels, either by natural or intentional ignition, to achieve identified land use objectives [FWS Manual 621 FW 1.7]
protection	mechanisms that ensure land use and land management practices will remain compatible with maintaining species populations at a site
public	individuals, organizations, and non-government groups; officials of Federal, State, and local government agencies; Native American tribes, and foreign nations
public involvement	offering an opportunity to interested individuals and organizations whom our actions or policies may affect to become informed; soliciting their opinions. We thoroughly study public input, and give it thoughtful consideration in shaping decisions about managing refuges.
public land	land owned by the local, State, or Federal Government
rare species	species identified for special management emphasis because of their uncommon occurrence

Record of Decision	(ROD) a concise public record of a decision by a Federal agency pursuant to NEPA. A ROD includes • the decision; • all the alternatives considered; • the environmentally preferable alternative; • a summary of monitoring and enforcement, where applicable, for any • mitigation; and, • whether all practical means have been adopted to avoid or minimize environmental harm from the alternative selected (or if not, why not)
refuge goals	"…descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units."—Writing Refuge Management Goals and Objectives: A Handbook
refuge lands	lands in which the Service holds full interest in fee title or partial interest like an easement
Refuge Operating Needs System	(RONS) a national database which contains the unfunded operational needs of each refuge. We include projects required to implement approved plans, and meet goals, objectives, and legal mandates.
refuge purposes	"The terms 'purposes of the refuge' and 'purposes of each refuge' mean the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."—National Wildlife Refuge System Improvement Act of 1997
relatively intact	the conservation status category indicating the least possible disruption of ecosystem processes. Natural communities are largely intact, with species and ecosystem processes occurring within their natural ranges of variation.
relatively stable	the conservation status category between vulnerable and relatively intact in which extensive areas of intact habitat remain, but local species declines and disruptions of ecological processes have occurred
riparian	referring to the interface between freshwater habitats and the terrestrial landscape
riparian habitat	habitat along the banks of a stream or river
runoff	water from rain, melted snow, or agricultural or landscape irrigation that flows over a land surface into a water body
scale	the magnitude of a region or process. Refers to both spatial size—for example, a (relatively small-scale) patch or a (relatively large-scale) landscape; and a temporal rate—for example, (relatively rapid) ecological succession or (relatively slow) evolutionary speciation

Service presence	Service programs and facilities that it directs or shares with other organizations; public awareness of the Service as a sole or cooperative provider of programs and facilities
shrublands	habitats dominated by various species of shrubs
socioeconomic	social and economic conditions and their interplay
species of concern	species not Federal-listed as threatened or endangered, but about which we or our partners are concerned
species richness	a simple measure of species diversity calculated as the total number of species in a habitat or community
staging area	habitat used during bird migration for rest, feeding and congregating
stakeholder	individuals, groups, organizations or agencies representing a broad spectrum of interests offering business, tourism, conservation, recreation, and historical perspectives.
State agencies	natural resource agencies of State governments
State-listed species	see “Federal-listed species”
status assessment	a compilation of biological data and a description of past, present and likely future threats to a species
step-down management plan	a plan for dealing with specific refuge management subjects, strategies, and schedules, e.g., cropland, wilderness, and fire [FWS Manual 602 FW 1.4]
strategy	a specific action, tool, technique, or combination of actions, tools, and techniques for meeting unit objectives
submerged aquatic vegetation	(SAV) plants that live under water, such as seagrasses like eelgrass
succession	the natural, sequential change of species composition of a community in a given area
surface water	all waters whose surface is naturally exposed to the atmosphere, or wells or other collectors directly influenced by surface water
terrestrial	living on land
threatened species	a Federal-listed, protected species that is likely to become an endangered species in all or a significant portion of its range

trust resource	a resource that the Government holds in trust for the people through law or administrative act. A Federal trust resource is one for which responsibility is given wholly or in part to the Federal Government by law or administrative act. Generally, Federal trust resources are nationally or internationally important no matter where they occur, like endangered species or migratory birds and fish that regularly move across state lines. They also include cultural resources protected by Federal historic preservation laws, and nationally important or threatened habitats, notably wetlands, navigable waters, and public lands like state parks and national wildlife refuges.
unexploded ordnance	explosive weapons (i.e., bombs, bullets, grenades, shells, land mines) that did not explode when they were deployed and that still pose a risk of explosion or detonation
upland	dry ground (i.e., other than wetlands)
vision statement	a concise statement of what the unit could achieve in the next 10 to 15 years
watershed	the geographic area within which water drains into a particular river, stream, or body of water. A watershed includes both the land and the body of water into which the land drains.
wet meadows	meadows located in moist, low-lying areas, often dominated by large colonies of reeds or grasses. Saltmarsh meadows are subject to daily coastal tides.
wetlands	lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. These areas are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to life in saturated soil conditions.
wilderness study areas	lands and waters identified by inventory as meeting the definition of wilderness and being evaluated for a recommendation they be included in the Wilderness System. A wilderness study area must meet these criteria: 1. generally appears to have been affected primarily by the forces of nature, with the imprint of human substantially unnoticeable; 2. has outstanding opportunities for solitude or a primitive and unconfined type of recreation; 3. has at least 5,000 contiguous, roadless acres, or sufficient size to make practicable its preservation and use in an unimpaired condition [FWS Manual 610 FW 1.5 (draft)].
wildfire	a free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands [FWS Manual 621 FW 1.7].
wildlife-dependent recreational use	a use of a national wildlife refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation (National Wildlife

	Refuge System Administration Act of 1966).
wildlife management	manipulating wildlife populations, either directly by regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

Erin Victory/TCI

Sentinels

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Appendix A


Erin Victory/TCI

American oystercatcher, newly hatched

Species and Habitats of Conservation Concern Known or Suspected on the Refuge

Table A.1. Bird Species of Conservation Concern Known or Suspected on the Refuge.

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]	BCC 2008[4]	BCC National[5]	BCR 30[6]	PIF[7]	NAWCP[8]	NAWMP ACJV[9]	MANEM[10]	US SCP[11]	Breeding Status[12]
American Black Duck			X				Highest	IIC		High			B
American Green-winged Teal							Moderate			Moderate			
American Kestrel			X										
American Oystercatcher			X	S2	X	X	Highest	IA				4	B
Arctic Tern		SC	X	S1					High		Highest		HB
Bald Eagle		E	X	S1	X	X	Moderate						
Baltimore Oriole							High	IA					
Bay-breasted Warbler						X	High						
Black-and-white Warbler							High	IIA					
Black-crowned Night-Heron			X	S2			Moderate		Moderate		Highest*		B
Black Tern									Moderate		High		
Blue-winged Teal										Moderate High			
Bobolink								III					
Bonaparte's Gull									Moderate		Moderate		
Broad-winged Hawk			X				High						
Bufflehead							High			Moderate			

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]	BCC 2008[4]	BCC National[5]	BCR 30[6]	PIF[7]	NAWCP[8]	NAWMP ACJV[9]	MANEM[10]	US SCP[11]	Breeding Status[12]
Canada Goose (Atlantic)							Highest			High			B
Canada Goose (North Atlantic)							High			Moderate High			B
Common Eider			X	S1			High			High			
Common Loon		SC	X	S1B					Moderate		Highest		B
Common Tern		SC	X	S3			Moderate				Highest*		B
Cooper's Hawk													
Double-crested Cormorant											*		B
Eastern Kingbird							High						
Eastern Towhee			X				High	IIA					
Field Sparrow			X				High						
Gadwall							Moderate			Moderate			
Glossy Ibis							High				Highest*		
Great Blue Heron											High		
Great Cormorant									Moderate		High		
Greater Yellowlegs							High					3	
Herring Gull											High*		B
Killdeer							Moderate					3	

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]	BCC 2008[4]	BCC National[5]	BCR 30[6]	PIF[7]	NAWCP[8]	NAWMP ACJV[9]	MANEM[10]	US SCP[11]	Breeding Status[12]
Leach's Storm Petrel		E	X	S1							Moderate		B
Least Bittern		E	X	S1	X		Moderate		High		Highest*		
Least Tern		SC	X	S3	X	X	High		High		Highest*		HB
Little Blue Heron							Moderate		High		Highest		
Mallard							High			High			B
Northern Flicker							High						
Northern Gannet							High				Moderate		
Northern Harrier		T	X	S1									UB
Peregrine Falcon		E	X	S1	X	X		IIC					
Piping Plover	T	T	X	S2			Highest	IA				5	HB
Redhead										Moderate High			
Red-headed Woodpecker					X	X	Moderate	IIC					
Red-throated Loon					X		Highest		High		Highest*		
Rose-breasted Grosbeak								IIA					
Roseate Tern	E	E	X	S2			Highest	IV	High		Highest*		HB
Sharp-shinned Hawk		SC	X	S3									
Short-billed Dowitcher			X	SNA	X	X	High					4	

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]	BCC 2008[4]	BCC National[5]	BCR 30[6]	PIF[7]	NAWCP[8]	NAWMP ACJV[9]	MANEM[10]	US SCP[11]	Breeding Status[12]
Snipe							Moderate					3	
Snowy Egret			X	S1	X		Moderate		High		Highest*		B
Spotted Sandpiper							Moderate						
Upland Sandpiper		E	X	S1	X	X	Moderate	IB				2	
Vesper Sparrow		T	X	S2									
Virginia Rail									Moderate				
White-winged Scoter							High			Moderate High			
Willow Flycatcher			X			X	High						

1 Federal and State Legal Status Codes (under Federal & State Endangered Species Acts)

E = Federal or State Endangered T= Federal or State Threatened SC= State species of Special Concern (Administrative category without legal standing) PT = Proposed Threatened PE= Proposed Endangered PN= Proposed None PTB= Proposed threatened (breeding only) PEB= Proposed Endangered (breeding only)

2 Massachusetts Comprehensive Wildlife Conservation Strategy (CWCS): Species of greatest conservation concern (SGCN) (MA DFW 2006)

3 Massachusetts Natural Heritage Inventory Rarity Ranks (MA DFW 2006, NatureServe 2009)

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical
SX = Presumed extirpated
B = Breeding
M = Migrating
N = Non-breeding
Species included in table only if Srank < S3

4 Birds of Conservation Concern (BCC) 2008 (Bird Conservation Region 14 List) (USFWS 2008)

5 Birds of Conservation Concern (BCC) National List (USFWS 2008)

6 BCR 30: New England / Mid-Atlantic Coast Conservation Priority Category (Steinkamp 2006)

Highest Priority: High BCR Concern and High BCR Responsibility and (High or Moderate Continental Concern)
High Priority: High Continental Concern and Moderate BCR Responsibility OR Moderate BCR Concern and High BCR Responsibility
Moderate Priority: Moderate BCR Concern and Moderate BCR Responsibility OR High Continental Concern and Low BCR Responsibility OR High BCR Responsibility and Low BCR Concern

7 Partner's in Flight (PIF) Bird Conservation Plan for Southern New England: Physiographic Area 09 (Dettmers and Rosenberg 2000)

IA = High continental concern & high regional responsibility
IB = High continental concern & low regional responsibility
IIA = High regional concern
IIB = High regional responsibility
III = Additional Federal listed
IV = Additional State listed

8 North American Waterbird Conservation Plan (NAWCP) Categories of Conservation Concern (Kushlan et al. 2002)

Highly Imperiled: includes all species with significant population declines and either low populations or some other high risk factor.
High Concern: Species that are not Highly Imperiled. Populations of these species are known or thought to be declining, and have some other known or potential threat as well.
Moderate Concern: Species that are not Highly Imperiled or High Concern. Populations of these species are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; or c) relatively small with relatively restricted distributions.
Species included in table only if > moderate

9 <u>North American Waterfowl Management Plan (NAWMP), Atlantic Coast Joint Venture (ACJV)</u> (ACJV 2005)

Conservation Tier Priorities = Highest, High, Moderately High, Moderate, Moderately Low, Low
Species included in table only if priority moderate or higher

[10] <u>Mid-Atlantic / New England / Maritimes (MANEM) Regional Waterbird Conservation Plan Priorities</u> (MANEM 2006a, 2006b)

* = MANEM Focal Species for Southern New England
Highly Imperiled: includes all species with significant population declines and either low populations or some other high risk factor.
High Concern: Species that are not Highly Imperiled. Populations of these species are known or thought to be declining, and have some other known or potential threat as well.
Moderate Concern: Species that are not Highly Imperiled or High Concern. Populations of these species are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; or c) relatively small with relatively restricted distributions.
Species included in table only if > moderate

11 <u>U.S. Shorebird Conservation Plan (US SCP) Codes</u> (Brown et al. 2001, Clark and Niles 2000)

5 = Highly imperiled
4 = Species of high concern
3 = Species of moderate concern
2 = Species of low concern
1 = Species not at risk
Species included in table only if >3

12 <u>Breeding Status</u>

B = Breeds on Refuge
HB = Historically bred on Refuge
UB = Suspected but unconfirmed breeding on Refuge

Table A.2. Fish Species of Conservation Concern Known or Suspected on the Refuge.

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]	AFS Status[4]
American Eel			X		
Snowy Grouper					V
Thorny Skate					V

1 Federal and State Legal Status Codes (under Federal & State Endangered Species Acts)

E = Federal or State Endangered T= Federal or State Threatened SC= Federal or State species of Special Concern (Administrative category without legal standing) PT = Proposed Threatened PE= Proposed Endangered PN= Proposed None PTB= Proposed threatened (breeding only) PEB= Proposed Endangered (breeding only)

2 Massachusetts Comprehensive Wildlife Conservation Strategy: Species of greatest conservation concern

3 Massachusetts Natural Heritage Inventory Rarity Ranks

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical
B = Breeding
N = Non-breeding
Species included in table only if Srank < S3

4 American Fisheries Society (AFS) Marine, Estuarine and Diadromous Fish Stocks at Risk of Extinction (Musick et al. 2000)

E = Endangered
T = Threatened
V = Vulnerable
CD = Conservation Dependent

Table A.3. Amphibian and Reptile Species of Conservation Concern Known or Suspected on the Refuge.

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]
Blanding's Turtle		T	X	S2
Green Sea Turtle	T	T	X	S1
Hawksbill Sea Turtle	E	E	X	S1
Kemp's Ridley Sea Turtle	E	E	X	S1
Leatherback Sea Turtle	E	E	X	S1S2
Loggerhead Sea Turtle	T	T	X	S1
Spotted Turtle			X	S3

1 Federal and State Legal Status Codes (under Federal & State Endangered Species Acts)

E = Federal or State Endangered T= Federal or State Threatened SC= State species of Special Concern (Administrative category without legal standing) PT = Proposed Threatened PE= Proposed Endangered PN= Proposed None PTB= Proposed threatened (breeding only) PEB= Proposed Endangered (breeding only)

2 Massachusetts Comprehensive Wildlife Conservation Strategy: Species of greatest conservation concern

3 Massachusetts Natural Heritage Inventory Rarity Ranks

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical.
B = Breeding
N = Non-breeding
Species included in table only if Srank < S3

Table A.4. Invertebrate Species of Conservation Concern Known or Suspected on the Refuge.

Species	Federal Legal Status[1]	MA Legal Status[1]	MA CWCS[2]	MA Rarity Rank[3]
Chain Dot Geometer		SC	X	S2S3
Drunk Apamea Moth		SC	X	S2S3
Dune Noctuid Moth		SC	X	S2S3
Regal Fritillary				SH
Spartina Borer Moth		SC	X	S1S3

1 Federal and State Legal Status Codes (under Federal & State Endangered Species Acts)

E = Federal or State Endangered T= Federal or State Threatened SC= State species of Special Concern (Administrative category without legal standing) PT = Proposed Threatened PE= Proposed Endangered PN= Proposed None PTB= Proposed threatened (breeding only) PEB= Proposed Endangered (breeding only)

2 Massachusetts Comprehensive Wildlife Conservation Strategy: Species of greatest conservation concern

3 Massachusetts Natural Heritage Inventory Rarity Ranks

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical.
B = Breeding
N = Non-breeding
Species included in table only if Srank < S3

Table A.5. Plant Species of Conservation Concern Known or Suspected on the Refuge.

Species	Federal Legal Status[1]	MA Legal Status[1]	MA Rarity Rank[2]
Arethusa		T	S2
Purple Needlegrass		T	S2
(Saltmarsh) Toad Rush			S1?
Sandplain Blue-eyed-grass		SC	S3
Seabeach Knotweed		SC	S3
Shore Pygmy-weed		T	S2
Sickle-leaf Golden-aster			
Saltpond Pennywort		T	S2
Yellow Thistle		Watch list	SNR

1 Federal and State Legal Status Codes (under Federal & State Endangered Species Acts)

E = Federal or State Endangered T= Federal or State Threatened SC= State species of Special Concern (Administrative category without legal standing) PT = Proposed Threatened PE= Proposed Endangered PN= Proposed None PTB= Proposed threatened (breeding only) PEB= Proposed Endangered (breeding only)

2 Massachusetts Natural Heritage Inventory Rarity Ranks

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical.
B = Breeding
N = Non-breeding
Species included in table only if Srank < S3

Table A.6. Plant Communities of Conservation Concern Known or Suspected on the Refuge.

Massachusetts Community Type	MA CWCS[1]	MA Natural Heritage Inventory State Rarity Rank[2]
Maritime beach strand	Coastal Dunes, Beaches and Small Islands	S3
Maritime dune	Coastal Dunes, Beaches and Small Islands	S2
Maritime shrubland	Young Forests and Shrublands	S3

1 Massachusetts Comprehensive Wildlife Conservation Strategy: Habitats of greatest conservation concern

2 Massachusetts Natural Heritage Inventory Rarity Ranks

S1 = Critically imperiled.
S2 = Imperiled
S3 = Either very rare or uncommon, vulnerable
S4 = Widespread, abundant, apparently secure
S5= Secure
SH = Historical.
Communities included in table only if Srank < S3

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Appendix B


Erin Victory/TCI

Greenbrier

Species Known or Suspected on the Refuge

Status Key:

E = Federal (F) or State (S) Endangered
T= Federal (F) or State (S) Threatened
SC= State species of Special Concern (Administrative category without legal standing)
WL = State Watch list

Table B.1. Plants Identified at the Refuge.

FAMILY or GROUP	COMMON NAME	SCIENTIFIC NAME
Horsetails	Common Horsetail	Equisetum arvense
Ferns	Hay-scented Fern	Dennstaedtia punctilobula
	Netted Chain Fern	Lorinseria areolata
	Sensitive Fern	Onoclea sensibilis
	Cinnamon Fern	Osmunda cinnamomea
	Interrupted Fern	Osmunda claytoniana
	Royal Fern	Osmunda regalis
	Bracken Fern	Pteridium aquilinum
	New York Fern	Thelypteris noveboracensis
	Marsh Fern	T. palustris
	Virginia Chain Fern	Woodwardia virginica
Conifers	Eastern Red Cedar	Juniperus virginiana
	Pitch Pine	Pinus rigida
	Pine sp.	Pinus sp.
Cattails	Broadleaf Cattail	Typha latifolia
Bur-reeds	Common Bur-reed	Sparganium americanum
	Narrowleaf Bur-reed	Sparganium angustifolium
Pondweeds	Running five fingers	
	Oakes' Pondweed	Potamogeton oakesianus
	Clasping Pondweed	Potamogeton perfoliatus var. bupleuroides
Grasses	Early Silver Hairgrass	Aira praecox
	Quackgrass	Agropyron repens
	Marsh Bentgrass	Agrostis stolonifera
	Dog Bentgrass	Agrostis canina
	Dunegrass	Ammophila breviligulata
	Bunched Broom-sedge	Andropogon glomeratus
	Broom-sedge	A. virginicus
	Sweet Vernal Grass	Anthoxanthum odoratus
	Purple Needlegrass (ST)	Aristida purpurascens var. purpurascens
	Soft Chess	Bromus mollis
	Drooping Brome	B. tectorum
	Reedgrass	Calamagrostis canadensis
	Orchard Grass	Dactylus glomerata
	Poverty Grass	Danthonia spicata

	Auburn Panicgrass (WL)	Dichanthelium acuminatum var. acuminatum
	Fascicled Panicgrass	D. acuminatum var. fasciculatum
	Deertongue	D. clandestinum
	Downy Panicgrass	D. columbianum
	Depauperate Panicgrass	D. depauperatum
	Roundseed Panicgrass	D. sphaerocarpon
	Purple Lovegrass	Eragrostis spectabilis
	Hair Fescue	Festuca capillata
	Red Fescue	F. rubra
	Rattlesnake Grass	Glyceria canadense
	Velvetgrass	Holcus lanatus
	Saltmarsh Switchgrass	Panicum virgatum var. spissum
	Reed Canarygrass	Phalaris arundinacea
	Timothy	Phleum pratense
	Phragmites (Common Reed)	Phragmites australis
	Canada Bluegrass	Poa compressa
	Kentucky Bluegrass	P. pratensis
	Little Bluestem	Schizachyrium scoparium
	Blue-eyed Grass	Sisyrinchium angustifolium
	Prairie Cordgrass	Spartina pectinata
	Pale False Mannagrass	Torreyochloa (Glyceria) pallida
Sedges	Greenwhite Sedge	Carex albolutescens
	Prickly Bog Sedge	C. atlantica var. atlantica
	Threadstem Prickly Bog Sedge	C. atlantica var. capillacea
	Silvery Bog Sedge	C. canescens
	Fringed Sedge	C. crinita
	White Edge Sedge	C. debilis var. rudgei
	Whitetinge (or Stellate) Sedge	C. emmonsii (2 varieties)
	Marsh Straw Sedge	C. hormathodes
	Greater Bladder Sedge	C. intumescens
	Smoothsheath Sedge	C. laevivaginata
	Long's Sedge	C. longii
	Shallow Sedge	C. lurida
	Beaked Sedge	C. rostrata
	Weak Stellate Sedge	C. seorsa
	Beach Sedge	C. silicea
	Awlfruit Sedge	C. stipata
	Swan's Sedge	C. swanii
	Fox Sedge	C. vulpinoidea
	Smooth Sawgrass	Cladium mariscoides
	Gray's Flatsedge	Cyperus grayi
	Strawcolored Flatsedge	Cyperus strigosus
	Saltmarsh Spikerush	Eleocharis halophila
	Dwarf Spikerush	E. parvula
	Common Spikerush	E. smallii

	Slender Spikerush	E. tenuis
	Fewnerved Cottongrass	Eriophorum tenellum
	Tawny Cottongrass	E. virginicum
	White Beaksedge	Rhynchospora alba
	Softstem Bulrush	Schoenoplectus tabernaemontani
	Woolgrass	Scirpus cyperinus
	Common Threesquare	S. pungens (americanus)
Arums	Swamp Jack in the pulpit	Arisaema stewardsonii
	Green Arrow Arum	Peltandra virginica
	Skunk Cabbage	Symplocarpus foetidus
Duckweeds	Duckweed	Lemna minor
Rushes	Tapertip Rush	Juncus acuminatus
	Seasice Rush	J. ambiguus
	Jointleaf Rush	J. articulatus
	Toad Rush	J. bufonius
	Canadian Rush	J .canadensis
	Forked Rush	J. dichotomus
	Common Rush	J. effusus
	Greene's Rush	J. greenei
	Grassleaf Rush	J. marginatus
	Common Woodrush	Luzula multiflora
Lilies	Canada Mayflower	Maianthemum canadense
	Indian Cucumber	Medeola virginiana
	Wild Oats	Uvularia sessilifolia
Catbriers	Common Greenbrier	Smilax rotundifolia
Irises	Yellow Iris	Iris pseudacorus
	Harlequin Blueflag	I. versicolor
	Sandplain Blue-eyed Grass (SC)	Sisyrinchium arenicola
	Narrowleaf Blue-eyed grass	S. angustifolium
	Eastern Blue-eyed Grass (Soft Blue-eyed Grass)	S. atlanticum (including "bermudianum")
Orchids	Arethusa (Dragons Mouth) (ST)	Arethusa bulbosa
	Grasspink	Calopogon tuberosus
	Green Fringed Orchid	Platanthera lacera
	Rose Pogonia	Pogonia ophioglossoides
	Northern Slender Lady's Tresses	Spiranthes lacera var. gracillis
Poppies	Yellow Hornpoppy	Glaucium flavum
Willows, Poplars	White Poplar	Populus alba
	Quaking Aspen	P. tremuloides
	Bebb Willow (Beaked Willow)	Salix bebbiana
	Bebb Willow (cross)	Salix bebbii
	Gray Willow	Salix cinerea ssp. Oleifolia
	Prairie Willow	Salix humilis var. humilis
	Willow sp.	S. sp.
Bayberries	Northern Bayberry	Morella pensylvanica
Nettles	False Nettle	Boehmeria cylindrica

	Stinging Nettle	Urtica dioica
Smartweeds, Docks	Nodding Smartweed	Persicaria lapathifolia
	Spotted Ladysthumb	P. maculosa
	Smartweed	P. pensylvanicum
	Saltpond Smartweed	P. pensylvanicum var. nesophilum
	Dotted Smartweed	P. punctatum
	Arrowleaf Tearthumb	P. sagittatum
	Seaside (Sea-beach) Knotweed (SC)	P. glaucum
	Water Smartweed	Polygonum amphibium
	Black Bindweed	P. convolvulus
	Swamp Smartweed	P. hydropiperoides
	Sheep Sorrel	Rumex acetosella
	Curly Dock	R. crispus
	Bitter Dock	R. obtusifolius
	Greater Water Dock	R. orbiculatus
Goosefoots	Crested Saltbush	Atriplex arenaria
	Scotland Orache	A. glabriuscula
	Triangle Orache	A. hastata
	Lamb's Quarters	Chenopodium album
	Mexican Tea	C. ambrosioides
	Russian Thistle	Salsola kali
Pokeweeds	Pokeweed	Phytolacca americana
Carpetweeds	Carpetweed	Mollugo verticillata
Pinks	Fivestamen Chickweed	Cerastium semidecandrum
	Big Chickweed	C. vulgatum
	Deptford Pink	Dianthus armeria
	Seaside Sandplant	Honckenya (Arenaria) peploides
	Bluntleaf Sandwort	Moehringia (Arenaria) lateriflora
	Birdeye Pearlwort	Sagina procumbens
	Bladder Campion	Silene latifolia ssp. Alba
	Salt Sandspurrey	Spergularia marina
	Common Stichwort	Stellaria graminea
	Common Chickweed	S. media
Buttercups	Common Buttercup	Ranunculus acris
Laurels, etc.	Sassafras	Sassafras albidum
Mustards	Yellow Rocket	Barbarea vulgaris
	Black Mustard	Brassica nigra
	Searocket	Cakile edentula
	Virginia Pepperweed	Lepidium virginicum
	Wild Radish	Raphanus raphanistrum
Sundews	Spoonleaf Sundew	Drosera intermedia
	Roundleaf Sundew	D. rotundifolia
Sedums, etc.	Water Pygmyweed (ST)	Crassula aquatica
Roses, Cherries, etc.	Red Chokeberry	Aronia arbutifolia
	Purple Chokeberry	Aronia floribunda

	Wild Strawberry	Fragaria virginiana
	Black Chokeberry	Pyrus arbutifolia
	Silver Cinquefoil	Potentilla argentea
	Sulphur Cinquefoil	P. recta
	Common Cinquefoil	P. simplex
	Black Cherry	Prunus serotina
	Swamp Rose	Rosa palustris
	Rugosa Rose	R. rugosa
	Virginia Rose	R. virginiana
	Multiflora Rose	R. multiflora
	Bristly Dewberry	Rubus hispidus
	Common Blackberry	R. allegheniensis
	Northern Blackberry	R. flagellaris
	Smith's Blackberry	R. jaysmithii
	Rose sp.	R. sp.
Buckthorns	Glossy Buckthorn	Frangula alnus
Peas, Legumes	Groundnut	Apios americana
	Beach Pea	Lathyrus japonicus var. pellitus
	Rabbitfoot Clover	Trifolium arvense
	Alsike Clover	T. hybridum
	Red Clover	T. pratense
	White Clover	T. repens
	Cow Vetch	Vicia cracca
Woodsorrels	Common Yellow Woodsorrel	Oxalis stricta
	Wood Sorrel sp.	Oxalis sp.
Milkworts	Seaside Milkwort	Glaux maritima
	Racemed Milkwort	Polygala polygama
Water-starworts	Variable Water Starwort	Callitriche heterophylla
Sumacs	Winged Sumac	Rhus copallinum
	Smooth Sumac	R. glabra
	Staghorn Sumac	R. typhina
	Poison Ivy	Toxicodendron radicans
Hollies	Smooth Winterberry	Ilex laevigata
	Winterberry (Black Alder)	I. verticillata
Touch-me-nots	Orange Jewelweed	Impatiens capensis
Bittersweets	Oriental Bittersweet	Celastrus orbiculatus
Mallows	Common Mallow	Malva neglecta
Spurges	Seaside Sandmat	Chamaesyce polygonifolia
	Cypress Spurge	Euphorbia cyparissias
Grapes, etc.	Virginia Creeper	Parthenocissus quinquefolia
	Thicket Creeper	Parthenocissus vitacea
	Silver-leaved Grape	Vitis aestivalis var. argentifolia
	Fox Grape	V. labrusca
	Grape sp.	V. sp
Waterworts	Waterwort	Elatine spp.

