

## Chapter 1



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*Seaside sparrow*

# The Purpose of, and Need for, Action

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## Introduction

This final comprehensive conservation plan (CCP) for Prime Hook National Wildlife Refuge (hereafter referred to as Prime Hook NWR, or the refuge) presents the combination of management goals, objectives, and strategies that will guide the management decisions and actions of Prime Hook NWR over the next 15 years. CCPs are required by the National Wildlife Refuge System Administration Act of 1996, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd, et seq.; Refuge Improvement Act). An environmental impact statement (EIS), required by the National Environmental Policy Act of 1969 (NEPA) was prepared concurrent with the draft CCP.

The decision to adopt this plan is included as appendix M, Record of Decision. The Record of Decision will present and explain the decision, and certify that we have met agency compliance requirements and that the CCP, when implemented, will achieve the purposes of the refuge and help fulfill the Refuge System mission. Once the Regional Director has signed the Record of Decision and we have completed the CCP for the refuge, we will notify the public in the *Federal Register*, and implementation can begin.

This document is organized in five chapters to outline the history, driving mandates, purposes, and conservation priorities guiding the management direction, as well as the existing environment of the refuge.

Chapter 1, *The Purpose of, and Need for, Action*, explains why and how we must prepare a CCP for Prime Hook NWR. It states the purpose and need for Federal action, i.e., the U.S. Fish and Wildlife Service (Service, we, our) needs we want to meet by preparing a CCP and the goals we wish to accomplish. It explains the legislated purposes of the refuge and the regulations, policies, and laws covering units of the National Wildlife Refuge System (NWRS or Refuge System); states our vision and long-range management goals for managing and protecting the land, waters, and Federal trust resources of Prime Hook NWR in the future; and identifies issues of public concern.

Chapter 2, *The Planning Policies and Process*, explains the planning steps in developing the CCP; describes the influences of other national, regional, ecosystem, and State plans; and identifies refuge operational or step-down plans.

Chapter 3, *Existing Environment*, describes the physical, biological, and human environment of the refuge, and explains some of the ecological processes that influence the existing environment in a manner that impacts management outcomes.

Chapter 4, *Management Direction and Implementation*, presents the actions, goals, objectives, and strategies that will guide our decision-making and land management for the refuge. It also outlines the staffing and funding needed to accomplish that management.

Chapter 5, *Consultation and Coordination with Others*, describes the public and partner involvement used throughout the planning process, and identifies the individuals involved in preparing this document.

Thirteen appendixes, a glossary with acronyms, and a bibliography provide additional documentation and references to support our analysis summarized within the report.

## Need for the Action

When Prime Hook NWR was established in 1963 “*for use as an inviolate sanctuary, or for any other management purpose, for migratory birds,*” the marshes, uplands, and waters now encompassed by the refuge had already been manipulated for more than 50 years through ditching and impoundments, draining agricultural lands, reducing mosquito habitat, and increasing freshwater waterfowl habitat. While many Service management actions over

the ensuing years improved the condition of the natural ecosystems, the Service also intentionally increased some of these manipulations and allowed others to continue. Climate change and natural processes, apart from human actions, have altered, and will continue to alter, this coastal environment apart from human actions. Over the nearly 50 years of Service management, the national directives from Congress and the Service for managing uses and planning for units of the Refuge System have become more comprehensive and attuned to the essential features of natural systems. Current Refuge System policies direct refuge managers to assess the historic (pre-human condition) or natural conditions of refuge ecosystems to inform management decisions. These policies direct the Service to avoid additional degradation of environmental conditions and natural processes and to restore degraded environmental components.

Development of a CCP addresses three needs:

First, there is currently no master plan to formally establish and ensure strategic management for the refuge. A vision statement, goals, objectives, and management strategies are all necessary to successful refuge management. Public and partner involvement throughout the planning process will also help to resolve various management issues.

Second, the Refuge Improvement Act of 1997 requires that all national wildlife refuges have a CCP by 2012.

Third, management practices should be consistent with current policies; the new CCP will bring the refuge into conformity with all current laws and policies.

## Purpose for the Action

This CCP has been developed in the context of a changing world. Our natural environment, human uses, and management direction have all changed over the past 50 years. This CCP is designed to address management and protection of valuable natural resources into the future; a future where continued change is even more likely to occur. Thus, the purpose of this CCP is to provide strategic management direction to ensure that our management of the refuge will best respond to four key areas of concern. Strategic here means approaches that are ecologically sound and sustainable in light of physical and biological change, practical, viable, or economically realistic, and responsive to the following:

- (1) Abides by and contributes to the mission, mandates, and policies of the Service and the Refuge System.
- (2) Meets the refuge's goals.
- (3) Addresses key issues.
- (4) Responds to public concerns.

While explained in more depth beginning on page 1-7, briefly this CCP will address:

- (1) The mission of the 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."* Important Refuge System laws and policies concerning habitat management and wildlife conservation include a key Service policy addressing biological integrity, diversity, and environmental health, known as "BIDEH." Other Service policies regarding human uses require that all uses of a refuge be evaluated for their appropriateness, and direct that inappropriate, incompatible, or harmful uses be prevented or eliminated. Compatible uses can be allowed and, in particular, six wildlife-dependent public uses should

be facilitated whenever possible. Not every aspect of refuge management implemented at earlier times complies with current directives. Other policies and laws direct how long-term refuge planning is conducted. This CCP is designed to bring all aspects of refuge management into conformity with current laws and policies.

- (2) The refuge's goals (pages 1-13 and 1-14) describe the desired future condition of the refuge and provide a framework for developing alternative objectives to achieve that desired future condition. Along with a vision statement, six fundamental goals were developed for Prime Hook NWR to frame how its purpose "*as an inviolate sanctuary, or for any other management purpose, for migratory birds*" can be best achieved in the future. Four of the goals direct management attention to protection and restoration of the ecological integrity, diversity, and sustainability of four key habitat types (barrier island beach and coastal salt marsh habitats, forests, wetland impoundments, and early successional uplands.) Other refuge goals address public uses of the refuge and collaborative initiatives with partners and the local community.
- (3) Through the NEPA scoping process and the refuge's understanding of its particular challenges, and incorporating the best available scientific and technical information, several key issues have been identified which this CCP will address. They are:
  - Climate change/sea level rise/barrier island overwash/marsh management and restoration
  - Mosquito control
  - Cooperative farming
  - Hunt management
- (4) Public interest in the future management of Prime Hook NWR is widespread. The concerns and situations of the interested members of the public are diverse. We have heard from neighboring farmers and residents of barrier island communities; hunters and harvesters of waterfowl, fish, and shellfish, and upland species; visitors who come to observe birds and other wildlife or who seek solitude and respite in the natural world; boaters, dog walkers, beach-goers and other non-priority recreation users; and State agencies and other programs and organizations concerned about the role and contributions the refuge can play in a larger network of natural areas across the State, the Mid-Atlantic, and the migratory bird flyway of the Atlantic coast.

