Appendix C

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Northern pintail male with two females

Final Hunting Management Plan

FINAL
HUNTING MANAGEMENT PLAN
Prime Hook National Wildlife Refuge
October 2012

U.S. Department of the Interior
Fish and Wildlife Service
Prime Hook National Wildlife Refuge
Sussex County, Delaware

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INTRODUCTION

Prime Hook National Wildlife Refuge (the refuge), which is managed by the U.S. Fish & Wildlife Service through the U.S. Department of the Interior, is located within the Atlantic Coastal Plain along the southwestern shore of the Delaware Bay in Milton, (Sussex County) Delaware (Map 1). The refuge is located within two hours driving time of metropolitan Baltimore, MD, Washington D.C., Wilmington, DE, and Philadelphia, PA, and 22 miles southeast of the state capital of Dover (population 35,808).

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

The refuge's natural environment features the following key vegetation communities: freshwater and brackish water wetlands, interdunal wetlands, *Spartina* high salt marsh, bishop-weed mixed species brackish marsh, red maple and blackgum swamp, mixed herb deep peat wetlands, fragmented upland forested areas, early successional upland habitats, and ancient sand ridge forest. These cover types currently provide habitat for approximately 308 species of birds, 51 species of fish, 45 species of reptiles and amphibians, 37 species of mammals, dozens of rare insect species and hundreds of rare plant species [Delaware Wildlife Action Plan (DWAP) 2005].

In the early 1960s the southeastern coastal marshes of Delaware were under threat of industrial development from oil refinery and manufacturing industries. To help preserve these coastal wetlands from industrial developmental threats, the refuge was established under the Migratory Bird Conservation Act (16 U.S.C. 715-715r) as amended on August 21, 1962, "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." Refuge boundaries were later expanded to include lands purchased under 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 "…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 purpose of this plan is to encourage the use of refuge lands for wildlife-dependent public recreation as outlined in various laws, regulations, and Service guidance policies governing the National Wildlife Refuge System. Hunting, which has been a tradition in Delaware for many years, is recognized by the Service as a compatible use and will be permitted on Prime Hook NWR.

CONFORMANCE WITH STATUTORY AUTHORITIES

Hunting is one of the priority public uses defined by Executive Order 12996 (March 25, 1996) and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). This legitimate and appropriate use of a national wildlife refuge is generally considered compatible, as long as it does not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge.

Map 1. Overview and Vicinity Map

U.S. Fish and Wildlife Service policy concerning hunting (605 FW1 & FW2) requires consideration of the following criteria: (1) compatibility with the refuge purpose(s) and the Refuge System mission which includes economic feasibility; (2) biological integrity, diversity, and environmental health; and (3) conflict management between user groups. In addition to a compatibility determination, the Refuge Recreation Act requires verification that funds are available for the development, operation, and maintenance of the hunting program.

Sport hunting is a tool managers use to maintain acceptable wildlife populations. In Delaware, the Division of Fish and Wildlife establishes hunting seasons and bag limits to meet population objectives and to offer people the opportunity to experience a traditional outdoor recreational activity. Game species population objectives are a function of factors such as habitat limitations and landowner tolerances, and each year the seasons and bag limits are designed to remove the harvestable surplus without long-term negative impacts to the population as a whole. The ability to effectively manage game species populations depends in large part on the ability of hunters to access land with quality habitat. Providing hunting opportunities on the refuge will aid the state in meeting its management objectives and preserve a wildlife-dependent priority public use long associated with this land.

The Service intends to continue the tradition of wildlife-related recreation on the refuge by allowing hunting in compliance with state regulations. By allowing this use to continue, hunters can experience this traditional recreational activity, aid the refuge and State in maintaining acceptable game species population levels, gain a better appreciation of the refuge's high quality wildlife habitats, and become better informed about the refuge and the National Wildlife Refuge System.

Refuge Purpose

The refuge 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. Approval was given for acquisition of 11,576 acres. The refuge currently consists of 10,144 acres acquired in fee simple and eight flowage easements totaling 884 acres.

For lands acquired under the Migratory Bird Conservation Act, 26 USC 715-715r, as amended, the purpose of the acquisition is: for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 USC 715d (Migratory Bird Conservation Act)

For lands acquired under the Refuge Recreation Act, 16 USC 460k, as amended, 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…" 16 USC 460k-1 (Refuge Recreation Act).

Several laws and executive orders apply to hunting on national wildlife refuges. They are summarized below.

Executive Order 13443 (August 16, 2007)

This Executive Order, entitled "Facilitation of Hunting Heritage and Wildlife Conservation," "directs Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat."

National Wildlife Refuge System Improvement Act of 1997

Signed by President Clinton on October 9, 1997, this law defines compatible wildlife-dependent recreation as "legitimate and appropriate general public use of the [National Wildlife Refuge] System." It establishes hunting, fishing, wildlife observation and photography, and environmental education and interpretation as "priority public uses" where compatible with the mission and purpose of individual national wildlife refuges.

Executive Order 12996 (March 25, 1996)

This Executive Order, entitled "Management and General Public Use of the National Wildlife Refuge System," contains a directive to: "...recognize compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation as priority general public uses of the Refuge System..."

Endangered Species Act of 1973

This act, as amended, did not specifically address the Refuge System but it does directly affect management activities within the National Wildlife Refuge System. The act directed Federal agencies to take actions that would further the purposes of the act and to ensure that actions they carry out, authorize or fund do not jeopardize endangered species or their critical habitat.

The National Wildlife Refuge System Administration Act of 1966

This act (16 U.S.C. 668 dd-ee; 80 Stat. 927) authorizes the Secretary to "...permit the use of any area within the System for any purpose...compatible with the major purposes for which such areas were established..."

The Refuge Recreation Act of 1962

This Act (16 U.S.C. 460k) authorizes the Secretary of the Interior to administer such areas for public recreation as an appropriate incidental or secondary use only to the extent that it is practicable and not inconsistent with the primary objectives for which the area was established. In addition, the Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation.

Code of Federal Regulations (CFR), Title 50

Section 31.2(e) lists hunting as a method of surplus wildlife population control.

Section 31.15 states that the privilege of hunting may be extended to the general public.

Section 32.1 states that the opening of a wildlife refuge area to hunting will be dependent upon the provisions of law applicable to the area and upon a determination by the Secretary of the Interior that the opening of the area to the hunting of migratory game birds, upland game, or big game will be compatible with the principles of sound wildlife management and will otherwise be in the public interest.

Section 32.2 has provisions applicable to each person engaged in public hunting on a wildlife refuge area.

Section 32.27 has specific regulations for this refuge and will need to be changed in accordance with this plan or policy as needed.

Section 32.3 explains the procedure for publication of special regulations.

HUNTING PROGRAM GOALS AND OBJECTIVES

Goals of the National Wildlife Refuge System

The following Refuge System goals help guide the development of comprehensive conservation plans (CCP) and the administration, management, and growth of the Refuge System:

1. Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.

2. Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

3. 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.

4. Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

5. Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Goals of Prime Hook National Wildlife Refuge

The following goals will guide the management of Prime Hook National Wildlife Refuge:

1. (Barrier Beach Island 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 the biological integrity, diversity and environmental health of North Atlantic high and low salt marsh habitats.

2. (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 (DFS), forest interior breeding and wintering landbirds, reptiles, amphibians, and other forest-dependent wildlife.

3. (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.

4. (Early Successional Upland Habitats) Maintain, enhance and restore the native vegetation, biological diversity and ecological integrity of early successional upland habitats to create an assorted mosaic of early successional habitats mixed with transitional forested areas to conserve migratory birds, breeding landbirds, and endangered species and to maximize benefits for other priority resources of concern.

5. (Visitor Services) 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 other public uses as may be allowed without interfering with refuge purposes and objectives for wildlife.

6. (Partnerships) Collaborate with the local community and partners to compliment habitat and visitor service programs on the refuge and the surrounding landscape.

Hunting Objectives of Prime Hook National Wildlife Refuge

The following objectives will guide the management of Prime Hook National Wildlife Refuge:

1. To provide a high quality hunting program that is administratively efficient and is used to maintain healthy habitats through the management of wildlife populations, where appropriate;

2. To provide high quality hunting opportunities for white-tailed deer;

3. To provide high quality hunting opportunities for waterfowl;

4. To provide high quality opportunities for upland game (rabbit, quail, pheasant, and red fox) and webless migratory birds (mourning dove, snipe, and woodcock); and

5. To provide high quality hunting opportunities for wild turkey.

Hunting on the refuge shall be in accordance with state, federal and refuge-specific regulations. The refuge hunting program will provide the public with high quality wildlife-dependent recreation opportunities. Also, the refuge hunting program will benefit the habitat management objectives of the refuge, especially in controlling the deer population. High deer densities have been shown to alter the understory of forests and negatively affect neotropical migrant birds as well as small game populations. Overbrowsing by deer in the State of Delaware in the 1990s is a well documented problem.

The negative effects of a hunting program on the refuge have been minimized through the use of refuge-specific regulations. Safety issues, game population concerns, non-target species and endangered species impacts, and "quality hunt" parameters have all been addressed in the Environmental Impact Statement, which was prepared by the Service in 2012 as part of the refuge's Comprehensive Conservation Plan (CCP). The CCP also includes a Section 7 consultation for impacts to endangered species.

ASSESSMENT

An assessment of refuge resources can be found in the CCP Environmental Impact Statement that has been prepared to address the direct, indirect, and cumulative environmental impacts of hunting on wildlife, visitor services, refuge facilities, cultural resources, and neighboring lands. Also, a Compatibility Determination has been completed for hunting which includes migratory game bird hunting, white-tailed deer hunting, turkey hunting, and upland (small) game hunting for a variety of species including rabbit, quail, pheasant, and red fox. These documents address environmental impacts, population status, inter-specific competition, and effects of hunting on non-target species. In summary, the hunt program will not result in unacceptable impacts to the refuge resources. The populations of those species open for hunting in this plan will not be adversely affected, provided the refuge-specific regulations listed in this document are followed.

MEASURES TAKEN TO AVOID CONFLICTS WITH OTHER MANAGEMENT OBJECTIVES

Hunting can result in positive or negative impacts to the wildlife resource. A positive effect of allowing visitors access to the refuge will be the provision of additional wildlife-dependent recreational opportunities and a better appreciation and more complete understanding of the wildlife and habitats associated with Delmarva ecosystems. This can translate into more widespread and stronger support for the refuge, the National Wildlife Refuge System, and the Service. The following is a discussion of refuge-specific impacts, which are supported by a compilation of baseline information relative to the featured topic.

General Impacts of Public Use

Direct impacts are those impacts immediately attributable to an action. Indirect impacts are those impacts that are farther in time and in space. Effects that are minor when considered alone, but collectively may be important are known as cumulative effects. Incremental increases in activities by people engaged in the variety of allowed uses on the refuge could cumulatively result in detrimental consequences to wildlife and/or habitats. It will be important for refuge staff to monitor these impacts to ensure wildlife resources are not impacted in a detrimental manner.

Impacts on Socioeconomic Environment

The USGS-Fort Collins Science Center estimated the direct and total economic impacts of refuge management activities, including hunting, in Sussex County. Refuge management activities of economic concern included refuge purchases of goods and services within the local community, refuge personnel salary spending, revenues generated by Refuge Revenue Sharing, and spending in the local community by refuge visitors, including hunters. The economic impacts were estimated using the “Impacts Analysis for Planning” (IMPLAN) regional input-output modeling system. Refuge management activities directly related to refuge operations generate an estimated $3.3 million in local output, 30 jobs and $892.9 thousand in labor income in the local economy. Including direct, indirect, and induced effects, refuge activities would generate total economic impacts of $4.7 million in local output, 41 jobs and $1.29 million in labor income.

More specifically, overall hunting activities directly related to refuge operations would generate an estimated $93.8 thousand in local output, 0.8 jobs, and $26.9 thousand in labor income in the local economy. Including direct, indirect, and induced effects, overall refuge hunting activities would generate total economic impacts of $132.1 thousand in local output, 1.2 jobs and $38.5 thousand in labor income. A further breakdown of hunting activities on the refuge, including direct, indirect, and induced effects, reveals that big game hunting on the refuge would generate total economic impacts of $47.8 thousand in local output, 0.4 jobs, and $13.7 thousand in labor income. Waterfowl hunting on the refuge would generate total economic impacts of $82.3 thousand in local output, 0.8 jobs, and $24.3 thousand in labor income. Small game hunting on the refuge would generate total economic impacts of $2.0 thousand in local output, 0.02 jobs, and $500 in labor income.

In 2007, total labor income was estimated at $2.996 billion and total employment was estimated at 87,113 jobs for Sussex County (IMPLAN 2007 data). These total economic impacts associated with refuge operations represent less than one percent of total income (0.04%) and total employment (0.05%) in the overall Sussex County economy. Total economic effects of refuge operations play a larger role in the Prime Hook communities near the refuge such as Milton and Lewes where most of the refuge public use related economic activity occurs.

Based on these findings, the refuge expects that hunting will have negligible short-term, long-term or cumulative impacts on the economy of the towns or county in which the refuge lies. The Service would not expect this activity to considerably alter the demographic of economic characteristics of the local community. All refuge actions would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. No adverse impacts are foreseen to be associated with changes in the community character or demographic composition.