St.John's-worts	Northern Dwarf St. Johnswort/Dwarf St. Johnswort	Hypericum boreale/mutilum
	Orange-grass St.Johnswort	H. gentianoides
	Common St. Johnswort	H. perforatum
	Spotted St. Johnswort	H. punctatum
	Marsh St. Johnswort	Triadenum virgincum
Violets	Bog White Violet	Viola lanceolata
	Small White Violet	V. macloskeyi spp pallens
	Arrowleaf Violet	V. sagittata
Water Loosestrifes	Swamp Loosestrife	Decodon verticillatus
	Purple Loosestrife	Lythrum salicaria
Autumn Olives, Oleasters	Autumn Olive	Elaeagnus umbellata
Evening Primroses	Waterpurslane	Ludwigia palustris
	Hairy Evening Primrose	Oenothera villosa ssp. Villosa
	Evening Primrose sp.	Oenothera sp.
Water Milfoils	Marsh Mermaidweed	Proserpinaca palustris
Carrots, Pennyworts, etc	Queen Anne's Lace	Daucus carota
	Manyflower Marshpennywort	Hydrocotyle umbellata
	Saltpond Pennywort (Whorled Marshpennywort) (ST)	Hydrocotyle verticillata
	Hemlock Waterparsnip	Sium suave
Sweet Pepperbush	Sweet Pepperbush	Clethra alnifolia
Heaths, Blueberries, etc.	Wintergreen	Gaultheria procumbens
	Black Huckleberry	Gaylussacia baccata
	Dangleberry	G. frondosa
	Sheep Laurel	Kalmia angustifolia
	Maleberry	Lyonia ligustrina
	Swamp Azalea	Rhododendron viscosum
	Raspberry spp.	Rubus
	Highbush Blueberry	Vaccinium corymbosum
	American Cranberry	V. macrocarpon
	Lowbush Blueberry	V. angustifolium
Yellow Loosestrifes, Pimpernels, etc.	Scarlet Pimpernel	Anagallis arvensis
	Earth Loosestrife	Lysimachia terrestris
Olives, Privets, etc.	Border Privet	Ligustrum obtusifolium
	Privet sp.	Ligustrum sp.
Dogbanes	Hemp Dogbane	Apocynum cannabinum
	Dogbane sp.	Apocynum sp.
Milkweeds	Swamp Milkweed	Asclepias incarnata var. pulchra
	Common Milkweed	A. syriaca
Morning-glories, Dodders	Morning Glory sp.	Calystegia sepium
	Dodder sp.	Cuscuta sp.
Mints	American Water Horehound	Lycopus americanus
	Clasping Water Horehound	L. amplectens
	Virginia Water Horehound	L. virginicus

	Northern Water Horehound or Virginia Water Horehound	L. uniflorus or virginicus
	Spearmint	Mentha spicata
	Catnip	Nepeta cataria
	Clustered Mountainmint	Pycnanthemum muticum
	Common Skullcap	Scutellaria epilobiifolia
Nightshades, etc.	Eastern Black Nightshade	Solanum ptycanthum
	American Black Nightshade/European Black Nightshade	Solanum americanum/nigrum
Figworts, Gerardias, etc.	Small-flowered Gerardia/Purple Gerardia	Agalinis paupercula/purpurea
	Purple Foxglove	Digitalis purpurea
	Golden Hedgehyssop	Gratiola aurea
	Blue Toadflax	Linaria canadensis
	Common Mullein	Verbascum thapsus
Bladderworts	Twin-scaped Bladderwort or Inflated Bladderwort (WL)	Utricularia geminiscapa or inflata
Plantains	Narrowleaf Plantain	Plantago lanceolata
	Saltmarsh Plantain	P. major var. scopulorum
	Sweetflag	Acorus calamus
Bedstraws, Buttonbush	Buttonbush	Cephalanthus occidentalis
	Stiff Marsh Bedstraw	Galium tinctorium
Honeysuckles, etc.	Japanese Honeysuckle	Lonicera japonica
	Common Elderberry	Sambucus canadensis
	Northern Arrowwood	Viburnum dentatum (V. recognitum)
Asters, Goldenrods, etc.	Seaside Yarrow	Achillea millefolium var. lanulosa
	Yarrow	A. millefolium var. millefolium
	Ragweed	Ambrosia artemisiifolia
	Pearly Everlasting	Anaphalis margaritacea
	Pussytoes	Antennaria neglecta
	Common Burdock	Arctium minus
	Dusty Miller	Artemisia stelleriana
	Bushy Aster	Aster dumosus
	Heath White Aster	A. ericoides
	Heath Aster	A. pilosus
	Flaxleaf Whitetop Aster	A. linariifolius
	New York Aster	A. novi-belgii
	Wavyleaf Aster	A. undulatus
	Purplestem Beggarticks	Bidens connata
	Oxeye Daisy	Chrysanthemum leucanthemum
	Yellow Thistle (WL)	Cirsium horridulum
	Common Thistle	C. vulgare
	Horseweed	Conyza canadensis
	American Burnweed	Erechtites hieraciifolia
	Common Boneset	Eupatorium perfoliatum

	Rough Boneset	E. pilosum
	Boneset or Thoroughwort	E. perfoliatum
	Sweet Everlasting Cudweed	Gnaphalium obtusifolium
	Low Cudweed	G. uliginosum
	Whip Hawkweed	Hieracium x flagellare
	Smooth Hawkweed	H. florentinum
	Field Hawkweed	H. pratense
	Spotted Cat's Ear	Hypochoeris radicata
	Wild Lettuce sp.	Lactuca sp.
	Oxeye Daisy	Leucanthemum vulgare
	Stiff Aster	Lonactis linariifolius
	Sickleleaf Silkgrass	Pityopsis falcata
	Gall-of-the-earth	Prenanthes trifoliolata
	Black-eyed Susan	Rudbeckia serotina
	Coastal Goldenrod	Solidago elliottii
	Goldentop sp.	S. graminifolia
	Field Goldenrod	S. nemoralis
	Rough Stemmed Goldenrod	S. rugosa
	Seaside Goldenrod	S. sempervirens
	Slender Goldentop	S. tenuifolia
	Spinyleaf Sow Thistle	Sonchus asper
	Lanceleaf American Aster	Symphyotrichum lanceolatum
	Coltsfoot	Tussilago farfara
	Cocklebur sp.	Xanthium strumarium
Mosses		Atrichum angustatum
		Aulacomnium palustre
		Brachythecium rivulare
		Bryhnia novae-angliae
		Bryum argenteum
		Callicladium haldanianum
		Ceratodon purpureus
		Dicranella heteromalla
		Dicranum flagellare
		Dicranum scoparium
		Ditrichum lineare
		Drepanocladus aduncus
		Entodon seductrix
		Fontinalis novae-angliae
		Helodium paludosum
		Isopterygium tenerum
		Micromitrium megalosporum
		Mnium hornum
		Philonotis fontana
		Plagiothecium denticulatum
		P. latibricola
		Pohlia nutans

		Polytrichum commune
		P. piliferum
		Rhynchostegium serrulatum
		Sphagnum atlanticum
		S. fallax
		S. fimbriatum
		S. henryense
		S. inundatum
		S .lescurii
		S. palustre
		S. recurvum
		S. torreyannum
		S. trinitense
		Warnstorfia fluitans
Lichen		Acarospora smaragdula
		Agonimia gelatinosa
		Amandinea milliaria
		A. polyspora
		A. punctata
		Anisiomeridium biforme
		Arthonia caesia
		A. muscigena
		A. quintaria
		Bacidina egenula
		Buellia Stillingiana
		Caloplaca citrina
		C. feracissima
		C. holocarpa
		C. lithophila
		Candelariella aurella
		Candelariella vitellina
		Cladonia boryi
		C. Chlorophaea
		C. coniocraea
		C. humilis
		C. cristatella
		C. floerkeana
		C. furcata
		C. grayi
		C. macilenta
		C. macilenta
		C. peziziormis
		C. polycarpoides
		C. rei
		C. subtenuis
		Cyalideospsis spp.

		Flavoparmelia caperata
		Lecanora caesiorubella prolifera
		L. dispersa
		L. hagenii
		L. hybocarpa
		L. minutella
		L. strobilina
		L. xylophila
		Micarea erractica
		M. denigrata
		Parmelia sulcata
		Parmotrema chinense
		P. stuppeum
		Peltigera didactyla
		Pertusaria xanthodes
		Phaeographis inusta
		Phaeophycia rubropulchra
		Physcia millegrana
		P. stellaris
		Placynthiella icmalea
		P. oligotropha
		P. uliginosa
		Polysporina simplex
		Pyrrhospora varians
		Ramalina americana
		Rinodina gennarii
		R. maculans
		Sarcogyne privigna
		Scoliciosporum chlorococcum
		S. umbrinum
		Trapelia involuta
		Trapeliopsis flexuosa
		T. granulosa
		Usnea strigosa strigosa
		Verrucaria muralis
		Xanthoria perietina
Liverworts		Calypogeia sullivantii
		Cephalozia macrostachya
		Lophocolea heterophylla
		Nardia insecta
		Riccia huebeneriana subsp. sullivantii
		Scapania nemorea
CHLOROPHYTA (Green algae)		Blastophysa rhizopus
		Blidingia minima
		Chaetomorpha linum

		C. minima
		Cladophora flexuosa
		Codium fragile ssp. Tomentosoides
		Derbesia marina
		Ulva intestinalis
		U. lactuca
CYANOPHTYA (Blue-green algae)		Calothrix sp.
		Coccoid Cyanophyte
PHAEOPHTYA (Brown algae)		Ascoophyllum nodosum
		Chorda filum
		Chordaria flagelliformis
		Desmarestia aculeata
		Elachista fucicola
		Fucus sprialis
		F. vesiculosus
		Laminaria digitata
		L. saccharina
		Leathesia difformis
		Melanosiphon intestinals
		Petalonia fascia
		Petroderma maculiforme
		Pilayella littoralis
		Punctaria plantaginea
		Sphacelaria radicans
		Stragularia sp.
RHODOPHTYA (Red algae)		Audouinella endozioica
		Bonnemaisonia hamifera
		Callophyllus cristata
		Ceramium rubrum
		Chondrus crispus
		Coccotylus truncatus
		Corallina officinalis
		Cruoriopsis gracilis
		Cystoclonium purpureum v. cirrhosum
		Dasya baillouviana
		Grinnellia americana
		Hildenbrandia prototypus
		H. rubra
		Lomentaria orcadensis
		Nemalion helminthoides
		Palmaria palmata
		Petrocelis sp.
		Phycodrys rubens
		Phyllophora pseudocerandoides
		Phymatolithon laevigatum

		Polyides rotundus
		Polysiphonia nigra
		P. stricta
		Pterothamnion plumula
		Rhodomela virgata
		Rhodophysema elegans
		Spermothamnion repens
		Trailiella
		Verebrata lanosa

Table B.2. Birds Identified at the Refuge.

COMMON NAME	SCIENTIFIC NAME
Coopers Hawk	Accipiter cooperii
Sharp-shinned Hawk (SC)	A. striatus
Spotted Sandpiper	Actitus macularia
Red-winged Blackbird	Agelaius phoeniceus
Wood Duck	Aix sponsa
Saltmarsh Sharp-tailed Sparrow	Ammodramus caudacutus
American Green-winged Teal	Anas crecca
Blue-winged Teal	A. discors
Mallard	A. platyrhynchos
American Black Duck	A. rubripes
Gadwall	A. strepera
American Pipit	Anthus rubescens
Ruby-throated Hummingbird	Archilochus colubris
Great blue Heron	Ardea herodias
Ruddy Turnstone	Arenaria interpres
Short-eared Owl (SE)	Asio flammeus
Redhead	Aythya americana
Upland Sandpiper (SE)	Bartramia longicauda
Cedar Waxwing	Bombycilla cedrorum
Canada Goose	Branta canadensis
Bufflehead	Bucephala albeola
Common Goldeneye	B. clangula
Red-tailed Hawk	Buteo jamaicensis
Rough-legged Hawk	B. lagopus
Broad-winged Hawk	B. platypterus
Green Heron	Butorides virescens
Sanderling	Calidris alba
Dunlin	C. alpina
White-rumped Sandpiper	C. fuscicollis
Pectoral Sandpiper	C. melanotos
Least Sandpiper	C. minutilla
Semipalmated Sandpiper	C. pusilla
Northern Cardinal	Cardinalis cardinalis
American Goldfinch	Carduelis tristis
House Finch	Carpodacus mexicanus
Purple Finch	C. purpureus
Hermit Thrush	Catharus guttatus
Willet	Catoptrophorus semipalmatus
Brown Creeper	Certhia americana
Belted Kingfisher	Ceryle alcyon
Piping Plover (FT-ST)	Charadrius melodus
Semipalmated Plover	C. senipalmatus

Killdeer	C. vociferus
Snow Goose	Chen caerulescens
Black Tern	Chlidonias niger
Common Nighthawk	Chordeiles minor
Northern Harrier (ST)	Circus cyaneus
Marsh Wren	Cistothorus palustris
Sedge Wren (SE)	C. platensis
Long-tailed Duck	Clangula hyemalis
Yellow-billed Cuckoo	Coccyzus americanus
Black-billed Cuckoo	C. erythropthalmus
Northern Flicker	Colaptes auratus
Eastern Wood-pewee	Contopus virens
American Crow	Corvus brachyrhynchos
Blue Jay	Cyanocitta cristata
Mute Swan	Cygnus olor
Black-throated Blue Warbler	Dendroica caerulescens
Bay-breasted warbler	D. castanea
Yellow-rumped Warbler	D. coronata
Yellow-throated Warbler	D. dominica
Magnolia Warbler	D. magnolia
Palm Warbler	D. palmarum
Yellow Warbler	D. petechia
Pine Warbler	D. pinus
Blackpoll Warbler (SC)	D. striata
Cape May Warbler	D. tigrina
Black-throated Green Warbler	D. virens
Bobolink	Dolichonyx oryzivorus
Gray Catbird	Dumetella carolinensis
Little Blue Heron	Egretta caerulea
Snowy Egret	E. thula
Flycatcher spp.	Empidonax spp.
Willow Flycatcher	E. traillii
Horned Lark	Eremophila alpestris
Rusty Blackbird	Euphagus carolinus
Merlin	Falco columbarius
Peregrine Falcon (SE)	F. peregrinus
Kestrel	F. sparverius
Northern Fulmar	Fulmarus glacialis
Wilson's Snipe	Gallinago gallinago
Common Loon (SC)	Gavia immer
Pacific Loon	G. pacifica
Red-throated Loon	G. stellata
Common Yellowthroat	Geothlypis trichas
American Oystercatcher	Haematopus palliatus
Bald Eagle (SE)	Haliaeetus leucocephalus
Cliff Swallow	Hirundo pyrrhonta

Barn Swallow	H. rustica
Harlequin Duck	Histrionicus histrionicus
Yellow-breasted Chat	Icteria virens
Baltimore Oriole	Icterus galbula
Least Bittern (SE)	Ixobrychus exilis
Dark-eyed Junco	Junco hyemalis
Herring Gull	Larus argentatus
Laughing Gull	L. atricilla
Ring-billed Gull	L. delawarensis
Lesser Black-backed Gull	L. fuscus
Glaucous Gull	L. hyperboreus
Great Black-backed Gull	L. marinus
Bonaparte's Gull	L. philadelphia
Short-billed Dowitcher	Limnodromus griseus
Hooded Merganser	Lophodytes cucullatus
Red-headed Woodpecker	Melanerpes erythrocephalus
White-winged Scoter	Melanitta fusca
Black Scoter	M. nigra
Surf Scoter	M. perspicillata
Swamp Sparrow	Melospiza georgiana
Song Sparrow	M. melodia
Red-breasted Merganser	Mergus serrator
Northern Mockingbird	Mimus polyglottos
Black-and-white Warbler	Mniotilta varia
Brown-headed Cowbird	Molothrus ater
Yellow-crowned Night-Heron	Nyctanassa violacea
Snowy Owl	Nyctea scandiaca
Black-crowned Night-Heron	Nycticorax nycticorax
Leach's Storm Petrel (SE)	Oceanodroma leucorhoa
Osprey	Pandion haliaetus
House Sparrow	Passer domesticus
Savannah Sparrow	Passerculus sandwichensis
Indigo Bunting	Passerina cyanea
Double-crested Cormorant	Phalacrocorax auritus
Great Cormorant	P. carbo
Cormorant spp.	Phalacrocorax spp.
Rose-breasted Grosbeak	Pheucticus ludovicianus
Three-toed Woodpecker	Picoides tridactylus
Downy Woodpecker	Picoides villosus
Eastern Towhee	Pipilo erythrophthalmus
Rufous-sided Towhee	P. erythrophthalmus
Scarlet Tanager	Piranga olivacea
Snow Bunting	Plectrophenax nivalis
Glossy ibis	Plegadis falcinellus
Black-bellied Plover	Pluvialis squatarola
Horned Grebe	Podiceps auritus

Pied-billed Grebe (SE)	Podilymbus podiceps
Blue-gray Gnatcatcher	Polioptila caerulea
Vesper Sparrow (ST)	Pooecetes gramineus
Sora	Porzana carolina
Greater Shearwater	Puffinus gravis
Sooty Shearwater	P. griseus
Manx Shearwater	P. puffinus
Common Grackle	Quiscalus quiscala
Virginia Rail	Rallus limicola
Ruby-crowned Kinglet	Regulus calendula
Golden-crowned Kinglet	R. Satrapa
Bank Swallow	Riparia riparia
Black-legged Kittiwake	Rissa tridactyla
Eastern Phoebe	Sayornis phoebe
American Woodcock	Scolopax minor
Ovenbird	Seiurus aurocapullus
Northern Waterthrush	S. noveboracensis
American Redstart	Setophaga ruticilla
Eastern Bluebird	Sialia sialis
Red-breasted Nuthatch	Sitta canadensis
White-breasted Nuthatch	S. carolinensis
Common Eider	Somateria mollissima
King Eider	S. spectabilis
Yellow-bellied Sapsucker	Sphyrapicus varius
Chipping Sparrow	Spizella passerina
Field Sparrow	S. pusilla
Northern Rough-winged Swallow	Stelgidopteryx serripennis
Pomarine Jaeger	Stercorarius pomarinus
Least Tern (SC)	Sterna antillarum
Roseate Tern (FE-SE)	S. dougallii
Common Tern (SC)	S. hirundo
Arctic Tern (SC)	S. paradisaea
Eastern Meadowlark	Sturnella magna
European Starling	Sturnus vulgaris
Northern Gannet	Sula bassanus
Tree Swallow	Tachycineta bicolor
Carolina Wren	Thryothorus ludovicianus
Brown Thrasher	Toxostoma rufum
Lesser Yellowlegs	Tringa flavipes
Greater Yellowlegs	T. melanoleuca
House Wren	Troglodytes aedon
Winter Wren	T. troglodytes
American Robin	Turdus migratorius
Eastern Kingbird	Tyrannus tyrannus
Nashville Warbler	Vermivora ruficapilla
Blue-headed Vireo	Vireo solitarius

Mourning Dove	Zenaida macroura
White-throated Sparrow	Zonotrichia albicollis
White-crowned Sparrow	Z. leucophrys

Table B.3. Mammals Identified at the Refuge.

COMMON NAME	SCIENTIFIC NAME
Gray Seal	Halichoerus grypus
River Otter	Lutra canadensis
Humpback Whale (FE – SE)	Megaptera novaeangliae
Muskrat	Ondatra zibethicus
Domestic Sheep	Ovis aries
Harp Seal	Pagophilus groenlandicus
Harbor Seal	Phoca vitulina
Striped Dolphin	Stenella coeruleoalba
Bottlenose Dolphin	Tursiops truncatus

Table B.4. Fish Identified at or in the surroundings waters of the Refuge.

COMMON NAME	SCIENTIFIC NAME
CHONDRICHTHYES (Cartilaginous Fish)	
Smooth Dogfish	Mustelus canis
Little Skate	Raja erinacea
Barndoor Skate	Raja laevis
Winter Skate	Raja ocellata
Thorny Skate	Raja radiata
Spiny Dogfish	Squalus acanthias
Atlantic Torpedo Ray	Torpedo nobiliana
OSTEICHTHYES (Bony Fish)	
Blueback Herring	Alosa aestivalis
Alewife	A. pseudoharengus
American Shad	A. sapidissima
Orange Filefish	Aluterus schoepfi
Scrawled Filefish	Aluterus scriptus
Northern Sand Lance	Ammodytes dubius
Striped Anchovy	Anchoa hepsetus
Bay Anchovy	A. mitchilli
American Eel	Anguilla rostrata
Gray Triggerfish	Balistes capriscus
Lefteye Flounder unclassified	Bothidae
Atlantic Menhaden	Brevoortia tyrannus
Blue Runner	Caranx crysos
Crevalle Jack	C. hippos
Black Sea Bass	Centropristis striata
Gulf Stream Flounder	Citharichthys arctifrons
Atlantic Herring	Clupea harengus
Conger Eel	Conger oceanicus
Conger Eel unclassified	Congridae
Lumpfish	Cyclopterus lumpus
Weakfish	Cynoscion regalis
Flying Gurnard	Dactylopterus volitans
Mackeral Scad	Decapterus macarellus
Fourbeard Rockling	Enchelyopus cimbrius
Silver Anchovy	Engraulis eurystole
Snowy Grouper	Epinephelus niveatus
Smallmouth Flounder	Etropus microstomus
Round Herring	Etrumeus teres
Cornetfish unclassified	Fistularia sp.
Bluespotted Cornetfish	F. tabacaria
Hake unclassified	Gadidae

Atlantic Cod	Gadus morhua
Goby unclassified	Gobiidae
Naked Goby	Gobiosoma bosc
Sea Raven	Hemitripterus americanus
Lined Seahorse	Hippocampus erectus
American Plaice	Hippoglossoides platessoides
Spot	Leiostomus xanthurus
Fawn Cusk-eel	Lepophidium profundorum
Atlantic Seasnail	Liparis atlanticus
Goosefish	Lophius americanus
Snapper unclassified	Lutjanidae
Gray Snapper	Lutjanus griseus
Ocean Pout	Macrozoarces americanus
Haddock	Melanogrammus aeglefinus
Atlantic Silverside	Menidia menidia
Northern Kingfish	Menticirrhus saxatilis
Silver Hake	Merluccius bilinearis
Atlantic Tomcod	Microgadus tomcod
Ocean Sunfish	Mola mola
Planehead Filefish	Monacanthus hispidus
Striped Bass	Morone saxatilis
Red Goatfish	Mullus auratus
Grubby	Myoxocephalus aenaeus
Longhorn Sculpin	Myoxocephalus octodecemspinosus
Cusk-eel unclassified	Ophidiidae
Crested Cusk-eel	Ophidion marginatum
Striped Cusk-eel	O. marginatum
Oyster Toadfish	Opsanus tau
Rainbow Smelt	Osmerus mordax
Red Porgy	Pagrus sedecim
Summer Flounder	Paralichthys dentatus
Fourspot Flounder	P. oblongus
Butterfish	Peprilus triacanthus
Rock Gunnel	Pholis gunnellus
Winter Flounder	Pleuronectes americanus
Yellowtail Flounder	P. ferrugineus
Pollock	Pollachius virens
Bluefish	Pomatomus saltatrix
Bigeye	Priacanthus arenatus
Northern Searobin	Prionotus carolinus
Striped Searobin	P. evolans
Short Bigeye	Pristigenys alta
Ninespine Stickleback	Pungitius pungitius
Vermilion Snapper	Rhomboplites aurorubens
Atlantic Mackerel	Scomber scombrus

Spanish Mackerel	Scomberomorus maculatus
Windowpane	Scophthalmus aquosus
Bigeye Scad	Selar crumenophthalmus
Atlantic Moonfish	Selene setapinnis
Lookdown	S. vomer
Banded Rudderfish	Seriola zonata
Northern Puffer	Sphoeroides maculatus
Northern Sennet	Sphyraena borealis
Guaguanche	S. guachancho
Scup	Stenotomus chrysops
Northern Pipefish	Syngnathus fuscus
Lizardfish unclassified	Synodontidae
Inshore Lizardfish	Synodus foetens
Tautog	Tautog onitis
Cunner	Tautogolabrus adspersus
Snakefish	Trachinocephalus myops
Rough Scad	Trachurus lathami
Hogchoker	Trinectes maculatus
Red Hake	Urophycis chuss
Spotted Hake	U. regia
White Hake	U. tenuis

Table B.5. Amphibians and Reptiles Identified at the Refuge.