NEPA requires that a thorough analysis be made of a range of alternatives, including the proposed action and no action. Both the draft and final CCP/EIS evaluated three alternatives that represented different ways to achieve the four areas of concern outlined above. We analyzed the socioeconomic, biological, physical, and cultural consequences of implementing each alternative, and selected among these alternatives based on their greater or lesser ability to meet the purposes and needs described above. For the final CCP, we chose alternative B which focuses on focal species with proactive habitat management and expanded public use. We have made several changes to alternative B based on comments we received on the draft CCP/EIS. This modified alternative B is presented in chapter 4 as the management direction that the refuge will implement over the next 15 years.

Developing a CCP with partner and public involvement is vital to the success of management at every national wildlife refuge. A CCP provides management direction for the next 15 years by:

- Stating clearly the desired future conditions of refuge habitat, wildlife, visitor services, staffing, and facilities.
- Providing state agencies, refuge neighbors, visitors and partners with a clear understanding of the reasons for refuge management actions.
- Ensuring that refuge management reflects the policies, legal mandates and the mission of the Refuge System and refuge purpose.
- Ensuring the compatibility of current and future public use.
- Providing long-term continuity in refuge management.
- Providing justification for our staffing, operations and maintenance, and projected budget requests.

The CCP will be reviewed, evaluated, and subsequently updated approximately every 15 years. However, if and when significant new information becomes available, ecological conditions change, major refuge expansion occurs, or when we identify the need to do so, the plan can be reviewed sooner. All plan revisions will require NEPA compliance.

## Project Area

Prime Hook NWR is located in the outer Atlantic Coastal Plain, along the southwestern shore of the Delaware Bay in Milton, Sussex County, Delaware. Located within 2 hours driving time from metropolitan Baltimore, Maryland; Washington, D.C; Wilmington, Delaware; and Philadelphia, Pennsylvania, the refuge lies 22 miles southeast of the State capital of Dover (population 35,808). Historically, agricultural lands dominated the area around the refuge. However, residential development starting in the 1990s and continuing to the present is rapidly changing the watershed. Sussex County lost 14,000 acres of farm land to development from 2002 to 2007 (DDA 2007 Census of Agriculture).

The 10,144-acre refuge stretches along the southeastern coastline of Delaware just north of Cape Henlopen. The eastern boundary of the refuge runs next to three beachfront communities: Slaughter Beach, Prime Hook Beach, and Broadkill Beach. Eighty percent of the refuge's vegetation cover types are characterized by tidal and freshwater creek drainages that discharge into the Delaware Bay and associated coastal marshes. The remaining 20 percent is composed of upland habitats. The land uses near the refuge are intensive agricultural and developed residential.

The natural environment of Prime Hook NWR features several different wildlife habitats, as delineated in the Delaware comprehensive wildlife management plan (DeWAP 2005). They are based on the National Vegetation Classification System and the known existence of species of greatest conservation need. Key refuge habitats include unvegetated sandy beach, dune grasslands, interdunal wetlands, *Spartina* high salt marshes, intertidal mudflats, *Spartina* low salt marsh, bishop-weed mixed species, brackish marsh, freshwater impoundments, red maple/ Atlantic white cedar/seaside alder swamps, mixed herb deep peat wetlands, forested uplands, early successional uplands, and ancient sand ridge forests. Those cover types provide habitat for 308 species of birds, 51 species of fish, 45 species of reptiles and amphibians, 37 species of mammals, and an array of rare insect and plant species.

The refuge is divided into four management units that include their wetlands and associated uplands (map 1-1). Unit I comprises the northern most end of the refuge and is delineated by Slaughter Beach Road as its northern boundary, overwashed barrier dunes and a portion of the Slaughter Beach community houses on the east, Fowler Beach Road on the south, and an upland fringe

Map 1-1. Overview Map of Prime Hook National Wildlife Refuge



of scrub-shrub areas on the western boundary. There is currently no water level management capability in Unit I, which contains about 1,400 acres of salt marsh. Tidal saltwater is the primary source of water for the unit, which flows approximately 2 miles from the Delaware Bay through the Mispillion Inlet and into Cedar Creek, entering through Slaughter Canal.

Attenuated tidal flow provided by Slaughter Canal bisects Unit I and receives its afflux from the ditches and creeks within the salt marshes in Unit I. The Draper-Bennett Tax Ditch drains the southwestern portion of this unit, which ultimately feeds into the Slaughter Canal. Daily tidal action has a 4.4-foot range and salinities range from 5 to 25 ppt in the canal. During drought periods, the salinity can get as high as 30 ppt. Rainfall, new and full moon tides, and spring and neap tides maintain the salt marsh community within Unit I. Natural formations of inlets from overwash events along the bay shoreline rejuvenate tidal marsh habitats in Unit I through maintenance of salinity levels and deposition of nutrients and sediments carried by tidal flow. Over the past 100 years, the dune line has been overwashed several times along this shoreline. Currently, a breach in the southern portion of Unit I has restored tidal flow into the unit east of the Slaughter Canal.

Unit II is just south of Unit I and has been managed as an impounded, nontidal freshwater system that is manipulated by water control structures. It is bounded on the north by Fowler Beach Road, barrier dunes and the Prime Hook beach community on the east, Prime Hook Road on the south, and an upland interface on the west.

During storm tides this sand dune system has been breached several times and washouts have deposited sand and saltwater into the Unit II impoundment. Freshwater input is from Slaughter Creek, which flows from the west. Delaware Bay's normal tidal ranges are from 3 to 3.5 feet, except for storm surges and spring tides ( $\pm$  6.5 ft). Tidal flow enters Slaughter Canal from the Delaware Bay through Unit I salt marshes into the northern portion of Unit II and through the breached along the shoreline and freshwater flow enters Unit II on the west from Slaughter Creek and from Unit III to the south.