This activity would result in several minor beneficial impacts on the social communities near the refuge and in the state and region as a whole. The Service expects public use of the refuge to increase, thereby increasing the number of days visitors spend in the area and correspondingly, the level of visitor spending in the local communities.

The “Recreation and Tourism” section in chapter 3 of the refuge’s CCP provides more information about national and statewide trends in the recreation of hunting.

Impacts on Cultural Resources

With a relatively small number of hunters dispersed across the refuge during the hunting season, impacts would be negligible on the refuge’s cultural resources based on our observations of past hunting impacts. Refuge lands are vulnerable to looting, despite our best efforts at outreach, education, and law enforcement. Upland areas adjacent to wetland areas have been identified for high potential for cultural resources. In addition, refuge visitors may inadvertently or even intentionally damage or disturb known or undiscovered cultural artifacts or historic properties. This problem will require, continued outreach, and use law enforcement where necessary.

For compliance with section 106 of the National Historic Preservation Act, the refuge staff will, during the early planning stages of any proposed new actions, provide the regional historic preservation officer a description and location of all projects, activities, routine maintenance and operations that affect ground and structures, details on requests for compatible uses, and the range of alternatives considered. That office will analyze those undertakings for their potential to affect historic and prehistoric sites,

and consult with the State Historic Preservation Officer and other parties as appropriate. This office will notify the State and local government officials to identify concerns about the impacts of those undertakings.

Impacts on Air Quality

Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on local or regional air quality. Localized increases in emissions from hunter's vehicles or boat motors would be negligible compared to current off-refuge contributions to pollutant levels and likely increases in air emissions in the Sussex County airshed from land development over the next 15 years. Any adverse air quality effects from refuge activities would be more than offset by the benefits of maintaining the refuge in natural vegetation. The hunting program would not violate EPA standards and would comply with the Clean Air Act.

Impacts on Soils

Hiking or walking can alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. Soil compaction makes root penetration more difficult, making it harder for seedlings to become established. In moderate cases of soil compaction, plant cover and biomass is decreased. In highly compacted soils, plant species abundance and diversity is reduced in the long-term as only the most resistant species survive (Liddle 1975).

Using these baseline impacts, the refuge's hunt program has the potential to cause some soil compaction since off-trail foot travel occurs; however, hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on soils. With a limited number of hunters dispersed across the refuge during the hunting season, impacts would be negligible based on our observations of past hunting impacts. Vehicles would continue to be confined to existing refuge roads and parking lots to minimize impacts outside of that developed footprint. Soil compaction will also occur in the immediate areas surrounding blind site stakes for waterfowl hunting in the Unit III Waterfowl Lottery Area. Impacts to bank erosion will be minimized through the use of no wake zones and a maximum motor restriction of 30 horsepower on Prime Hook Creek and Slaughter Canal.

To facilitate hunting, maintenance or improvement of facilities (parking areas, roads, trails, and boat ramps) will be needed, which are expected to cause negligible to minor short-term impacts to localized soils and waters. Negligible short-term disturbance to soils will occur during the construction of new parking areas on Fowler Beach Road, Broadkill Beach Road, and Slaughter Beach Road.

Several rare peat bog communities have been located near Goose Pond and Flaxhole Pond and these areas are open to deer hunting. Sensitive hydric soils that support these rare plant communities are easily destroyed by trampling. Visitation to this site will be kept to a minimum in order to protect damage to hydric soils and trampling of sensitive rare plants.

Impacts on Hydrology and Water Quality

Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on hydrology or water quality based upon staff observations of past hunting impacts. The hunting program would not violate federal or state standards for contributing pollutants to water sources and would comply with the Clean Water Act.

The use of boats by hunters has the potential to affect water quality negatively by increasing erosion, stirring up bottom sediments, or introducing pollutants into waterways. The Service does not expect emissions from vehicles or boat motors to substantially affect the water quality of the region since the majority of hunters are using air-cooled mud-motors instead of water-cooled two-cycle outboard motors due to the shallow water depth in the hunt areas. Localized increases in emissions from hunter's boat motors would be negligible compared to current off-refuge contributions of boaters to pollutant levels in the nearby Broadkill River and the Delaware Bay. Furthermore, the refuge posts no wake zones and imposes a maximum 30HP restriction on Prime Hook Creek and Slaughter Canal.

Non-toxic shot is required for all hunting except lead slugs are permitted for deer and fox hunting. Public outreach and education on littering and proper waste disposal will lessen potential negative water quality impacts.

Impacts on Vegetation

Repeated visitation to any particular locale at the refuge would continue to cause minor site-specific damage to vegetation. Repeated use of an aquatic area by boats equipped with go-devils can damage emergent and submergent vegetation beds. Portions of or whole plants can be torn, sometimes by roots, and boat wakes contribute to erosion. Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to boats or trailers, or on shoes or clothing, is another source of direct minor impacts on vegetation. In places where unmarked paths are created by hunters and anglers, little used pathways will retain their dominant vegetation species, but on medium-use pathways some plant species will be replaced and heavily-used paths will often contain invasive species (Liddle and Scorgie 1980).

Using the information previously presented as a baseline and considering staff observations of past impacts, hunting is expected to have negligible adverse short-term, long-term, or cumulative impacts on vegetation. Disturbance to vegetation is expected to increase due to an expected increase in deer and waterfowl hunters in new free roam hunting areas in upland and wetland habitats during all hunting seasons, particularly around blinds sites in Unit III. The possibility for new trails to be developed from repeated hunter entry may occur. However, given the large expanse of both upland and wetland acreage, anticipated dispersal of hunters across hunting areas, the inherent nature of hunters to only travel as far as needed to find a hunting location, and knowing that most vegetative species will have already undergone senescence or become dormant, the impacts to vegetation are expected to be negligible from hunting.

Salt marsh habitats were found to be the most resistant to human trampling when compared to other habitats such as a natural dune, a man-made dune, and man-made coastal grasslands (Anderson 1995). This study analyzed the vegetation of five paths (one in each of the habitats) created and sustained by human trampling and reported that trampling of vegetation (estimated to be 1,815-3,630 passages per year) can be considered as very light. Even though it created paths and reduced vegetation cover and species diversity, the paths still retained a persistent vegetation (Anderson 1995). Even using inflated and unlikely estimates of free roam use in refuge salt marsh habitats for deer and waterfowl hunting, the impact from the trampling of vegetation would be considered very light and consistent with the findings reported in Anderson (1995).

The phasing out and elimination of all of the refuge's 115 deer hunting stands and waterfowl hunting blinds will also remove disturbance to impacted vegetation and soils and create a more aesthetically

pleasing landscape for refuge visitors. Impacts to vegetation are also minimized by not permitting hunters to cut vegetation for shooting lanes or for use as camouflage. No natural vegetation is permitted for use as camouflage on the refuge. Impacts to vegetation are further minimized because hunting from a stand which has been attached with nails, wire, or screws or permanently attached in any other way is prohibited.

Hunting plays a role in how white-tailed deer, snow geese, resident non-migratory Canada geese, and mute swans impact vegetation. Canada goose herbivory during the growing season is a relatively new impact upon wetlands. In 2002, a research study conducted at neighboring refuges, Bombay Hook and Chincoteague NWRs, suggested that higher levels of use by geese may cause a long-term change in wetland community structure (Laskowski et al. 2002). Biomass of several species of vegetation was significantly adversely impacted by feeding resident Canada geese at both refuges. Resident geese directly damage agricultural resources by eating grain crops and trampling spring seedlings. Heavy grazing by geese can result in reduced yields and in some instances a total loss of the grain crop (Allen et al. 1985, Flegler et al. 1987). Lethal and nonlethal Canada goose control activities would be expected to significantly decrease the number of injurious resident Canada geese in specific areas, thus reducing local impacts on vegetation. The long-term viability of migrant Canada goose populations would not be affected, however. Similarly, because mute swans are highly invasive of wetland habitats, and can consume large quantities of submerged aquatic vegetation, control of mute swans on the refuge will have a local beneficial impact on wetland vegetation communities.

Various light goose (snow goose) populations in North America have reached such high levels that they are damaging habitats on their Arctic and subarctic breeding areas (Abraham and Jefferies 1997, Alisauskas 1998, Jano et al. 1998, Didiuk et al. 2001) as well as in some migration and wintering areas (Giroux and Bedard 1987, Giroux et al. 1998, Widjeskog 1977, Smith and Odum 1981, Young 1985). The increasing numbers of light-geese are viewed as a continental problem, but with real local adverse impacts on vegetation. Grubbing for rhizomes, especially in salt marshes, results in areas denuded of vegetation, typically referred to as eat-outs. Vegetation density at these eat-outs may return to previous normal levels after several years, if left alone. However, where eat-outs occur within salt marsh habitats, snow geese often return each winter to the same areas to feed. Such impacts have been observed at the refuge. It is also speculated that during the time snow geese are feeding in a salt marsh, much of the soil and sediment may be loosened and placed into suspension. In fact, recently analyzed water quality samples from the refuge impoundments have found extremely high sediment concentration in the water during times of extensive snow goose browsing on the refuge. This material may then be washed away during high or flood tide periods. After several years of successive erosive eat-outs at the same location, the lower ground elevation may further prevent the return of vegetation, causing a more long-term impact to vegetation community on the site. Reducing snow goose numbers on the refuge will reduce adverse minor-to-moderate impacts of snow goose herbivory on salt marsh habitats.

Deer overabundance can affect native vegetation and natural ecosystems and has been well-studied (Tilghman 1989, Nudds 1980, Hunter 1990; Behrend et al. 1970). White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). Over-browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). High densities of deer have also been recognized as vectors for spreading invasive species like Japanese stiltgrass. Thus, control of the white-tailed deer population on the refuge will have a moderate beneficial impact on the vegetation communities.

Impacts on Federal and State Endangered Species

Disturbance factors resulting from public use are always considered for all listed species. The Delmarva fox squirrel *(Sciurus niger cinereus)* and piping plover *(Charadrius melodus)* are listed as endangered and threatened by the U.S. Fish and Wildlife Service and the red knot was designated as a candidate species in 2006 for possible listing. Several other species listed as endangered by the Delaware Division of Fish & Wildlife include American oystercatcher *(Haematopus palliates),* common tern *(Sterna hirundo),* Forster's tern *(Sterna forsteri*), least tern *(Sterna antillarum),* and bald eagle *(Haliaeetus leucocephalus).* Of these, the piping plover, red knot, American oystercatcher, common tern, Forster's tern, and least tern will not be impacted by hunting because they would be unlikely to use the refuge's forested habitats and/or their occurrence on the refuge is outside of the hunting season for deer, upland game, and waterfowl. A Section 7 Evaluation has been conducted as part of this review and it was determined that proposed activities would not likely affect the Delmarva fox squirrel or piping plover. Furthermore, the hunting of any squirrel species is prohibited on the refuge to further minimize impacts to this endangered species.

While the bald eagle is no longer a federally listed species, the refuge uses the national bald eagle management guidelines for bald eagle management to implement time-of-year restrictions for nesting eagles. The guidelines do not permit any activity within 330 feet of an active nest during the breeding season, particularly where eagles are unaccustomed to such activity (U.S. Fish and Wildlife Service 2007).

Hunting on or near Turkle Pond was an existing activity prior to nesting by bald eagles on the adjacent Horse Island. When bald eagles were listed as endangered, the Section 7 Evaluation conducted on the refuge concluded that this activity in Turkle Pond would not likely affect this species and the use was permitted. Monitoring will continue in Turkle Pond to determine if there is an impact on the eagle nest on Horse Island, which is currently abandoned.

Impacts on Waterfowl

Below is a discussion of the generalized impacts of hunting on critical life history requirements of waterfowl, the use of sanctuaries to mitigate adverse impacts to waterfowl, and impacts of hunting through the harvest of waterfowl. Refuge-specific impacts of hunting on waterfowl are discussed in each of these sections.

<u>Wintering Waterfowl - Waterfowl Habitats</u>
Since the refuge consists of 80 percent wetlands, all recreational activity has the potential of impacting waterfowl, shorebirds, marsh birds, and other migratory bird populations feeding and/or resting near the hunting area(s). Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes departure from site (Owen 1973, Burger 1981, Korschgen et al 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of suboptimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day.

During the period of September 1 – March 15, which is when most wintering and migrating waterfowl are on the refuge, adverse impacts to these birds could result from unregulated human disturbance in optimum waterfowl habitats at the refuge. This conclusion is based on the role of disturbance as it relates to waterfowl life history requirements and behaviors such as feeding, flight, metabolic processes,

molting, preening, and resting. These daily waterfowl maintenance activities are costly from an energetic standpoint and require that waterfowl have undisturbed access to quality habitats with diverse food resources to meet their daily and seasonal energy requirements. Since these activities are critical to the survival of waterfowl, a discussion of their behaviors and metabolic processes is appropriate.

Feeding: Waterfowl have complex feeding strategies, which are conducted at optimum levels only in an environment void of disturbance. Feeding is the only activity that provides energy to birds, and the amount of time allocated to feeding is dependent upon relationships between energy-nutrient requirements and foraging strategies used in meeting these needs (King 1974). Feeding on readily available and easily consumed foods requires less time than feeding on dispersed resources or foods which require searching (e.g. mobile invertebrates) or complex foraging behavior (e.g. underground tubers) (Rapport 1980).