COMMON NAME	SCIENTIFIC NAME
Loggerhead Sea Turtle (FT – ST)	Caretta caretta
Green Sea Turtle (FT – ST)	Chelonia mydas
Snapping Turtle	Chelydra serpentia
Eastern Painted Turtle	Chrysemys picta picta
Spotted Turtle (SC)	Clemmys guttata
Leatherback Sea Turtle (FE – SE)	Dermochelya coriacea
Blanding's Turtle (ST)	Emydoidea blandingii
Hawksbill Sea Turtle (FE – SE)	Eretmochelys imbricata
Kemp's ridley Sea Turtle (FE – SE)	Lepidochelys kempii
Eastern Garter Snake	Thamnophis sirtalis sirtalis

Table B.6. Invertebrates Identified at the Refuge.

COMMON NAME	SCIENTIFIC NAME
MOLLUSCA	
BIVALVIA (Bivalves)	
Jingle Shell	Anomia simplex
Ocean Quahog	Arctica islandica
Bay Scallop	Argopecten irradians
Chestnut Astarte	Astart castanea
Iceland Scallop	Chlamys islandica
Iceland Scallop clapper	C. islandica clapper
Northern Quahog	Mercenaria mercenaria
Ribbed Mussel	Modiolus demissus
Northern Horsemussel	M. modiolus
Blue Mussel	Mytilus edulis
Sea Scallop	Placopecten magellanicus
Atlantic Surfclam	Spisula solidissima
Stout Tagelus	Tagelus plebeius
Northern Cardita	Venericardia borealis
GASTROPODA (Gastropods)	
Well-ribbed Dove Shell	Anachis translirata
Waved Whelk	Buccinum undatum
Knobbed Whelk	Busycon carica
Channeled Whelk	Busycotypus canaliculatus
Common Slipper Shell	Crepidula fornicata
Flat Slipper Shell	C. plana
Common Perwinkle	Littorina littorea
Smooth Perwinkle	L. obtusata
Northern Moon Shell	Lunatia heros
Spotted Moon Shell	L. triseriata
Moon Snail	Naticidae
Dogwinkle	Thais lapillus
Oyster Drill	Urosalpinx cinerea
CEPHALOPODA (Squids & Octopuses)	
Northern Shortfin Squid	Illex illecebrosus
Longfin Squid	Loligo pealeii
Longfin Squid egg mops	L. pealeii egg mops
ARTHROPODA	
MEROSTOMATA	
Horseshoe Crab	Limulus polyphemus
CRUSTACEA (Crustaceans)	

Blue Crab	Callinectes sapidus
Jonah Crab	Cancer borealis
Atlantic Rock Crab	C. irroratus
Green Crab	Carcinus maenas
Shrimp unclassified	Crustacea shrimp
American Lobster	Homarus smericanus
Spider Crab unclassified	Majidae
Lady Crab	Ovalipes ocellatus
Hermit Crab unclassified	Paguroidea
Mantis Shrimp unclassified	Stomatopoda
ECHINODERMATA	
Sand Dollar unclassified	Clypeasteroida
Sea Star, Brittle Star	Stelleroidea
INSECTA	
LEPIDOPTERA (Butterflies & Moths)	
Least Skipper	Ancyloxypha numitor
Polyphemus Moth	Anthaerea polyphemus
Velvetbean Caterpillar Moth	Anticarsia gemmatalis
Drunk Apamea Moth (SC)	Apamea inebriata
Io Moth	Automeris io
Common Wood Nymph	Cercyonis pegala
Chain Dot Geometer (SC)	Cingilia catenaria
Orange Sulphur	Colias eurytheme
Clouded Sulphur	C. philodice
Monarch	Danaus plexippus
Azalea Sphinx	Darapsa choerilus
Eastern Tailed Blue	Everes comyntas
Corn Earworm Moth	Heliothis zea
Leonard's Skipper	Hesperia leonardus
Common Buckeye	Junonia coenia
Viceroy	Limenitis archippus
American Copper	Lycaena phlaeas
Zebra Caterpillar Moth	Melanchra picta
Mourning Cloak	Nymphalis antiopa
Dune Noctuid Moth (SC)	Oncocnemis riparia
Pearl Crescent	Phyciodes tharos
Cabbage White	Pieris Rapae
Peck's Skipper	Polites coras
Long Dash (skipper)	P. mystic
Army Worm	Pseudaletia unipuncta
Banded Woolly Bear (Isabella tiger moth)	Pyrrharetia isabella
Spartina Borer Moth (SC)	Spartiniphaga inops
Regal Fritillary (presumed extirpated)	Speyeria idalia
Gray Hairstreak	Strymon melinus

European Skipper	Thymelicus lineola
Red Admiral	Vanessa atalanta
European Painted Lady	V. cardui
American Lady	V. virginiensis
Pale-banded Dart	Xestia badinodis
COLEOPTERA & OTHER INSECTS (Beetles & Other Insects)	
Hairy-necked Beach Tiger Beetle	Cicindela hirticollis
Punctured Tiger Beetle	C. punctulata punctulata
Praying Mantis	Mantis religiosa
American Carrion Beetle	Necrophila americana
Fireflies	Photuris spp.

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Appendix C

Erin Victory/TCI

Refuge upland

Wilderness Review

Introduction

A wilderness review is the process used to determine whether or not to recommend lands or waters in the National Wildlife Refuge System (System) to the United States Congress (Congress) for designation as wilderness. Planning policy for the System (602 FW 3) mandates conducting wilderness reviews every 15 years through the Comprehensive Conservation Planning (CCP) process. Section 610 FW 4 of the Service's Wilderness Stewardship Policy provides guidance on the wilderness review process.

The wilderness review process has three phases: inventory, study, and recommendation. After first identifying lands and waters that meet the minimum criteria for wilderness, the resulting wilderness study areas (WSA) are further evaluated to determine if they merit recommendation from the Service to the Secretary of the Interior for inclusion in the National Wilderness Preservation System (NWPS).

Areas recommended for designation are managed to maintain wilderness character in accordance with management goals, objectives, and strategies outlined in the final CCP until Congress legislatively designates an area or the CCP is amended to modify or remove the wilderness proposal. A brief discussion of wilderness inventory, study, and recommendation follows.

Wilderness Inventory

The wilderness inventory consists of identifying areas that minimally meet the requirements for wilderness as defined in the Wilderness Act of 1964 (Wilderness Act).

The definition of wilderness is in section 2(c) of the Wilderness Act: "A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. In this act, an area of wilderness is further defined to mean an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value."

Wilderness Study

During the study phase, lands and waters qualifying for wilderness as a result of the inventory are studied to analyze values (ecological, recreational, cultural, spiritual), resources (e.g., wildlife, water, vegetation, minerals, soils), public uses, and refuge management activities within the area. The analysis includes evaluation of whether the WSA can be effectively managed to preserve its wilderness character.

An "All Wilderness Alternative" and a "No Wilderness Alternative" is analyzed for each WSA to compare the benefits and impacts of managing the area as wilderness as opposed to managing the area under an alternate set of goals, objectives, and strategies that do not involve wilderness designation. The environmental analysis addresses benefits and impacts to wilderness values and other resources under each management alternative. The study evaluates how each alternative will:

- Achieve the purposes of the Wilderness Act and the NWPS;
- Affect achieving refuge or planning unit purpose(s);

- Affect that refuge's contribution toward achieving the Refuge System mission;
- Affect maintaining and, where appropriate, restoring biological integrity, diversity, and environmental health at various landscape scales; and

- Meet other legal and policy mandates.

The findings of the study help determine whether to recommend the area for designation as wilderness. The information, analysis, and decisions in the CCP and associated NEPA document provide the rationale for wilderness suitability determinations and the basic source of information throughout the public, executive, and legislative review processes that follow.

Wilderness Recommendation

There is no requirement to recommend a WSA for congressional designation as wilderness. The final CCP and record of decision document the U.S. Fish and Wildlife Service (Service) determination on a WSA's suitability (or unsuitability) for wilderness and decision to recommend (or not recommend) an area for designation.

For a WSA recommended suitable for designation, additional steps will be required including preparing a wilderness study report that presents the results of the wilderness review and a Legislative Environmental Impact Statement (LEIS). Once these documents are prepared, they are transmitted, along with the CCP, through the Secretary of Interior to the President of United States, and ultimately to the United States Congress for approval.

Wilderness Inventory of Nomans Land Island NWR

The wilderness inventory is a broad look at the CCP planning area to identify WSAs. WSAs are roadless areas within the refuge boundaries that meet the minimum criteria for wilderness identified in Sect. 2. (c) of the Wilderness Act. A WSA must meet the minimum size criteria (or be a roadless island), appear natural, and provide outstanding opportunities for solitude or primitive recreation. Other supplemental values are evaluated, but not required.

The Wilderness inventory was conducted by Service staff and reviewed by the CCP Planning Team comprised of agency personnel representing the Service, Massachusetts Division of Fish and Wildlife and the Wampanoag Tribe of Gay Head (Aquinnah). The inventory process and application of the wilderness criteria is described in the following sections and summarized in Table C-1.

Evaluation of Size Criteria

The initial step to identify roadless areas and roadless islands in a planning area requires gathering land status maps, land use and road inventory data, satellite imagery, aerial photographs, and personal observations of areas within refuge boundaries. Lands and waters currently owned by the Service in fee title are evaluated. "Roadless" refers to the absence of improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use.

An inventory unit meets the size criteria for a WSA if any one of the following standards applies (610 FW 4.8).

- An area with over 5,000 contiguous acres. State and private lands are not included in making this acreage determination.

- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features

- An area of less than 5,000 contiguous federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.

Discussion

Nomans Land Island NWR is a 628-acre island. The boundary of the Refuge is the mean low water mark. All of the lands and waters within the Refuge boundary are owned by the United States, and managed by the Service. The boundary of the Nomans Land wilderness inventory unit coincides with the Refuge boundary. The Refuge is one of eight refuges in the Eastern Massachusetts NWR Complex headquartered in Sudbury, MA.

Waters surrounding Nomans Land Island are within a military reservation boundary restricted area. Unauthorized vessels and persons are prohibited within the restricted area. The restricted area is monitored by the U.S. Coast Guard. Airspace over the island is restricted as well.

Remnants of old farm and military roads on the island total 4.6 miles. The original construction specifications and condition of these routes are unknown. The trails have been cleared of unexploded ordnance (UXO) and provide the only safe access across and around the perimeter of the island. Refuge staff and authorized agents of the Service use the trails to access the Refuge on foot and ATV for management activities and research. Every five years, Navy personnel use the trails for surface Munitions and Explosives of Concern (MEC) surveillance and clearance operations. The trails are generally maintained annually by mowing using an ATV with an attached mowing unit. Maintenance of the trails using herbicides applied with a backpack sprayer is an option. Due to the effects of time, storm activity, and vegetative growth, the routes are little more than 5 to 6 foot wide overgrown trails. The routes are not improved, maintained, or used regularly for travel by vehicle by Service or Navy personnel and therefore do not meet the definition of a road.

Conclusion

Nomans Land Island meets the wilderness criteria of a roadless island of any size.

Evaluation of the Naturalness Criteria

To qualify as a WSA, an area must meet the naturalness criterion (610 FW 4.9). Section 2 (c) of the Wilderness Act defines wilderness as an area that "…generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable." The area must appear "natural" to the average visitor rather than "pristine." The presence of ecologically intact, historic landscape conditions is not required.

An area may include some man-made features and human impacts provided they are substantially unnoticeable in the unit overall. In the inventory phase, the naturalness evaluation focuses on the existing physical impacts of refuge management activities, refuge uses, or human-caused hazards, like UXO. At this stage, we do not disqualify an area from further study solely on the basis of established or proposed activities or uses that require the use of temporary roads, motor vehicles, motorized equipment, motorboats, mechanical transport, landing of aircraft, structures, and installations generally prohibited in designated wilderness. In addition, an area may not be considered unnatural in appearance solely on the basis of "sights and sounds" of human impacts and activities outside the boundary of the unit.

Discussion

The wilderness inventory documented the following man-made features and evidence of human impact related to historic and existing uses and management activities and uses in the Nomans Land Island inventory unit.

Nomans Land Island has a long history of human use. Native Americans of the federally recognized Wampanoag Tribe of Gay Head (Aquinnah) used the island perhaps as early as 5,000 years ago and as a summer camp until the late 1600's. Five pre-Contact sites have been located from surface artifacts and reported to the Massachusetts Historical Commission.

In the 1800s, European Americans lived and farmed on the island. The major occupations were fishing, raising sheep, and piloting. The island was a hunting and fishing camp in the early 1920s. From historical accounts, the Service has inferred the locations of "Gulltown" (a fishing village also referred to as Crow Town) and the Joshua Crane Lodge. There is one plainly visible historic ruin consisting of a stone building foundation. Remnants of the low stone walls that delineated the historic property boundaries of the sheep farms are found in the shrubland habitats on the western side of the island. A wood and stone cistern near the center of the island provides further evidence of the community that lived on the island. The island is the site of the Luce Cemetery, a small family burial ground surrounded by crumbling stone walls. The cemetery contains one known grave marked by a toppled headstone. All of these features are periodically overgrown and hidden by vegetation. Vegetation in the Luce family cemetery is occasionally cleared by hand-pulling or cutting. The use of ground-penetrating radar might also be used to assist in the location of additional cultural resources as approved by and coordinated with the Service and the Navy.

Early settlers created artificial ponds on the island, largely on the western portion, by diking the outflow of bogs or digging below the water table and mounding the excavated dirt in a horseshoe shape to retain the water. Ben's Pond lies just west of the center of the island and is 1,000 feet by 500 feet. Rainbow Pond lies on the east end of the island. It is about 625 feet long and has two arms extending from it (Stone and Webster 1996). Adjacent to Rainbow Pond is a small pond with a water control structure consisting of a 18 to 24-inch diameter corrugated metal culvert. The metal culvert was installed in 1998 to control erosion caused by a failed vitreous clay pipe outlet.

The military used the island as a military aerial bombardment and gunnery range with live and dummy bombs from the early 1940s to 1996. In the years following WWII, a construction battalion was stationed on the island to improve the airstrip, erect structures including a radio tower, and maintain the bombing range. All of the structures were eventually removed or demolished and no one has lived on the island since then. Although the island was cleared of surface ordnance when the military ceased operations in 1996 and two surface clearance operations have occurred since then, frost heave and erosion may continue to expose sub-surface ordnance over time.

Plywood warning signs, approximately 4 feet by 8 feet, have been erected around the perimeter of the island to advise the public of the dangers of the island and access restrictions.

Three black and silver Conex steel storage structures, approximately 20-25 feet long and 10 feet wide are located on the northern side of the island. The structures were originally moved onto the island by the Navy by crane and are used for storage of Service and Navy supplies, field camp equipment, and an ATV and mowing unit. The structures also provide emergency storm shelter for personnel.

Despite the varied human history on the island, all remnant structures are occasional, and are largely unnoticeable upon visitation. They are largely hidden from view by acres of thick shrubland and some small degree of undulating topography. The trails also disappear from view by the vegetation. The island is primarily a shrub-dominated, uninhabited place appearing to be subject to natural processes. The sights from the island include unobscured views of vast expanses of ocean to the south and west, and views of

Martha's Vineyard to the northeast where the visible buildings and lighthouses provide a sharp contrast. The sounds of the island largely consist of seasonal avifauna, wind and waves.

Conclusion

The presence of UXO may disqualify an area from wilderness consideration where "….human-caused hazards make that area unsafe for public use, such as contaminated sites or the existence of unexploded ordnance…." (610 FW 4.9D); however, public access has not been allowed on the island since the Navy began their operations, and the Refuge will continue to enforce the ban on public access in the future. Although evidence of past human occupation and use exists, none of the existing imprints of man individually stand out as obvious detractors from the natural characteristics of the island. On the whole, Nomans Land Island appears to have been affected primarily by the forces of nature. The Nomans Land Island inventory unit meets the naturalness criteria.

Evaluation of Outstanding Opportunities for Solitude or Primitive Recreation

In addition to meeting the size and naturalness criteria to qualify as WSA, an area must provide outstanding opportunities for solitude or primitive recreation (610 FW 4.10). The area does not have to possess outstanding opportunities for both solitude and primitive recreation, and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under these criteria. Congress has designated a number of Refuge System wilderness areas that are closed to public access to protect ecological resource values.

Opportunity for solitude refers to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure.

These two opportunity "elements" are not well defined by the Wilderness Act but in most cases can be expected to occur together. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreation use that experiencing solitude is not an option.

Conclusion

Nomans Land Island inventory unit meets the solitude criterion, but does not meet the primitive and unconfined recreation criterion. Nomans Land Island is and will remain closed to public access under the terms of the Navy transfer agreement, so there are no outdoor recreational opportunities. The island is three miles offshore from Martha's Vineyard. Views to the south and east are of an expanse of open ocean. Human visitors to the island are limited to Refuge and Navy personnel, contractors and authorized volunteers. In the future, access may be provided to members of the Wampanoag Tribe for cultural purposes. Because visiting parties are limited in size and visitors are confined to the existing access trails for safety, the predominantly shrub vegetation and topographic diversity is sufficient to allow one to escape the sights and sounds of other humans on the island. Solitude is the overwhelming force that these limited numbers of authorized employees, staff, volunteers and tribal members experience on Nomans Land Island.

Supplemental Values

Supplemental values are defined by the Wilderness Act as "ecological, geological, or other features of scientific, educational, scenic, or historic value."

Nomans Land Island is a vital and unique maritime resource for migratory birds along the Atlantic Flyway and provides a diversity of habitat for passerines, raptors, waterfowl, and seabirds. Several unique and significant natural plant community types exist on Nomans Land Island. Much of the Refuge habitat is maritime shrubland, which is considered rare in Massachusetts. This is found in coastal areas characterized by patches of dense shrubs with scattered more open areas of low growth or bare ground. The small areas of maritime beach strand community and maritime dune community on the Refuge are also considered rare in Massachusetts.

Nomans Land Island also has cultural and historic supplemental values. The island is the setting for a recurring story in the oral traditions of the Wampanoag Tribe of Gay Head (Aquinnah). The Wampanoag tell that the first Indians on Martha's Vineyard were the giant, Maushop (Proto-Algonquian for "big man" or "giant") and his wife, Squant (derived from the seventeenth-century word, Squáuanit, the woman's god) and their children. One Maushop story recurs frequently, but was first collected in 1792 and published in the Massachusetts Historical Society Collections in 1806. In this story, Maushop separates Nomans Land Island from Martha's Vineyard by making marks with his toe across the beach, isolating a section of the isthmus that separates (or joins) them. Water rushed into the cuts on each side of the isthmus and eroded the rest of the beach, separating the islands (Simmons 1986). In fact, Nomans Land Island was likely attached to Martha's Vineyard until recent geological time, within the past 1,000 years. The separation of Nomans Land Island from the Vineyard reflects rising sea level, but the event that finally removed the spit was a storm (LaFarge 1933).

Nomans Land Island had permanent inhabitants in the eighteenth and nineteenth centuries. Two villages arose, Gull Town (also known as Crow Town; Wood 1978) and Jimmy Town, and there were over 20 dwellings and fishing shacks that were home to about 40 families. In addition, the island housed a church, school, store, gristmill, graveyard, and a boardinghouse for sailors. The three major occupations were fishing, raising, sheep, and piloting.

These supplemental values provide unique opportunities for scientific research and off-site environmental education of cultural and historic resources. These values are not required for wilderness but their presence complements the requirements for wilderness designation. See Chapter 3 of the EA/draft CCP for a more complete description of these supplemental values.

Table C.1. Wilderness Inventory Area Findings Summary for Nomans Land Island Unit.

Refuge unit and acreage	(1) has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island;	2) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;	(3a) has outstanding opportunities for solitude;	(3b) has outstanding opportunities for a primitive and unconfined type of recreation;	4) contains ecological, geological or other features of scientific, educational, scenic, or historical value.	Parcel qualifies as a wilderness study area (meets criteria 1, 2, and 3a or 3b)
Nomans Land Island 628 acres	Yes, the area is a roadless island.	Yes, impacts of past historic habitation and Navy use and minimal facilities related to current Refuge management activities are obscured by the forces of nature and substantially unnoticeable.	Yes. The island is approximately 3 miles from the mainland and offers sights and sounds of wilderness. No homes and other improvements are visible from most places on this island, except the view of the distant MA mainland coast. Authorized persons will be able to experience solitude when visiting the Refuge.	No. The area is closed to public access.	Yes. Diversity of waterbirds, rare maritime shrub and coastal dune habitat as well as cultural and historic values.	Yes.

Wilderness Study of Nomans Land Island NWR

The Nomans Land Island WSA (Map C-1; encompasses Refuge acquisition boundary (area outlined in white)) was further evaluated to determine suitability for designation, management, and preservation as wilderness (610 FW 4.13). Considerations in this evaluation included:

- quality of wilderness values; and
- capability for management as wilderness (or manageability) and minimum requirements/tools analysis.

This information provides a basis to compare the impacts of a range of management alternatives and determine the most appropriate management direction for each WSA.

Evaluation of Wilderness Values

The following information considers the quality of the WSAs' mandatory and supplemental wilderness characteristics.

Size

Nomans Land Island WSA is a 628-acre roadless island and meets the minimum size criterion.

Naturalness

Nomans Land Island WSA generally appears to have been affected primarily by the forces of nature, with the imprint of human uses and activities substantially unnoticeable. The impacts of human presence are small in terms of structures and constructed features and do not affect the overall naturalness of the WSA.

Outstanding Opportunities for Solitude

Solitude overwhelms the human spirit on Nomans Land Island.

Evaluation of Manageability and Minimum Requirements/Tools Analysis

Several management activities are required for the Service to meet responsibilities for managing Nomans Land Island WSA as a national wildlife refuge as specified in relevant legislation and policies.

Jurisdiction

In 1996 all military operations were ceased on the island, and an extensive surface ordnance sweep was conducted to ready the island for transfer to the Service. Management responsibility of the island was transferred from the Department of Defense to the Department of the Interior in 1998, under the Act Authorizing the Transfer of Certain Real Property for Wildlife. A transfer agreement was established by both parties to delineate the terms of the transfer and the ongoing responsibilities of both parties. These terms mandate that the Service keep the island closed to the public due to safety and liability hazards, that permanent warning signs be erected on the island, and that the Navy maintain the right to access the island to continue remedial operations to a level commensurate with that of an unstaffed national wildlife refuge. Close cooperation by both agencies since the transfer has allowed for UXO removal and resource management to positively affect the island.

The Navy retains responsibility for contaminants and Munitions and Explosives of Concern (MEC) that remain on Nomans Land Island as a result of past military operations. The Navy's current management of residual MEC is based on the Services designation of Nomans Land Island as an unstaffed national wildlife refuge. Any change to this designation that would result in increased exposure to MEC would require additional cleanup at the Service's expense.

As noted elsewhere in this document, the Navy has been working with the Service and the Massachusetts Department of Environmental Protection on the cleanup of the site since the mid-1990's. Contaminant remediation has taken place and extensive clearance operations were conducted in 1998. In addition there have been two limited follow-up MEC surface clearances, in 2003 and 2008, to address MEC that was exposed by erosion.

Consistent with the guidance and regulations set forth in CERCLA, the Navy will conduct five year reviews of the island so long as human use of the island is restricted. The nature and extent of these five year reviews by the Navy of Nomans Land Island are subject to the alternative chosen in the Navy's Phase III/Feasibility Study Report.

A draft Phase III/Feasibility Study (FS) Report has been prepared for the Navy which identifies and evaluates appropriate Remedial Action Alternatives (RAAs) to address the risk to safety for Nomans Land Island. Risks to the environment, human health, and public welfare have been previously addressed and closure attained. The feasibility of alternatives for remedial actions is evaluated according to criteria set forth in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the 2004 Naval Facilities Engineering Command - Guidance for Optimizing Remedy Evaluation, Selection, and Design, and is consistent with the guidance and regulations from the Massachusetts Contingency Plan. The public will be provided an opportunity to comment on the Phase III/Feasibility Study Report in 2010. Once that report is finalized, the Navy will prepare a Proposed Plan to indicate the preferred remedy.

We do not anticipate any conflicts with our proposed management, including wilderness, of the Refuge as a result of these final plans. Except for Navy activities, the Service has complete jurisdiction to manage Nomans Land Island NWR.

Manageability

In order to fulfill the Refuge purpose and uphold legal responsibilities, there are several generally prohibited uses that are necessary to continue on the island (by both the Service and the Navy) that may temporarily detract from its wilderness character. These actions would be subject to evaluation by a MRA. Though it may not possible to eliminate these activities or uses, they would be modified if possible and as necessary to minimize any impacts that detract from wilderness character.

The use of motorboats is one such generally prohibited use. Located in the Atlantic Ocean three miles south of Martha's Vineyard, transportation to Nomans Land Island can only occur via boat. For reasons of safety and practicality, small motorized vessels are used to transport equipment and personnel to the island to establish temporary field camps and conduct biological survey and monitoring activities. Service biologists visit the Refuge a few times a year for periods of 1 to 3 days. Two moorings installed offshore the island by the Navy in 2008 are now property of the Service. The beaching of motorboats is necessary to unload personnel and supplies. The boats are then tied up at the established moorings located about 50 feet out in the water on the northeast side of the island. It is the intent of the Service to allow this activity to continue under a wilderness designation.

In addition, Refuge staff utilize an ATV with attached mowing unit to maintain the existing access trails on the island. The trails have been cleared of surface ordnance and are necessary to ensure safe access around and across the island for Refuge management activities.

There exist three Conex storage structures that are used for storage of the ATV and field camp supplies and equipment. The structures are necessary to provide emergency shelter for Refuge staff in the event of storm or hurricane activity. The storage structures do not require regular maintenance, but might have to be replaced in the event of damage or destruction from storms.

Installations include the eight warning signs that are erected around the perimeter of the island. These are required for public safety, are mandated in the transfer agreement signed with the Navy, and must be maintained by Refuge staff. Because of the size and weight of the signs, an ATV is required to transport new signs or materials when replacement or maintenance is required. In addition, smaller warning signs posted on Refuge beaches may also be installed, depending on the alternative chosen as part of the Navy's Phase III/Feasibility Study. Minimal remote weather equipment might be used to monitor weather and climate change on the island in the future.

Efforts to control invasive species on the Refuge began in 2004. Methods of control include hand pulling and herbicide application. In 2004 and 2005, Phragmites was aerially treated with glyphosate. Phragmites must be treated aerially because wetlands have not been cleared of UXO. Backpack sprayers with either glyphosate or triclopyr have been used to treat Japanese honeysuckle, Asiatic bittersweet, black swallow-wort, Phragmites, autumn olive and silver poplar. Poplar and autumn olive are also cut and the stumps treated with glyphosate. Purple loosestrife and spotted knapweed have been pulled by hand. Treatment has varied each year based on the timing of trips to the island, weather and staffing.