Landowners had the marsh drained and dug Slaughter Canal in the early 1900s to improve drainage of their upland areas by channelizing water north to Cedar Creek. In 1906, the Slaughter Canal dredging reached into Unit II and ended at Oak Island. Portions of Unit II were also heavily grid-ditched during the 1930s for mosquito control. To maintain water on the marsh during the fall and winter for muskrat trapping and waterfowl hunting, private owners built water control structures at Fowler Beach Road, Oak Island, and near the bridge at Slaughter Creek to hold water.

Management Unit III is bounded by Prime Hook Road on the north, Route 16 (Broadkill Beach Road) on the south, upland edge on the western boundary, and the Prime Hook and Broadkill Beach developments immediately adjacent to the refuge's eastern boundary.

Unit III consists of roughly 3,600 acres, which include impounded freshwater emergent marsh, red maple-seaside alder swamp, low-lying farmed areas, brush, barrier beach on the east, and 140 acres of flowage easement (tract numbers 84R, 99F and 99i) on the southeastern boundary of Unit III. This flowage easement drains directly into Prime Hook Creek and flows south to the water control structure of this watercourse. Twenty-five hundred acres of marsh were impounded in the 1980s to create the freshwater marsh it is today.

About 150 years ago, Unit III was a tidal marsh system with several small creeks and abundant potholes where Prime Hook Creek and Deep Hole Creek

drained directly into the Delaware Bay (1.5 miles north of current Prime Hook Creek water control structure) (USFWS 1982). A major storm in 1911 plugged and sealed the Deep Hole Creek and Prime Hook Creek outlets to the Delaware Bay. The closing of these two outlets drastically changed the daily tidal influence and hydrology of Unit III. Prime Hook Creek now flows through the Petersfield Ditch to empty into the Broadkill River, which drains into the Delaware Bay about 2 miles south of the present-day refuge.

Management Unit IV is surrounded by Route 16 on the north, the Broadkill Beach community on the east, the Broadkill River on the south and west, and the upland edge on the west. Prior to Service ownership, this marsh had been excessively drained by man-made ditches. When the refuge was established, about 1,000 acres of tidal salt marsh surrounded about 150 acres of farm fields. Before 1963, private owners maintained pumping stations for ponds in Units III and IV for cattle and to manage waterfowl and muskrats.

Tidal action occurs along the Broadkill River, whose salinity ranges from 10 to 30 ppt. The majority of the water for Unit IV is provided through the Broadkill River. Some tidal action and leakage of saltwater into the Unit IV impoundment also occurs during peak tides from a ditch connected to the Broadkill Sound. Rainfall and runoff from Unit III are other sources that provide freshwater. However, normal runoff and tidal action are not sufficient to recharge the impoundment above its perimeter elevation.

This section highlights the Service and Refuge System policies, laws, regulations, and mandates that directly influenced the development of the Prime Hook NWR CCP document.

## **The U.S. Fish and Wildlife Service, its Policies, and Legal Mandates**

### **The Service and its Mission**

The Service administers the Refuge System. The Service is an agency under the Department of the Interior and its purpose is to conserve the nature of America. The Service's commitment to safeguard the Nation's fish, wildlife and their habitats is reflected in its vision statement and mission: *"We will continue to be a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service."*

Its 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."*

The Service is the primary Federal agency responsible for conserving, protecting, and enhancing America's fish and wildlife populations and their habitats. These include migratory birds, federally listed endangered or threatened species, interjurisdictional fish, wetlands, certain marine mammals, and national wildlife refuges. The Service oversees the enforcement of Federal wildlife laws and international treaties on importing and exporting wildlife, management and protection of migratory bird populations, restoration of national fisheries, administration of the Endangered Species Act, and restoration of native plant habitats. The Service also assists states with their fish and wildlife programs and helps other countries develop conservation programs.

The Service Manual, <http://www.fws.gov/policy/manuals/>, contains the standing and continuing directives to implement its authorities, responsibilities, and activities. Special Service directives that affect the rights of citizens or the authorities of other agencies are published separately in the Code of Federal

## **The National Wildlife Refuge System, its Mission, and Policies**

Regulations (CFR); the Service Manual does not duplicate them (see 50 CFR 1-99 at <http://www.gpoaccess.gov/cfr/index.html>; accessed November 2012).

The Refuge System is the world's largest collection of lands set aside specifically for the conservation of fish, wildlife and plants. The Refuge System began in 1903, when President Theodore Roosevelt designated Pelican Island, a pelican and heron rookery in Florida, as a bird sanctuary. Today, this unique wildlife conservation system consists of over 560 national wildlife refuges. These refuges encompass more than 150 million acres of lands and waters in all 50 states and several island territories. More than 45 million visitors hunt, fish, observe and photograph wildlife, or participate in environmental education and interpretive activities on refuges across the Nation each year.

The Refuge System is home to more than 700 species of birds, 220 species of mammals, 260 reptile and amphibian species, and more than 200 species of fish. This unique network of conserved lands also provides critical habitat for more than 250 threatened and/or endangered plants and animals. As a result of international treaties for migratory bird conservation, such as the Migratory Bird Conservation Act, many refuges have been established to protect migratory birds. Refuges are also places where people can enjoy wildlife-dependent recreational and educational opportunities about the great outdoors, and the Refuge System provides some of the best places across the country where people can hunt, fish, observe, and enjoy wildlife throughout the year.

In 1997, the Refuge Improvement Act was passed. This law established a unifying mission for the Refuge System, a new process for determining compatible public use activities on the refuges, and the requirement to prepare a CCP for each refuge. The Refuge Improvement Act states first and foremost that the Refuge System must focus on wildlife conservation. This law established several new mandates to make the management of the Refuge System more cohesive and standardized to ensure that wildlife is considered first when managing refuges. The preparation of this CCP fulfills many of these mandates.

The Refuge Improvement Act directs the Secretary of the Interior to ensure that the mission of the Refuge System and purposes of the individual refuges are carried out. It states that the national mission, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction for each refuge. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the Refuge System. The mission of the 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.*

*—Refuge Improvement Act, Public Law 105-57*

The Refuge Improvement Act identifies six wildlife-dependent public uses – hunting, fishing, wildlife observation and photography, environmental education, and interpretation—that will receive priority consideration on refuges and in CCPs. The Refuge Improvement Act also declares that all existing or proposed refuge uses must be “compatible” with the refuge’s purpose and consistent with public safety.

These Refuge System goals have been designed to help guide the development of CCPs and improve the administration, management, and growth of the Refuge System in a unified and consistent manner. These goals are:

- Conserve a diversity of fish, wildlife and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that are strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation, photography, environmental education, and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, plants, and their habitats.