Generally, feeding periods for wintering waterfowl are early morning and late evening. Morton, et al., (1989) found that American black ducks (*Anas rubripes*) spent an average of 4.49 hours per day feeding, with the majority of feeding activity occurring either during the first three hours after daylight, or the last three hours of the day, and then spend the remainder of the day engaging in resting, (4.54 hours) swimming, (1.83 hours), or several other maintenance activities (balance of the day). This suggests that waterfowl, when undisturbed, prefer to feed early and late, while spending the remainder of the day in maintenance activities such as resting, preening, or courtship.

Mallards (*Anas platyrhynchos*) generally do not feed in water deeper than 40 cm (Thomas 1976), but prefer to feed in water depths of 10 cm or less (Fredrickson and Taylor 1982), which is indicative of the habitat provide in the refuge's managed impoundment complex. Accordingly, unregulated access in these provided habitats could adversely impact the feeding strategies of waterfowl using the refuge.

Flight: Many research projects have been conducted on the basic energy requirements of waterfowl, and these projects emphasize the importance of readily available food resources. As birds arrive in Delaware during fall migration, they need areas to rest and feed to replenish energy reserves. And, although migratory flight is often associated only with migration, it is important to recognize that approximately 90 percent of the migration period is spent in a stationary mode at successive stopover sites (Hedenstrom and Alerstam 1998). Birds at stopover sites spend their time resting and foraging as they rebuild protein and energy stores in preparation for their next migratory flight (McWilliams, et al 2004). It is also important to recognize that the cost associated with flight is a very expensive activity from a metabolic perspective and forcing birds into flight creates the need to replace lost energy reserves that could have been used for other maintenance activities. Protection is needed to allow waterfowl the opportunity to forage and replenish energy reserves depleted during migration, or to avoid the energetic costs associated with being forced into unnecessary flight.

Metabolic Processes: Along with rebuilding protein and energy stores, one must recognize that in addition to flight, there exists the basic energy maintenance requirement of birds. These daily requirements, which include the energy costs of thermoregulation, maintenance of basal metabolic rate (BMR), and other activities, combine to account for 40-60 percent of the annual energy budget (Walsberg 1983). Thus, without reliable access to high quality food resources, waterfowl must either migrate to better habitats or suffer reduced fat reserves, which can result in below optimum body condition. As an illustration of the food resources required to maintain body condition, Magee (1996) found that, in waterfowl, the energetic cost of flight for one hour would require enough foraging effort to consume 19.6 grams of corn (75 kernels) or 117.8 grams of amphipods (6250 individuals) to replace lost energy

reserves. And, from the standpoint of how fat deposition relates to reproductive potential, Heitmeyer (1985) discovered that hen mallards in the Mingo Basin of Missouri needed to reach a minimum weight threshold of 1360 grams (>3 pounds) when they left the wintering grounds to ensure there would be adequate fat reserves to initiate nesting activities upon arrival at the breeding grounds. At Chincoteague NWR, Morton et al (1989) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Black ducks consumed 10.4 times more energy in flight than at rest, and 1.8 times more energy in alert behavior or swimming than at rest, suggesting that human disturbance of wintering black ducks impaired their physiological condition, thereby reducing winter survival and/or nutrient reserves carried to the breeding grounds. Subsequently, during migration stopovers, waterfowl must be afforded the time and opportunity to forage in high quality habitat to attain the desired body mass and fat depots, and replace lost energy reserves. To meet these metabolic demands, waterfowl rely on many Federal, State, and private wetlands, including the refuge, to rest, feed, and reacquire lost fatty deposits.

Molting: Feather molts are very costly from a metabolic standpoint, as waterfowl are converting from the alternate (summer) plumage to their basic (breeding) plumage. Most feathers are replaced during this period, as these birds are preparing for courtship rituals and pair bonding. Heitmeyer (1985) describes the prebasic molt of female mallards as extensive and intense, as these birds replace approximately 50 grams of feathers in a 6-7 week period, which requires a substantial amount of energy reserves to complete. This increase in nutrient demand translates to the need for individual mallards to be afforded the opportunity for undisturbed foraging. Excess disturbance may negatively impact the ability of waterfowl to secure nutrients, thus disrupting molting processes and associated reproductive strategies.

Preening: Maintenance of feathers by preening has been previously correlated to molt activity and is undoubtedly influenced by molt chronology. Male mallards preen most often during autumn; but preening declines throughout early winter, which corresponds with declining molt activity (Combs 1987). Adverse impacts to preening activities would be similar to those associated with the molting process.

Resting: Resting appears to be a complementary activity to feeding, molting, and preening. As feeding declines from morning to afternoon, resting increases, which is necessary to allow birds to digest food consumed during previous periods of feeding (Paulus 1984b, Clark et al. 1986), and to rejuvenate muscle fibers that may have been damaged during periods of flight (McWilliams et al. 2004). The inability of waterfowl to rest may have a direct negative impact on the ability of waterfowl to digest foods and repair muscle fibers, thus impacting other necessary life history behaviors.

Waterfowl Sanctuaries

As discussed in the previous section, wintering waterfowl need access to areas that are free from human interruption to complete seasonal and annual life cycle events. These interruptions can be characterized as disturbance, which causes an animal to deviate from behavior patterns that normally transpire without human influence. To explain further, a disturbance stimulus is produced when a human-related presence or object (e.g. birdwatcher, motorized vehicle) or sound (e.g. seismic blast or gunshot) occurs that causes changes to the natural behavioral patterns of animals (Frid and Dill, 2002). Activities such as hiking, photography, jogging, hunting, fishing, boating, research and management activities, bicycling, and driving are among many types of disturbance that can and do occur on any national wildlife refuge. Because a disturbance free sanctuary is critical to waterfowl during the period of September 1 – March 15, it is important to understand that if unimpeded access is allowed, the ability of the refuge sanctuary to meet the needs of waterfowl may be reduced. The following sections discuss the values and functions of waterfowl sanctuaries and illustrate the impacts of disturbance on the ability of waterfowl to utilize habitat.

Disturbance is a primary factor influencing avoidance behaviors in waterfowl (Paulus 1984b, Heitmeyer 1985, Austin 1987) as ducks and geese are highly sensitive to motor traffic and human disturbance (walking, bird viewing, vehicular traffic) along roads during fall and winter (e.g., Bartelt 1987; Belanger and Bedard 1989, 1990; Bowles 1995; Dalhgren and Korschgen 1992; Gabrielson and Smith 1995; Heitmeyer 1985; Klein 1989; Knight and Cole 1991, 1995; Madsen 1985; Van Der Zande et al. 1980; Raasch 1996). Thus, when waterfowl are in areas adjacent to roads, they reduce time spent foraging and spend more time alert and vigilant to disturbance. For instance, a research study examining disturbance effects conducted on Mingo NWR in southeastern Missouri showed that mallards became alert at a mean distance of 213 m (698 ft) and flew from the site at a mean distance of 173 m (568 ft) in response to vehicle disturbance (Raasch 1996). In another study in Virginia, Pease, et al. (2005) described the responses of seven species of dabbling ducks to six different forms of disturbance and recorded whether the birds had: 1) no response; 2) alert; 3) swam; and 4) flew. Analysis of the data from Virginia showed that 74.2 percent of birds responded (alert, swam, or flew) when birds were within 200 meters (656 feet) of a human caused disturbance. As a result, when birds exhibit avoidance behaviors, swimming and flying activities increase, while resting and feeding activities decrease (Combs 1987), which creates the need for additional foraging effort, which in turn influences seasonal movements and habitat selection. Areas void of regulations can cause increased human-wildlife interactions that can negatively impact the life history behaviors and metabolic processes of migratory waterfowl.

Laskowski et al. (1993) studied behavior of snowy egrets, female mallards, and greater yellowlegs on Back Bay National Wildlife Refuge in Virginia within 91.4 meters of impoundment dikes used by the general public. Behavior of snowy egrets was recorded during August and September. Mallards were monitored during migration in November and January. Greater yellowlegs behavior was observed during the northward shorebird migration. Behavior was monitored during the typical public activities of walking, bicycling, and driving a vehicle past the sample sites.

The study found that snowy egret resting behavior decreased and alert behavior increased in the presence of humans. Preening decreased when humans were present, but this change was not significant. Feeding, walk/swim, and flight behaviors were not related to human presence. Female mallards in November increased feeding, preening and alert behaviors in the presence of humans. Resting, walk/swim, and flight behavior were not influenced by human presence. In January, female mallard resting and preening behavior were not influenced by the presence of humans. However, feeding, alert, walk/swim, and flight behaviors were related to human presence. Greater yellowlegs increased alert behavior in the presence of humans. No other behaviors were affected. Maintenance behavior (combined feeding, resting, and preening) decreased when humans were present for all study species. In addition, this decrease was accompanied by an increase in escape behavior by each species. Maintenance behavior of mallards in January decreased in the presence of vehicles and combined disturbance. Escape behavior increased when vehicles or bicycles were present. Maintenance behavior of greater yellowlegs declined when bicycles and vehicles were present but was not influenced by pedestrian presence. Snowy egrets and female mallards increased movement between subplots and to areas within the study area but further from the disturbance.

Speed of approach by vehicles has also been identified as having detrimental effects to waterfowl, as objects that approach quickly tend to frighten birds more often than objects that approach at lower speeds (Frid and Dill, 2002). Pease (2005), found that vehicles traveling more than 13 miles per hour but less than 30 miles per hour created the least amount of disturbance. As a contrast to speed, Pease noted that humans approaching waterfowl on foot had a greater disturbance impact than passing vehicles. Thus, research suggests that waterfowl are disturbed less by vehicles that pass at a moderate rate of speed, and more distressed by vehicles going very fast, very slow, or by humans on foot.

Non-motorized boating can affect refuge resources in a number of ways. Studies show that canoes and kayaks disturb wildlife (Bouffard 1982; Kaiser and Fritzell 1984; Knight 1984; Kahl 1991). They may affect waterfowl broods, wintering waterfowl, shorebirds, raptors and wading-birds, but their low speed and their use primarily during the warmer months would mitigate those impacts, especially on wintering waterfowl and raptors. Little canoeing/ kayaking occurs in areas frequented by shorebirds. Air thrust boats and jet skis are not permitted.

When birds leave the refuge because of human disturbance, high quality habitat is left unexploited for the duration of time that the birds are displaced. The length of time that a bird is displaced from a feeding site determines how much additional foraging effort will be required to replace lost food resources, which in turn impacts other maintenance activities such as molting, resting and preening. There have been several research studies which examined how long it took waterfowl to return to habitats after being disturbed. For example, the return rate of mallards and Canada geese (*Branta canadensis*) at Mingo NWR following vehicular disturbance indicated that two thirds of the birds were still displaced after 25 minutes. At the Russell Lakes State Wildlife Area in Colorado, mallards flew from a pond during disturbances and did not return within 1 hour (George et al. 1991). In Wisconsin, only 15-56 percent of canvasbacks (*Aythya valisineria*) returned to foraging sites following disturbances (Kahl 1991), and staging snow geese (*Chen caerulescens*) populations in Quebec were found to be lower the day after they have been disturbed at a rate of less than two disturbances per hour, and that vehicular disturbance and unobstructed visual sight planes of approximately 400-500 m (1312 -1640 ft) are detrimental to waterfowl use and subsequent rates of return (Belanger and Bedard 1989). Thus, repeated disturbances (> 2 per hour), which could occur if unregulated access is permitted, can have serious detrimental impacts on the utilization of seasonal wetlands, which may ultimately cause birds to completely abandon a site, disperse to poorer quality habitat, and/or change feeding strategies.

Public use and access is recognized as important, but must be managed so that disturbance to wildlife is minimized and habitat utilization is not compromised. With these objectives in mind, it becomes necessary to recognize that disturbance to waterfowl early and late in the day can negatively impact biological processes such as feeding, flight, metabolic processes, molting, preening, and resting. For example, birds are feeding early in the morning to obtain food resources, but are beginning to come to roost at sunset to begin a period of rest after returning from evening feeding forays. This period of rest is just as important as feeding as it permits the digestion of food ingested prior to roosting and allows the repair of muscle fibers damaged during flight. Therefore, if measures to minimize or eliminate the cause of disturbance are not considered, the impacts from these activities can negatively affect the potential for wildlife to acquire the necessary resources needed to meet nutritional life history requirements throughout their annual life cycle (Raasch 1996, Fredrickson and Reid, 1988).

Providing waterfowl sanctuaries will minimize some of these impacts and allow waterfowl to have undisturbed access to these areas during biologically critical periods of the day. Havera et al (1992) and Dahlgren (1988) in comprehensive literature reviews of human disturbances to migrating and wintering waterfowl have noted that the use of sanctuaries (non-hunted areas) was the most common and effective solution to mitigating adverse disturbance impacts.

The use of sanctuaries as a management tool is an old concept. Bellrose (1954) wrote of the early 1900's when owners of duck lands found that providing non-hunted areas on their properties was of value in building and holding concentrations of waterfowl. A distinctive degree of sense of security constituted the principal factor governing duck use of areas that were all hunted, half hunted/half unhunted, or no hunting. Waterfowl numbers averaged 16 times more abundant per acre on half hunted/half unhunted

areas than on areas that were completely hunted. Bregnballe et. al (2003) also reported that to ensure high species diversity, a waterbird reserve should include a non-shooting refuge that encompasses adjoining shooting marshland. Reducing hunting to a few hours on shooting days may be used to mitigate hunting disturbance in zones surrounding shooting-free refuges.