Remediation and management by the Navy in the past has required periodic surveillance and surface ordnance clearing. This has typically included surveillance by foot of burned areas using hand-held magnetometers to identify exposed and buried ordnance. The clearance operations have included retrieval of the ordnance, detonation and other activities to render it inert, and transport and disposal off the island. These activities typically required heavy equipment, which were brought in by barge to load and remove heavy UXO from the island. These operations will likely be necessary to some lesser extent in the future as frost heave and erosion may continue to expose sub-surface ordnance over time. Though the nature and extent of the Navy's future remedial actions will not be finalized until later this year, these clearance operations are short-term, temporary activities. They would be subject to evaluation by a MRA, and would not permanently impact the island's wilderness character.

None of the current or expected Refuge management activities or Navy operations and maintenance would permanently diminish the wilderness character of Nomans Land Island WSA. Proposed management activities and protocols for invasive species control, prescribed burning, predator control, and maintenance or stabilization of cultural sites and the Luce cemetery could carried out using the minimum impact methods and tools, including the potential use of ground penetrating radar, to accomplish the work safely and with a minimal amount of impairment to wilderness character. The Nomans Land Island Refuge could be managed in the long-term to maintain wilderness character and supplemental values recognizing that using a "minimum requirements" approach would be required for all activities.

In summary, safety, practicality, and effectiveness require the occasional use of management programs and associated tools (some of which are generally prohibited by the Wilderness Act) to pursue achievement of Refuge purposes, goals and objectives. Current and proposed Refuge management would be consistent with wilderness designation and management of the Nomans Land Island WSA. Although occasionally diminished, the area's wilderness character and supplemental values would not be permanently impacted because of wilderness designation and the management described herein.

Map C-1

Nomans Land Island National Wildlife Refuge - Comprehensive Conservation Plan

Wilderness Study Area

Sources:
Orthophoto from MassGIS

0 0.5 1 Miles

0 0.25 0.5 1 1.5 Kilometers

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W E
S

Alternatives

After evaluating the quality of wilderness values, manageability, minimum management requirements, the following alternatives were developed and analyzed for wilderness designation. The alternatives are described in detail in Chapter 2 of the EA/draft CCP.

Alternative A (Current Management)

This alternative is the "No Action" alternative required by the National Environmental Policy Act of 1969. Alternative A defines our current management activities, and serves as the baseline against which to compare the other alternatives. The island would remain closed to public access and Refuge lands and waters would be managed as they have been in the past to accomplish Refuge purposes in accordance with legal and policy guidance for the System.

Our habitat management would focus on allowing natural processes and prescribed burns conducted by the U. S. Navy for UXO removal operations to maintain the diversity of the maritime shrubland habitat that supports migratory and nesting birds of conservation concern such as the eastern towhee and gray catbird. Other than some invasive species management, only natural processes would affect the ponds and wetlands on the Refuge that provide important breeding habitat for Virginia rail and other species of conservation concern.

We would continue to maintain the 15 acres of herbaceous upland and 100 acres of intertidal beach and rocky shore to provide suitable habitat conditions for nesting American oystercatcher, piping plover and terns as well as other shorebird, colonial waterbird, and seabird species identified as conservation concern. We would continue to enforce the ban on public access along the shoreline to prevent public use activities that may pose safety risks due to UXO.

We would continue to work with our partners to monitor the island habitats for invasive plants and disease, and we would treat the vegetation to fight invasive species if we have available funding and staffing. Our biological monitoring and inventory program and habitat and trail management would continue at its current minimal level, and would be limited by safety concerns and UXO removal conducted by the Navy.

We would continue to protect cultural resources by strengthening our relationships with the Tribe and the Chilmark Historical Commission. We would consult with the Navy, Regional Archaeologist, and state and tribal historic preservation offices before committing to any ground-disturbing activities or the use of equipment such as ground penetrating radar, as with all alternatives.

Our visitor services programs would not change; minimal off-site interpretation of the island's resources would occur via our website and virtual tour. Our staffing and facilities would remain the same. Existing staff for the refuge complex would remain in place, and the headquarters would remain at the Sudbury Office. No new staff would be hired specifically for this Refuge.

Alternative B (Enhanced Wildlife Management and Visitor Services)

In this alternative, the Service would take a more active role in managing habitats, research, monitoring and inventorying its priority natural and cultural resources. The Nomans Land Island WSA would not be recommended suitable for wilderness designation.

We would coordinate with the U.S. Navy on all management activities and to provide additional trails for monitoring and management access throughout the island. Under this alternative we would establish a fire-based management regime with prescribed burns to maintain 400 acres of desired shrubland habitat conditions to support focal nesting bird species and to provide critical shrubland stop-over habitat for migrating landbirds and butterflies. We would also explore the potential to introduce the New England cottontail on the Refuge to support regional recovery efforts for this species of state and regional conservation concern.

We would manage the 15 acres of herbaceous upland vegetation that provides habitat for shorebirds and terns, and the 100 acres of marine intertidal beach and rocky shore habitats to benefit marine mammals, and nesting and migrating shorebirds. We would manage the 100-150 acres of freshwater wetland communities to support breeding marshbirds and native plant and animal communities, and control non-native invasive species and predators as necessary to support nesting focal species of conservation concern. We would create a habitat map for the Refuge and conduct inventories, research and monitoring on rare and special concern species.

Since no public use is allowed, we would increase visitor services programming off-site with environmental education and interpretation by developing partnerships with the Tribe, Town of Chilmark, and the Aquinnah Cultural Center. We would work with partners to conduct shoreline surveys for archeological resources at risk from erosion, develop protocols for collection and repository of artifacts and remains. We would increase refuge complex staff by 3 new positions for the Complex to allow for increased Biological, Visitor Services and Law Enforcement. Under this alternative we would focus on strengthening partnerships with the Tribe for ceremonial access. We would also increase access and management throughout the Refuge with the cooperation of the U.S. Navy.

Alternative C (Natural Processes Emphasis, Focal Species Management, and Wilderness Designation (Service-Preferred Alternative)

This alternative is the Service-preferred alternative for management of the Refuge over the next 15 years. It includes an array of less active management actions that, in our professional judgment, works best toward achieving the Refuge purposes, our vision and goals (including a goal to maintain the wilderness character of Nomans Land Island), and the goals of other state and regional conservation plans. We also believe it most effectively addresses the key issues that arose during the planning process. Lastly, it is the most realistic given the relatively modest increase in staffing and funding that is anticipated over the next 15 years.

Under this alternative, Nomans Land Island WSA would be recommended suitable for designation and inclusion in the NWPS. Since Congress has reserved the authority to make final decisions on wilderness designation, the wilderness recommendation is a preliminary administrative determination that would receive further review and possible modification by the Director, the Secretary of Interior, or the President. However, the analysis of environmental consequences is based on the assumption that Congress would accept the recommendation and designate Nomans Land Island NWR as wilderness. The information and analyses in the CCP/EA would be used to compile a wilderness study report and legislative EIS to accompany the wilderness recommendation.

The Nomans Land Island Wilderness would be managed according to the provisions of the Wilderness Act and Service Wilderness Stewardship Policy (610 FW 1-3). The wilderness area would be managed to accomplish Refuge purposes and the Refuge System mission, while also preserving wilderness character and natural values for future generations. Uses that are “generally prohibited” in wilderness (use of motorized vehicles, motorized equipment, and mechanical transport) would be allowed on the island for emergency purposes and when necessary to meet minimum requirements for the administration of the area as wilderness and to accomplish Refuge purposes. “Generally prohibited uses” and proposed or new Refuge management activities would be evaluated through a minimum requirements analysis (MRA) to determine if the activities are necessary and to identify impacts and mitigating measures. The island would continue to be accessible by motorboat.

Alternatives considered but eliminated from detailed study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). It was determined that there was no benefit in analyzing a partial wilderness alternative. There are no feasible or practical boundary adjustments that would improve the manageability of the Nomans Land Island WSA.

Appendix D

Erin Victory/TCI

Conex storage structures

Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS)

Refuge Operations Needs System Databases

Table D.1. Proposed projects currently in RONS database (FY08).

Title	Project number	Costs: Year 1	Costs: Recurring
Habitat Restoration, Invasive Species Control and Rare Plant Restoration	4180	$55,000	$15,000
Evaluate Habitat Suitability for Priority Migratory Bird Species	4186	$85,000	$15,000
Implement Off-Site Refuge Interpretation and Outreach	4188	$85,000	$12,500
Evaluate Impacts of Double-crested Cormorants to Local Fisheries	4208	$55,000	$10,000

Table D.2. New projects proposed for RONS database for Nomans Land Island NWR under Alternative C.

Title	Project Number	Costs: Year 1	Costs: Recurring
New England Cottontail Habitat Evaluation, Management and Reintroduction	2248	$249,470	$30,000

Service Asset Maintenance Management System Database

Table D.3. New projects proposed for SAMMS database for Nomans Land Island NWR under Alternative C.

Project Description	Cost Estimate
Maintain boundary warning signs	$15,000
Maintain water control structure	$40,000

Appendix E

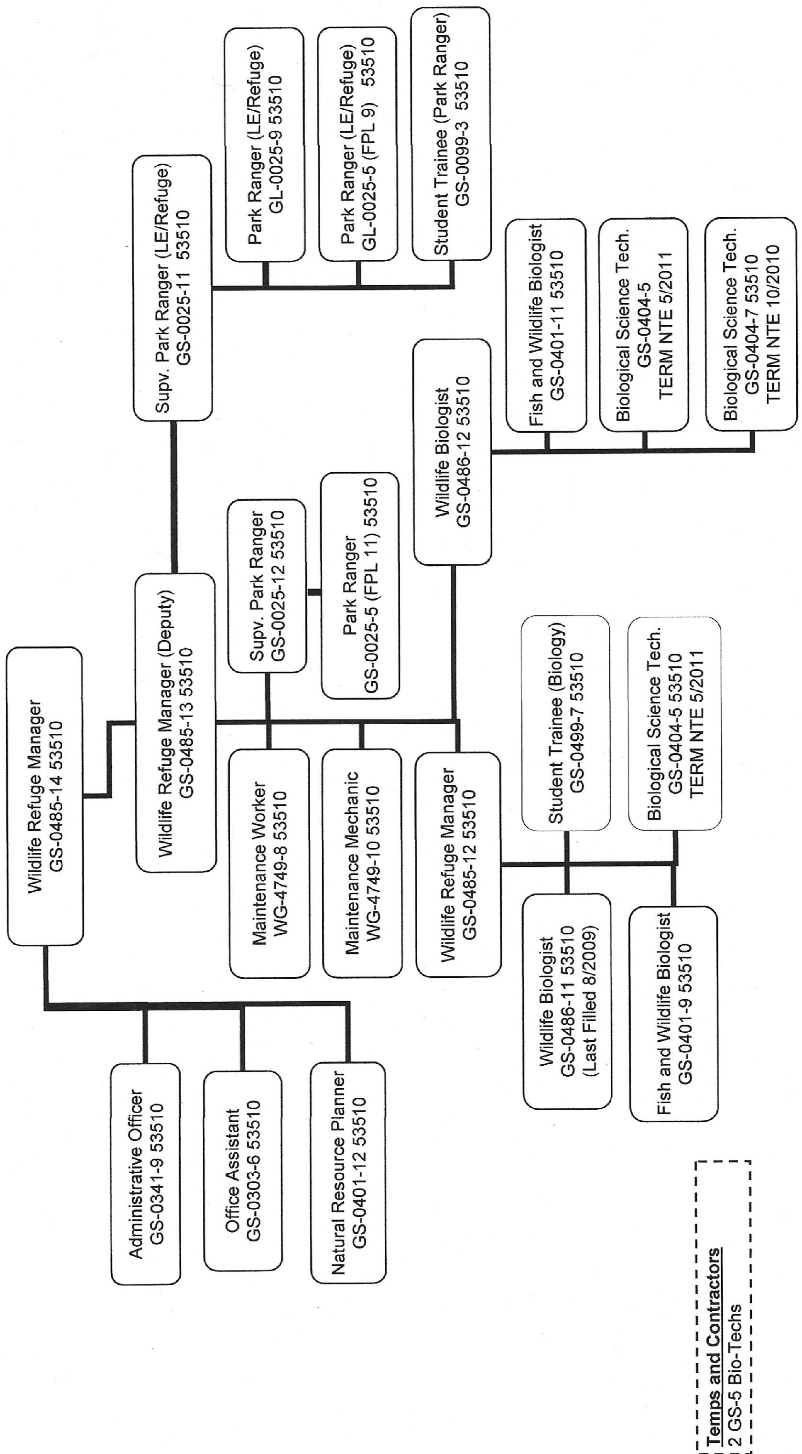

Erin Victory/TCI

Nomans Land Island's southern shore

Staffing Charts

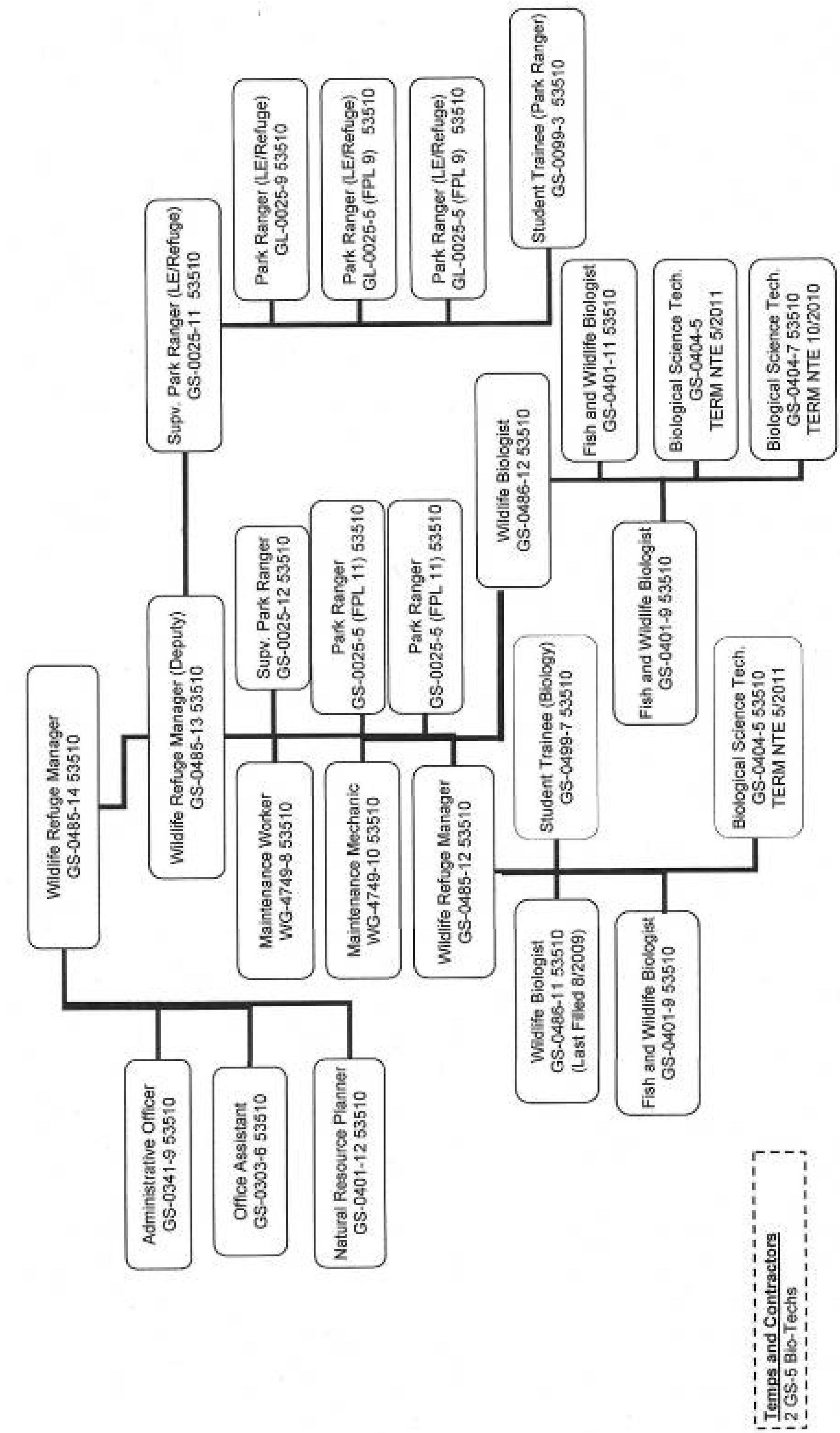
Eastern Massachusetts National Wildlife Refuge Complex (Assabet River/Great Meadows/Mashpee/Massasoit /Monomoy/Nantucket/Nomans Land Island/Oxbow)

Alternative A: Current Staffing Chart



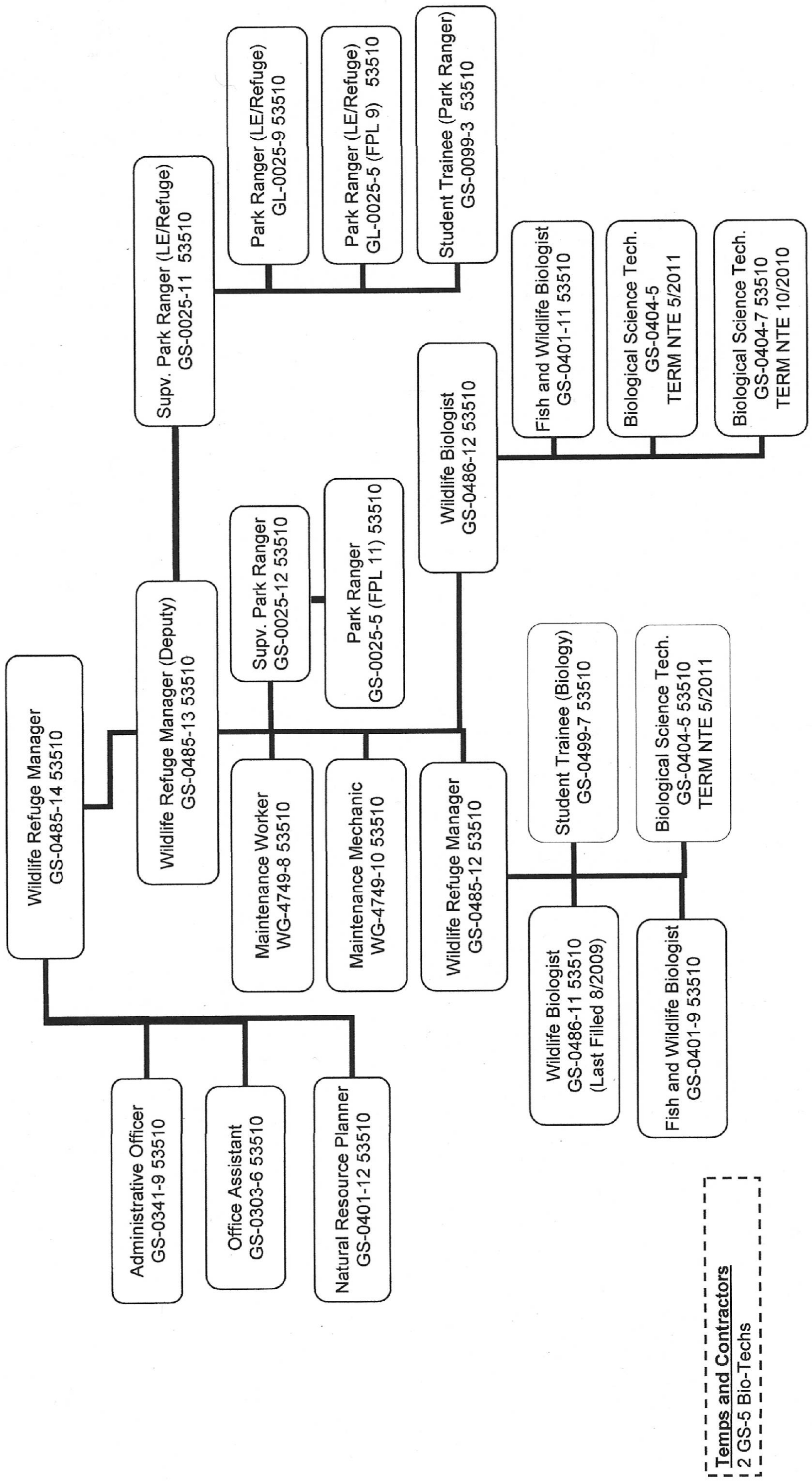
Eastern Massachusetts National Wildlife Refuge Complex (Assabet River/Great Meadows/Mashpee/Massasoit /Monomoy/Nantucket/Nomans Land Island/Oxbow)

Alternative B: Proposed Staffing Chart



Eastern Massachusetts National Wildlife Refuge Complex (Assabet River/Great Meadows/Mashpee/Massasoit /Monomoy/Nantucket/Nomans Land Island/Oxbow)

Alternative C: Proposed Staffing Chart (Same as Alternative A)



Appendix F


Erin Victory/TCI

Vegetation one year after a prescribed burn

Fire Management Program Guidance

Introduction

The mission of the National Wildlife Refuge System is “to administer 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” as stated in the National Wildlife Refuge Improvement Act (October 9, 1997).

The Role of Fire

Historically, natural fire and ignitions by Native American people played an important disturbance role in many ecosystems by removing fuel accumulations, decreasing the impacts of insects and diseases, stimulating regeneration, cycling nutrients, and providing a diversity of habitats for plants and wildlife.

In the heavily manipulated areas of the northeastern U.S. that role has been modified significantly. However, when fire is used properly it can –

- reduce hazardous fuels build-up in both Wildland-urban interface (WUI) and in non-WUI areas;
- improve wildlife habitats by reducing the density of vegetation, and/or changing plant species composition;
- sustain and increase biodiversity;
- improve woodlands and shrublands by reducing plant density;
- reduce the susceptibility of plants to insect and disease outbreaks;
- assist in the control of invasive and noxious species.

Wildland Fire and Management Policy and Guidance

In 2001, the Secretaries of the Interior and Agriculture approved an update of the 1995 “Federal Fire Policy.” The 2001 “Federal Wildland Fire Management Policy” directs federal agencies to achieve a balance between fire suppression to protect life, property and resources, and fire use to regulate fuels and maintain healthy ecosystems. It also directs agencies to provide a management response to all wildfires, commensurate with values at risk, safety, and costs for suppression.

This policy provides nine guiding principles that are fundamental to the success of the fire management program. Firefighter and public safety is the first priority in every fire management activity. The role of wildland fires as an ecological process and natural change agent will be incorporated into the planning process.

Fire management plans (FMPs), programs and activities support land and resource management plans and their implementation. Sound risk management is the foundation for all fire management activities. Fire management programs and activities are economically viable, on the basis of values to be protected, costs, and land and resource management objectives. FMPs and activities are based on the best available science. FMPs and activities incorporate public health and environmental quality considerations. Federal, state, tribal, local, interagency and international coordination and cooperation are essential. Standardization of policies and procedures among federal agencies is an ongoing objective.

The fire management considerations, guidance, and direction should be addressed in the land use resource management plans (for example, the CCP). The FMP is a step-down plan derived from the land use plans and habitat plans, with more detail on fire suppression, prescribed fire and fuels management activities.

Management Direction

Nomans Land Island NWR as part of the Eastern Massachusetts NWR Complex is an uninhabited island approximately three miles southwest of Martha's Vineyard, the closest landmass. Without the need to protect life, property, and other resources from wildland fire, we would not make an effort to suppress wildfires, but would certainly monitor any wildfire as a minimum suppression response. Prescribed fire is often utilized in conjunction with chemical, manual and mechanical fuel treatments in an ecosystem context to protect federal and private property, for habitat management purposes. Given the absence of property to protect, the prevalence of remaining UXO on the island, access restrictions, and safety considerations, it is likely that fire management on the island would be largely restricted to prescribed burning. Fuel reduction activities, if any, will be applied in collaboration with federal, state and nongovernmental organizations partners.

Prescribed fire will be used as a management tool to promote and accomplish the goals set forward in the Comprehensive Conservation Plan:

- Protect and enhance Service Trust Resources and Species and Habitats of Special Concern.
- Maintain a healthy and diverse complex of natural community types comprised of native plants and animals to pass on to future generations of Americans.
- Conduct effective outreach activities to promote quality off-site wildlife dependent public use programs to raise public awareness of the Refuge and the Refuge System, and to promote enjoyment and stewardship of natural resources in the Cape Cod and Islands region.

All aspects of the fire management program will be conducted in a manner consistent with applicable laws, policies, and regulations. Nomans Land Island NWR will maintain a FMP to accomplish the fire management goals that follow (see Fire Management Goals). Prescribed fire, chemical, manual and mechanical fuel treatments will be applied in a scientific way, under selected weather and environmental conditions.

Fire Management Goals

The goals and strategies of the National Wildlife Refuge System Wildland fire Management Program Strategic Plan are consistent with Department of Interior (DOI) and the U.S. Forest Service policies, National Fire Plan direction, the President's Healthy Forest Initiative, the 10 year Comprehensive Strategy and Implementation Plan, National Wildfire Coordinating Group (NWCG) Guidelines, initiatives of the Wildland Fire Leadership Council, and Interagency Standards for Fire and Aviation operations.

The fire management goals for the Refuge are to use prescribed fire to meet the habitat goals and objectives identified in this CCP.

Fire Management Objective

The purpose of the fire management program is to use prescribed fire, chemical, and manual and mechanical treatment to:

- Ensure public and firefighter safety while protecting property and natural resource values from wildfire.

- Reduce the wildfire impacts to all resource management activities. Reduce the threats associated with accumulations of hazardous fuel loads in marsh and woodland habitats.

- Provide and enhance and protect habitats for state and federal endangered and threatened species and species of special concern.

- Provide, maintain, enhance, and protect feeding, resting, nesting and brood habitat that meet the requirements of migratory waterfowl, other migratory birds, and resident wildlife.

- Maintain health and vigor of marsh vegetation.

- Facilitate the control of invasive and exotic species.

- Increase habitat diversity in Refuge upland habitats.

- Demonstrate and educate the public about the role and benefits of Wildland fire protection and prescribed fire use in natural resource management.

- Maintain current ecosystem diversity within the landscape context, and contribute to the recovery and restoration of the Chesapeake Bay ecosystem.

- Comply with state Air Quality Implementation Plans to protect public health and the environment.

Strategies

The Refuge will use strategies and tactics that consider public and firefighter safety as well as resource values at risk. Wildfire suppression, prescribed fire, chemical, manual and mechanical treatment methods, along with timing, and monitoring are described in more detail within the step-down FMP.

Prescribed fire burn plans will be developed for specific sites, following the interagency Prescribed Fire planning and Implementation Procedures Reference Guide (2006) template. Prescribed fire temporarily reduces air quality by diminishing visibility and releasing components through combustion. The Refuge will meet the Clean Air Act emission standards by adhering to the Massachusetts Air Quality requirements during all prescribed fire activities.