The Refuge System Manual provides a central reference for current policies governing the operation and management of the Refuge System not covered by the Service Manual, including technical information on implementing refuge policies and guidelines. This manual can be reviewed at refuge headquarters. A few noteworthy policies instrumental in developing this CCP follow.

#### **Maintaining Biological Integrity, Diversity and Environmental Health Policy (BIDEH policy)**

This policy provides guidance on maintaining or restoring the biological integrity, diversity, and environmental health (BIDEH) of the Refuge System, including the protection of a broad spectrum of fish, wildlife, and habitat resources found in refuge ecosystems. Refuge managers are provided with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and restoring lost or severely degraded environmental components. They accomplish this by assessing the current status of BIDEH on each refuge through baseline vegetation surveys and studies and by understanding historic conditions, (i.e., those which were/would be present and self-sustaining without human changes to the landscape). Historic conditions serve as a frame of reference to understand the functional processes that naturally shaped the refuge's ecosystem and the scale and frequency of such processes (e.g., fire, flooding, and plant succession) to ascertain the refuge's natural ecosystem. First and foremost, refuges are directed to preserve habitats that maintain a high degree of biological integrity and environmental health. Lost or severely degraded habitats shall be restored via natural processes or by using management measures that mimic natural ecosystem processes or functions. Guidelines are also provided for dealing with external threats to the BIDEH of a refuge and its ecosystem. The BIDEH policy (601 FW 3) can be viewed online at: <http://www.fws.gov/policy/601fw3.html> (accessed November 2012).

#### **Appropriate Refuge Uses Policy**

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. This policy (603 FW 1) provides a national framework for determining appropriate

refuge uses in an effort to prevent or eliminate those uses 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:

- The use is a wildlife-dependent recreational use as identified in the Refuge Improvement Act.
- 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 Refuge Improvement Act was signed into law.
- The use involves the take of fish and wildlife under state regulations.
- The use has been found to be appropriate after concluding a specified findings process using 10 criteria.

This policy can be viewed online at: <http://www.fws.gov/policy/603fw1.html> (accessed November 2012).

### **Compatibility Policy**

This policy (603 FW 2) defines a compatible use as a use “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 compatibility policy complements the appropriateness policy. Once a refuge manager finds a use appropriate, they conduct further evaluation through a compatibility determination assessment. The refuge manager must first find that a use is appropriate before undertaking a compatibility review of that use. If the proposed use is not appropriate, the refuge manager will not allow the use and will not prepare a compatibility determination.

The policy provides guidelines for determining compatibility of uses and procedures for documentation and periodic review of existing uses. Below is a summary of this policy:

- The Refuge Improvement Act and its regulations require an affirmative finding by the refuge manager on the compatibility of a public use before allowing it on a national wildlife refuge.
- The act defines six wildlife-dependent uses that are to receive enhanced consideration on refuges: hunting, fishing, wildlife observation and photography, 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 or 10 years for other uses.
- However, the refuge manager may reevaluate the compatibility of any 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 (602 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.
- This policy (603 FW 2) and its regulations, including a description of the process and requirements for conducting compatibility reviews, can be viewed online at: <http://www.fws.gov/policy/603fw2.html> (accessed November 2012).

### **Wildlife-dependent Recreation Policy**

The Refuge Improvement Act defines and establishes that compatible wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) are the priority general public uses of the Refuge System and will receive enhanced and priority consideration in refuge planning and management over other general public uses. The Wildlife-dependent Recreation Policy explains how we will provide visitors with opportunities for those priority public uses on units of the Refuge System and how we will facilitate these uses. The policy:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflict with fish and wildlife population or habitat goals or objectives in an approved plan.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources.
- Provides reliable and reasonable opportunities to experience wildlife.
- Uses facilities that are accessible to people and blend into the natural setting.
- Uses visitor satisfaction to help to define and evaluate programs.

This policy can be viewed online at: <http://www.fws.gov/policy/605fw1.html> (accessed November 2012).

### **Refuge System Planning Policy**

The planning policy provides guidance, systematic direction, and minimum requirements for developing all CCPs, and stipulates a systematic decision-making process that fulfills those requirements. This policy also establishes 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 which, when implemented, will achieve refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System; help achieve the goals of the National Wilderness Preservation

**Refuge Establishment, History, and Purpose**

System; and meet other mandates (Service Manual [602 FW 1,2,3]). Additional information on the CCP planning process and other relevant mandates and plans is provided in chapter 2.

In the early 1960s, the southeastern coastal marshes of Delaware were under the threat of industrial development by oil refinery and manufacturing industries. To help preserve those coastal wetlands, the refuge was established under the authority of the Migratory Bird Conservation Act (16 U.S.C. 715–715r), as amended, on August 21, 1963, “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

We later expanded the boundaries of the refuge to include 934 acres of land purchased with funding from the Land and Water Conservation Fund, under the authority of the Refuge Recreation Act (16 U.S.C. 460k–460k-4), as amended, for the following purposes: “[land] suitable for (1) incidental fish and wildlife-oriented recreation development; (2) the protection of natural resources; and (3) for the conservation of endangered species.” The refuge has acquired 10,144 acres encompassing 100 tracts ranging in size from 0.4 acres to 1,600 acres from 75 landowners (table 1-1).

**Table 1-1. History of Refuge Land Acquisition**

<b>Date of Acquisition</b>	<b>Acreage</b>
1963	101.35
1964	1,468.88
1965	2,283.39
1966	471.06
1967	356
1968	1,756.90
1972	516.22
1974	1,561.60
1975	317.60
1976	92.80
1981	140.10
1983	635
1987	1.10
1998	20.36
2001	343.73
2003	47.02
2007	11.20
2009	8.60
2012	11.69
<b>TOTAL</b>	<b>10,144</b>

The acquisition of land for the refuge was highly controversial. In 1963, Delaware Governor Elbert N. Carvel wrote to President Kennedy, requesting that acquisition not be carried out. Secretary Udall’s reply to Governor Carvel advocated the continued Federal acquisition of Prime Hook wetlands to protect migratory bird resources for future generations.