Other hunting measures that serve to mitigate adverse impacts to waterfowl:

1. provide adequate buffer areas and large enough sanctuaries to ensure full use by waterfowl;
2. provide "temporal respite" for ducks by limiting hunts to half days and/or use an intermittent hunt program (3-4 hunts/week); and
3. regulate hunter access limiting boat access and traffic to specific areas.

To minimize waterfowl disturbance, the refuge has designated approximately 3,185 acres as waterfowl sanctuaries that will be closed to hunting and other recreational uses on a seasonal or annual basis. Given the dominant role of the refuge in the Atlantic Flyway migration corridor, this closed area system was established to provide waterfowl with a network of resting and feeding areas and to disperse waterfowl hunting opportunities on the refuge. These sanctuaries lie in Unit II (~1,800 acres), the southern half of Unit III (~390 acres), and in Unit IV (~995 acres). The northern portion of Unit IV, which contains a trail and observation platform, will be closed from the Monday before Thanksgiving to March 15 to also minimize disturbance to wildlife in this area. The southern portion of Unit IV will not be open to any public use. Waterfowl hunting will stop at 3pm in all hunting areas and will be limited to four days per week to reduce disturbance to waterfowl feeding patterns, which in turn will result in high quality hunting experiences. Disturbance is also decreased by closing the Oak Island Area in Unit II, the area south of Fowler Beach Road in Unit II, and disabled deer hunting area in Unit IV in late November to hunting and by closing the Deep Branch Trail to non-consumptive users from September 1 through March 15. Literature reviews of visitor use and its relationship to disturbance to waterbirds support the time restriction and are reflected in the hunting regulations of other refuges, particularly in the Southeast Region of the FWS (DeLong 2002).

The term "sanctuary", as used in the context of the CCP, indicates an area free from hunting and other uses. A key feature of a sanctuary is to make it large enough that intrusions on it's borders do not unduly disturb the normal lifecycle functions, e.g. feeding, resting, preening, courtship or cause the birds to take flight. The Service believes the areas designated for sanctuary are sufficiently large to reduce the detrimental affects of all forms of disturbance, including those resulting from hunting activity.

Sanctuaries also allow birds to have adequate escape distances (ED), which are defined as the shortest distance at which they flush or otherwise move away from the approaching person or other disturbing stimulus. Many factors influence EDs such as hunting, flock size, hunger, migratory motivation, etc. Laursen et. al (2005) suggested providing a mean ED of the largest ED of a bird species plus one to two standard deviations to calculate the size of the core area or buffer zone. In their study, the largest ED was 1000 meters for wigeon (other species included mallard, etal, pintail, waders, and gulls) and would be approximately 1700 meters with two standard deviations. Based on this information, refuge sanctuary areas can accommodate the ED's of most species.

Disturbance to waterfowl in or adjacent to the refuge is not a new phenomenon. The Service agrees, in part, there is virtually no area of the refuge that is not susceptible to auditory and visual disturbance. The refuge is relatively narrow and is crossed by several county roads. Some days auto traffic on Route 1 can be clearly heard a couple miles to the west, aircraft fly overhead, patrons of the refuge drive the county roads, birders walk the trails, refuge staff run tractors and airboats as part of their management

program, residents drive to and from the neighboring communities to the east, beach enthusiasts travel to the public beaches, kayakers paddle the creek, crabbers park along the roads, neighbors hunt right up to the refuge border, and refuge hunters occasionally fire guns. Unfortunately, this is the nature of NWRs in the heavily populated eastern US. Most NWRs on the east coast do not harbor qualities that we generally think of as constituting "wilderness", eg. quiet, or solitude. Under an official wilderness designation, refuge staff would not be permitted the use of many of the standard management tools used on PHNWR. Even so, hunting is in fact permitted on areas designated as wilderness.

More specifically, hunting on adjacent private property causes disturbance to waterfowl every year in the following areas: Unit 1 along the western boundary, Unit 2 along Cods Road and Fowlers Beach Road, Unit 3 along the southeastern portion near Broadkill Beach, along Prime Hook Creek, and in the state managed Prime Hook Wildlife Area, and Unit 4 along the Broadkill River, Petersfield Ditch, and in salt marshes on the western boundary. Hunting has been open in all four units of the refuge and Unit 1 has been hunted for years by free-roaming hunters seeking deer and upland game in refuge saltmarshes. Despite disturbance of waterfowl from vehicular traffic, refuge staff observe visitors year after year viewing and photographing waterfowl within 20 yards of vehicle even during the hunting season. Adding additional sanctuary areas on the refuge will only increase areas of respite for waterfowl and other wildlife and further enhance opportunities to enjoy them by refuge visitors.

Hunting is a priority, wildlife-dependent, consumptive activity with additional direct effects on waterfowl. General adverse impacts of waterfowl hunting are mortality, crippling and disturbance. Belanger and Bedard (1995) concluded that disturbance caused by waterfowl hunting to waterfowl resources can:

1. modify the distribution and use of habitats by waterfowl;
2. affect their activity budget and decrease their foraging time; and
3. disrupt pair and family bonds and contribute to increased hunting mortality.

The U.S. Fish and Wildlife Service annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow State selections of season and limits for recreation and sustenance; aid Federal, State, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which States may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United

States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. The refuge is in the Atlantic Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g. dove, woodcock, etc.); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl season not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Though not as detailed as that for waterfowl, relevant data are collected and summarized for migratory bird species such as dove, woodcock, etc. Bird monitoring data are available through the Service's Division of Migratory Bird Management Website (*http://www.fws.gov/migratorybirds/*; accessed October 2012).

Because the Service is required to take abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, State and Provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest were considered. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of State and Federal Governments. After Service establishment of final frameworks for hunting seasons, the States may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a national wildlife refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows.

National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14)," filed with the Environmental Protection Agency on June 9, 1988. The Service published Notice of Availability in the *Federal Register* on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate environmental assessment, in which the FONSI is published generally in August of that hunt year. Further, in a notice published in the September 8, 2005, *Federal Register* (70 FR 53376), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the

migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9. 2006, *Federal Register* notice (71 FR 12216). More information may be obtained from: Chief, Division of Migratory Bird Management., U.S. Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

At the refuge, the impacts of hunting of waterfowl are negligible when compared to the State's total waterfowl harvest. For example, from 1987 to 2011, the average annual waterfowl harvest at the refuge is 2.5 percent of Delaware's total waterfowl harvest (Table 1.1). Furthermore, in 2011, the refuge's harvest of ducks was only 2.3 percent of Delaware's total duck harvest, 0.06 percent of the Atlantic Flyway's duck harvest, and 0.01 percent of the entire United States' duck harvest (Table 1.2; Raftovich et al. 2012). Also in 2011, the refuge's harvest of geese (Canada and snow geese combined) was only 0.75 percent of Delaware's total goose harvest, 0.02 percent of the Atlantic Flyway's goose harvest, and less than 0.01 percent of the entire United States' goose harvest (Table 1.2; Raftovich et al. 2012).

The impacts of waterfowl hunting at the refuge are also negligible when compared to long-term trends in duck and goose populations at the refuge and across the state. Through monthly aerial surveys from October through November, the Delaware Division of Fish and Wildlife is able to evaluate long-term trends in duck and goose populations. The surveys give fairly accurate information about geese, but duck populations such as wood ducks and sea ducks are almost impossible to count. Furthermore, these surveys do not cover the entire state, but only the primary waterfowl habitat in Delaware which is approximately the eastern half of the state. These figures represent the numbers of ducks and geese at the time of the survey, but do not reflect an actual annual estimate for the waterfowl population in Delaware due to the transitory nature of birds migrating through the State during the fall and winter months.

Based on the findings of these monthly surveys from 1987 to 2011, the average annual waterfowl harvest at the refuge is only 1.8 percent of the estimated peak waterfowl survey findings on the refuge (Table 1.1). During an individual season, the percent of the refuge's harvest on statewide and refuge populations may range greatly depending on the timing of refuge hunting activity and peak waterfowl migration. For example, during the 2011-2012 hunting season, the refuge harvested between 0.58 percent and 1.61 percent of the State's estimated monthly duck population and between 0.02 percent and 0.03 percent of the State's estimated monthly goose population (Table 1.3; October and November statewide waterfowl survey information was unavailable). Refuge hunters harvested between 1.60 percent and 7.04 percent of the refuge's estimated monthly duck population and between 0.04 percent and 0.08 percent of the refuge's estimated monthly goose population (Table 1.3).

Table 1.1. Waterfowl harvest and aerial survey estimates on Prime Hook NWR compared to statewide harvest. Waterfowl includes geese and ducks.

Year	Statewide Waterfowl Harvest*	Refuge Waterfowl Harvest	Refuge Waterfowl Survey**	Refuge Hunter Visits
1987	63,360	1,202	21,243	1,206
1988	62,160	771	21,814	826
1989	61,480	578	64,822	333
1990	59,510	1,241	49,611	1,065
1991	63,410	1,625	55,792	1,178

Year	Statewide Waterfowl Harvest*	Refuge Waterfowl Harvest	Refuge Waterfowl Survey**	Refuge Hunter Visits
1992	46,600	1,155	55,238	1,291
1993	46,850	1,421	86,087	962
1994	53,290	2,053	155,096	1,604
1995	45,540	1,572	71,131	1,024
1996	44,170	1,980	104,447	1,630
1997	71,070	3,116	191,446	1,904
1998	118,560	2,964	193,617	1,530
1999	96,410	1,987	224,693	1,403
2000	94,610	2,047	134,156	1,250
2001	76,210	2,679	107,919	1,683
2002	95,170	1,936	102,690	1,330
2003	88,800	2,546	203,615	1,486
2004	73,190	1,573	69,737	1,422
2005	71,740	1,624	111,544	1,301
2006	64,630	2,389	132,088	1,750
2007	81,620	2,989	44,086	1,850
2008	107,120	1,634	90,875	1,253
2009	86,600	1,934	79,263	1,453
2010	84,130	1,604	58,960	874
2011	56,370	1,050	138,894	908

* Statewide waterfowl harvest data from: http://www.flyways.us/regulations-and-harvest/harvest-trends; accessed October 2012.

** Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Some monthly surveys were incomplete in 2007, 2010, and 2011, which may not have reflected the peak (http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20Surveys.aspx; accessed October 2012).

Table 1.2. Comparison of waterfowl harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2011 hunting season.

Waterfowl Harvest Area	Ducks	Geese
Prime Hook NWR	934	116
Delaware*	41,000	15,400
Atlantic Flyway*	1,672,900	580,400
United States*	15,931,200	2,879,900

*Harvest estimates from (Raftovich et al. 2012)

Table 1.3. Comparison of duck and goose (Canada & snow geese) harvest at Prime Hook NWR to State waterfowl surveys during the 2011-2012 hunting season.

Month	Refuge Duck Harvest	Refuge Duck Population Estimates*	Statewide Duck Survey Results*	Refuge Goose Harvest	Refuge Goose Population Estimates*	Statewide Goose Survey Results*
October 2011	219	6,236	Data Unavailable	11	16,823	Data Unavailable
November 2011	126	7,857	Data Unavailable	12	15,540	Data Unavailable
December 2011	217	8,707	37,185	45	99,869	174,992
January 2012	372	5,287	23,053	48	133,634	199,204

* Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1 *(http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20 Surveys.aspx;* accessed October 2012).

Impacts of refuge hunting on snow geese and resident Canada geese are negligible. For resident Canada geese, hunters averaged 8.8 birds per year from 2001 to 2006 (Table 1.4). For snow geese in the late season (late January into March), hunters averaged 16.0 birds per year from 2001 to 2006 (Table 1.5). From 2000 to 2011, refuge hunters harvested between 0.03 percent and 0.43 percent of the refuge's estimated monthly snow goose population (Table 1.5).

Table 1.4. Resident Canada Goose Harvest in Prime Hook National Wildlife Refuge.

Year	Resident Canada Goose Harvest	Refuge Hunter Visits
2001	14	33
2002	6	15
2003	10	13
2004	14	10
2005	0	0
2006	9	2

Table 1.5. Snow Goose Harvest and Aerial Survey Estimates at Prime Hook National Wildlife Refuge.

Year	Total Snow Goose Harvest*	Hunted in Late Season**	Snow Goose Harvested in Late Season**	Refuge Hunter Visits in Late Season**	Refuge Snow Goose Survey***
2000	174	No	n/a	n/a	96,112
2001	242	Yes	37	42	67,840
2002	48	Yes	7	9	72,200
2003	118	Yes	33	24	124,500
2004	121	Yes	3	5	55,330
2005	36	Yes	4	8	86,627
2006	73	Yes	12	12	132,088
2007	130	No	n/a	n/a	30,500
2008	56	No	n/a	n/a	84,520
2009	43	No	n/a	n/a	27,000
2010	15	No	n/a	n/a	52,451
2011	60	No	n/a	n/a	103,301

* Includes snow geese harvested in February/March when applicable
** Late season includes late January to mid-March
*** Snow goose estimates were derived from peak numbers found during aerial. Zone 7 was used to estimate snow goose numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Some monthly surveys were incomplete in 2007, 2010, and 2011, which may not have reflected the peak *(http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20 Surveys.aspx;* accessed October 2012).