Fire Management Organization, Contracts, and Cooperation

Fire management technical oversight for the Refuge has been established in Region 5 of the Service, using the fire management zone approach. Under this approach, fire management staff has been determined by established modeling systems based on fire management workload of a group of refuges, and possibly interagency partners. The fire management workload consists of historical wildfire suppression activities, as well as past hazard fuels treatments. At this time, Nomans Land Island NWR is within the New England fire management zone, which includes all the national wildlife refuges in Massachusetts. The primary fire management staffing and support equipment are located at the Eastern Massachusetts NWR Complex, and are shared among all units. All fire management activities are conducted in a coordinated and collaborative manner with the Refuge and other federal and non-federal partners. The fire management zone has also developed a close working relationship with the Massachusetts Department of Fish and Game, and the Nature Conservancy (TNC).

Upon approval of this CCP, a new FMP will be developed for the Refuge. The FMP may be done as an FMP that covers only Nomans Land Island NWR or an FMP that covers all the refuges within the Eastern Massachusetts NWR Complex.

Appendix G

Pokeweed

Transfer Agreement Between the U.S. Navy and the U.S. Fish and Wildlife Service for Nomans Land Island

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06/29/98 16:02 ☎70. 03 2734 DASN(I&E) 003/008

DEPARTMENT OF THE NAVY
THE ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
1000 NAVY PENTAGON
WASHINGTON, D.C. 20350-1000

June 26, 1998

The Honorable Bruce Babbitt
Secretary of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Dear Mr. Secretary:

By letter of November 22, 1995, the Department of the Interior's U.S. Fish And Wildlife Service requested an interagency transfer of Navy base closure property known as Nomans Land Island for the protection of migratory birds and other wildlife. The island is composed of approximately 628 acres of land associated with the former Naval Air Station South Weymouth, Massachusetts, and is located 2.7 miles southwest of Martha's Vineyard, Massachusetts.

Under the authority of Title 16, United States Code, Section 667b, I hereby transfer to the Department of the Interior, without any requirement for reimbursement to the Department of the Navy, approximately 628 acres of land known as Nomans Land Island.

Navy has complied with the National Environmental Policy Act of 1969, by concluding that this interagency transfer is categorically excluded in accordance with 32 CFR 775. Navy has prepared a Finding of Suitability to Transfer (FOST) the property. The FOST concludes that this property is suitable for transfer to another Federal agency. We will provide copies of the FOST and other pertinent transfer documents under separate correspondence.

As a result of this interagency transfer, the Department of the Interior will accept responsibility for custody and accountability as well as protection and maintenance of the property. This transfer is subject to the attached Statement of Conditions, Covenants, and Reservations of Transfer that arise out of the property's previous use as a gunnery and bombing range.

In arranging for the transfer of custody and accountability of this property, your staff should contact the Naval Facilities Engineering Command's Northern Division in Lester, Pennsylvania. The Commanding Officer may be reached at the following address:

Captain W. P. Fogarty, CEC, USN
Commanding Officer
Naval Facilities Engineering Command
Northern Division
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090
Telephone: (610) 595-0600

Navy is pleased to help advance the programs of the Department of the Interior and the United States Fish And Wildlife Service by providing Nomans Land Island for inclusion in the Great Meadows National Wildlife Refuge.

Sincerely,

ROBERT B. PIRIE, JR.

CONDITIONS, COVENANTS, AND RESERVATIONS OF TRANSFER
APPROXIMATELY 628 ACRES OF LAND
KNOWN AS NOMANS LAND ISLAND, MASSACHUSETTS
FROM THE DEPARTMENT OF THE NAVY TO THE
DEPARTMENT OF THE INTERIOR, U.S. FISH AND WILDLIFE SERVICE

This transfer is subject to the following conditions, covenants, and reservations:

a. This transfer is subject to the terms and conditions of the Finding of Suitability to Transfer attached hereto and made a part hereof as enclosure (2) and the Explosive Safety Remediation Plan for Nomans Land Island attached hereto and made a part hereof as enclosure (3).

b. The Department of the Navy reserves and retains the right of access to the property transferred herein for the purpose of conducting ongoing investigations, studies, and required remedial action related to environmental clean-up.

c. The Department of the Navy, subject to the availability of appropriated funds, shall retain the responsibility on behalf of the Government to process and defend any claims made against the Government for personal injury and property damage arising from the Department of the Navy activities prior to the effective date of this transfer or the condition of the property as of the effective date of this transfer. Provided, however, that the Department of the Interior, U. S. Fish and Wildlife Service shall administratively close the island to all public access, conduct periodic surveillance and install and maintain appropriate and adequate warning devices. The Department of the Navy agrees to provide U. S. Fish and Wildlife a total of twelve (12) "No trespassing" signs.

d. The Navy acknowledges that DOI has had no presence on and has not used or occupied the Property in any manner which would make DOI liable for any costs or claims attributable to existing contamination on or emanating from the Property on the Date of Transfer. Accordingly, nothing in this Agreement is to be construed as requiring DOI to accept the responsibility for the payment of any taxes, assessments, or environmental costs or fees becoming due on the Property and attributable to events occurring or actions taken prior to the Date of Transfer of the Property.

The Navy acknowledges that one of the purposes of this Agreement is to ensure that DOI does not and shall not assume any of the United States Government's potential liability or responsibility for contamination, nor have any obligation to undertake the United States Government's defense or payment of any claim or action, whether in existence now or brought in the future, caused by the use, storage, management, release, or disposal of hazardous materials, substances, wastes, petroleum products or any contamination thereof (including any use, storage, management, release, or disposal of such that occurs during any subsequent environmental remediation conducted by the Navy) on any portion of the Property prior to its transfer to DOI, including any contamination not presently known but subsequently discovered and determined to attributable to activities or conditions on the Property prior to the date of transfer to DOI. For purposes of this Agreement, the term "hazardous substance(s)" means any substance that is identified or designated as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 et seq. including, but not limited to, all substances referred to in this section.

With respect to contaminants existing on the Property as of the Date of Transfer, except as otherwise specifically provided herein, the Navy shall retain all of the United States Government's responsibility and potential liability, as required by law and regulation, for the costs of implementing environmental investigations, site inspections, cleanup, restoration, monitoring and closure. Should a release or threatened release of any hazardous substance, pollutant, contaminant, or petroleum derivative occur as a result of Navy activities on the Property, or the existence of such Navy contamination existing on the Property before the Date of Transfer, or as a result of Navy efforts to remediate or dispose of the contamination after transfer the Navy will be responsible for conducting all remedial action necessary to protect human health and the environment in accordance with applicable laws and regulations. Except as otherwise specifically provided herein, DOI shall assume no liability or costs arising out of, or related to, such contamination.

Appendix H

Erin Victory/TCI

East Bend Pond

Summary of U.S. Navy Environmental Programs on Nomans Land Island

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, ATLANTIC
REMEDIAL ACTION CONTRACT (RAC)
CONTRACT NO. N62472-99-D-0032
CONTRACT TASK ORDER NO. 0033

ENVIRONMENTAL PROGRAMS SUMMARY REPORT

NOMANS LAND ISLAND
CHILMARK, MASSACHUSETTS
RTN #4-13390

October 9, 2009

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Avenue
Norfolk, VA 23511-3095

and

Base Realignment and Closure
Program Management Office, Northeast
4911 South Broad Street
Philadelphia, PA 19112-1303

Prepared by

Tetra Tech EC, Inc.
133 Federal Street
Boston, Massachusetts 02110

Revision	Date	Prepared by	Approved by
1	10/9/09	K. Myers	B. Corbett

TABLE OF CONTENTS

TABLE OF CONTENTS – Cont'd

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AVS	acid volatile sulfide
AWQC	Ambient Water Quality Criteria
AWQS	Ambient Water Quality Standards
BAF	Bioaccumulation Factor
bgs	belowground surface
BRAC	Base Realignment and Closure Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMR	Code of Massachusetts Regulations
COC	contaminants of concern
CRIP	Community Relations and Involvement Plan
CSA	Comprehensive Site Assessment
CSM	Conceptual Site Model
DoD	Department of Defense
DU	depleted uranium
EBS	Environmental Baseline Survey
EBST	Environmental Baseline Survey for Transfer
EOD	Explosives Ordnance Disposal
EPC	exposure point concentration
EPH	extractable petroleum hydrocarbon
FDA	Former Debris Area
FS	Feasibility Study
GIS	Geographic Information System
HMX	cyclotetramethylenetetranitramine
LN	natural log
LOAEL	lowest observable adverse effects level
LSI	Limited Site Investigation
LSP	Licensed Site Professional
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MDAS	materials documented as safe
MEC	Munitions and explosives of concern
mg/Kg	milligrams per kilogram
NARA	National Archives and Records Administration
NAS SOWEY	Naval Air Station South Weymouth
NOAEL	no observable adverse effects level
NOR	Notice of Responsibility
O&M	Operation and maintenance
OHM	oil and/or hazardous material
PCB	polychlorinated biphenyl
PEC	probable effects concentration
PIP	Public Involvement Plan
PP	priority pollutant
ppm	parts per million
PRAP	Proposed Remedial Action Plan

iii

ACRONYMS AND ABBREVIATIONS – Cont'd

RAA	Remedial Action Alternative
RAM	release abatement measure
RAO	Response Action Outcome
RC	reportable concentration
RDX	cyclotrimethylenenitramine
ROD	Record of Decision
SEBS	Supplemental Environmental Baseline Survey
SEM	simultaneously extracted metal
site or island	Nomans Land Island
TNT	trinitrotoluene
TRC	Technical Review Committee
TtEC	Tetra Tech EC, Inc.
UCL	upper concentration limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
XRF	X-ray fluorescence
μg/kg	micrograms per kilogram
μg/L	micrograms per liter

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Environmental Programs Summary Report for the Department of the Navy (Navy), under the Naval Facilities Engineering Command Remedial Action Contract N62472-99-0032, to present a concise account of the environmental programs implemented on Nomans Land Island (site or island) since the initiation of the Base Realignment and Closure Act (BRAC) in 1996 and the transfer of ownership of the island from the Navy to the U.S. Fish and Wildlife Service (USFWS) in 1998. This report also presents the programs that have been implemented in addressing remaining munitions and explosives of concern (MEC) on the island from its former use as a military training range.

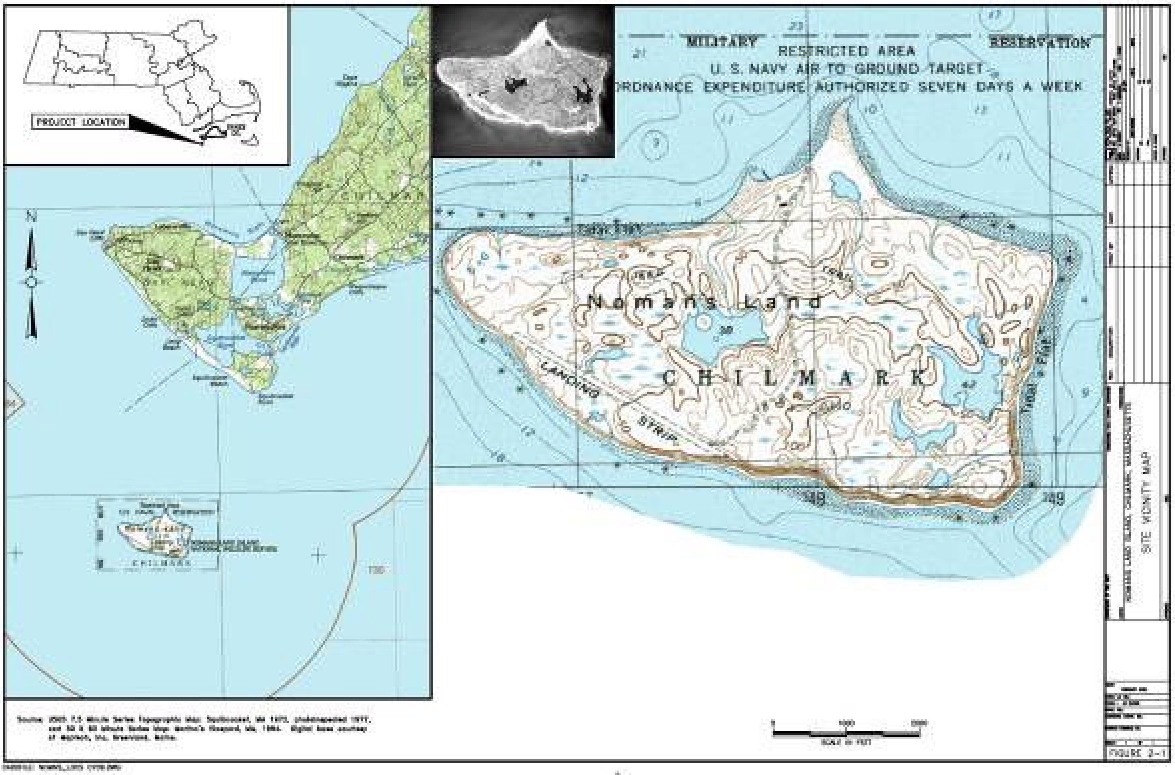
2.0 SITE SETTING AND SITE HISTORY

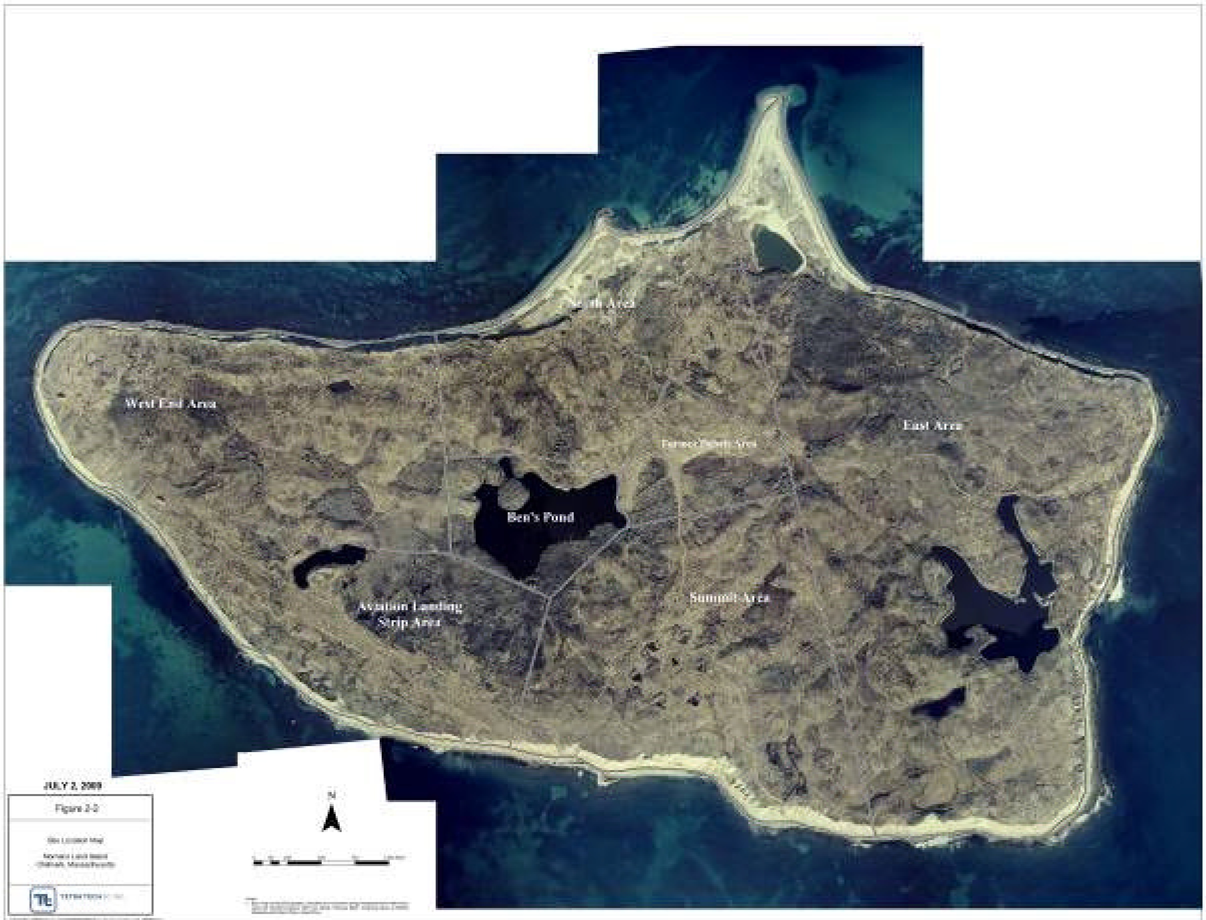
Nomans Land Island is situated off the east coast of the United States, approximately 2.7 miles south of Martha's Vineyard Island in Massachusetts. The 628-acre island is surrounded on three sides by wave-cut bluffs and narrow beaches, and a gently sloping sand and pebble beach on the north. East to west, the island is 1.6 miles long and slightly more than 1.0 mile wide, north to south. Two large freshwater ponds and several smaller ponds dot the island. Ben's Pond lies just west of the center of the island and is approximately 1,000 feet east to west and about 500 feet north to south. Rainbow Pond lies on the east end of the island and is approximately 625 feet east to west. Two arms of the pond extend to the north and northwest. The island is heavily vegetated and dominated by rolling hills.

Nomans Land Island was utilized by the U.S. Government as an air-to-surface target range from 1943 until 1996. Prior to 1943, the island was utilized for various purposes, including fishing and game hunting, and at one time, a small population of people occupied a portion of the island. No civilians have lived on the island since 1943. The water surrounding the island is a Restricted Waterway as marked on nautical maps depicting the island and its vicinity. The airspace above the island remains restricted for military use and is managed by the 104th Fighter Wing.

The Navy and the Department of the Interior entered into a Joint Wildlife Management Agreement for Nomans Land Island in 1970 designating the entire island as a National Wildlife Refuge in recognition of known wildlife nesting habitats. The island was transferred in June 1998 from the Department of Defense (DoD) to the USFWS for the intended use as a wildlife refuge (as part of what is now known as the Eastern Massachusetts National Wildlife Refuge Complex). The USFWS is the current owner and operator of the island. The Navy has retained responsibility for the environmental and MEC remediation aspects of the site.

Figure 2-1 provides the Site Vicinity Map and Figure 2-2 provides the Site Location Map.


PROJECT LOCATION
N
MILITARY RESTRICTED AREA RESERVATION
U. S. NAVY AIR TO GROUND TARGET
ORDNANCE EXPENDITURE AUTHORIZED SEVEN DAYS A WEEK
Nomans Land
CHILMARK
LANDING STRIP
SITE VICINITY MAP
FIGURE 2-1


West End Area
East Area
Ben's Pond
Aviation Landing
Strip Area
Summit Area
JULY 2, 2009
Figure 2-2
N

3.0 ROLES AND RESPONSIBILITIES/PUBLIC INVOLVEMENT

Various project stakeholders have been actively involved in the environmental and MEC programs for this site since it was first Tier-Classified in 1999. The site was also designated a Public Involvement Plan (PIP) site. These stakeholders include the USFWS, the Massachusetts Department of Environmental Protection (MassDEP), the general public, and the Technical Review Committee (TRC) established by the Navy to provide review and comment on the various stages of the investigation, assessment, and remediation programs conducted. Project stakeholders have changed throughout the years of conducting the environmental and MEC programs on Nomans Land Island.

Public involvement and community relations have played a very important role in the development and progress of the environmental program being implemented on Nomans Land Island. Since 1997, public involvement activities have been conducted that have resulted in a shared vision of the future use of the island. These activities also provided a means to communicate the investigation, assessment, and remedial approach being conducted. Specific public involvement and community relations initiatives are discussed below as they have been applied to this site.

3.1 Stakeholder Identification and Relations

As part of the TRC (along with the Community Relations Involvement Plan) a comprehensive stakeholder relations program has been and is being implemented. The first TRC meeting was held on March 14, 2001. A stakeholder is defined as anyone with an economic, social, political, or personal interest in an issue. A wide range of stakeholders are involved and interested in the environmental effort. Table 3-1 provides a list of current project stakeholders (and describes their roles and responsibilities), most of which are members of the TRC. These stakeholders are part of the ongoing efforts to keep the public informed by review of reports as well as providing community and stakeholder constituency contacts.

The goal of the TRC is to create a forum that allows the voice of interested individuals to be considered in decision-making. The stakeholder communications agenda identifies the ideas, concerns, values, principles, motivations, and plans of all interest groups involved. The stakeholder relations program currently in place serves to identify incongruities regarding factual information, understandings, and interests. It further seeks to assist the public in understanding the selected technical application being applied by providing the public additional opportunities for input. Numerous one-on-one stakeholder meetings have been conducted both in person and via telephone. In addition, the Navy conducted on-island interviews in winter 2003 as part of the Supplemental Environmental Baseline Survey (SEBS) program, to garner community input, suggestions, and concerns.

3.2 Information Repositories

The following information repositories have been established for Nomans Land Island:

- Aquinnah Township Building
  Aquinnah, MA 02535
  Attn: Carl Widdis

- Chilmark Town Office
  P.O. Box 119
  Chilmark, MA 02535-0119
  Attn: Bea Endriga

- Wampanoag Tribe of Gay Head, Aquinnah Headquarters
  20 Black Brook Road
  Aquinnah, MA 02535-1546
  Attn: Cheryl Andrews-Maltais

These repositories contain copies of all supporting project documentation (both electronic and hardcopy, as applicable) for the site. The repositories provide a location at which the material can be easily viewed by all interested parties.

3.3 Community Relations and Involvement Program

The Nomans Land Island Community Relations and Involvement Plan, dated September 2000 formalizes the process for involving the Martha's Vineyard community, interested members of the public, and the extended community in environmental restoration activities for the site. The CRIP has two purposes:

- To establish channels for communicating information to the public; and
- To provide opportunities for citizens to express their concerns.

The CRIP identifies mechanisms to facilitate communication of technical information and concerns between the Navy and the public to help the community become fully appraised of environmental conditions and related actions. This program reflects the technical progress of the activities and addresses the needs and concerns of the community.

3.4 Technical Review Committee

In 2000, the Navy established the TRC to discuss environmental actions on Nomans Land Island. This TRC is comprised of numerous stakeholders, as identified above, and holds meetings (as necessary) to discuss various phases of the environmental program. Technical work plans, completion reports, and technologies are generally presented to the TRC during the designated public review period, in which the TRC provides comments that are then incorporated into the final reports or actions. TRC meetings are open to the general public and are held in an accessible location that provides convenient access for the Martha's Vineyard community.

3.5 Mailing List

The Navy maintains and regularly updates two mailing lists: a TRC-members list (via e-mail) and a general mailing list. Approximately 22 names are on the TRC-members list. More than 125 names are on the general mailing list, which includes individuals, environmental organizations, businesses, and agencies. Both lists are updated regularly as additional individuals request information and/or involvement.

3.6 Public Notice

The public notices are generally published within the Martha's Vineyard Gazette and Cape Cod Times (as appropriate). Publications may include the following:

- Availability of a draft technical report for review
- Extension of comment period deadlines
- Notice of TRC meeting (open to public) – 14 and 7 days prior notice
- Completion of a release abatement measure (RAM) activity

3.7 Public Comment

Public comments have been solicited through the public notices and/or TRC meetings when each technical report is in draft form and submitted to the TRC and the repositories for review and comment. These plans are presented during the TRC meetings and through teleconference calls, as appropriate.

4.0 SUMMARY OF ENVIRONMENTAL AND MEC PROGRAMS

Based upon three reports for the site, including the BRAC Cleanup Plan (dated September 13, 1996), the Environmental Baseline Survey (EBS) - Phase I Report (dated November 18, 1996) and the Prescribed Burn Prescription (dated January 7, 1997), the island was listed as a site by the MassDEP in a Notice of Responsibility (NOR) letter dated September 26, 1997 and assigned Release Tracking Number 4-13390. The site listing was for the reported release of hazardous materials due to the historical use of the island as an air-to-surface target range by the DoD. Figure 4-1 presents an overview of the environmental (including MEC) programs conducted for the site, in a chronological timeline format. This figure can be used as a guide and follows alongside Section 4.0 of this report.

4.1 Environmental Baseline Survey

4.1.1 Introduction/Purpose

The EBS - Phase I Report for the Naval Air Station South Weymouth (NAS SOWEY) in South Weymouth, Massachusetts (dated November 18, 1996) also included Nomans Land Island. Because the NAS SOWEY is administratively responsible for Nomans Land Island, the EBS - Phase I Report included a section about Nomans Land Island. This work included collecting information from site documents, interviews, aerial photographs, and a site reconnaissance.

Subsequent to the EBS report, the Northern Division Naval Facilities Engineering Command completed the Environmental Baseline Survey for Transfer (EBST) report for the island (March 1998) in support of the Environmental Summary Document for transfer of federal property from one agency to another. The EBST is based upon the EBS - Phase I Report and presents updated information (where applicable) to reflect additional data and actions concerning the current conditions at the site at the time.

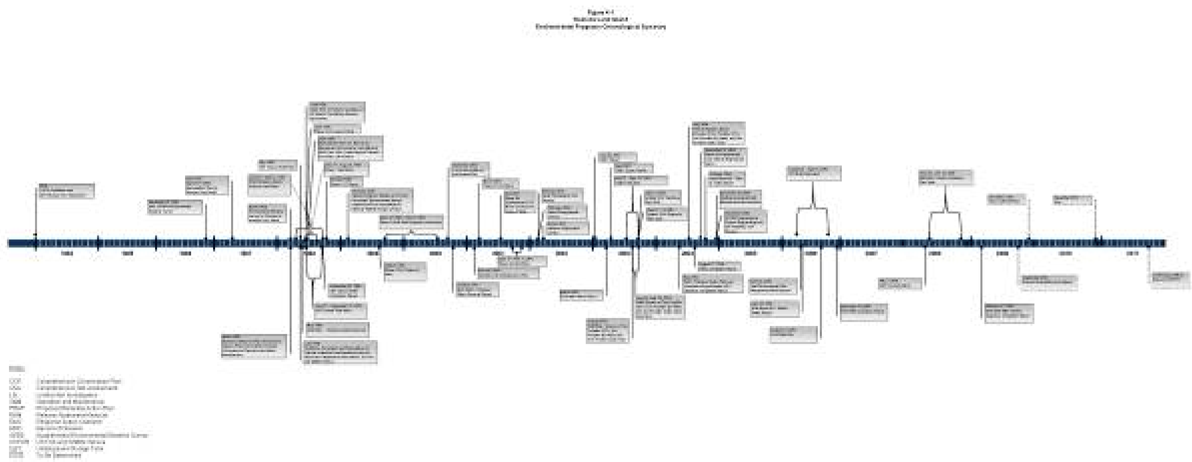
4.1.2 Results/Conclusions

Ten areas, designated as Review Items Nos. 67 through 75 and 81, were identified during the EBS as requiring further investigation. These Review Items are listed in Table 4-1.