Prime Hook NWR historically consisted of tidal marshes and agricultural lands cultivated in corn and small grains. These refuge areas were also grazed by cattle. The landscape surrounding the refuge was dominated by small farms producing vegetables and small grains. Today, resort and residential development increasingly surround the refuge. Agriculture is still one of Delaware's major industries, with more than 480,000 acres in croplands, mostly to support a considerable poultry industry located in Sussex County. The refuge's 10,000 acres are adjacent to three bay front communities: Slaughter Beach, Prime Hook Beach, and Broadkill Beach. Eighty percent of the refuge is dominated by emergent wetlands, mostly impounded freshwater marshes with various inclusions of red maple, Atlantic white cedar, and seaside alder swamps. The remaining area consists of 700 acres of upland mixed pine and hardwood forest, 600 acres of farmed fields, and 700 acres of early successional habitats.

The Service's management over the years was designed to foster freshwater habitats to maximize migratory waterfowl production. In the late 1980s, a water level management structure was constructed in Unit II, which allowed this unit as well as Unit III to be flooded with freshwater. These two impoundments rely upon three cross-marsh State roads (Fowler Beach Road, Prime Hook Road, and Broadkill Road) and sand manipulations on the barrier beach to separate these freshwater areas from the adjacent two salt marsh units (I and IV) and from the Delaware Bay.

Game agencies use farming to attract and provide forage for waterfowl on wildlife management areas. On the Delmarva Peninsula, crop or food plot management has been largely to attract Canada goose, and to a lesser extent, dabbling ducks. Cropland management has also historically been a traditional habitat management tool on national wildlife refuges nationwide. Refuges have used farming to attract and feed waterfowl species to support migrating goose and duck populations, as well as to provide hunting and viewing opportunities for the public. Some refuge visitors have come to expect vast acreages of row crops on refuges. Prime Hook NWR began a cooperative farming program when the refuge was created in the 1960s. At its peak in the 1970s, 1,070 acres were in agricultural production on the refuge. In 2006, the last year of the cooperative farming program, the refuge farmed 485 acres. The program ceased until the farming program could be formally evaluated through this CCP process.

The Delmarva fox squirrel was extirpated from Delaware the 1800s. The recovery team decided to reintroduce fox squirrels throughout the Delmarva area and beyond. Prime Hook NWR's translocations occurred in 1986 and 1987. A founder Delmarva fox squirrel population of 17 individuals, 4 from Dorchester County, Maryland, and the remainder from Blackwater NWR was introduced into the refuge. By 1993, the Prime Hook translocations were deemed "successful" as per the 1993 second Recovery Plan. Recent changes in land use surrounding Prime Hook NWR (i.e., development), a small scale of available habitats on Prime Hook NWR, climate change, and sea level rise modeling data, all suggest poor prospects for long-term viability and persistence for the refuge Delmarva fox squirrel population.

The wildland urban interface is defined as the line, areas, or zone where structures and other human development meet or intermingle with undeveloped wildland or natural vegetative fuels. Past marsh management practices along with deferred funding decisions have contributed to a buildup of highly flammable *Phragmites* fuels on refuge lands adjacent to private beach communities. The result is that fire hazards and higher associated risks, as well as increasing beach populations, have augmented the wildland urban interface fire hazard potential directly associated with refuge lands. In recognition of these facts, the refuge received funding to reduce fire hazards and risks associated with the refuge's current wildland urban interface situation. A large

majority of homes lie immediately adjacent to refuge wetland and upland habitats and would be directly affected by any marsh fires fueled by *Phragmites*. It was estimated that approximately 4,000 acres of *Phragmites* located on and off the refuge pose an extreme fire hazard at the wildland urban interface. The refuge initiated a plan to reduce the hazardous fuels on the refuge and other areas adjacent to the local beach communities. This program continues today.

## Refuge Vision Statement

The vision statement below qualitatively describes our desired future character of Prime Hook NWR. It was refined throughout the planning process with input from our partners and the public, and it will guide program emphases and priorities at the refuge.

*Prime Hook National Wildlife Refuge will comprise a variety of Delmarva coastal plain habitats, such as barrier island beach, freshwater wetlands, tidal salt marshes, grassland, shrubland, and forest. The refuge will manage, maintain, enhance, and, where appropriate, restore ecologically sustainable habitats for native plants and animals, with an emphasis on migratory birds and rare species. A balanced approach will be used to ensure all wildlife-dependent recreational users experience quality opportunities. The refuge will be a leader in conservation, research, and community partnerships, adapting to physical and natural changes as necessary to maintain the ecological integrity of the refuge and build a stewardship ethic for current and future generations.*

## Refuge Goals

Goals describe the desired future condition of the refuge and provide a framework for what the refuge is trying to accomplish in adopting a CCP. Developing goals early in the planning process helped focus our thinking about management actions. Our goals are described below in three categories: habitat, public use, and other.

### Habitat

We will preserve, restore, and enhance the biological diversity and ecological integrity of Prime Hook NWR's native plants and wildlife in wetland and upland habitats within the Delmarva coastal plain ecosystem with the following goals:

#### **Barrier Island Beach and Coastal Salt Marsh Habitats**

Manage, enhance, and protect the dynamic barrier beach island ecosystem for migratory birds, breeding shorebirds, and other marine fauna and flora. Perpetuate and restore the biological integrity, diversity, natural sustainability, and environmental health of North Atlantic high and low salt marsh habitats.

#### **Forested Habitats**

Manage the biological diversity, integrity, and environmental health of refuge upland and wetland forested cover types to sustain high quality habitats for migratory birds and increase quality habitat for the endangered Delmarva fox squirrel, forest interior breeding and wintering landbirds, reptiles, amphibians, and other resident wildlife.

#### **Refuge Impounded Marsh Complex**

Maintain the quality of the wetland habitats within and surrounding the refuge's wetland impoundment complex for migrating shorebirds, breeding rails, wading birds, American black ducks, and migrating and wintering waterfowl consistent with the BIDEH policy. Support other native wetland-dependent species and provide fish passage and nursery habitats for anadromous fish species.

#### **Early Successional Upland Habitats**

Maintain, enhance, and/or restore the native vegetation, biological diversity, and ecological integrity of early successional upland habitats to create a mosaic of native grassland, herbaceous scrub/shrub habitats, and transitional young forest

to conserve migratory birds, breeding landbirds, and endangered species, and maximize benefits for other priority resources of concern.

**Public Use**

Provide visitors with a place to safely take part in the six priority wildlife-dependent recreational uses established by the Refuge Improvement Act, as well as such other public uses as may be allowed without interfering with refuge purposes and objectives for wildlife.

**Other**

Collaborate with the local community and partners to complement habitat and visitor services programs on the refuge and the surrounding landscape.

**Issues, Concerns, and Opportunities**

We developed a list of key issues and opportunities from our issues workbook, public and focus group meetings, and planning team meetings. Along with the goals stated above, these key issues formed the basis for developing and comparing the management alternatives.