Migratory bird hunters may also disturb migratory birds and other wildlife as they travel to and from their hunting sites or when retrieving downed birds. Depending on the location and the number/species of migratory birds in the area, a disturbance can be temporary with displaced birds moving to nearby backwaters, or major in the case of motoring through a large flock of snow geese. For some species like bald eagles and other predators, migratory bird hunting creates a readily available food source due to birds lost or wounded.

Direct disturbance to waterfowl occurs during white-tailed deer hunting seasons, as hunters flush deer through wetlands, creeks, and open water habitats. Deer hunters have been free roam hunting in Unit I of the refuge for years and upland game hunters free roam hunt in areas in Unit I, Unit II, and Unit III. Free roam hunting of deer was permitted in all deer hunting areas between 9am and 3pm up until the 2002-2003 hunting season, but was prohibited due to complaints of unethical hunting behaviour such as harvesting deer from the stands of other hunters. Dogs running at large during upland game hunting seasons will also flush wintering waterfowl resting and feeding in both wetland and upland areas. The ingestion of lead sinkers or lead shot is another concern; however the impacts are lessened from refuge regulations requiring the use of non-toxic shot for upland hunting, except for slugs for deer hunting.

Expanded hunting opportunities for deer and waterfowl will cause disturbance to waterfowl in hunting areas and is expected to be negligible (refer to impacts to waterfowl for more information). Participating in the early teal, resident Canada goose, and snow goose conservation order will cause direct impacts to increase but will be negligible based on current refuge harvest contributions to Statewide and

national harvests. Free roam areas for deer and waterfowl hunting (jump shooting) will provide hunters with greater access and also increase the potential for waterfowl disturbance. These disturbances are mitigated by creating sanctuary areas where no waterfowl hunting occurs.

Prior to the conservation order taking affect in late January, all snow goose hunting on-refuge will be isolated to the same areas/blinds and refuge specific hunting dates as other waterfowl hunting. A continuous period (except Sundays) from January 28 – April 13(for 2012-2013 hunting season) will be open for hunting snow geese during the Conservation Order which will open all emergent wetlands on-refuge to snow goose hunting only, once all other waterfowl seasons have closed. Snow geese present a fairly unique issue, finding themselves on the Service's Migratory Bird Program focal species list for actually being over abundant. It is the desire of the USFWS, Canadian Wildlife Service and all Provinces and States to drastically reduce the size of the current continental populations of light (snow) geese, primarily because of the dramatic damage excessive numbers of snow geese have inflicted on very fragile arctic breeding grounds, areas that are important to other breeding migratory species, as well. Seasons, bag limits and methods of take have been liberalized for the purpose. Opening all available habitats on the refuge from January 28 – April 13 is specifically designed to reduce damage sustained from overbrowsing of refuge saltmarshes.

Unfortunately, the Service projects, based upon documented history of similar hunts on-refuge, that very few hunters will take advantage of the snow goose hunting opportunity. The hunting season starts October 1, several weeks before any number of birds arrive on Delmarva, and while many hunters are more interested in deer hunting instead. Snow geese are difficult to hunt and there may be an incidental few killed during the regular duck and migratory Canada Goose season.

Over the period 2001 – 2006, when the refuge was open to late season snow goose hunting, 100 hunters harvested 96 snow geese over a shortened season extending from late January to mid-March and averaged 16.0 birds per year. The hunter success rate averaged 0.96 birds per hunt. Because of the difficulty of hunting snow geese, hunting parties were likely composed of a minimum of two hunters. Thus a maximum of 50 total parties hunted over a combined total of approximately 216 days available over the 6 year period with each party potentially having several thousand acres upon which to hunt. From 2000 to 2009, refuge hunters harvested between 0.04 percent and 0.43 percent of the refuge's estimated monthly snow goose population (Table 5-8). The Service projects negligible impacts to other refuge resources from snow goose hunting.

In addition, non-refuge areas in Delaware will also be open to snow goose hunting during the same period. It appears anecdotally that the limited few hunters that attempt snow goose hunting during the late season are likely to do so from agricultural fields, alleviating most waterfowl hunting pressure on Delaware's tidal marshes and impoundments.

Waterfowl hunting in Unit I salt marshes have the potential to increase adverse impacts and disturbance on refuge wintering American black ducks. Since black ducks are a focal species of conservation concern, monitoring and evaluation of impacts of increased recreational use of salt marsh habitats will be required to identify and respond to unacceptable impacts. Unit IV salt marshes will continue to be a sanctuary area.

The American Black Duck was selected as a" focal" or indicator species by the refuge because of its listing on Federal and State conservation lists, but more importantly for its close association with native saltmarsh. Targeting conservation actions to a few focal species, specifically in habitat management

objectives, is made with the assumption that hundreds of other fish, wildlife and native plant species will benefit.

From the larger Service perspective, the USFWS, Migratory Bird Program, has generated its own list of Birds of Management Concern and "Focal" Species. The Birds of Management Concern is a list of species, subspecies, populations or geographic segments of populations that warrant management or conservation attention. Birds of Management Concern are drawn from the list of species afforded protection under the Migratory Bird Treaty Act (50 CFR Part 10) and therefore fall under Federal jurisdiction. To be of management concern, a bird must be a high priority gamebird, on the Birds of Conservation Concern 2008 list, a federal threatened or endangered species listed in the U.S. (T/E), or overly abundant (OA) leading to management conflicts. Full species are considered of management concern throughout their U.S. range (including Caribbean and Pacific islands) unless specific subspecies populations, or geographic units (e.g., U.S. Fish and Wildlife Service Regions or Bird Conservation Regions) are designated.

The Migratory Bird Program's "focal" species or "focal" populations are covered under the Migratory Bird Treaty Act, are a subset of the Birds of Management Concern, and are those the program believes need additional investment of resources to address pertinent conservation or management issues. Also included in the list are species occurring in the U.S. that are listed under the Endangered Species Act (ESA) or are on the Bird of Conservation Concern (BCC) 2008 list but are not protected under the Migratory Bird Treaty Act (MBTA).

Within the Migratory Bird Program's list of "focal" species, not to be confused with the PHNWR specific list generated by the refuge for this CCP, are some species of game birds, including the American Black Duck. The Migratory Bird Treaty Act, grants the Secretary of the Interior the authority to establish hunting seasons for any of the migratory game bird species. For waterfowl management specifically, the US and Canada are divided into four flyways; the Atlantic, Mississippi, Central, and Pacific. In the US, the Flyway Councils, consisting of representatives from state and provincial game-management agencies, recommend regulations to the U.S. Fish and Wildlife Service (Service) for waterfowl and for most migratory, shore and upland game birds.

The Councils are advised by flyway technical committees consisting of state and provincial biologists. These technical committees evaluate species and population status, harvest, and hunter-participation data during the development of the Council recommendations.

The Service's Office of Migratory Bird Management (MBMO), with advice from biologists in the Service's Regional Offices, evaluates the Council recommendations, considering species status and biology, cumulative effects of regulations, and existing regulatory policy, and makes recommendations to the Service's Regulations Committee to set hunting seasons for migratory birds that ensure healthy game populations in years to come and fair distribution of hunting opportunities throughout the migration routes.

The Service Regulations Committee considers both the Council and MBMO recommendations, then forwards its recommendations for annual regulations to the Service Director.

Once regulatory proposals are approved, they are published in the *Federal Register* for public comment. After the comment period, final regulations are developed, which are then signed by the Assistant Secretary of the Interior for Fish, Wildlife, and Parks. From this federal framework, individual States

may select hunting seasons and bag limits. Once the States have adopted their respective seasons and bag limits, individual refuges may choose to adopt State regulations in-whole, or the refuge may choose additional refuge specific regulations.

In an effort to reduce undesirable impacts on refuge resources and management programs, PHNWR has adopted more restrictive regulations than those adopted by either the Service's MBMO or the State of Delaware. These regulations include area closures (sanctuaries), hunting 4 of 7 days/week instead of 6 of 7, and ending the hunt day at 3:00 PM instead of sunset.

As indicated above, black ducks and black duck hunting are managed on a state, flyway and continental scale. The process of setting hunting regulations is a deliberative one, based on substantial data. Regulations are set with the full knowledge and desire that a proportion of the population will be removed by hunters, whether on or off of NWRs. Within the northeastern US and eastern Canada particularly, the black duck is considered a valuable recreational and economic resource. The apparent 50% decline in black duck numbers over the last half of the last century, has raised concern for the long-term sustainability of a currently viable, albeit reduced, population. Thus, the American Black Duck has received the designation of "focal" species by the Service's Migratory Bird Program for some reasons other than those presented by PHNWR .

Under both the Administration Act, as amended, and 43 CFR 24, the Director as the Secretary of the Interior's designee will ensure that Refuge System regulations permitting hunting and fishing are, to the extent practicable, consistent with State laws, regulations, and management plans (605 FW 2). The Service and the State of Delaware consider the black duck population capable of sustaining harvest; so PHNWR will comply with State seasons and bag limits.

Impacts to Shorebirds

Disturbance to shorebirds has been well documented. Pfister et al. (1992) investigated human disturbance as a factor that might limit the capacity of appropriate staging areas to support migrating shorebirds. Results indicate that adverse impacts from human disturbance will be greater on shorebird species using the front side of beach habitats and that the local abundance of impacted species may be reduced by 50 percent. Such disturbance is implicated as a potential factor in long-term declines in shorebird abundance during migration periods at disturbed sites.

Disturbance of shorebirds becomes a very crucial issue during incubation or nesting periods. Direct adverse impacts of displacement caused by human disturbance during nesting periods include egg exposure to temperature extremes, predation of eggs when the nest is vacated by the adult, and predation at a later time due to predators following human trail or scent (Korschgen and Dahlgren 1992). Protection of nesting colonial shorebirds is easier than protection of solitary nesters, like the American oystercatcher and piping plover, because much larger beach areas must be protected, managed, and patrolled. Public education, active protection methods (small fences around nests, signs, wardens), legal measures (beach use regulations, active enforcement patrols), and well-advertised closures of portions of the beach are management actions that often successfully reduce the adverse impacts of human disturbance when shorebirds are most vulnerable. Protection of nesting colonies using fences and wardens has markedly decreased reproductive losses of least tern colonies in New Jersey (Burger 1995).

Based on these findings and past observations of impacts on shorebirds by refuge staff, disturbance by refuge hunters to shorebirds is expected to be negligible since most shorebird species have completely passed through Delaware by peak hunting season in November through January. Some hunting occurs

when these species may be migrating before and after this peak hunting time. Shorebirds using refuge marsh habitats that are also open to hunting may be disturbed by hunters traveling in these areas or by their gunshots; however, established sanctuaries provide disturbance-free areas for migrating birds during the hunting season.

A direct beneficial impact for shorebirds is derived from seasonal closures to hunting and other public use. Minimizing human disturbance will increase nesting and foraging opportunities on overwash habitats which will subsequently increase shorebird nesting productivity. Seasonal closures of designated beach dunes and overwash areas from March 1 through September 1 are in place to minimize disturbance to nesting shorebirds such as least terns, American oystercatchers, and, potentially, piping plovers.

Indirect beneficial impacts on shorebirds are obtained by educating hunters about special beach closures with news releases and other outreach mechanisms to engage the public to understand the needs of nesting shorebirds. Public awareness and appreciation of the refuge's efforts to conserve and protect shorebirds could inspire some to volunteer or support refuge needs in the conservation and protection of critical habitats required to protect continental and hemispheric shorebird resources in perpetuity in other ways.

Impacts to Landbirds

Disturbance to landbirds has been well documented. Pedestrian travel can influence normal behavioral activities, including feeding, reproductive, and social behavior and the location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al. 1998). For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Some other species, such as wood thrush, will avoid areas frequented by people, such as developed trails and buildings, while other species, particularly highly social species such as tufted titmouse, Carolina chickadee, or Carolina wren, seem unaffected or even drawn to a human presence. When visitors approach too closely to nests, they may cause the adult bird to flush exposing the eggs to weather events or predators.

Disturbance to these non-hunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. Disturbance is expected to non-hunted landbirds, such as feeding and resting, to increase due to an expected increase in deer hunters in new free roam hunting areas. However, the direct, indirect, and cumulative impacts of hunting on these non-hunted landbirds are expected to be negligible because the deer, upland game, and waterfowl hunting seasons are during the fall and winter months which do not coincide with the critical nesting periods of most bird species. Turkey hunting, which does occur during the nesting season of many non-hunted landbird species in April and May, is expected to have negligible impacts because hunter numbers are limited to less than five and are scattered over 3,729 acres.

Direct impacts to hunted landbirds such as quail, woodcock, and snipe are expected to remain stable since no increase in upland game hunting is expected. Hunting of resident game species such as quail does not have any regional impact on their respective populations due to their restricted home ranges.

Delaware Division of Fish & Wildlife periodically reviews populations of all harvested resident species, and has determined that populations are adequate to support hunting efforts throughout the State. The refuge contributes negligibly to the State's total harvest for resident game species. For example, the number of quail taken per year has been no more than 14 per year on the refuge in recent years (Table 1.6).

Table 1.6. Number of upland game, small game, and webless migratory birds harvested and hunter visits on Prime Hook NWR.