4.2 Phase I Limited Site Investigation

4.2.1 Introduction/Purpose

A Phase I Limited Site Investigation (LSI), to initially characterize the nature and extent of contamination, was completed in 1998. This LSI (along with other assessment and remediation activities) addressed the ten Review Items identified in the EBS. A sampling and analysis program was conducted in 1998 to meet the requirements of the Massachusetts Contingency Plan (MCP) in the Code of Massachusetts Regulations (CMR) 310 CMR 40.0483(1)(e). The sampling program was intended to evaluate the potential for releases of oil and/or hazardous material (OHM) on the island. Various site media were sampled as part of the investigatory program, and a combined analytical program was



devised, which included field analytical screening as well as off-site laboratory chemical analyses. The sampling and analytical program was designed to provide data for as much geographical area of the island as was feasible and to focus around areas of ordnance debris and to provide "worst-case" site-specific data for the presence of OHM in various media within the scope of a Phase I investigation.

This sample collection and analytical program was the first comprehensive analytical program at the site and included the following:

- Sampling and analysis of surface soils, pond sediments, pond surface water, and groundwater to determine the presence or absence of OHM.
- Field screening of surface soils for potential contaminants of concern (COCs) (explosives and metals).
- Off-site laboratory analysis of selected samples of all media types to provide definitive data for site chemical characterization.

4.2.2 Results/Conclusions

One hundred and twenty-three (123) surface soil samples were collected for field screening for explosives and metals, of which 52 samples were further analyzed at a laboratory. In addition, seven groundwater samples, seven bottom sediment samples, seven surface water samples, and six potential source media samples were collected and analyzed at a laboratory for various parameters.

Based upon the Phase I data, the site was Tier-Classified using the Numerical Ranking Scoresheet contained within the MCP. The score is based on factors such as contaminant characteristics, site location and features, and potential exposure pathways. In ranking the site, the maximum concentration (conservative approach) of any single chemical parameter was used, as required, regardless of the location on-site. The completed scoresheet for the site was included as part of the Phase I report (FWENC 1998c). Key points from the Numerical Ranking Scoresheet are summarized below.

- Detection of zinc and lead above Ambient Water Quality Criteria (AWQCs) and the presence of a mapped habitat of a Species of Concern, Endangered or Threatened Species (150 points).
- Evidence of soil and groundwater contamination (35 points total).
- Greater than three potential OHM source areas (50 points).
- More than three contaminants with a toxicity score of equal to or greater than 30 (30 points). This includes trinitrotoluene (TNT), which was detected only once out of 52 samples, at a concentration below the Reportable Concentration S-1 (RCS-1) level.
- The presence of a mapped habitat of a Species of Concern, Endangered or Threatened Species, wetlands, fish habitat and protected open space (120 points).

Based on the Numerical Ranking Scoresheet, the site received a score of 508 points, resulting in a Tier IB classification. Therefore, a Tier IB Permit Application was submitted to the MassDEP simultaneously with the Phase I report (FWENC 1998c) and Tier-Classification submittal. The MassDEP issued the Tier IB permit on January 14, 1999 and the Navy returned the Permit Acceptance on February 10, 1999 to the MassDEP. The effective date of the permit is March 10, 1999.

The laboratory analyses of surface soil samples indicated non-detectable levels of explosives in most samples and no exceedances of current MCP RCS-1 criteria. Various levels of metals were detected in the surface soil samples; however, only the parameters lead, zinc, antimony, thallium, chromium, and copper were detected above RCS-1 levels. Sediment samples were non-detect for explosives. The parameters lead and zinc were detected at concentrations above the RCS-1 levels. However, it is noted that the RCS-1 limits are for soil and not for sediment.

Most of the surface water sample analyses for metals and explosives were non-detect. However, a low level of RDX was detected in one sample. Furthermore, of the seven samples analyzed, four samples contained levels of metals above the U.S. Environmental Protection Agency (USEPA) Chronic AWQC for freshwater. The analyses for explosives in the groundwater samples did not detect any compounds, and approximately half of the metals analyte results for the groundwater samples were non-detects. Most of the metals detected in the groundwater samples were below Reportable Concentration GW-1 (RCGW-1) levels, with the exceptions of zinc, nickel, thallium and cadmium. Of the seven groundwater samples analyzed for volatile organic compounds (VOCs), only toluene was present in any of the samples; however, the detected concentrations were well below the RCGW-1 criteria.

The results of the investigation and assessment of the ten EBS Review Items (designated as Review Items Nos. 67 through 75 and 81) are provided within Table 4-1.

4.3 O & M Plan

4.3.1 Introduction/Purpose

The most recent version of the Unexploded Ordnance (UXO) Safety Operation and Maintenance Plan is dated June 22, 2004 (TtEC 2004b). The plan focuses solely on operation and maintenance (O&M) objectives related to the potential for UXO remaining on the island. The goal of the plan is to protect USFWS personnel, authorized visitors to the island, and to deter unauthorized visitors from going to the island. The plan clearly defines the roles and responsibilities of the USFWS and Navy in relation to the initial site transfer documentation.

4.3.2 Results/Conclusions

Precautions and preventative measures are outlined in the plan and include training, institutional controls, periodic surveillance, and maintenance of signs. Institutional controls include:

- Signage (USFWS Wildlife Refuge, Restricted Area, and UXO Danger Area)
- Nautical and air chart notations
- U.S. Coast Guard/armed forces continued surveillance
- Explosives Ordnance Disposal (EOD) handout
- EOD response

4.4 UST RAM

4.4.1 Introduction/Purpose

Numerous underground storage tanks (USTs) were discovered during the EBS and Phase I that required assessment and removal. The RAM consisted of five excavation areas:

- Tank 1 (approximately 5,000 gallons)
- Tank 1 pipeline
- Tanks 3 (approximately 6,500 gallons) and 4 (approximately 6,500 gallons)
- Tank 5 (approximately 5,000 gallons)
- 4-inch pipeline

4.4.2 Results/Conclusions

The four USTs and associated piping utilized for fuel oil storage, one water tank, and one presumed septic tank were removed or closed-out. Approximately 25 cubic yards of impacted soils were removed. The fuel oil UST closures were completed as part of the MassDEP approved RAM. Post-excavation confirmatory sample results indicated that all associated contaminated soil was remediated. The RAM Completion Report (FWENC 1998b) describes the work performed and results.

4.5 1998 MEC Surface Clearance RAM

4.5.1 Introduction/Purpose

Pursuant to the MCP (310 CMR 40.0446), TtEC completed a RAM on behalf of the Navy. This action was taken to neutralize any potential surface live ordnance by the removal and off-site recycling of inert surface ordnance debris from the site. Because the RAM was conducted prior to Tier-Classification of the site, a RAM Plan, dated May 7, 1998 (FWENC 1998a) was submitted to the MassDEP for approval.

In general, the RAM ordnance debris removal involved the following activities:

- Site preparation (a controlled burn of the island with MassDEP air quality approval was completed on April 28, 1998)
- Surface clearance of ordnance debris (695 grids) and residual target materials
- Neutralizing suspected MEC
- Consolidation of ordnance related material
- Marking of inert ordnance
- Screening for potential depleted uranium (DU)
- Data compilation and reporting
- Off-site transport and recycling of non-ordnance related scrap
- Off-site transport and recycling of ordnance related materials

Limited MEC surface clearances were conducted during the summers of 2003 and 2008 as follow-ups to that performed in 1998. These events are further described below.

4.5.2 Results/Conclusions

Of the 695 grids (each grid approximately 200 feet by 200 feet) swept and cleared, 11,021 items were collected weighing approximately 551,780 pounds (in addition, over 59,000 pounds of non-ordnance scrap were collected and removed). All of the items were practice round type. However, 4,047 items were considered suspect (containing small smoke-charge or residual rocket fuel) and explosively vented between July 24 and August 7, 1998, following the procedure presented in the Remedial Action Work Plan attached to the RAM Plan (FWENC 1998a).

As required by the MassDEP, the ordnance debris recovered from the clearance was surveyed for the potential presence of DU. The work was completed by Inter-Link Group Ltd. and Duke Engineering & Services Environmental Laboratory as presented in a plan dated July 23, 1998 that was submitted to the MassDEP prior to conducting the survey. Two surveys were completed, between July 31 and August 5, 1998 and on August 31, 1998. The surveys concluded that no unusual or elevated levels of gamma radiation above background levels measured on Martha's Vineyard that would be associated with DU were present in the ordnance debris staging area. Based upon these findings, which were presented to the MassDEP after these two surveys, the MassDEP approved the transport of the material off the island verbally on August 11, 1998 (with follow-up letter dated August 12, 1998) after the first survey and during the week of September 7, 1998 after the second survey. The results of these surveys are contained within the Survey Report for the Radiological Screening Survey on Nomans Land Island, dated September 2, 1998 included within the RAM Completion Report (TtEC 2004a).

4.6 Phase II Comprehensive Site Assessment

4.6.1 Introduction/Purpose

A Phase II field investigation was conducted to further characterize the nature and extent of contamination on the site and involved four quarterly sampling and monitoring events conducted between September 1999 and July 2000. The Phase II also included the performance of the human health, public welfare, safety, and environmental risk characterizations.

In general, the field events consisted of mainly groundwater, surface water, soil, and sediment sampling from previous Phase I locations to confirm or verify the previous results. The soil and sediment sampling focused on those areas identified in the Phase I investigation that exhibited levels of metals and/or explosives above RCS-1 concentrations. Sediment sampling provided additional data in areas where previous sediment samples exhibited detectable levels of contaminants. The goal of the surface water and groundwater sampling and analysis program was to provide additional data concerning previously detected metals, explosives, and VOCs (in one well). To be consistent with the RCS-1 soil screening during the Phase I program, the RCGW-1 criteria were also used to screen the Phase II groundwater data. The Massachusetts Ambient Water Quality Standards (AWQS) were used to screen the Phase II surface water data. The field program included the collection of groundwater, surface water, soil, and various sediment samples within areas described as non-target areas based upon historical use and during the documented removal of surface ordnance debris completed in 1998.

Groundwater and surface water samples were collected during all four events. Soils and sediments were sampled for further assessment and delineation of elevated levels of metals identified in the Phase I. The Phase II field program focused on areas that indicated the greatest potential for contamination. These areas included:

- The Former Target Areas – Aviation Landing Strip Target Area, Summit Target Area, and West End Target Area;
- The Former Debris Area;
- Areas of stressed vegetation/disturbed areas – the Southeast corner of the island, Former Debris Area, and target areas;
- Larger surface water bodies such as Ben's Pond and Rainbow Pond; and
- Non-target and coastline areas.

<u>Groundwater Monitoring</u>

Fifteen groundwater wells, seven from Phase I and eight installed as part of the Phase II investigation, were sampled during the course of the Phase II investigation. Two additional wells were co-located at Phase I and Phase II well locations during Quarter 4 of the Phase II program. These wells were installed in an effort to determine if relatively high zinc levels detected in groundwater samples could be attributed to wells constructed with galvanized risers. The groundwater samples collected from the wells were submitted to an off-site laboratory for PP metals, explosives, hardness, and VOCs analyses, where applicable. Hardness data were also collected during Quarters 3 and 4.

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Seven groundwater monitoring wells were installed at the site during the Phase I sampling program. Because concentrations of metals were detected above the screening values (i.e., RCGW-1 levels) in groundwater samples collected during the Phase I, all seven existing wells were again sampled and analyzed for dissolved 13 PP metals (USEPA Method 6010) during Quarter 4 of Phase II. Groundwater samples were also analyzed for explosives (USEPA Method 8330) during Quarter 1 of the Phase II program to provide additional data to confirm previous results. Analytical results again indicated non-detect levels of explosives in all seven wells. Explosives analysis was not performed during the remaining sampling quarters during the Phase II.

Surface Water Monitoring

The Phase II surface water sampling program included quarterly sample collection from the previous seven Phase I locations as well as three additional locations. All samples were analyzed for dissolved PP metals (USEPA Method 6010) and explosives (USEPA Method 8330). Hardness data were also collected during Quarters 3 and 4.

Surface Soil Sampling

A total of 43 surface soil samples (composite and grab) were collected during the Quarter 1 event and analyzed for PP metals, explosives, pesticides, and/or VPH/EPH, as appropriate. Phase II soil sampling locations were chosen from areas where Phase I data indicated elevated levels of contaminants. The Phase II sampling was designed to characterize the vertical and horizontal extent of contamination at previously sampled areas and to confirm the magnitude of the contaminant levels found during the Phase I investigation. Samples were collected at the original Phase I sampling locations (0 to 0.5 feet below ground surface (bgs)) that showed elevated contaminant concentrations to confirm the magnitude of the previously detected levels. In addition, samples were collected at the 1.0 to 1.5 feet bgs interval below that sample to delineate the vertical extent of contamination. Composite samples were also collected around the original Phase I sampling locations that showed elevated contaminant concentrations to delineate the horizontal extent of contamination.

Additional soil samples were collected in an effort to characterize non-target areas on the island. Non-target areas are defined as those areas in the northeastern and eastern coastal portions of the island that were designated as "No Fire Zones" around 1970 based upon the known nesting of a number of wildlife species in these areas. During the Phase I and Phase II field investigations, the field team did not observe any evidence of Navy ordnance expenditure within this part of the island.

Since the Phase II data revealed that levels of contaminants were significantly lower in both the horizontal and vertical directions from the original area of concern, soil sampling did not continue in Quarters 2, 3, and 4 of the Phase II program.

Sediment Sampling

A total of 21 sediment samples were collected and analyzed during the Phase II program. The Former Debris Area (FDA) was first selected for sediment sampling during the Quarter 1 event because levels of lead and zinc were previously detected during Phase I sampling rounds. Three samples were analyzed for PP metals only. Nine sediment samples were also collected on the site in areas that included the FDA, Ben's Pond, and Rainbow Pond, the man-made pond within the vicinity of the Summit Target Area, West End Target Area, Aviation Landing Strip Target Area, and the Southeast Corner of the island. These samples were analyzed for acid volatile sulfide/simultaneously extracted metals (AVS/SEM).

Marine sediment sampling was also performed and included the collection of nine samples along the island's shoreline. The locations were determined by the areas most likely to be accessed by USFWS personnel or potential trespassers in order to access the island, and areas where surface water bodies discharged into the ocean. Five samples were analyzed for both PP metals and AVS/SEM, while the remaining four were analyzed for PP metals only.

4.6.2 Results/Conclusions

The Phase I and subsequent Phase II Quarters 1-4 investigations by TtEC identified the presence of metals in soil, sediments, surface water, and groundwater at the site. In addition, limited detections of EPHs, VOCs, and pesticides were found in select site samples. Although a subset of samples in each phase of sampling was analyzed for explosives, explosives parameters were detected in only three samples during Phase I. No explosives were detected in subsequent Phase II Quarters 1-4 confirmation sampling.

Upon completion of the Phase II Comprehensive Site Assessment (CSA) activities, the site was re-scored, using the Numerical Ranking Scoresheet, as a Tier 1A site. A discussion with MassDEP had indicated that the site is considered part of Cape Cod and the Islands. Therefore, the site was considered as a potentially productive aquifer resulting in a higher score with GW-1 criteria applicable. The MassDEP concurred with the site re-scoring and the Tier 1A designation.

The findings of the Phase II assessment can be divided into four aspects under the MCP Method 3 Risk Characterization: risk to human health, risk to environment, risk to public welfare, and risk to safety. These findings are described in Section 4.7.

4.7 Risk Characterization

Risk to Human Health

The human health risk assessment characterized the potential risks to USFWS workers, adult and child trespassers and authorized visitors. The human health risk assessment was prepared based upon the current and reasonably foreseeable future use of the island as an unstaffed wildlife refuge. Based on the exposure frequencies and duration associated with these receptors and the contaminated media identified, a condition of "No Significant Risk" was established for human health.

Risk to Public Welfare

In accordance with 310 CMR 40.0994, a characterization of risk to public welfare was also conducted. This characterization consisted of two aspects – a comparison of the levels of the COCs detected on the island and an evaluation of nuisance conditions and significant community effects. A comparison of exposure point concentrations (EPCs) developed for soil and groundwater for each COC indicated that the chemical specific upper concentration limits (UCLs) for these media were not exceeded. No specific nuisance or negative impacts associated with the conditions on the island were identified. Therefore, a condition of "No Significant Risk" to public welfare was established for the island based on its current and foreseeable use.

Risk to the Environment

The characterization of the potential risk to ecological receptors on-island and in the near shore environment (off-island) did not reach a finding of "No Significant Risk" during the Phase II program. A supplemental investigation to the Phase II was conducted to further characterize the site and to determine the risk to the environment. This Phase IIA investigation is discussed in Section 4.8. An Environmental Risk Management Memorandum was drafted to provide a concise document indicating specific locations of concern, impacts, and proposed action. This Environmental Risk Management Memorandum is discussed in Section 4.12.

Risk to Public Safety

An evaluation of the potential risk to safety in consideration of the ordnance that may be present in the subsurface and near shoreline environment did not find a condition of "No Significant Risk" to public safety. A Phase IIB evaluation was then implemented to present an expanded conceptual site model to more completely evaluate the site with respect to explosive safety. A summary of this evaluation and findings is presented in Section 4.14.

4.8 Phase IIA Supplemental CSA – Risk to Environment

4.8.1 Introduction/Purpose

A Phase IIA investigation was conducted in 2001. The purpose of the Phase IIA CSA was to:

- Further characterize the nature and extent of contamination from specific areas that were recommended for further assessment in the Phase II CSA Report (FWENC 2001).
- Incorporate the chemical data obtained from the Supplemental Environmental Baseline Survey (SEBS) into the overall ecological risk assessment for the site.
- Determine whether a significant risk to the environment is present at the site as related to the conclusions discussed within the second revision Phase IIA CSA Supplemental Investigation – Risk to the Environment Report, (TtEC 2004d).

Former Debris Area – Surface Soil and Wetland Sediment Sampling

Samples were collected for surface sediment (0-0.5 feet bgs) at all sample locations and for subsurface sediment (0.5-1 feet bgs) at select locations within the FDA wetlands. Surface soil samples (0-0.5 feet bgs) were collected from all soil sample locations in the FDA and from the subsurface (0.5-1 feet bgs) from select locations.

Nearshore Marine Areas – Sediment Sampling

Marine sediment samples were collected from seven potential nearshore areas (MT-01 to MT-07) identified as potentially receiving on-island contaminant run-off.

Nearshore Marine Areas – *Mytilus edulis* Evaluation

A nearshore biological sampling program was performed to assess if a complete pathway from the on-island sources to nearshore biota exists. This program focused on exposure in the nearshore environment in shallow waters. Shallow waters were defined to be from surface to 10 feet in depth below mean low tide. This effort included the collection and sampling of native *Mytilus edulis* (Blue Mussel) and transplanted mussels (deployment of shellfish cages).

4.8.2 Results/Conclusions

Phase IIA results for the FDA were incorporated into the overall risk assessment. Generally the PP metals concentrations detected were found to be low in the nearshore marine areas and within the range of metals detected from the beach areas during the Phase II investigation. No explosives related compounds were detected in the nearshore marine sediment samples. The work performed and results are provided in the Phase IIA CSA Supplemental Investigation – Risk to the Environment Report, (TtEC 2004d).

Statistical comparisons between the transplanted blue mussels deployed in shallow sub tidal waters and a cage of transplant mussels deployed for the same period from a background location (near Menemsha Harbor), revealed no significant differences in metals concentrations in tissues. Collection of replicate, indigenous blue mussel samples from the inter-tidal zone around the island revealed concentration of Chromium and Nickel to be slightly elevated when compared to blue mussels collected from Martha's Vineyard and these two metals also exceeded corresponding tissue based NOAEL values. Results of the evaluation indicate that exposure to explosives is not occurring in near-shore marine life. Exposure to most metals appears to be occurring but this exposure was deemed to be insignificant when compared to site-specific and regional reference tissue data and to effects-based NOAEL levels. The only exception appears to be near the West End Target area in which slightly higher exposure may be occurring resulting in exceedance reference tissue concentrations and NOAEL based values for Chromium and Nickel. A potential pathway from the target areas into the near shoreline environment is suggested by the presence of metals in the source area soils, sediments, and biological tissue samples collected in the shallow waters around the island. The presence of scattered ordnance in addition to pipes, lobster cages, pilings and other miscellaneous metal debris present on the beach could also be contributing to the slightly elevated levels of metals in the inter-tidal zone around Nomans Land Island. A finding of potential risk to marine life was determined, based upon exceedances of literature based NOAEL values and a difference in the indigenous mussel data when compared to reference tissue data.

4.9 Supplemental Environmental Baseline Survey

4.9.1 Introduction/Purpose

The SEBS report (TtEC 2004c) detailed the results of the SEBS program (conducted in the summer of 2003), which assessed various information sources as they related to the Conceptual Site Models (CSMs) for the site and the overall site characterization. The following surveys/assessments were performed to gather additional data:

- Aerial Photographic Site Analysis – Research was performed to locate all available aerial photographs for the site. As a result 16 aerial photographs ranging from 1941 to 1999 were located and utilized during the analysis. This analysis is described within the Aerial Photographic Site Analysis Report, dated February 2002.

- Airborne Magnetometry Survey – Between October 21, 2001 and October 28, 2001 an airborne magnetometry survey was conducted for the site with the purpose of mapping underground ferrous items. The Report on Airborne Geophysical Survey Report , dated March 2002, provides the description and results of this effort.

- Historical Research for Military Documentation – The Ordnance and Explosives Engineering Section within the U.S. Army Corps of Engineers (USACE), Rock Island District, was tasked with locating and documenting appropriate classified and unclassified ordnance and chemical historical documentation at the National Archives and Records Administration (NARA), DoD, Library of Congress, and on-line repositories. This research is described within the Historical Research for Military Documentation Report, dated January 4, 2002).

- Historical Design Drawings – Research was performed into base closure archives for the former Naval Air Station South Weymouth to determine if additional historical information could be obtained regarding the construction of the island as a military target range. Many design drawings were discovered and utilized in the SEBS program.
- Public Interviews – Additional public interviews were performed on Martha's Vineyard during three separate sessions on December 11, 12, and 13, 2001. The results of these interviews were incorporated into the SEBS program and are presented within the Interview Summary Letter Report, dated March 15, 2002.
- Geographic Information System (GIS) – To incorporate all of these information sources an extensive GIS was developed. The base layer for this GIS was the photogramatic base map that was flown in 2001. The GIS allowed the data to be presented, analyzed, evaluated, and taken into the field to be appropriately investigated.

4.9.2 Results/Conclusions

A total of 102 prominent features were identified from this program and assessed. Relatively minor features were not considered to be environmentally significant and were not assessed further. Of the 102 prominent features identified, 19 of these features were determined to warrant further field investigation as Review Items addressed during the summer of 2003. The other 83 features were identified/assessed with available information and were determined to not warrant further environmental investigation.

The SEBS report finalized on December 3, 2003 described the 20 Review Items that were investigated, assessed, and/or remediated. Table 4-2 provides a summary of the Review Items (and additional sampling areas requested from the MADEP) and their investigative conclusions/findings that were included in the SEBS Completion Report, dated August 27, 2004 (TtEC 2004c).

The MassDEP also requested that additional soil sampling be performed throughout the site at locations/areas selected by the MassDEP. The results of these analysis were incorporated into the overall chemistry database for the site and incorporated into the site risk assessments. A MassDEP representative was present during the implementation of the SEBS field program and assisted in decision-making associated with Review Item close-out.

4.10 UST/Septic System/Dry Well Closure RAM

4.10.1 Introduction/Purpose

The RAM completed in 2003 consisted of five excavations, to address four Review Items from the SEBS, as follows.

- Review Item N-19 – Former Personnel Building UST
- Review Item N-22 – Possible Former Heater House UST
- Review Item N-14 – Former Garage Building Dry Wells
- Review Item FDA-5 – Former Debris Area Septic Tank Location

4.10.2 Results/Conclusions

Review Item N-19 – Former Personnel Building UST

Review Item N-19 addressed a 275-gallon gasoline storage tank located at the northeast side of the former Personnel Building. The tank (and contaminated soils) were located, excavated, backfilled and the area restored.

Review Item N-22 – Possible Former Heater House UST

Review Item N-22 represented a 550-gallon gasoline storage tank associated with the former Heater House. Since there was no evidence that the Heater House had been built, and the test pit information yielded no evidence of a gasoline storage tank, it was determined that the UST was not present. Both test pits were backfilled with the soil that was excavated, and the areas were seeded.

Review Item N-14 – Former Garage Building Dry Wells

At Review Item N-14, the Former Garage Building, were two dry wells associated with the former structure. The dry wells were located and removed, confirmatory samples were collected, and the site was restored.

Review Item FDA-5 – Former Debris Area Septic Tank Location

In the FDA, a septic system was located that likely serviced the former Quonset huts. The pipe leading from the Quonset hut to the possible septic tank was uncovered and the former septic tank location was found (though the tank had previously been removed), confirmatory samples were collected, and the site was restored.

The findings and conclusions of this RAM were presented in the FDA RAM Completion Report dated, December 19, 2006.

4.11 2003 Limited MEC Surface Clearance

4.11.1 Introduction/Purpose

The 2003 Limited MEC Surface Clearance consisted of a site reconnaissance and MEC assessment, demolition and removal effort. Accessible coastline, roads, and three interior grids were included in this scope with the purpose to evaluate the potential for MEC to migrate to the surface of the site.

4.11.2 Results/Conclusions

Overall, 63 MEC items were observed and removed from along the shoreline. Two MEC items were discovered upland. One was located along a road that appeared to be relocated due to surface runoff and the other was incidental to environmental investigations. These items were properly evaluated, demilitarized, certified, and sent off-site for recycling/disposal. This surface clearance was documented within the Ordnance RAM Completion Report, dated May 14, 2004.

4.12 Environmental Risk Management Memorandum

4.12.1 Introduction/Purpose

At the request of the Navy, USFWS, and the MassDEP, TtEC drafted an Environmental Risk Management Memorandum, which provided a supplemental evaluation of the extent of areas potentially impacted by the historical use on the site and the potential risk reduction in these areas if hypothetical removal actions were to occur at discrete locations. This supplemental evaluation provided a more realistic estimate of exposure by re-evaluating the no observable adverse effects level (NOAEL) and the lowest observable adverse effects level (LOAEL) for songbirds through utilization of the mean Bioaccumulation Factor (BAF) and the natural log (LN) mean BAF in addition to the 90^{th} percentile BAF. These supplemental evaluations were requested by the USFWS to provide a more accurate and realistic estimation for risk management decision-making.