**Key Issues and Concerns**

Since a key purpose of this CCP is to develop management goals and strategies for the next 15 years, the CCP will focus on several key issues that have been identified by Service staff and through public input.

**Climate Change/Sea Level Rise/Overwash**

*Climate Change*

A growing body of evidence indicates that accelerating climate change, associated with increasing global temperatures, is affecting water, land, and wildlife resources (Titus et al. 2009). While climate change has occurred throughout the history of our planet and the planet has been warming over the past 20,000 years, current changes are occurring at a greatly accelerated rate as compared to the relatively slow warming trend of the most recent 7,000 years. These accelerated rates are largely a result of the accumulation of greenhouse gases from human activities since the onset of the United States (U.S.) Industrial Revolution (USCCSP 2009). Across the continental U.S., climate change is affecting migratory phenology and body condition of migratory songbirds (Van Buskirk et al. 2009). Along our coasts, rising sea levels have begun to affect fish and wildlife habitats, including those used by waterfowl, wading birds, and shorebirds on our national wildlife refuges.

Successful conservation strategies will recognize that climate change is a continuing, ongoing condition, so we need to understand how natural systems have evolved in this context and predict how those changes will affect fish and wildlife at multiple scales. We need to develop, test, and implement conservation strategies to cope with the physical changes in the coastal environment resulting from climate change. Some of the current and predicted impacts of climate change in the coastal zone include:

- Shoreline erosion and shoreline displacement.
- Displacement of wildlife (as critical habitats decline).
- Conversion of upland habitats to wetter habitats, freshwater habitats to saline.
- Conversion of forested areas to emergent wetlands.
- Conversion of tidal wetlands to mudflat or open water.
- Decreased nearshore and/or freshwater recreational opportunities.
- Damage to refuge facilities, roads, trails, towers, etc.
- Decreased water quality as a result of increased temperatures and runoff associated with stronger, more frequent storm events.

- Decreased groundwater availability due to changes in precipitation regimes.

Refuge staff will need to increase cooperative efforts with science partners, such as Delaware Department of Natural Resources and Environmental Control (DNREC), Ducks Unlimited, U.S. Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA), and others to research and monitor the current and likely physical and biological impacts of climate change, and to assess species and habitat vulnerabilities. This information will be used to formulate guidelines or thresholds to mitigate habitat losses and assist ecosystem adaptation to the refuge's changing environment.

#### *Sea Level Rise*

Sea level rise, a manifestation of a warming climate, has been gradually occurring for thousands of years. Increasing ocean water volumes are caused by thermal expansion of water and the melting of polar ice caps. In addition to the volume of the ocean increasing, land in the mid-Atlantic region is actually sinking as a result of geologic changes near the surface and deep within the Earth (Holdahl and Morrison 1974). This is known as shallow and deep zone subsidence. Thermal expansion, melting of the polar icecaps, and subsidence all contribute to relative sea level rise.

Sea level rise has been recognized as a key issue facing coastal communities for decades. The Federal Coastal Zone Management Act of 1972 directed local governments to anticipate and plan for the effects of sea level rise. At the international level, the Intergovernmental Panel for Climate Change (IPCC) was formed to assess sea level rise on a global scale. In its fourth assessment report, the IPCC estimated that global sea level could rise between 0.2 and 0.6 meters by the year 2100 based on projected greenhouse gas emission scenarios. Some climatologists believe that these projections far underestimate the potential rise in sea levels and suggest that sea level rise may exceed 1.0 meters (Rahmstorf 2007) or substantially more if rapid polar melting is considered. At the national level, the U.S. Climate Change Science Program was formed to investigate climate change and sea level rise. This committee recently released a multi-year study entitled *Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region*. This study discussed the potential impact from sea level rise using three scenarios for the year 2100: a rise of 1.3 feet (current rate), 1.6 feet, and 3.3 feet. The third projection is consistent with the higher estimates suggested by recent publications (USCCSP 2009).

Potential impacts from sea level rise can vary significantly depending upon the scenario; therefore, different sea level rise scenarios should be evaluated to consider an entire range of potential effects. Sea level rise has the potential to significantly impact the refuge, Delaware's coastal resources and communities, and Delaware's overall economy over the next several decades. Because of higher sea levels, low-lying coastal communities are becoming more frequently inundated during storm events. As storm events are predicted to become more frequent and more intense, coastal erosion and flooding events will likely be more severe than previously experienced. These impacts will have profound effects on the refuge.

In 2008 and 2009, the Delaware Coastal Program conducted a Sea Level Rise Affecting Marsh Model (SLAMM) exercise, using high-resolution elevation data, at Prime Hook NWR. The SLAMM model that was used (version 5) incorporated inundation, erosion, overwash, and saturation processes into modeled predictions about land cover change under various sea level rise scenarios. However, the SLAMM model does not incorporate a dynamic accretion rate that changes with varying sea level rise, which could influence and possibly improve the ability of the wetlands to keep pace with sea level rise. It also does not account for potential accelerated bluff erosion, and may thus underestimate the availability of sediment to replenish wetlands in some cases. The model used estimated

minimum and maximum sea level predictions and incorporated a minimum and maximum accretion rate estimate, assuming that the actual values will probably fall somewhere within those ranges. Certain conditions are predicted by both scenarios and we assume they are good predictors of the future environment at the refuge, even in light of the limitations of the model. By the year 2050, the model projects that at least half of the current upland area of the refuge will be lost (either converted to wetlands or open water), decreasing from 20 percent to, at most, 12 percent of the current land base. Open water and tidal mud flat areas may increase throughout the next 100 years.

If sea level rises at an accelerated rate to 1 meter in the next 100 years, the impact will be much greater on the refuge. By the year 2050, open water and mudflats are predicted to constitute 26 percent of the refuge under conditions that would allow marshes to build at high accretion rates, or up to 58 percent of the refuge with low accretion rates. Under the worst case scenario, by the year 2100, up to 88 percent of the today's refuge could be open water or tidal mud flats and only 1 percent of the refuge would be uplands. Predicted land cover changes under each sea level rise scenario are fairly similar with or without the bay dunes remaining intact. It is worth noting, however, that as conditions on the refuge change in the predicted manner, the ability of the refuge to manage wetlands through water level manipulation and exclusion of saltwater from impoundments will be lost long before the full effects of sea level rise are realized. The more immediate effect of sea level rise on the management of refuge resources is a critical issue for the refuge to consider during planning. The full SLAMM modeling report (Scarborough 2009) can be found at: <http://www.swc.dnrec.delaware.gov/coastal/Pages/SeaLevelRiseAdaptation.aspx> (accessed November 2012). Additional information regarding climate change and sea level rise can be found on the Service's Web site: <http://www.fws.gov/home/climatechange/> (accessed November 2012).