Year	Dove Harvest	Snipe Harvest	Woodcock Harvest	Quail Harvest	Rabbit Harvest	Refuge Hunter Visits*
1996	110	0	0	5	83	126
1997	77	0	0	0	117	169
1998	30	0	0	0	46	112
1999	90	0	0	0	98	123
2000	13	0	0	0	29	81
2001	6	0	0	0	65	128
2002	58	0	0	0	163	114
2003	13	0	0	0	79	81
2004	12	0	0		75	53
2005	6	0	0	0	257	129
2006	20	0	0	14	115	106
2007	22	0	0	11	145	178
2008	0	0	1	10	176	171
2009	0	0	6	1	163	149
2010	4	0	1	3	108	129
2011	9	0	1	0	76	100

*Hunter visits include all species combined; majority are hunting rabbits

For migratory birds such as mourning dove, an estimated 14,700 birds were harvested in Delaware during the 2011 season (Table 1.6; Raftovich et al. 2012) when only nine were taken on the refuge. (Table 1.7). Similarly, very few snipe and woodcock were harvested (Table 1.7). Direct, indirect, and cumulative impacts on these species on the refuge are negligible. See Impacts to Waterfowl for a description of how the Federal and State migratory bird hunting frameworks are established.

Table 1.7. Comparison of mourning dove, woodcock, and snipe harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2011 hunting season.

Harvest Area	Dove	Woodcock	Snipe
Prime Hook NWR	9	1	0
Delaware*	14,700	500	500
Eastern Management Unit*	6,666,900	77,000	57,500
United States*	16,580,900	308,700	136,300

*Harvest estimates from (Raftovich et al. 2012); Estimates for snipe are from the Atlantic Flyway

The refuge proposes to open 3,729 acres for wild turkey hunting. This additional acreage includes many of the areas open for deer hunting. Turkey hunting was permitted on the refuge in Unit I west of Slaughter Canal from 1993 up until 1998. Turkey is a resident game species that is managed by DNREC's Division of Fish and Wildlife. The refuge falls within Zone 9 of DNREC's Wild Turkey Management Regions and the refuge will work closely with DNREC to evaluate the status of the turkey population and its hunting potential. Zone 9, which includes the state-owned Prime Hook Wildlife Area that is adjacent to the refuge, is currently open during the spring turkey hunting season. To ensure a sustainable harvest of the state's turkey population, DNREC biologists track their health, distribution and reproductive success. Current efforts include a volunteer-based survey used to generate an index of annual turkey productivity and recruitment, monitoring turkey harvest and hunter efforts, tracking turkeys with radio transmitters to evaluate their reproductive ecology, habitat use, and survival, and evaluating the genetic diversity of turkeys. The number of permitted hunters, which will be no more than five, may be adjusted (increased or decreased) based on changes in turkey population data.

The hunting of deer can be a beneficial impact to landbirds. The reduction of the vegetation's physical structure and diversity due to overbrowsing by deer also can negatively impact landbirds. Casey and Hein (1983) have found greatly reduced bird species diversity in areas with long term, high density populations of deer. These changes were mainly attributed to habitual landscape alteration with pronounced browse line and sparse cover caused by overbrowsing.

Impacts on Secretive Marsh and Waterbirds

Resident waterbirds tend to be less sensitive to human disturbance than are migrants, and thus will be less impacted by disturbance from public use on the refuge. However, wading birds have been found to be extremely sensitive to disturbance in the northeastern U.S. and may be adversely impacted by disturbance from public use on the refuge (Burger 1981). The impacts of intrusion through public use are generally negligible for this group of birds, but can vary by species and between years (Gutzwiller and Anderson 1999).

Disturbance to secretive marsh birds and waders from hunting would start in September and usually end in January, unless hunting is allowed during the snow goose conservation order into mid-April. This disturbance may have direct effects on migrating and wintering secretive marsh birds and waders. However, these birds would receive added benefits from the establishment of new sanctuary areas or zones, where 3,185 acres would be protected from hunting activities and other public use that cause disturbances to secretive marsh and waterbirds. Furthermore, the refuge has limited the number of hunting days and has restricted hunting hours. Disturbance is also decreased by closing the Oak Island Area in Unit II, the area south of Fowler Beach Road in Unit II, and disabled deer hunting area in Unit IV in late November to hunting and by closing the Deep Branch Trail to non-consumptive users from September 1 through March 15.

Impacts on Fisheries

Impacts to fisheries from visitors engaged in hunting are expected to be temporary and negligible. Anticipated increases in hunting will cause increased suspension of bottom sediments from boat motors. However, since hunting occurs during the fall and winter months, this sediment suspension should not adversely affect biological oxygen demand (BOD) for fisheries resources. Early season hunters may harm submerged or emergent vegetation by accessing small ditches, which may cause negligible adverse impacts to protective cover for fisheries based on past observations of these impacts from refuge staff.

Effects on interjurisdictional fishes are expected to be unlikely from hunting because the majority of the refuge will experience minimal, transitory use by hunters.

Impacts on Mammals

In general, the presence of humans will disturb most mammals, which typically results in indirect negligible short-term adverse impacts without long-term effects on individuals and populations.

Adverse impacts on resident game populations from hunting would be negligible. The Delaware Division of Fish and Wildlife periodically reviews populations of all harvested resident species and has determined that populations are adequate to support hunting efforts throughout the State. Hunter visits and harvest of upland and small game such as rabbit on the refuge have been relatively low (Table 1.6) and impacts are expected to be negligible. The refuge does not allow hunting of eastern gray squirrel to minimize conflicts with endangered Delmarva fox squirrel.

Overall impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Since small mammals are less active during winter when hunting season occurs, and since these species are mostly nocturnal, hunter interactions with small mammals are very rare. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. Impacts of hunting to migratory bat species would be negligible. These species are in torpor or have completely passed through Delaware by peak hunting season in November through January. Some hunting occurs during September-October and March-April when these species are migrating; however, hunter interaction would be commensurate with that of non-consumptive users.

The Delaware Division of Fish and Wildlife recently finalized a new statewide 10-year deer management plan (Rogerson 2010). The plan was created with input from a 22-member advisory group, a public phone attitude survey, a mail survey to hunters, comments solicited from the general public, and technical reviews from deer experts outside the division. The resultant plan identifies population objectives based on habitat capability and societal tolerances.

The refuge is located in the State's deer management zone 9, which encompasses the northeastern coastal portion of Sussex County (Rogerson 2010). The Division of Fish and Wildlife manages deer populations, in part, through recreational hunting. Based on their monitoring programs, the Division of Fish and Wildlife adjusts hunting levels in terms of season length, sex ratio in the harvest, and number of hunters (tag availability) to move population levels toward desired objectives. Of course, other factors such as disease, severe weather, predation, and automobile collisions influence mortality are taken into account by annual monitoring.

Delaware deer herd statistics indicate that the deer density in zone 9 was estimated in 2009 at 22.5 deer per square mile with a variability of plus or minus 20.75 percent (Rogerson 2010). This is a decrease of 58 percent from the 2005 estimated density of 39.2 deer per square mile (Rogerson 2010). The total Statewide post-hunting season deer population in 2005 was estimated at 37,563 deer, while in 2009 it was estimated at 31,071 deer, a 17.3 percent Statewide reduction. Major land use changes over the last 100 years have created a deer herd that exceeds normal deer densities of 10 to 20 deer per square mile.

High deer numbers are associated with crop damage, reduction of some forest understory species, and reduction of reforestation seedling survival, which all impact habitat that is important for a variety of wildlife. White-tailed deer hunting is the single most important public use on the refuge that would impact mammals, including deer, and other forest-dependent wildlife. It serves both as a wildlife-dependent recreational use and a method to reduce and stabilize deer densities. This benefits other mammals, including the endangered Delmarva fox squirrel.

Based on a nationwide survey of all states (Krausman 1992), deer populations are effectively controlled with hunting and habitat manipulation in many areas where they were overpopulated. In a 10-year study in northwestern Pennsylvania examining the impacts of varying densities of deer on deer health and habitat, starvation mortality resulted when densities reached higher than 25 deer per square kilometer (247 acres). Also, no prevention or control of epizootic hemorrhagic disease exists to date except by keeping populations below the carrying capacity of their habitats. Such breakouts have occurred on the refuge in the past. Based on these considerations, it is anticipated that hunting would have short-term and long-term minor-to-moderate beneficial impacts on deer health and quality and habitat condition.

Hunting resident game species on the refuge, such as deer, will result in negligible impacts on their populations because of their restricted home ranges. The refuge contributes negligibly to the State's total harvest for resident game species (figure 1.1 and tables 1.8 and 1.9). For example, since 1999, deer harvest at the refuge has ranged from 0.5 percent to 1.5 percent of Delaware's total deer harvest each year. The current harvest level of deer on the refuge (66) has a negligible impact on the Statewide deer population, which was last estimated at 31,071 deer in 2009 (Table 1.9). Given the low numbers of animals harvested from the refuge in respect to the total Statewide harvest and deer population, no cumulative impacts to local, regional, or Statewide populations of white-tailed deer are anticipated from allowing hunting of the species on the refuge.

Figure 1.1. Delaware annual deer harvest, 1954 – 2008/09 seasons. ***(Source: Rogerson (2010)***

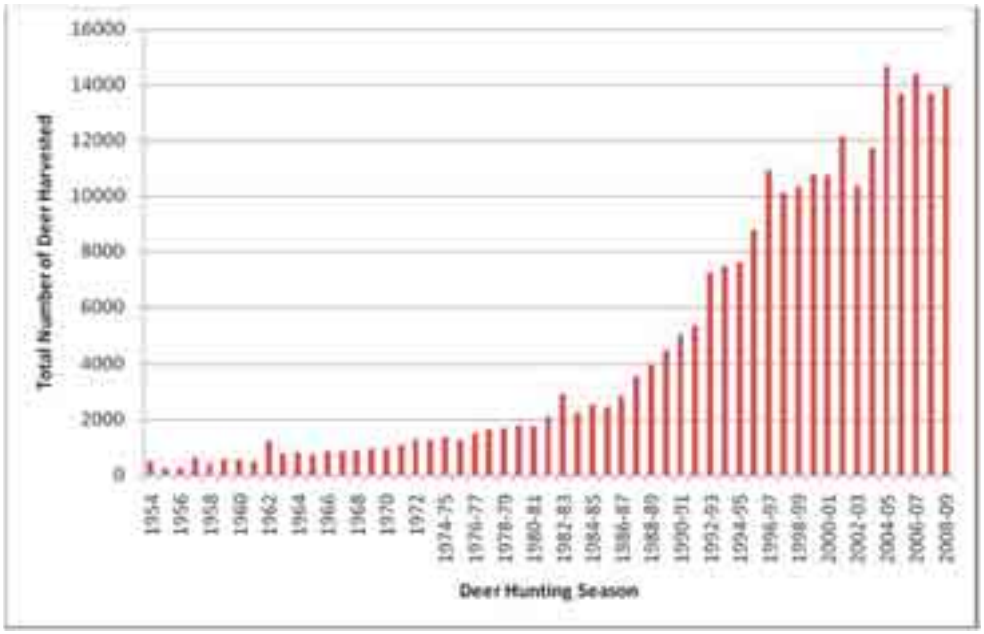


Table 1.8. Number of deer harvested and hunter visits on Prime Hook NWR compared to statewide harvest (Source: DNREC 2010b, refuge harvest data; http://www.dnrec.state.de.us/fw/deer.pdf)

Year	Statewide Deer Harvest	Refuge Deer Harvest	Refuge Hunter Visits
1988	3,998	141	1,289
1989	4,504	155	1,131
1990	5,066	178	1,689
1991	5,336	163	1,703
1992	7,245	257	1,608
1993	7,465	219	1,616
1994	7,615	169	1,568
1995	8,781	217	1,184
1996	10,915	221	1,326
1997	10,091	187	1,510
1998	10,312	138	1,335
1999	10,756	114	870
2000	10,741	125	941
2001	12,133	188	1,003
2002	10,357	160	913
2003	11,712	175	891
2004	14,669	143	841
2005	13,670	133	884
2006	14,401	120	825
2007	13,369	108	790
2008	13,926	106	670
2009	12,400*	107	552
2010	14,183	114	549
2011	13,559	66	513

*Data from DNREC (2010b).

Table 1.9. Cumulative impacts of existing deer hunting on Prime Hook NWR/State Deer Management Zone 9 (2011-2012 data) compared to Statewide Harvest.

Hunt Location & Type	Harvest
Prime Hook NWR	66
State Deer Management Zone 9	852
Statewide Harvest (all 17 Deer Management Zones)	13,559

Delaware permits hunting for red fox, which assists State management efforts in reducing the incidence of mange outbreaks to maintain a healthy population and reducing the predatory impact of this species on migrating and breeding birds, particularly State and federally endangered or threatened species. Hunting

would be opportunistic in most cases. In other states, the incidental harvest of fox occurs during other open seasons such as deer season and the pelts are often retained for personal use. Though no county-specific data are available, healthy populations of fox exist in the State and anticipated harvest rates would result in negligible impacts to local or State populations (Reynolds, personal communication 2010).

Impacts to Amphibians and Reptiles

The direct, indirect, and cumulative effects of hunting to amphibians and reptiles such as snakes, skinks, turtles, lizards, salamanders, frogs, and toads are expected to be negligible. Hibernation or torpor by cold-blooded reptiles and amphibians limits their activity during the hunting seasons for deer, waterfowl, and upland game when temperatures are low and hunters would rarely encounter them during most of the hunting season. Turkey season occurs during the warmer months of April and May; however, the impact of turkey hunters is expected to be negligible because hunter numbers are limited to less than five and are scattered over a large area.