Numerous project management meetings and conference calls were conducted with the Navy, USFWS, and MassDEP throughout the development of the Environmental Risk Management Memorandum. The final version of the Environmental Risk Management Memorandum, dated April 24, 2006, detailed that utilization of the mean LN BAF resulted in no LOAEL based exceedances for cadmium, chromium, lead, or zinc on an island-wide basis for the songbird. However, the FDA wetland soil/sediment did exceed multiple benthic community endpoints.

4.12.2 Results/Conclusions

Upon discussion of these results with the Navy, USFWS, and MassDEP, it was concluded that a level of "No Significant Risk" to environmental receptors associated with the soil/invertebrate pathway related to the target areas had been achieved. Furthermore, it was concluded that remedial action should be performed at the FDA in order to remove the source material in the FDA slope. This source material was believed to contribute to downgradient soil/sediment (located in the FDA wetland) exceeding multiple benthic community endpoints. The USFWS drafted a letter dated August 5, 2006 in response to the final Environmental Risk Management Memorandum. This letter included four recommendations as follows:

Recommendation 1	A limited removal and restoration of wetland sediment appears to be warranted at the toe of the slope associated with the FDA in the vicinity of sample point MP1-01.
Recommendation 2	Indications that there is buried metallic debris remaining in the slope above the FDA wetland should be evaluated and remedied by appropriate removal and restoration actions.
Recommendation 3	Indications that there may be one or two isolated "hot spots" of elevated zinc concentrations within Area A2 and/or A1 of the Former Aviation Landing Strip Target location should be further evaluated, and limited soil removal and restoration actions be completed as warranted.
Recommendation 4	Soil removal actions to alleviate low predicted risk to insectivorous birds due to soil concentrations of cadmium, chromium, lead, and zinc are not warranted at any target area (with the exception of zinc at one or two isolated areas at the Aviation Landing Strip, as discussed in the preceding paragraph).

Through the Environmental Risk Management Memorandum, project management discussions, and the implementation of the USFWS recommendations listed above, a level of "No Significant Risk" to environment has been achieved for this site. Section 4.14 below discusses the implementation of the USFWS recommendations.

4.13 Former Debris Area RAM

4.13.1 Introduction/Purpose

The objectives of this RAM were two-fold:

- Removal of buried metal debris in the upgradient FDA slope; and
- Removal of soil/sediment sample MP1-01.

These two objectives addressed USFWS recommendations 1 and 2 on the Environmental Risk Management Memorandum, dated April 24, 2006. In addition to the above objectives, the USFWS also requested that further evaluation occur at the Aviation Landing Strip Areas A1 and A2. Therefore, the Navy, USFWS, and MassDEP agreed on a grid surface soil field screening approach for metals (cadmium, lead, chromium, and zinc) analysis at these areas. This approach was built into the RAM/Work Plan and addressed USFWS recommendations 3 and 4.

4.13.2 Results/Conclusions

Field activities were conducted from August 28, 2006 to September 26, 2006, resulting in the excavation and mechanical screening of approximately 900 cubic yards of soil from the FDA slope. Twenty-eight hundred (2,800) pounds of scrap metal/debris was removed and recycled off-site. The MP1-01 sample location was excavated (approximately 2 feet by 2 feet by 2 feet) and approximately one cubic yard of sediment was removed and disposed of offsite. X-ray fluorescence (XRF) field screening was performed on three areas (Areas A1, A2, and A3) at the Aviation Landing Strip. A total of 43 samples were analyzed in the field and six were sent off-site for laboratory analytical comparisons. Field screening and off-site chemistry results indicted levels of metals in the surface soils were much lower than previous biased sampling had indicated. The FDA RAM Completion Report, dated December 19, 2006 (TtEC 2004e) presents the results of the implementation of the FDA RAM.

4.14 Phase IIB CSA – Risk to Safety

4.14.1 Introduction/Purpose

The Phase IIB report, dated April 25, 2006 addresses ordnance safety at Nomans Land Island, in accordance with the DoD and USEPA Unexploded Ordnance Management Principles for Closed, Transferring, and Transferred Ranges dated 7 March 2000 (USEPA 2000). These principles include authority granted to DoD relative to ordnance safety and CERCLA. This analysis also follows MCP regulations. The Phase IIB analysis was performed to further evaluate the risk to safety posed by ordnance and munitions items at the Nomans Land Island Site. An earlier Phase II analysis following the MCP guidelines (referred to as the "original analysis") concluded that a finding of "No Significant Risk" relative to safety had not been established pending completion of DoD actions to address explosives safety due to the current and future potential for trespassers to the island to be exposed to energetic ordnance and explosive items that may be present.

4.14.2 Results/Conclusions

The Phase IIB CSA was conducted to further explore the original analysis of risk to safety in accordance with the provisions of the MCP. The Phase IIB CSA Report, dated April 25, 2006 identifies a number of possible measures to increase public awareness to ordnance hazards and addresses the issue of trespassing at the Site. These measures have been discussed with stakeholders (consistent with DoD/USEPA Management Principles), during a previous TRC meeting, and are being evaluated within the Phase III/FS (see Section 4.16).

4.15 2008 MEC Surface Clearance

4.15.1 Introduction/Purpose

The 2008 effort was comprehensive and included the nearshore coastline and areas found to have significant concentrations of ordnance during the 1998 clearance.

4.15.2 Results/Conclusions

A total of 394 munitions-related items were encountered (not including scrap recovered from grids), documented, and disposed off-site. A total of 16,119 pounds of materials documented as safe (MDAS) were recycled. The land area under this scope included the western portion of the island (not including the eastern historic no-fly zone). The controlled burn did not sufficiently reduce the vegetation in many areas, creating a physical barrier for field personnel conducting the clearance operations and resulted in areas being inaccessible. This inaccessibility also creates a physical barrier inhibiting access for potential trespassers on the site. The magnetometry data (originating from the airborne magnetometer survey conducted in 2001) demonstrates that that the priority areas were cleared. The priority areas refer to the target areas, paths/roads, beaches, etc. The historical target areas and the magnetometry data confirm that these areas exhibit the highest degrees of subsurface ferrous content. Further description of the work performed and results can be found in the 2008 MEC Surface Clearance Completion Report, dated March 27, 2009.

4.16 Phase III/FS

4.16.1 Introduction/Purpose

As described within Section 9.0 the Phase IIA Comprehensive Site Assessment Supplemental Investigation – Risk to the Environment Report, dated September 10, 2004 (TtEC 2004d), the specific objectives of this Phase III/FS Report are threefold:

- Identify RAAs to address the risk to safety;
- Evaluate RAAs in accordance with MCP and CERCLA requirements; and
- Select an RAA to appropriately address the risk to safety to obtain a Permanent Solution and the RAO proposed, as well as a Record of Decision (ROD) under CERCLA.

As a result of finalizing of the Environmental Risk Management Memorandum and implementation of the FDA RAM, a level of "No Significant Risk" to the environment has been achieved. Therefore, the Phase III/FS report is focused on "risk to safety." MEC remain in subsurface soils and have the potential to migrate to the surface through frost heave and erosion. The objective of this Phase III/FS Report is to reach a remedy for the site. The overall objective is to select alternatives which, when implemented, will reduce receptor exposure to MEC remaining in site soils.

4.16.2 Results/Conclusions

The projected future use of Nomans Land Island remains that of an unstaffed wildlife refuge. This future use plays a direct role in the identification, screening, and detailed evaluation of alternatives included within the Phase III/FS Report. It is known that trespassing does occur on the site, thus producing a risk to safety. This scenario has been evaluated in detail within the environmental, human health, and safety risk assessments performed for this project. The Draft Phase III/FS report dated June 5, 2009 was submitted to the USFWS and MassDEP on June 5, 2009 for their review and comment.

5.0 OPERATION AND MAINTENANCE

Operation and maintenance activities associated with the "risk to safety" at the site continue to be on-going. The activities monitor, assess, remove/remediate, and document the potential for MEC to remain on the site.

5.1 In-place Activities

MEC Awareness Pamphlet, Training, and Education

A MEC awareness pamphlet, dated December 22, 2005 was prepared and submitted to the USFWS for their use in managing the island. This pamphlet presents the following information:

- Line drawings or photographs of common MEC items;
- Safety precautions to be observed when encountering MEC items;
- MEC site marking procedures; and
- Contact information for the Navy EOD unit responsible for the Island.

A master copy of this handout was provided to the Eastern Massachusetts National Wildlife Refuge Complex headquarters for future copying and distribution to official Island visitors. USFWS staff and authorized visitors visit the island periodically and educate trespassers (if encountered) as to the restricted nature of the island and possible enforcement actions that may be applied.

Water and Air Space Restrictions

The Navy, in cooperation with the Federal Aviation Administration, designated the airspace surrounding the island as Restricted Area R-4105. The Navy, in cooperation with the U.S. Coast Guard, designated the waters surrounding the island as Prohibited Area 204.5, and required this designation to appear on National Oceanic and Atmospheric Administration surface charts. The waters and air space around the island are restricted and not to be entered without authorization (with resulting fines and enforcement provisions).

Signage

Two types of signage are currently installed along the upland shoreline of the island at strategic locations. USFWS refuge signs indicate that the island is a Wildlife Refuge and is closed to public access. The second type of signs that are strategically placed throughout the site are Navy ordnance warning signs describing the island as a Danger Zone and off-limits. These signs are inspected and maintained by the USFWS. During the MEC surface clearance conducted in 2008 four signs were replaced.

MEC Response

The Navy has been assigned the responsibility of responding to any reports of MEC discovered, marked, and noted on a map of the island by USFWS Workers or Authorized Visitors. The response will be immediate if the situation is deemed critical to the safety of the on-island personnel or may be delayed until the next time appropriately trained EOD personnel are scheduled to be on the Island. A database documents these sightings for future evaluation.

MEC Removal Actions

Three MEC surface clearances have been conducted on the site. The most comprehensive effort was conducted in 1998 followed by a 2003 MEC clearance along the accessible portions of the site including the shoreline and upland roads. The recent 2008 MEC surface clearance was focused on those areas from the 1998 effort where elevated levels of MEC were encountered and all other accessible areas.

5.2 Future Activities

Currently, the Phase III/FS report is being reviewed by the USFWS and MassDEP. The finalization of this report will describe the institutional controls to be implemented to address the "risk to safety" on the site.

6.0 CONCLUSION

A level of "no significant risk" has been established on this site in relation to the environment, human health, and public welfare aspects. The "risk to safety" (related to the potential for MEC to migrate to the site surface with the potential to come into contact with site receptors) is being managed by the institutional controls already in-place (as described in Section 5.0). The Phase III/FS Report, focused on addressing "risk to safety" has been submitted to the USFWS and the MassDEP and is currently under review. A Proposed Remedial Action Plan (PRAP) will be developed and a ROD will be prepared to implement the selected remedy (resulting from the Phase III/FS process) to address the "risk to safety" remaining on the island.

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TABLES

Table 3-1
Project Stakeholder Roles and Responsibilities

Stakeholder	Project Role	Project Responsibility
Primary Stakeholders		
United States Navy	Previous site owner and operator	Overall funding and project management of the site environmental and safety program.
United States Fish and Wildlife Service	Current site owner and operator	Overall operation of the site in accordance with the current site use as an unstaffed wildlife refuge.
Massachusetts Department of Environmental Protection	State regulator	Ensure project compliance with state statutes and regulations.
Technical Review Committee (TRC)		
Wampanoag Tribe of Gay Head, Aquinnah	TRC member	Review and comment of project reports.
Massachusetts Division of Marine Fisheries	TRC member	Review and comment of project reports.
Massachusetts Department of Public Health	TRC member	Review and comment of project reports.
Chilmark Conservation Commission	TRC member	Review and comment of project reports.
Chilmark Board of Health	TRC member	Review and comment of project reports.
Chilmark Board of Selectmen	TRC member	Review and comment of project reports.
Aquinnah Board of Health	TRC member	Review and comment of project reports.
Aquinnah Board of Selectmen	TRC member	Review and comment of project reports.

Table 4-1
Environmental Baseline Survey Review Item Summary

Review Item	Description	Conclusion
#67	Areas of stressed and burnt vegetation (observed in 1995)	According to the EBST report, the areas of stressed and burnt vegetation were temporary impacts as a result of target activities.
#68	Rust colored water and bombs in Ben's Pond	Ben's Pond surface water sampling and sediment sampling concludes COCs are present. These results were incorporated into the Phase I, II, and IIA reports.
#69	Solid waste on the shoreline	According to the EBST report, the debris has not been identified to consist of hazardous materials.
#70	Remains of Seabee buildings; possible storage of hazardous materials	No hazardous materials identified. Dry wells investigated in 2003.
#71	Scrap metal northeast of Ben's Pond	Removed during Ordnance Removal RAM in 1998.
#72	Bombs and bomb debris scattered over the entire island	Ordnance Removal RAM implemented in 1998.
#73	Vent pipe near the remains of the SeaBee buildings; possible use and storage of fuel oil	Piping and USTs removed (1998).
#74	An underground pipe that was open to the shoreline near the SeaBee dock; possible use and storage of hazardous materials	Piping and USTs removed (1998).
#75	Minor evidence of live ammunition (not bombs, but auxiliaries) and evidence of live bombing (e.g., craters)	Stated in the EBST report, the Navy will continue to be responsible for addressing the potential for any newly identified surface UXO brought to the Navy's attention, in accordance with the DDESB Board management plan for addressing explosive safety.
#81	Possible use of spent uranium in practice ammunition rounds	DU survey conducted in 1998 on ordnance removed from site indicates that no DU was present.

Table 4-2
SEBS Review Item/Additional Areas Summary

Review Item	Description	Conclusion/Findings
Review Item N-101	Barge/Pier	Investigated and found to not warrant further assessment and/or sampling.
Review Item N-13	Linear Anomaly	Investigated and found to not warrant further assessment and/or sampling.
Review Item N-14	Possible two dry-wells	Investigated per RAM Plan.
Review Item N-19	Possible 275 gallon UST	Investigated, assessed, and removed. Impacted soils remediated as part of RAM Plan.
Review Item N-22	Possible 550 gallon fuel oil tank – Heater House	Investigated and found to not warrant further assessment and/or sampling.
Review Item N-2	Two Areas of Open Storage	Investigated and found to not warrant further assessment and/or sampling.
Review Item W-6	Two Strafing Target	Nineteen surface soil samples were collected at each strafing target (total of 38 samples). Samples were analyzed for PP metals and explosives analyses. Results indicate low to moderate levels of metals including one detection of 332 mg/Kg for lead. No explosives were detected in the samples from the strafing target areas.
Review Item N-104	Storage Pad	Six surface soil samples were collected from around the perimeter of the Storage Pad. These samples were analyzed for PP metals, VOCs, SVOCs, VPH, EPH, and pesticides. Results indicate low levels of polynuclear aromatic hydrocarbons (PAHs) (no detectable petroleum hydrocarbon ranges), low levels of metals, and trace concentrations of volatile organics. No pesticides were detected in the samples collected.
Review Item N-105	Unknown Anomaly with Staining	Three surface soil samples were collected within the perimeter of this area. These samples were analyzed for PP metals, VOCs, SVOCs, VPH, EPH, pesticides, and explosives. Results indicate low levels of PAHs (with some evidence of EPH ranges), low levels of metals, and trace concentrations of volatile organics. No explosive compounds or pesticides were detected in the soil samples collected.
Review Item N-7	One Excavation with Dark Material	Four surface soil samples were collected and analyzed for PP metals, VOCs, SVOCs, VPH, EPH, and pesticides. Results indicate low levels of PAHs (some low level detections of petroleum hydrocarbon ranges (EPH and VPH)), and low levels of metals. No pesticides were detected in the samples collected.
Review Item B-1	Ben's Pond	Nitroglycerin was detected in one sediment sample at 3.6 mg/Kg and 3-nitrotoluene (1.9 mg/Kg) was detected at another sediment location. Concentrations for metals in the sediments were generally low to moderate. Sediment samples were found to have concentrations for arsenic, cadmium, chromium, copper, lead, mercury and zinc that exceeded the freshwater sediment screening benchmarks (MassDEP 2002). Surface water samples were collected from select locations collocated with sediment samples. Surface water samples were collected for explosives, metals and perchlorate analysis. Explosive compounds and perchlorate were not detected in any of the surface water samples collected. Trace to low levels of metals were detected in the surface water samples.
Review Item FDA-101	Fuel Oil Aboveground Storage Tank (AST)	Two surface soil samples were collected and analyzed for VPH and EPH parameters. Results indicate one sample had low concentrations of EPH ranges. No benzene, toluene, ethylbenzene, and xylene (BTEX) or PAHs were detected above the sample reporting limits.
Review Item FDA-102	Drum Storage Area	Four surface soil samples were collected and analyzed for VPH, EPH, VOCs, SVOCs, and pesticides. Results indicate low concentrations of PAHs (with low levels of EPH ranges), low concentration detects for DDT (0.021 mg/Kg), and trace levels of volatile organics.

Table 4-2 - *cont'd*
SEBS Review Item/Additional Areas Summary

Review Item	Description	Conclusion/Findings
Review Item FDA - 5	Possible Septic Tank	Investigated, assessed, and evaluated as part of RAM Plan.
Review Item S-4	Unknown Anomaly with Excavation	Two surface soils were collected and analyzed for VOCs, SVOCs, pesticides, PP metals, and explosives. No petroleum range hydrocarbon, SVOCs, explosive compounds or pesticides were detected in the samples collected.
Review Item S-7	Possible Shipwreck	Investigated and found to not warrant further assessment and/or sampling.
Review Item A-4	Aviation Landing Strip – possible horizontal tank	Investigated and found to not warrant further assessment and/or sampling.
Review Item A-5	Possible trench	Investigated and found to not warrant further assessment and/or sampling.
Review Item A-7	Aviation Landing Strip – possible horizontal tank	Investigated and found to not warrant further assessment and/or sampling.
Review Item A-8	Possible Culvert	Investigated and found to not warrant further assessment and/or sampling.
Rainbow Pond	-	Sediment samples were collected from Rainbow Pond to be used as a background comparison to the historically impacted Ben's Pond. Sediment samples were collected for explosives, metals, perchlorate, AVS/SEM and grain size analysis. No explosive compounds were detected in the sediment samples collected from Rainbow Pond. Metals concentrations were generally low to moderate with results for cadmium, copper, lead, mercury and zinc exceeding freshwater sediment benchmark values. Surface water samples were collected from select locations co-located with sediment samples. Surface water samples were collected for explosives, metals, and perchlorate analysis. Explosive compounds and perchlorate were not detected in any of the surface water samples collected. Trace to low levels of metals were detected in the surface water sample.
Anomaly Area A-A	-	Anomaly was found to be an MK82 – 500-lb practice bomb (with a possible live fuse). Two downgradient groundwater wells were analyzed for PP metals, explosives, and perchlorate. Results indicate no detectable explosive compounds and trace levels of metals. Also, one sediment sample was collected directly alongside the MK82 item. This sediment sample was analyzed for PP metals, explosives, and perchlorate. Results indicate relatively low levels of metals.
Additional Sampling Area A-A	-	Three sediment and surface soil samples were collected. The sediment samples were analyzed for PP metals, explosives, and perchlorate. Results indicate low levels of metals and no detectable concentrations of explosive compounds. The surface soil samples were analyzed for PP metals and explosives. Results indicate no explosives were detected and only low levels of metals were reported.
Anomaly Area A-B	-	Two surface soil samples were collected from a drainage channel directly south of this area. These samples were analyzed for PP metals and explosives. Results indicate no detectable explosive compounds and trace to low concentrations of metals.
Additional Sampling Area A-B	-	Twenty-eight surface soil samples were collected. These samples were analyzed for PP metals and explosives. Results indicate no detections for explosive compounds except for one sample (NL-SS-AB26-0-0.5) with reported concentrations of pentaerythritol tetranitrate (PETN) and picric acid. Metals concentrations are generally low for samples collected in the area.
Anomaly Area A-C		Two surface soil samples were collected from the drainage channel located to the southwest of the Anomaly

Table 4-2 - *cont'd*
SEBS Review Item/Additional Areas Summary

Review Item	Description	Conclusion/Findings
	-	Area. These samples were analyzed for PP metals and explosives. Results indicate trace to low concentrations for metals and one low level detect of tetryl at one location (NL-SS-01-0-0.5).
Anomaly Area S-A/Additional Sampling Area S-A	-	Twenty surface soil samples were collected. These samples were analyzed for PP metals and explosives. Results indicate no detectable level of explosive compounds and trace to low concentrations of metals in the soil.
Anomaly Area E-A	-	One downgradient groundwater well was sampled for PP metals, explosives, and perchlorate. Results indicate no detectable explosives and trace to low concentrations of metals

Appendix I

Erin Victory/TCI

Refuge beaches

SLAMM (Sea Level Affecting Marshes Model) Analysis

Application of the Sea-Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR

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Application of the Sea-Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR

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Introduction

Tidal marshes are among the most susceptible ecosystems to climate change, especially accelerated sea level rise (SLR). The International Panel on Climate Change (IPCC) Special Report on Emissions Scenarios (SRES) suggested that global sea level will increase by approximately 30 cm to 100 cm by 2100 (IPCC 2001). Rahmstorf (2007) suggests that this range may be too conservative and that the feasible range by 2100 could be 50 to 140 cm. Pfeffer et al. (2008) suggests that 200 cm by 2100 is at the upper end of plausible scenarios due to physical limitations on glaciological conditions. Rising sea level may result in tidal marsh submergence (Moorhead and Brinson 1995) and habitat migration as salt marshes transgress landward and replace tidal freshwater and brackish marsh (Park et al. 1991).

In an effort to address the potential effects of sea level rise on United States national wildlife refuges, the U. S. Fish and Wildlife Service contracted the application of the SLAMM model for most Region 4 refuges. This analysis is designed to assist in the production of comprehensive conservation plans (CCPs) for each refuge along with other long-term management plans.

Model Summary

Changes in tidal marsh area and habitat type in response to sea-level rise were modeled using the Sea Level Affecting Marshes Model (SLAMM 5.0) that accounts for the dominant processes involved in wetland conversion and shoreline modifications during long-term sea level rise (Park et al. 1989; www.warrenpinnacle.com/prof/SLAMM).

Successive versions of the model have been used to estimate the impacts of sea level rise on the coasts of the U.S. (Titus et al., 1991; Lee, J.K., R.A. Park, and P.W. Mausel. 1992; Park, R.A., J.K. Lee, and D. Canning 1993; Galbraith, H., R. Jones, R.A. Park, J.S. Clough, S. Herrod-Julius, B. Harrington, and G. Page. 2002; National Wildlife Federation et al., 2006; Glick, Clough, et al. 2007; Craft et al., 2009.

Within SLAMM, there are five primary processes that affect wetland fate under different scenarios of sea-level rise:

- **Inundation:** The rise of water levels and the salt boundary are tracked by reducing elevations of each cell as sea levels rise, thus keeping mean tide level (MTL) constant at zero. The effects on each cell are calculated based on the minimum elevation and slope of that cell.
- **Erosion:** Erosion is triggered based on a threshold of maximum fetch and the proximity of the marsh to estuarine water or open ocean. When these conditions are met, horizontal erosion occurs at a rate based on site-specific data.
- **Overwash:** Barrier islands of under 500 meters width are assumed to undergo overwash during each 25-year time-step due to storms. Beach migration and transport of sediments are calculated.
- **Saturation:** Coastal swamps and fresh marshes can migrate onto adjacent uplands as a response of the fresh water table to rising sea level close to the coast.

- **Accretion:** Sea level rise is offset by sedimentation and vertical accretion using average or site-specific values for each wetland category. Accretion rates may be spatially variable within a given model domain.

SLAMM Version 5.0 is the latest version of the SLAMM Model, developed in 2006/2007 and based on SLAMM 4.0. SLAMM 5.0 provides the following refinements:

- The capability to simulate fixed levels of sea-level rise by 2100 in case IPCC estimates of sea-level rise prove to be too conservative;
- Additional model categories such as "Inland Shore," "Irregularly Flooded (Brackish) Marsh," and "Tidal Swamp."
- *Optional.* In a defined estuary, salt marsh, brackish marsh, and tidal fresh marsh can migrate based on changes in salinity, using a simple though geographically-realistic salt wedge model. This optional model was not used when creating results for Nomans Land Island NWR.

Model results presented in this report were produced using SLAMM version 5.0.1 which was released in early 2008 based on only minor refinements to the original SLAMM 5.0 model. Specifically, the accretion rates for swamps were modified based on additional literature review. For a thorough accounting of SLAMM model processes and the underlying assumptions and equations, please see the SLAMM 5.0.1 technical documentation (Clough and Park, 2008). This document is available at http://warrenpinnacle.com/prof/SLAMM

All model results are subject to uncertainty due to limitations in input data, incomplete knowledge about factors that control the behavior of the system being modeled, and simplifications of the system (CREM 2008).

Sea-Level Rise Scenarios

The primary set of eustatic (global) sea level rise scenarios used within SLAMM was derived from the work of the Intergovernmental Panel on Climate Change (IPCC 2001). SLAMM 5 was run using the following IPCC and fixed-rate scenarios:

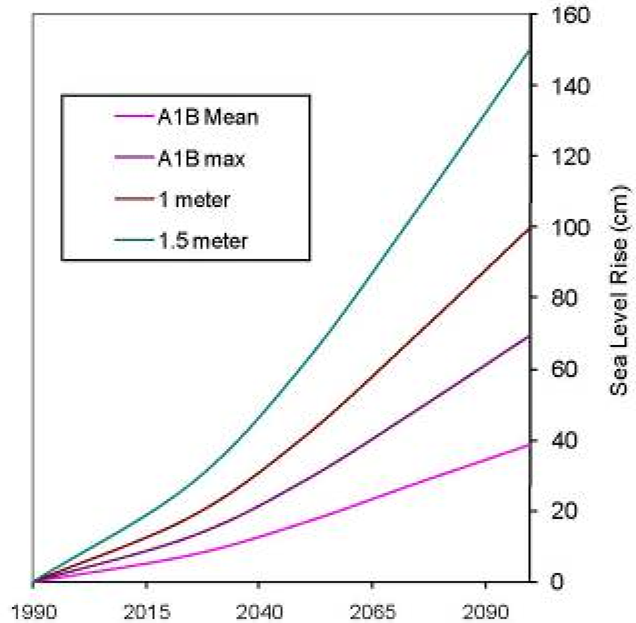
Scenario	Eustatic SLR by 2025 (cm)	Eustatic SLR by 2050 (cm)	Eustatic SLR by 2075 (cm)	Eustatic SLR by 2100 (cm)
A1B Mean	8	17	28	39
A1B Max	14	30	49	69
1 meter	13	28	48	100
1.5 meter	18	41	70	150

Recent literature (Chen et al., 2006, Monaghan et al., 2006) indicates that the eustatic rise in sea levels is progressing more rapidly than was previously assumed, perhaps due to dynamic changes in ice flow omitted within the IPCC report's calculations. A recent paper in the journal *Science* (Rahmstorf, 2007) suggests that, taking into account possible model error, a feasible range by 2100 might be 50 to 140 cm. A recent US intergovernmental report states "Although no ice-sheet model is currently capable of capturing the glacier speedups in Antarctica or Greenland that have been observed over the last decade, including these processes in models will very likely show that IPCC

AR4 projected sea level rises for the end of the 21st century are too low." (US Climate Change Science Program, 2008)

To allow for flexibility when interpreting the results, SLAMM was also run assuming 1 meter, 1½ meters of eustatic sea-level rise by the year 2100. The A1B- maximum scenario was scaled up to produce these bounding scenarios (Figure 1).