#### *Overwash*

Overwash is a natural manifestation of rising sea levels; it is anticipated that the refuge will be confronted with an increasing frequency of these natural events. Overwashes are also critical to maintaining healthy emergent wetlands in barrier island systems of estuaries, such as the Delaware and Chesapeake Bays. Emergent marshes must, in part, receive periodic influxes of sediment to help build marsh elevation to keep pace with rising sea levels. When humans impede natural overwash and marsh building processes by constructing dunes or filling overwash areas, they impede back-bay marsh development. This natural process of migrating landward is a barrier island system's response to sea level rise as they would otherwise be inundated. Overwashes provide nutrients and sedimentation that are vital for tidal salt marshes and provide critical habitat for priority coastal migratory birds.

Notable storm-induced overwashes occurred on the refuge in 1982, 1988, and 1998. The dunes were artificially rebuilt in 1999. In 2006, Hurricane Ernesto caused a beach overwash just north of Fowler Beach Road on Prime Hook NWR. On May 12, 2008, a nor'easter brought flooding that overtopped or completely removed portions of the beach dunes extending from the Slaughter Beach community to the Prime Hook Beach community, which includes the 2006 overwash area. The overwash north of Fowler Beach Road (Unit I) joins the Delaware Bay to a lagunal tidal salt marsh. As explained in more detail in chapter 3, this area has experienced overwash events in the past, which form and heal naturally over time. For example, an overwash in nearly the exact same location was present in the 1930s (figure 1-1).

The beach immediately south of Fowler Beach Road has formed inlets the past few years, as well. The impacted area south of Fowler Beach Road (Unit II) covers approximately 4,000 linear feet of beach, with 30 percent of the breaches

on private land or a mix of private and refuge-owned lands. These inlets have flooded the formerly managed freshwater impoundment in Unit II with saline bay water. DNREC enhanced the dunes in this area when the Unit II impoundment was established in 1988, and DNREC and the Service have reconstructed them on several occasions between 1988 and 2008 to prevent high tides from entering the freshwater impoundment from the bay. The refuge reasoned that allowing the overwashes to continue could result in a shift in vegetation composition in Unit II, which would reduce value of the impoundments as waterfowl habitat and in the quality of the Prime Hook NWR hunt program. However, it should be noted that prior to the extensive alteration of hydrology in this area caused by construction of roads, ditches, and canals, the native vegetation consisted largely of salt marsh communities. A former salt marsh peat sediment layer persists beneath the upper sediment, despite more than 20 years of freshwater inundation.

Unit III has also been managed as a freshwater impoundment for the benefit of waterfowl. Although not directly impacted by overwashes and inlets as Unit II is, the two units share water exchange through culverts under Prime Hook Road. Increased salinity in Unit II will influence the salinity in Unit III, even as freshwater inputs reduce the salinity in at least the central portion of Unit III. The impacts of the coastal overwashes on Unit III are not as direct as in Unit II, but they are present. Management challenges associated with the overwashes and inlets will ultimately affect both of these freshwater impoundment units.

The refuge's response to recent overwashes has been controversial, particularly within local beachfront communities. Some believe that overwashes, inlet formation, and subsequent flooding of the road and impoundment system are the fault of the refuge, and have suggested that the refuge should be managed to prevent flooding of private properties. Others, including some waterfowl hunters, insist that maintenance of the freshwater impoundments is critical to meet the refuge's management objectives for migrating and wintering waterfowl. However, also at issue is the recognition that management of freshwater wetlands through water level manipulation and repeated dune reconstruction over the long term is at odds with the BIDEH policy and with the Service's climate change strategic plan. The refuge also faces ecological uncertainty regarding how the impounded wetland will respond to rapidly increasing tidal flow, given its physical condition after decades of saltwater exclusion, and must consider how best to address that uncertainty. At the current rate of overwash, the refuge would be restoring dunes on average every 5 years, if not more often, in order to prevent tidal waters from entering the impoundments directly. Even with dunes along Unit II in place, saltwater intrusion would continue to impact freshwater habitats on the refuge periodically, as bay water enters the Unit II impoundment either through or over Fowler Beach Road.

Chapter 3 of this CCP provides further details about the various factors that influence freshwater impoundment management in the face of the three coastal processes of climate change, sea level rise, and overwash. The status of the physical environment and the condition of the management infrastructure are described to set the stage for the future management actions as outlined in chapter 4. Shortly following the formation of the major breaches in 2009, the refuge proposed to fill inlets and reestablish dunes along Unit II to maintain short-term stability of wetland habitats until the CCP was finalized and to prevent break-up of the peat layer, which protects the upland shoreline from direct wave action and is vital to an effective marsh restoration effort. The size of these breaches elevated the situation from that of minor dune repair to a more substantial management activity. Thus, an environmental assessment was prepared to conduct dune repair one more time (USFWS 20120). Legal challenges delayed the dune repair until 2011. By the time the repair was conducted, Hurricane Irene (August 2011) had reduced the amount of onsite material available significantly. The repair was conducted by the Shoreline Section of DNREC to the best of their ability, but the breaches reopened merely

days later. Daily tidal flow of saltwater through the breaches and into Unit II continues. Ultimately, the options that the refuge can reasonably consider in managing the impounded coastal wetlands will be guided by the challenging dynamic coastal conditions.

### **Mosquito Control**

Balancing the needs of wildlife and people is becoming more difficult as residential developments encroach upon wild areas and more visitors participate in wildlife-dependent recreational opportunities on Prime Hook NWR. Providing quality habitat at sufficient quantities for an increasing number of species and individuals is challenging to wildlife managers and biologists. Another critical factor to take into account is the threat of disease to wildlife and humans and how to gauge this threat in making decisions. Numerous factors must be considered before actions are implemented to ensure that all precautions and long-term consequences of those actions are considered.

Mosquito control has a long history in Delaware. The Service has worked cooperatively with the DNREC Mosquito Control Section to provide access and permits to control mosquitoes on Prime Hook NWR for nearly 40 years. Numerous techniques have been employed to reduce nuisance mosquitoes on the refuge, including the use of open marsh water management to allow biological control of mosquito larvae and pesticide application of larvicides and adulticides.