Impacts to Invertebrates

Impacts to invertebrates such as butterflies, moths, other insects, and spiders are expected to be negligible. Invertebrates are not active during the majority of the hunting seasons and would have few interactions with hunters during the hunting season.

Impacts on Public Use and Access

Public opportunities to hunt on the Delmarva Peninsula are decreasing with increasing private land development. Refuge lands have become increasingly important in the region as a place to engage in this activity. A recent study found that 78% of hunters in Delaware hunt on private land (U.S. Department of the Interior 2006). When asked the importance of hunting activities in the USGS Visitor and Community Survey (Sexton et. al 2007), a little over half of responses were rated as moderately to very important. Both consumptive and nonconsumptive use visitors reported that being in a natural, undeveloped area and experiencing a serene environment are equally important to their refuge experience as well as the trails that afford this opportunity (Sexton et. al 2007).

Hunters have the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to the local community. Refuge lands allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting, often costing a person several hundred to several thousand dollars per year for membership. Refuge hunting programs also make special accommodations for mobility-impaired hunters and youth hunters, which provide opportunities to experience a wildlife-dependent recreational activity, instill an appreciation for and understanding of wildlife, the natural world and the environment and promote a land ethic and environmental awareness.

The moderate beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation and education, as documented in the State Comprehensive Outdoor Recreation Plan (DNREC 2009) and in the Visitor and Community Survey (Sexton et. al 2007). Visitors interested in hunting would find high quality opportunities to engage in their favored pastime. Visitor use is increasing over time as local residents and visitors become increasingly aware of refuge opportunities, and as progress is made in creating new facilities and programs. The economic benefits of increased tourism likely would also benefit local communities.

The refuge would also be promoting a wildlife-oriented recreational opportunity that is compatible with the purpose for which the refuge was established. The public would have an increased awareness of PHNWR and the National Wildlife Refuge System and public demand for more areas to hunt and learn about wildlife would be met. Over time, it is reasonable to believe that public awareness of the refuge would increase, and, in turn, visitation would increase on the areas open to hunting. The refuge may or may not be capable of meeting the demand as it increases and would depend on staffing levels and the availability of partners and volunteers to assist.

Eventually, the level and means of use resulting from this increase in visitation could change the nature of the experience for many visitors. Some may choose either to forgo hunting due to issues of crowding or behavior, or to go elsewhere. Because the refuge provides opportunities now for only a small portion of the area's hunters, if that shift occurs, it is not imminent in the next 15 years. If it does occur, it could put additional strains on other public lands, or diminish the refuge contribution to the mission of the Refuge System. Continuing to distribute our programs and facilities minimizes conflicts among users.

The hunting program for deer, waterfowl, upland game and webless migratory birds, and turkey provides an administratively simple program that balances other public use activities. The program supports Presidential Executive Order #13443: Facilitation of Hunting Heritage and Wildlife Conservation, regional directives, and parallels State hunting regulations. In addition, it provides seasonal closures to minimize wildlife disturbance and/or avoid conflicts with other uses, eliminates hunting fees except for lottery hunts, enhances disabled hunting opportunities, further develops an appreciation for fish and wildlife, and expands public hunting opportunities.

Hunting areas will be closed to other public uses, unless the uses can be safely sequester from the locations of hunting activity. Experience has proven that time and space zoning (e/g., establishment of separate use area, use periods, and restriction on the number of users) is an effective tool in eliminating conflicts between user groups. Short-term, moderate adverse impacts are expected for non-consumptive users due to the seasonal closures that are highlighted below:

1. Deep Branch Road Trail (includes Goose and Flaxhole Ponds; Unit III), Eastern Prime Hook Creek (from Foord's Landing to headquarter ramp) (Unit III), and hiking trail on Fowler Beach Road (southside of Unit II): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order or turkey hunting. If and when the photography blind is available on the southside of Fowler Beach Road, this portion of the trail will be open year round and open every Sunday during the hunting season.

2. Headquarters area (includes Turkle and Fleetwood Ponds) (Unit III): Closed only for a maximum of two days for deer hunts and portions may be closed for turkey hunts.

3. Island Farm Area in Unit IV (includes trail overlooking Vergie's Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order.

4. Hiking trails on Fowler Beach Road (Unit I), Prime Hook Road (Unit III), and Slaughter Beach Road and Slaughter Canal (Unit I): Open only on Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order or turkey hunting.

Negative reactions by some visitors may be caused by the closure of the eastern end of Prime Hook Creek from September 1 through March 15 and the temporary closure of the general public use area near the refuge headquarters to conduct deer and turkey hunts. The closure of the eastern end of Prime Hook Creek in September is only one month earlier than current management. In fact, for the last few years, the eastern end has been closed in early September for safety reasons due to the opening of the early teal hunting season on the adjacent state-owned Prime Hook Wildlife Area. The deer hunts in the refuge headquarters are the same as current management and only portions of this area will be closed for one-half day for turkey hunting. Seasonal closures for hunting occur during the fall and winter months, which is typically a slower period of use due to weather conditions. Law Enforcement Officers would enforce these and other current refuge regulations, where appropriate, and would seek the assistance and cooperation of Delaware Division of Fish and Wildlife in enforcing common regulations to provide a safe environment for refuge visitors and promote activities that are compatible with protecting the resources.

At first glance, these seasonal closures give the appearance that opportunities for wildlife observation and photography are being significantly reduced or totally eliminated for over eight months during the proposed expanded hunting activities. To the contrary, the majority of the refuge would remain open to wildlife observation and other non-consumptive uses and provide more opportunities and open areas than under current management. More specifically, opportunities for wildlife observation and photography have been expanded to include seven new trails totaling 3.7 miles throughout the refuge in all four management units on existing maintained trails or interior refuge roads, bringing the total number of trails to 14 and 9.9 miles. The Headquarters area, which contains six trails covering six of the nine total miles of refuge trails, remains available 363 days a year for non-consumptive uses, but portions may be closed for turkey hunting. All other areas except for the Deep Branch Trail, Fowler Beach Road trail (southside), and Prime Hook Creek are open on every Sunday during the hunting seasons. The Deep Branch Trail, the Fowler Beach Road trail (southside), and Prime Hook Creek are open with seasonal closures of every day from September 1 through March 15 and if necessary during the snow goose conservation order or turkey hunting seasons. If and when the photography blind is available on the southside of Fowler Beach Road, this portion of the trail will be open year round and open every Sunday during the hunting season. The majority of the hunting will occur during the main hunting season, which typically runs for five months from September through January, with additional hunting opportunities for rabbit through the end of February. Hunting during the snow goose conservation order, which will occur for 2 ½ months from late January through mid-April, will take place mostly in the wetland areas, leaving the upland areas open to other uses. This hunt is not anticipated to bring large numbers of hunters, but is beneficial to the species and other wildlife due to overpopulation. With five or less turkey hunting permits issued in April and May, a vast majority of the refuge would still remain open to wildlife observation and other non-consumptive uses.

Increases in proposed hunting acreages will provide new hunting opportunties from current management; however, many of these proposed “new” hunting areas are currently open to some type of hunting or have been previously open either under refuge management or private ownership. For example, Unit I is currently open for deer and upland game hunting (including dove hunting) and is now proposed to be open for waterfowl hunting - same land, but with a new opportunity. The only refuge land proposed to be open for any type of hunting that is not currently being hunted for any species includes: an area located north of Prime Hook Road commonly referred to as Oak Island (deer only), an area north of Route 16 referred to as the Millman Tract (deer and turkey), an expanded area of the existing Jefferson Lofland Area and Headquarters Area (deer & turkey), an expanded area of the Unit III waterfowl hunt area (waterfowl only), and an area west of Petersfield Ditch in Unit 4. Of these areas,

Oak Island was previously hunted under refuge management up until 1995 and the Millman Tract was hunted under private ownership up until the Service purchased it in 2001. The expanded areas of the Jefferson-Lofland Area, Headquarters Area, and nearly all of the proposed Unit III waterfowl hunt area were previously hunted under refuge management. No prior hunting of the area west of Petersfield Ditch is known.

Due to an increase in new hunting areas and by allowing hunters to free roam, an increase in violations may occur until hunters become familiar with the refuge boundaries and regulations. As a result, short-term minor adverse impacts may occur with some landowners due to hunter trespassing. These impacts will be minimized through enhanced law enforcement efforts. We anticipate some conflict between concurrent hunting programs (i.e., waterfowl, deer, and upland game hunting seasons overlapping). For the majority of the hunting seasons, the Delaware Division of Fish and Wildlife has made efforts to avoid these overlaps in the various hunting programs.

Although the refuge provides hunting maps and refuge-specific regulations, it is ultimately the responsibility of the hunter to know and obey them. Unfortunately, not all do. The Service will ensure that refuge boundaries are and continue to be properly posted to notify both refuge visitors and private landowners. Private landowners will be encouraged to contact either refuge and/or state law enforcement when these trespassing incidents occur and every effort will be made to respond in an efficient and timely manner. The Service also encourages private landowners to post their own property. Restricting hunter access within a 100 yard buffer to private property was discussed and it was concluded that too much hunting area would be lost by this zone and that there are already sufficient laws and regulations in place to discourage boundary shooting. Furthermore, neighboring landowners would benefit by having easy access to designated areas open to hunting on the refuge.

Visitor safety at refuges is a high priority when developing compatible wildlife-dependent recreation programs, such as hunting; however, it is ultimately the responsibility of every hunter to be safe. An accident involving hunter safety results from either a lack of hunting ethics or a violation of hunting regulations. Use of portable deer climbing stands will be recommended but not required. For hunters who may be unable to climb trees using portable deer stands or who may wish to hunt from permanent deer stands or duck blinds, the state-owned Prime Hook Wildlife Area, which adjacent to the Refuge, will continue to provide these opportunities.

Provision of elevated deer stands, and to a lesser degree waterfowl blinds, is relatively unique to Delaware. There are many areas on the Delmarva Peninsula, other than Prime Hook NWR, that offer public hunting opportunities in free-roam areas where the hunter is required to provide the blind or stand, if desired.

The Service conducted a web-search for public lands within the three states making up the Delmarva Penninsula in order that we evaluate the prevalence of permanent waterfowl blinds or deer stands on public hunting lands. A wide assortment of ownership and management regimes was evident across 215 tracts managed or described by 19 different designations, e.g. State Park, National Park Service, State Forest, Chesapeake Forest Lands, Natural Resources Management Area. For waterfowl hunting, 131 of the 215 tracts examined permitted waterfowl hunting. Of the 131, only 36 provided either a pit or standup blind somewhere on the tract. The Service makes this qualifying statement because some areas, Tuckahoe State Park for example, provide four pit blinds but also allow free roaming along the Tuckahoe River. Of the 36, 28 were located in Delaware, 8 in Maryland, and none in Virginia. Twenty

tracts required hunters to hunt at a stake or within some designated distance from a blind site where the hunter would provide the blind (if desired), including nine in Delaware, 11 in Maryland, and none in Virginia. A total of 84 tracts permitted free-roam hunting where the hunter would provide the blind (if desired), 17 in Delaware, 60 in Maryland, and seven in Virginia.

For deer hunting, of the 215 tracts examined, 181 permitted some form of deer hunting. Unfortunately, the Service did not make a distinction between the various methods, i.e. some tracts may be limited to bow hunting only. Of the 181 tracts, 95 were located in Delaware, 77 in Maryland and nine in Virginia. A total of 51 of the 181 tracts required hunters to use stands that were provided, all of which were located in Delaware. Free-roam hunting was permitted on 165 tracts, including 80 in Delaware, 76 in Maryland, and nine in Virginia. The Service acknowledges that some free roam areas were for bow hunting only, however such a distinction would only apply in Delaware; all deer hunting tracts in Maryland and Virginia permitted free-roam hunting regardless of hunting method.

For the 85 tracts located in Maryland and Virginia where no stands are provided, only two require an elevated stand, which the hunter must provide. For areas immediately adjacent to the building complex on Blackwater NWR, the hunter must use an assigned blind site where the hunter erects a stand with a platform minimum of eight feet above the ground. All other tracts on Blackwater NWR are free-roam where ground-hunting is permitted.

The second site where elevated deer hunting is required is on Chincoteague NWR, around the tour loop. Here the hunter must erect his/her own stand with a platform minimum of 14 feet above the ground. All other areas on Chincoteague NWR permit free-roam hunting. The Service should also add that rifle hunting, as well as deer drives, are permitted on most public hunting lands on the lower eastern shore of Maryland and the eastern shore of Virginia.

Preseason lottery drawings at PHNWR provide hunting opportunities for local, in State, and out-of-State hunters. Advance knowledge of a hunting opportunity allows hunters to prepare, plan, and scout, which ultimately helps to provide a quality hunting experience.

According to the USGS Visitor and Community Survey (Sexton et. al 2007), the overall mean desirability of additional hunting opportunities was not as high as that of other public use activities. However, upon further breakdown between hunters and non-hunters, the additional hunting opportunities listed were very desirable by the hunting community. We detail below the impacts that may result from the different types of hunting: white-tailed deer, waterfowl, upland game and webless migratory birds (dove), and wild turkey.