Figure 1: Summary of SLR Scenarios Utilized



Methods and Data Sources

LIDAR elevation data are unavailable for this National Wildlife Refuge (NWR). Elevation data used are based on National Elevation Data (NED). An examination of the NED metadata indicates that this digital elevation map (DEM) was derived from a 1942 survey (Fig. 2). The contour interval used to derive the DEM was ten foot.

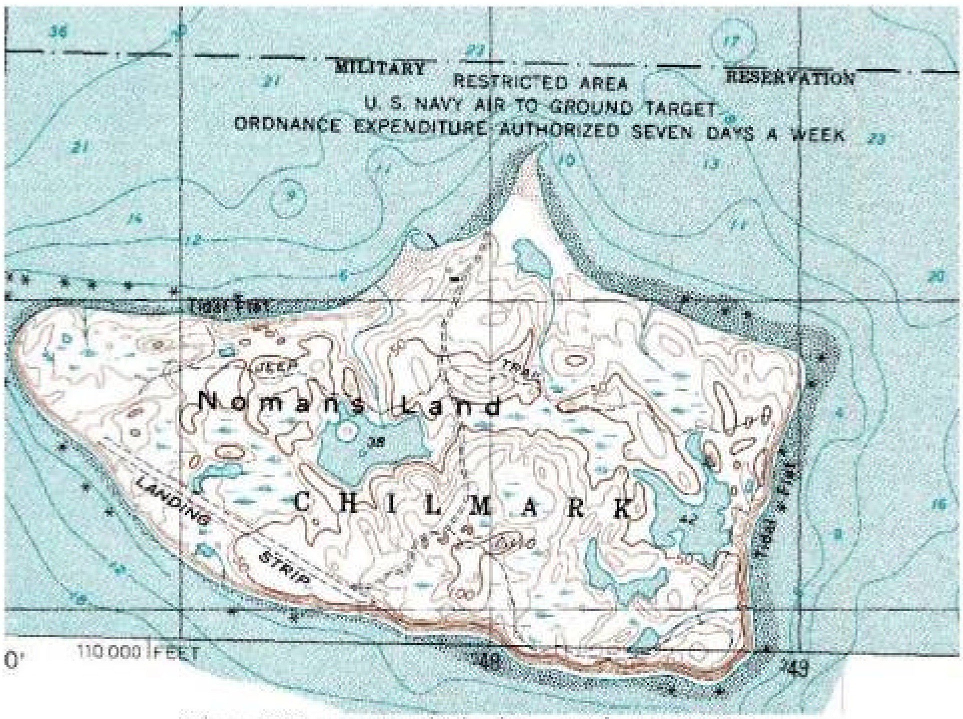


Figure 2: Nomans Land Island Excerpt from USGS Map.

The National Wetlands Inventory for Nomans Land Island is based on a photo date of 2005. The digitized NWI map and the digital elevation map match closely but there is a minor offset evident at the southern portion of the site (Figure 3).

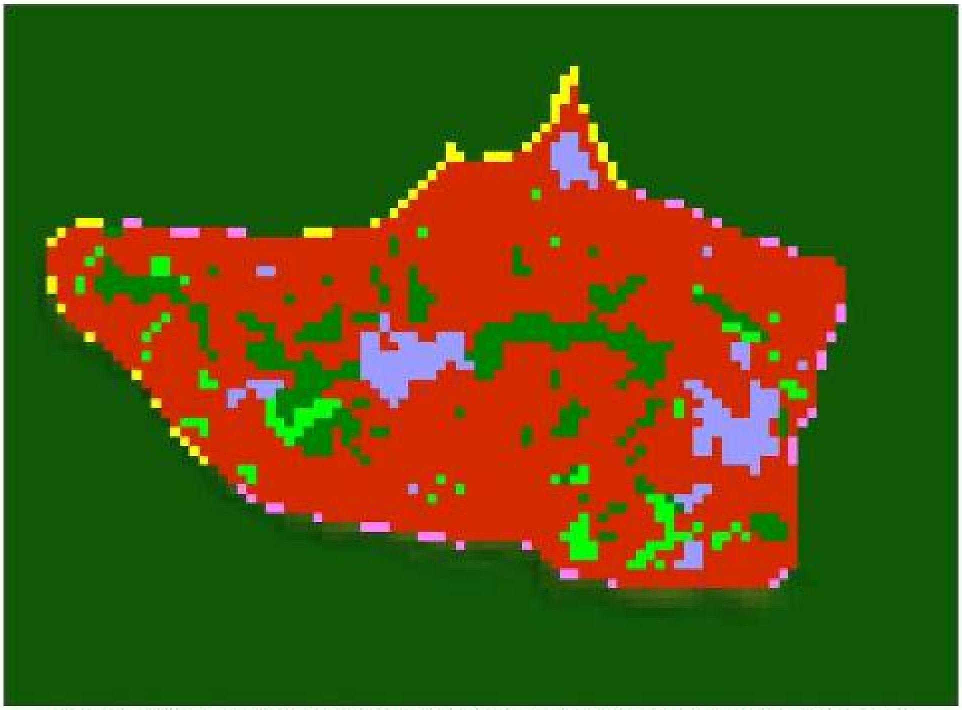


Figure 3: NWI Layer over DEM layer (green). Minor Discrepancy at Southern End.

Converting the NWI survey into 30 meter cells indicates that the approximately six hundred acre refuge (approved acquisition boundary) is primarily composed of the categories as shown below:

Dry Land	71.9%
Swamp	10.5%
Open Ocean	6.0%
Inland Open Water	5.9%
Inland Fresh Marsh	3.6%
Rocky Intertidal	1.2%
Ocean Beach	1.0%

Based on the NWI coverage, there are no dikes or impounded wetlands within the Nomans Land Island NWR.

The historic trend for sea level rise was estimated at 2.665 mm/year using the average value of the two closest stations (8449130, Nantucket Island, MA; 8447930, Woods Hole, Buzzards Bay, MA). This measured rate is somewhat higher than the global average for the last 100 years (approximately 1.5-2.0 mm/year). Any effects of isostatic rebound that have affected this region for the last 100 years are assumed to be captured within that historic trend and that same rate of isostatic rebound is projected forward into the next 100 years.

The tide range at this site was estimated at 1.05 meters using the average value from the two closest NOAA oceanic gages (8448376, Cuttyhunk, MA; 8448725, Menemsha Harbor, MA). The NAVD88 correction source was determined from average values of the four closest gages with NAVD data (8447930, Woods Hole, Buzzards Bay, MA; 8447505, Chatham, Stage Harbor, MA; 8447435, Chatham, Lydia Cove, MA; 8447495, Saquatucket Harbor, MA).

Figure 4: NOAA Gages Relevant to the Study Area.

Accretion rates in salt and brackish marshes are not relevant to this site as no marshes appear in the initial condition, nor in future predictions.

Modeled U.S. Fish and Wildlife Service refuge boundaries are based on Approved Acquisition Boundaries as published on the FWS "National Wildlife Refuge Data and Metadata" website. The modeling team was in contact with Eastern Massachusetts National Wildlife Refuge Complex biologist Stephanie Koch to ensure model parameters were consistent with local knowledge.

Application of the Sea-Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR

The cell-size used for this analysis was 30 meter by 30 meter cells. However, the SLAMM model does track partial conversion of cells based on elevation and slope.

SUMMARY OF SLAMM INPUT PARAMETERS FOR NOMANS LAND

Description	Nomans Land Island
DEM Source Date (yyyy)	1942
NWI_photo_date (yyyy)	2005
Direction_OffShore (N|S|E|W)	S
Historic_trend (mm/yr)	2.865
NAVD88_correction (MTL-NAVD88 in meters)	-0.092
Water Depth (m below MLW- N/A)	2
TideRangeOcean (meters: MHHW-MLLW)	1.05
TideRangeInland (meters)	1.05
Mean High Water Spring (m above MTL)	0.698
MHSW Inland (m above MTL)	0.698
Marsh Erosion (horz meters/year)	1.8
Swamp Erosion (horz meters/year)	1
TFlat Erosion (horz meters/year) [from 0.5]	0.5
Salt marsh vertical accretion (mm/yr) Final	3.78
Brackish March vert. accretion (mm/yr) Final	3.78
Tidal Fresh vertical accretion (mm/yr) Final	5.9
Beach/T.Flat Sedimentation Rate (mm/yr)	0.5
Frequency of Large Storms (yr/washover)	50
Use Elevation Preprocessor for Wetlands	TRUE

Results

Nomans Land Island National Wildlife Refuge is predicted to show some effects from sea level rise. The refuge is predicted to lose more than half of its ocean beach in the most conservative scenario. Swamp and dry land loss is predicted to be less severe.

SLR by 2100 (m)	0.39	0.69	1	1.5
Dry Land	3%	4%	4%	5%
Swamp	1%	1%	2%	2%
Ocean Beach	56%	62%	98%	98%

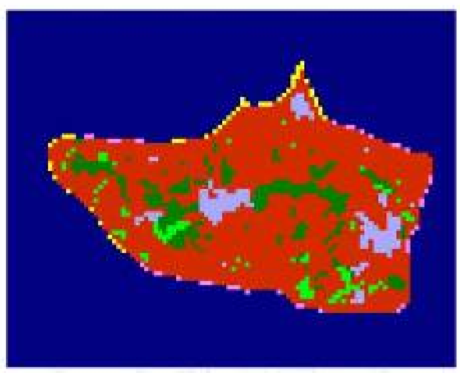
Predicted Loss Rates of Land Categories by 2100 Given Simulated Scenarios of Eustatic Sea Level Rise

Maps of SLAMM input and output to follow will use the following legend:

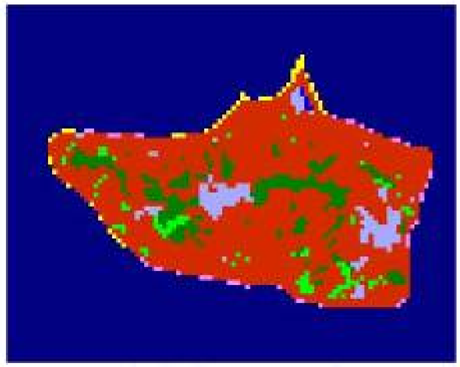
Nomans Land Island NWR
IPCC Scenario A1B-Mean, 0.39 M SLR Eustatic by 2100

Results in Acres

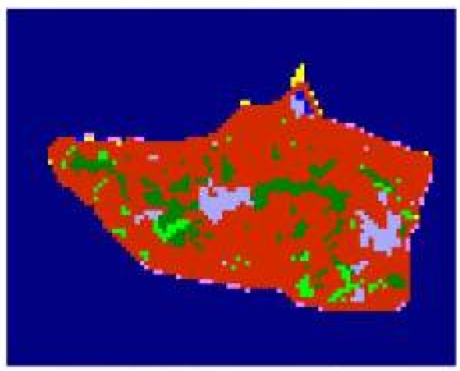
	Initial	2025	2050	2075	2100
Open Ocean	1106.9	1110.0	1117.1	1123.7	1128.7
Dry Land	449.0	447.8	444.2	439.5	435.6
Swamp	64.9	64.5	64.3	64.3	64.3
Inland Open Water	36.5	35.1	34.7	34.5	34.5
Inland Fresh Marsh	22.0	22.0	22.0	22.0	22.0
Ocean Beach	11.1	9.6	6.9	5.3	4.9
Rocky Intertidal	9.6	9.1	8.1	7.0	5.9
Estuarine Open Water	0.0	1.3	2.2	2.9	3.1
Tidal Flat	0.0	0.4	0.4	0.1	0.0
Estuarine Beach	0.0	0.0	0.1	0.8	1.0
Total (incl. water)	**1700.0**	**1700.0**	**1700.0**	**1700.0**	**1700.0**



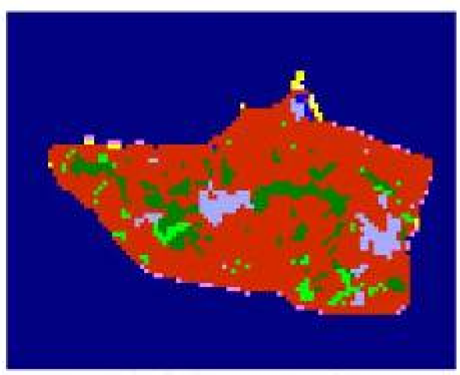
Nomans Land Island, Initial Condition



Nomans Land Island, 2025, Scenario A1B Mean

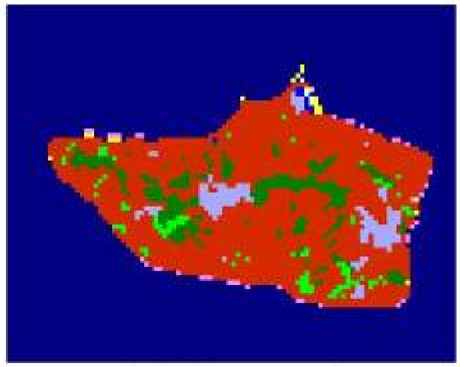


Nomans Land Island, 2050, Scenario A1B Mean



Nomans Land Island, 2075, Scenario A1B Mean

Application of the Sea Level Affecting Marshes Model (SLAMM 5.0) to Nomans Land Island NWR

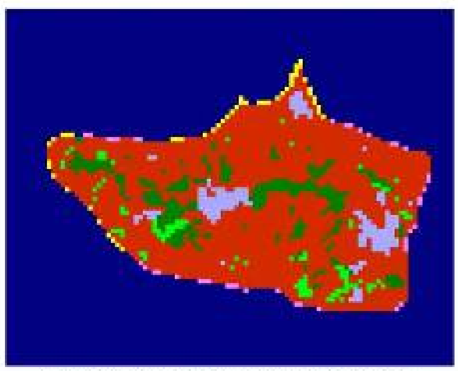


Nomans Land Island, 2100, Scenario A1B Mean

Nomans Land Island NWR
IPCC Scenario A1B-Max, 0.69 M SLR Eustatic by 2100

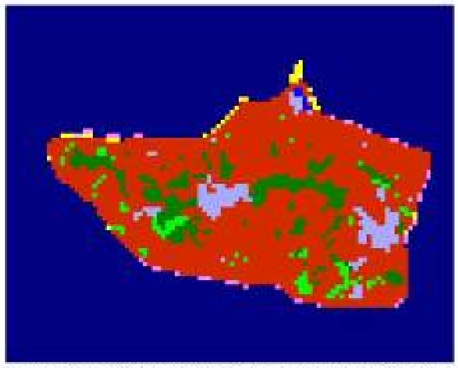
Results in Acres

	Initial	2025	2050	2075	2100
Open Ocean	1106.9	1111.4	1120.8	1129.0	1134.8
Dry Land	449.0	447.3	441.2	434.8	432.4
Swamp	64.9	64.5	64.3	64.3	64.0
Inland Open Water	36.5	35.1	34.7	34.5	34.5
Inland Fresh Marsh	22.0	22.0	22.0	22.0	22.0
Ocean Beach	11.1	9.0	6.5	5.5	4.3
Rocky Intertidal	9.6	8.9	7.4	5.6	3.7
Estuarine Open Water	0.0	1.3	2.3	3.1	3.0
Tidal Flat	0.0	0.4	0.4	0.1	0.3
Estuarine Beach	0.0	0.0	0.4	1.1	1.1
Total (incl. water)	**1700.0**	**1700.0**	**1700.0**	**1700.0**	**1700.0**

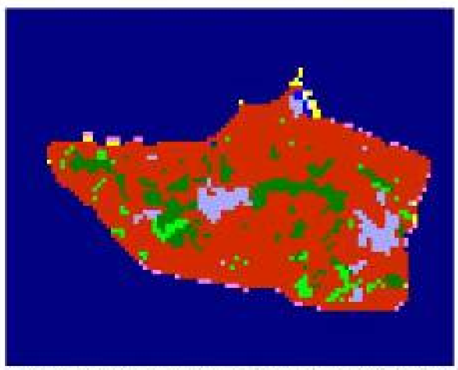


Nomans Land Island, Initial Condition

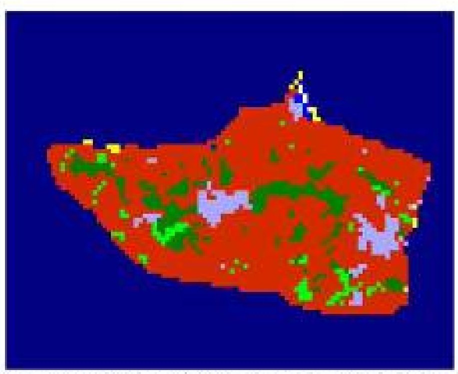
Nomans Land Island, 2025, Scenario A1B Maximum



Nomans Land Island, 2050, Scenario A1B Maximum



Nomans Land Island, 2075, Scenario A1B Maximum

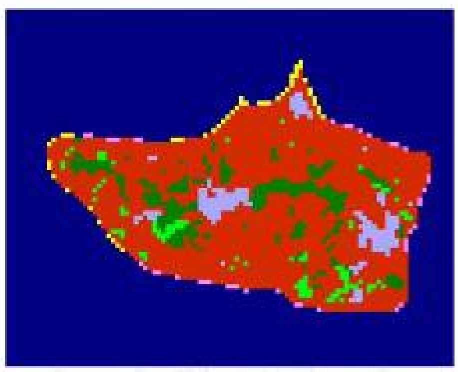


Nomans Land Island, 2100, Scenario A1B Maximum

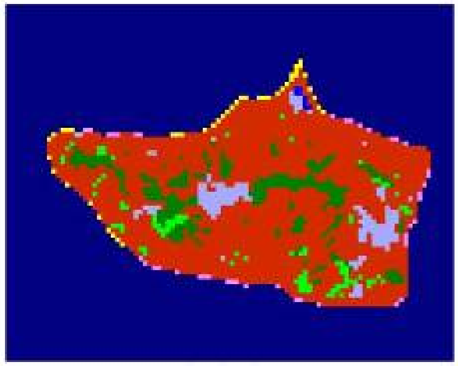
Nomans Land Island NWR
1 Meter Eustatic SLR by 2100

Results in Acres

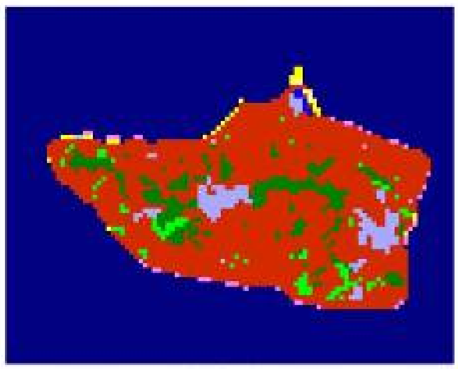
	Initial	2025	2050	2075	2100
Open Ocean	1106.9	1112.9	1123.4	1133.8	1143.1
Dry Land	449.0	446.5	438.4	433.0	430.3
Swamp	64.9	64.5	64.3	64.1	63.8
Inland Open Water	36.5	34.7	34.5	34.5	34.2
Inland Fresh Marsh	22.0	22.0	22.0	22.0	22.0
Ocean Beach	11.1	8.4	7.0	4.0	0.2
Rocky Intertidal	9.6	8.7	6.7	4.1	1.5
Estuarine Open Water	0.0	1.8	2.7	3.2	3.3
Estuarine Beach	0.0	0.0	0.8	1.1	1.1
Tidal Flat	0.0	0.5	0.4	0.3	0.4
Total (incl. water)	**1700.0**	**1700.0**	**1700.0**	**1700.0**	**1700.0**



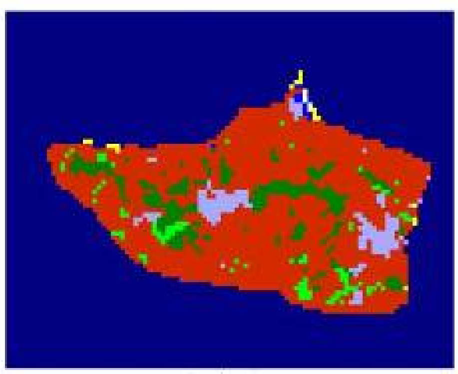
Nomans Land Island, Initial Condition



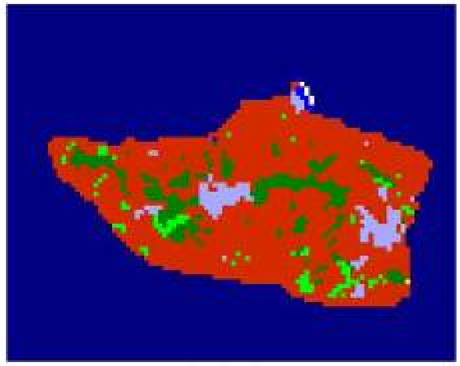
Nomans Land Island, 2025, 1 meter



Nomans Land Island, 2050, 1 meter



Nomans Land Island, 2075, 1 meter

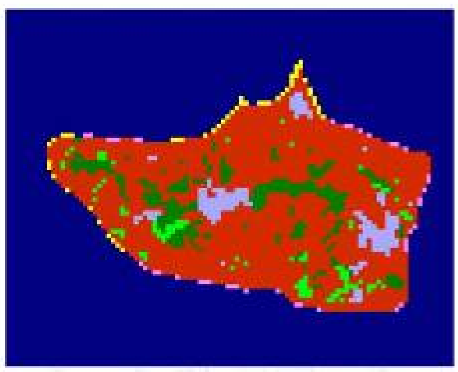


Nomans Land Island, 2100, 1 meter

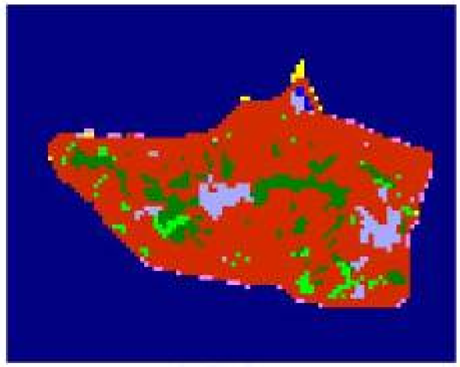
Nomans Land Island NWR
1.5 Meters Eustatic SLR by 2100

Results in Acres

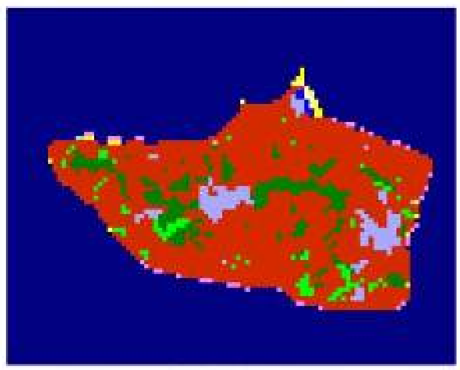
	Initial	2025	2050	2075	2100
Open Ocean	1106.9	1115.8	1130.6	1142.1	1148.4
Dry Land	449.0	445.2	434.6	430.6	426.8
Swamp	64.9	64.4	64.3	64.0	63.7
Inland Open Water	36.5	34.7	34.5	34.2	34.2
Inland Fresh Marsh	22.0	22.0	22.0	22.0	22.0
Rocky Intertidal	9.6	8.3	5.4	1.8	0.0
Ocean Beach	11.1	7.2	4.2	0.4	0.2
Estuarine Open Water	0.0	1.8	2.7	3.2	3.2
Estuarine Beach	0.0	0.0	1.4	1.3	0.9
Tidal Flat	0.0	0.5	0.4	0.4	0.5
Total (incl. water)	**1700.0**	**1700.0**	**1700.0**	**1700.0**	**1700.0**



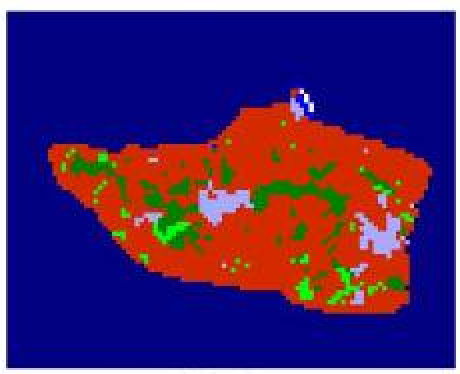
Nomans Land Island, Initial Condition



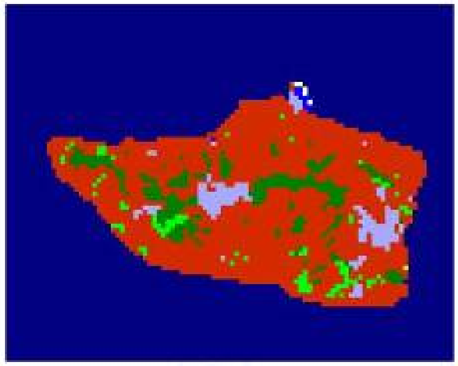
Nomans Land Island, 2025, 1.5 meter



Nomans Land Island, 2050, 1.5 meter



Nomans Land Island, 2075, 1.5 meter



Nomans Land Island, 2100, 1.5 meter

Discussion:

Model results for Nomans Land Island NWR indicate that only the lowest-elevation portions of the island (such as the Cobble Spit to the north of the island) are vulnerable to the effects of sea level rise. Vulnerability of ocean beaches is high relative to other land categories due to its low elevation. Dry land and swamp lie in elevations mostly above sea level rise predictions, so these land categories are expected to remain relatively unchanged.

Model results for this site are subject to some uncertainty. Dry land elevations are poorly characterized by a low-resolution and out-of-date digital elevation model (from 1942). Predicted dry-land loss rates would be refined with a higher vertical resolution and more updated dataset (LiDAR, for instance). Additionally, ocean beach erosion is difficult to precisely characterize with a relatively simple model. In this analysis, ocean beach elevations were estimated as a function of tidal range because elevation data have low vertical resolution.

Despite the uncertainty about what may occur around the edges of the model domain, the higher elevation portions of the island, which comprise the majority of the refuge, may safely be assumed to remain invulnerable to sea level rise.

The SLAMM model does account for the local effects of isostatic rebound by taking into account the historical sea level rise for each site. The historical rate of land movement is predicted to continue through the year 2100 (i.e. the rate of isostatic rebound is assumed to remain constant).

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http://www.fws.gov/northeast/nomanslandisland/

Federal Relay Service
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U.S. Fish and Wildlife Service Website
http://www.fws.gov

For National Wildlife Refuge System Information:
1800/344 WILD

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