The aim of the refuge is to work in cooperation with the Mosquito Control Section to establish appropriate and compatible mosquito control activities on the refuge based on sound science. This includes relying on Center for Disease Control guidelines, the Service's BIDEH and compatibility policies, Interim Guidance for Mosquito Management on National Wildlife Refuges (USFWS 2005), the State's best management practices, and American Mosquito Control Association/Environmental Protection Agency's Pesticide Environmental Stewardship program.

Mosquitoes are a part of the natural environment and a food source for a variety of wildlife. Insecticides, in particular adulticides, used to control mosquitoes can have significant impacts on insects, including nontarget insects, that are used by fish, amphibians, and migratory birds as important food sources.

The refuge will continue to work with the State while striving to protect the biological integrity, diversity, and environmental health of the refuge. This working relationship will eventually lead to the development of a mosquito control plan for the refuge. The refuge's strategies associated with mosquito control, along with their impacts, are discussed further in the chapters to follow.

### **Cooperative Farming Program**

Agriculture, more than any other human activity, has had a profound influence on North American waterfowl and other wildlife (Ringelman 1990). In the past, farming has been an effective wildlife management tool as crops were used to supplement native food resources. When wildlife objectives were not being met through the maintenance of native vegetation, the more intensive method of cropland management was employed. Migratory waterfowl fed on waste crops left behind after harvest, and the refuge used farming as part of a cooperative farming program. Today, even though the potential agricultural production of row crops can be high for wildlife, improvements in combine headers and other farm equipment have resulted in harvest efficiencies of greater than 95 percent and rapidly approaching 99 percent (Gliem et al. 1990). As harvesting has taken place earlier, what waste grain remains usually germinates before migratory Canada geese arrive.

The refuge's overall contribution to the dietary consumption of agricultural foods by trust resources has been insignificant when considering the available cropped acreage on the local and regional scale. Prime Hook NWR has never tilled more than 870 acres in any year. This farmed acreage was incrementally reduced over the years to a total 544 acres in 2006. Presently, there are 40,565 acres of production cropland in the watershed. Waterfowl are not sedentary. Geese especially will make lengthy foraging flights between roosts and suitable feeding habitats. The State of Delaware maintains 490,000 acres of production farmland, while the Delmarva Peninsula as a whole has 1.5 million acres.

Major concentrations of wintering snow geese use Prime Hook NWR; in excess of 100,000 snow geese have been found during the fall and winter season. Extensive wetland acreage used by snow geese as safe loafing and roosting sites. In 2007, the final EIS for light goose management was published. The preferred management alternative supports the reduction of farming and sanctuary for snow geese on the refuge. In 2008, Delaware House Joint Resolution No. 12 was signed, asking the Service to issue the final rule of the light goose management EIS and the implementation of the conservation measures it recommends. The final rule on the EIS was issued by the Service in 2008, and is referred to as the snow goose conservation order. This conservation order is a special management action authorized by the Migratory Bird Treaty Act to control certain wildlife populations when traditional management programs are unsuccessful in preventing overabundance. It is consistent with this CCP's management plan to reduce overabundant snow geese populations on the refuge that can destroy marsh habitats and displace other species.

We know today that fragmenting native habitats has contributed substantially to the decline in many trust resources, including numerous species of migratory birds. In addition, fertilizers required to maintain farming, which is a relatively sterile, nearly monotypic habitat by ecological standards, may have substantial negative impacts on the local ecosystem. Sediment and nutrient runoff have affected fish and wildlife species far downstream, and aquifers once used as sources of human drinking water on Delmarva are now deemed unsafe for consumption due to applied nitrate leaching from the surface.

Under the Migratory Bird Conservation Act and Refuge Recreation Act, Prime Hook NWR was approved by the Migratory Bird Conservation Commission on August 21, 1962, to protect and preserve coastal wetlands that are historically of high value as waterfowl habitat. Agricultural lands were not of primary importance. Additionally, lands were acquired under the Migratory Bird Conservation Act "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." For lands acquired under the Refuge Recreation Act states the purpose of the acquisition is "...suitable for (1) incidental fish and wildlife-oriented development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." Although agricultural practices were viewed as a common management tool at the time the refuge was established, it is apparent that the intent of the refuge's establishing legislation gives no undue weight or particular mandate to agricultural activity.

Two acts of Congress also play a role in the cropland management program: NEPA and Refuge System Improvement Act (1997). NEPA requires the government to evaluate the impacts of its management actions on the affected environment. The Refuge Improvement Act requires Prime Hook NWR to ensure that cooperative farming is compatible (see section 1.423 in this chapter) with the purpose for which the refuge was established. Cooperative farming is also considered an economic use, refuge policy 5 RM 17 also plays a role in the formation of cropland management planning.

In 2006, the Delaware Audubon Society, Center for Food Safety, and Public Employees for Environmental Responsibility filed suit against the Service alleging the refuge's failure to comply with these acts and policies. The refuge ceased all farming operations in 2006. In 2009, the judge enjoined the refuge from farming and planting genetically modified organisms until the refuge completed compatibility determinations and environmental assessments dealing with the impacts. We are now complying with the court's directive by assessing the impacts of agriculture in this CCP and the attached compatibility determination.

### **Hunting**

Hunting on the Delmarva Peninsula is a traditional outdoor past time and is deeply rooted in American and Delaware heritage. Opportunities for public hunting are decreasing with increasing private land development. Refuge lands thus become increasingly important in the region as a place to engage in this activity. Hunting has and will continue to be an integral component of the public use program at the refuge. Section 605 (FW 2) of the Service Manual states that hunting programs will be compatible, provide quality experiences, and to the extent practicable, be consistent with State fish and wildlife laws and regulations. In preparation of the CCP, the refuge closely examined aspects of the current hunting program that some have described as inefficient, overly complex, and requiring a significant amount of staff resources. It has also addressed whether increasing opportunities for one user group, i.e., hunters, might appreciably reduce opportunities for non-consumptive wildlife-dependent uses, such as wildlife observation and photography.

### **Opportunities**

The refuge should seek to establish new and strengthen current partnerships with conservation organizations, such as the Service's Partners for Fish and Wildlife program, the coastal program, private individuals, etc. The refuge relies on partnerships with several organizations and individuals for help with refuge programs, biological surveys, environmental education, and habitat restoration on private lands that support the refuge's purpose. Opportunities exist to establish an outstanding research and monitoring site, develop wetland and hydric soil indicator reference sites, expand the environmental education program, etc.