White-tailed deer hunting: A total of 5,221 acres is open for deer hunting, which includes archery (to include the use of crossbows), muzzleloader, handgun, and shotgun hunting. Seasonal closures would occur to not only protect wildlife, but also to minimize conflicts between different hunting activities and/or other non-consumptive recreational uses (e.g., minimize conflict with anglers on Prime Hook Creek and close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance). Non-ambulatory hunters are allowed to hunt in all hunt zones in accordance with refuge policy and regulations. Only non-ambulatory hunters may hunt in the Island Farm Unit, where we have provided non-ambulatory hunt blinds to accommodate hunters with this need.

Permanent deer hunting stands will be phased out over a five-year period in all areas except the disabled hunting area. A limited number of permits (no more than 30) in the lottery hunt area will be issued to

minimize hunter conflict in an area historically known to attract large hunter numbers. In the regular hunt area, hunting will be open every day during designated seasons (except the October antlerless and handgun seasons).

The phasing out of all permanent deer hunting stands (except non-ambulatory hunt blinds) will require hunters to find a suitable hunting location within designated hunting areas through effective scouting. Use of portable deer climbing stands is recommended but not required. Hunters have expressed an interest in scouting and choosing their hunting locations to enhance the quality of their hunt. Maintenance mowing will no longer occur to provide trails to facilitate hunting. Minor to moderate short-term adverse impacts are expected among hunters over desired hunting locations and proper hunting ethics is encouraged.

Waterfowl hunting: A total of 3,432 acres is open to migratory bird hunting, which is 40% of the refuge (includes lands purchased with Land and Water Conservation Funds which are excluded from the 40% rule). Seasonal closures would occur to not only protect wildlife, but also to minimize conflicts between different hunting activities and/or other non-consumptive recreational uses (e.g., close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance and provide access for non-consumptive users only on Sundays in designated areas during the hunting season). In all hunt areas, hunting will occur four days per week and cease at 3pm.

Although the permanent waterfowl blinds on the refuge will be phased out over a five-year period, in the lottery hunt area hunters will be required to hunt within a defined area around a designated blind site (marker). This will minimize hunter conflict in an area historically known to attract large hunter numbers. In past years for daily drawings on opening days, it was common to see over 60 to 80 duck hunting parties compete for 25-27 available hunting opportunities.

The phasing out of all permanent waterfowl hunting blinds (except non-ambulatory blinds) in lieu of blind sites in the lottery hunt area will now require hunters to provide their own means to camouflage themselves (e.g., boat blind, pop up blind, etc.). Hunters would be required to find a suitable hunting location within a specified area around the blind site marker. Hunters have expressed an interest in scouting and having the flexibility to adjust their hunting locations for weather conditions to enhance the quality of their hunt. In free roam areas, hunters may hunt anywhere in the designated area. Minor to moderate short-term adverse impacts are expected among hunters over desired hunting locations and proper hunting ethics will be encouraged.

Upland game and webless migratory bird hunting: A total of 1,995 acres are available for hunting of upland game and webless migratory birds. Dove hunting will not be open on 110 of these acres, which should affect few hunters. Some conflict with concurrent hunting and the potential for trespassing on adjacent private land are expected and previously discussed in this section. As a result, some landowner conflicts may erupt due to hunter trespassing. These minor short-term adverse impacts will be minimized through enhanced law enforcement efforts.

Wild turkey hunting: A total of 3,729 acres are open for hunting wild turkey during legal shooting hours on selected hunt days. In recent years, hunter and staff observations indicate that a huntable population

of turkeys may exist on the refuge (Refer to impacts to landbirds for more information). Limited opportunities exist on public lands to hunt turkey and the refuge may contribute to providing additional quality opportunities for hunters. Hunting of turkey will be permitted to a limited number of hunters (no more than five) and this number may be adjusted (increased or decreased) based on changes in turkey population data.

The elimination of nearly all hunting permit fees (except for lottery hunts) should be well received by hunters. An administratively simplified hunting program minimizes the amount of staffing resources needed to conduct the hunt by as much as 54 staff days and by $17,890 from the previous program and thereby reduces the administrative burden and minimizes the amount of staffing resources needed to conduct the hunt. The minor beneficial impact to the hunter is a reduction in the cost to hunt.

Fees will still be required to manage the lottery hunts for deer, waterfowl, and turkey. The Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation. The proposed permit fee ($10 for deer and turkey; $15 for waterfowl), preseason application fee ($5/hunter), and processing fee for permits acquired after the preseason drawing ($2 to 3 per hunt) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and manage the lottery hunts. Due to the uncertainty in the level of hunter participation with these new program changes, permit fees may need to be adjusted (increased or decreased) and therefore will be evaluated. New fees for preseason application for waterfowl and turkey hunting, new processing fees for standby permits, and charging a flat blind fee for waterfowl rather than an individual fee are anticipated to be unpopular with the hunting public. Application and permit fees for turkey hunting may be waived if the lottery drawing is administered by the State.

Refuge Facilities - Minimal infrastructure, which includes the addition of two to three parking areas, enhancement of existing boat ramps, and placement of informational signs, is anticipated in support of this priority public use. There would be some costs associated with these programs in the form of road maintenance, law enforcement, and boat ramp maintenance. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs. Impacts to refuge resources are expected to be negligible.

Cumulative Impact Analysis of Hunting

"Cumulative impact" is the term that refers to impacts on the environment that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts of hunting on resident wildlife, migratory birds, non-hunted wildlife, endangered species, refuge environment, and other wildlife recreation were analyzed. Because of the regulatory process of harvest management of migratory birds in place within the Service, the setting of the hunting seasons largely outside the breeding seasons of resident and migratory wildlife, and the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, no direct or indirect cumulative effects on resident wildlife,

migratory birds, non-hunted wildlife, endangered species, refuge environment, and other wildlife recreation of hunting on the refuge are anticipated.

Anticipated Cumulative Impacts on Wildlife Species

1.1 Resident Big Game

White-tailed Deer

The Delaware Division of Fish and Wildlife (DFW) recently finalized a new statewide ten-year deer management plan (Rogerson 2010). The plan was created with input from a 22-member advisory group, a public phone attitude survey, a mail survey to hunters, from comments solicited from the general public, and technical reviews from deer experts outside of the DFW. The resultant plan identifies population objectives based on habitat capability and societal tolerances.

The refuge is located in DFW Deer Management Zone 9 (Figure 1.2; Rogerson 2010). The DFW has the ability to manage deer populations, in part, through recreational hunting because these animals have a "k-selection population strategy." This means that reproductive rates are low, adults invest a tremendous amount of energy bringing young to maturity, and survival rates are relatively high compared to more prolific breeders (e.g. rabbits). Based on their monitoring programs, the DFW adjusts hunting levels in terms of season length, sex ratio in the harvest, and number of hunters (tag availability) to move population levels toward desired objectives. Of course, other factors such as disease, severe weather, predation, and automobile collisions influence mortality, but these are taken into account by the annual monitoring. Their analysis of populations and hunting on populations, habitat and communities is cumulative.

Figure 1.2. White-tailed Deer Management Zones in Delaware (Source: Rogerson 2010)

Delaware deer herd statistics indicate that the deer density in Zone 9 is estimated in 2009 at 22.5 deer per square mile with a variability of ±20.75% (Rogerson 2010). This is a decrease of 42.6 percent from the 2005 estimated density of 39.2 deer per square mile (Table 1.10; Rogerson 2010). The total statewide post-hunting season deer population in 2005 was estimated at 37,563 deer, while in 2009 it was estimated at 31,071 deer, a 17.3% statewide reduction. Major land use changes over the last 100 years have created a deer herd that exceeds normal deer densities of 10 to 20 deer per square mile. High deer numbers are recognized as a problem causing crop damage, reducing some forest understory species, and reducing reforestation seedling survival. Hunting is the only viable solution to keep the deer herd and other resident wildlife in balance, resulting in long-term impacts on wildlife habitat.

Table 1.10. Estimated Deer Density in 2005 and 2009 within each of Delaware's 17 Deer Management Zones. Deer densities were estimated via aerial infrared surveys. (Source: Rogerson 2010)

Deer Management Zone	2005 Deer Density*	2009 Deer Density*
1	134.8**	46.7**
2	59.7	85.4
3	33.2	22.0
4	42.1	34.8
5	42.1	14.5
6	15.2	37.6
7	72.4	65.4
8	57.9	59.4
9	39.2	22.5
10	37.7	108.7
11	43.5	21.1
12	36.0	16.8
13	16.3	53.6
14	73.2	114.4
15	70.8	29.8
16	74.6	51.8
17	11.3	53.8
Statewide Average	52.2	**44.3 (-15.1%)**

White-tailed deer hunting is the single most important public use that would affect mammals and other forest-dependent wildlife. It serves both a wildlife-dependent recreational use and a method to reduce and stabilize deer densities that not only benefits other mammals, but also benefits endangered species management for Delmarva fox squirrels, conserves migratory landbird habitats, and lessen impacts to adjacent agricultural lands. Reducing deer densities is best accomplished by means of the refuge deer hunting program.

Deer overabundance can affect native vegetation and natural ecosystems and have been well studied (Tilghman 1989, Nudds 1980, Hunter 1990; Behrend et al. 1970). White-tailed deer selectively forage

on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). These changes can lead to adverse impacts on other wildlife species which depend on this vegetation for food and/or shelter. Several studies have shown that over browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). Heavy deer populations in the Great Smokey Mountains National Park in Tennessee caused a reduction in the number of plant species, a loss of hardwood species, and a predominance of conifer species compared to an ecologically similar control area with fewer deer (Bratton 1979).

The alteration and degradation of habitat from over-browsing deer can have a detrimental effect on deer herd health and may displace other wildlife communities (e.g., neotropical migrant songbirds and small mammals such as the endangered Delmarva fox squirrel) that depend on the understory vegetation habitat destroyed by deer browsing (VDGIF 1999). Deer browsing also affects vegetation that songbirds need for foraging surfaces, escape cover, and nesting (DeCalesta 1997). DeCalesta (1997) also found that species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities. Intermediate canopy-nesting birds declined 37 percent in abundance and 27 percent in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer per square mile and another two disappeared at 63.7 deer per square mile. Casey and Hein (1983) found that three species of birds were lost in a research preserve stocked with high densities of ungulates and that the densities of several other species of birds were lower than in an adjacent areas with lower deer density. Waller and Alverson (1997) hypothesize that by competing with squirrels and other fruit-eating animals for oak mast, deer may further affect many other species of animals and insects.

Based on a nationwide survey of all states (Krausman 1992), deer were effectively controlled with hunting and habitat manipulation in many areas where they were overpopulated. The remaining overpopulated herds were either not hunted, had an inadequate doe harvest, or an inadequate general harvest. Because the refuge boundary area is open, with numerous tracts and corridors for movement and contact with other herds, it is unlikely that hunting will reduce the population to such low levels as to place it at risk of becoming genetically bottlenecked. Also, no prevention or control of epizootic hemorrhagic disease exists to date except by keeping populations below the carrying capacity of their habitats. In a 10-year study in northwestern Pennsylvania examining the impacts of varying densities of deer on deer health and habitat, starvation mortality resulted when densities reached higher than 25 deer per square kilometer (247 acres). Species richness and abundance of shrubs and herbaceous vegetation also has been shown to decline when deer densities reach between 4-8 deer/km2 (deCalesta and Stout 1997). At high densities, deer may act as a host reservoir for Lyme-disease bearing ticks (Jones et al. 1998). Reducing the deer population will reduce the potential for Lyme disease transmission. Based on these considerations, it is anticipated that hunting would have a positive impact on deer health and quality and habitat condition.

High densities of deer have also been recognized as vectors for spreading invasive species like Japanese stiltgrass. Deer consumed the seed and fruits of many plant species and when excreted, a large

percentage of seeds remain viable. In some areas over 50% of seeds eaten represent highly invasive plant species (Williams and Ward 2006). Stiltgrass invasions serve to prevent the shrub layer from returning which decreases and/or eliminates these forest structural components used by songbirds and also interferes with native plant successional dynamics.

Reducing the deer population will also benefit the surrounding human community by reducing damage on agricultural crops and residential landscape vegetation and by reducing deer-vehicle collisions. The average estimated economic impact from deer depredation to high-value agricultural crops from 1994 to 2000 in Delaware was $375,966 (Drake et al. 2005). High-value agricultural crops included fresh market and processed vegetables including but not limited to snap beans, sweet corn, leafy vegetables, tomatoes, and peppers. Fruits such as apples and peaches were also included as high-value crops (Drake et al. 2005). The average estimated economic impact from deer depredation to grain crops from 1994-2000 in Delaware was $867,937 (Drake et al. 2005). Grain crops included corn (silage and grain), soybeans, wheat, and oats. The average annual vehicle damage from deer-vehicle collisions in Delaware from 1986 to 2000 is estimated at $592,000. This does not include costs of human fatalities associated with deer collisions or costs associated with disposal of deer carcasses.

Hunting of resident game species such as deer does not have any regional impact on their respective populations due to their restricted home ranges. The refuge contributes negligibly to the State's total harvest for deer (Figure 1.3 and Tables 1.11-1.12). For example, since 1999, deer harvest at the refuge has ranged from 0.5 percent to 1.5 percent of Delaware's total deer harvest each year.

Figure 1.3. Delaware annual deer harvest, 1954–2008/09 seasons. (Source: Rogerson (2010)

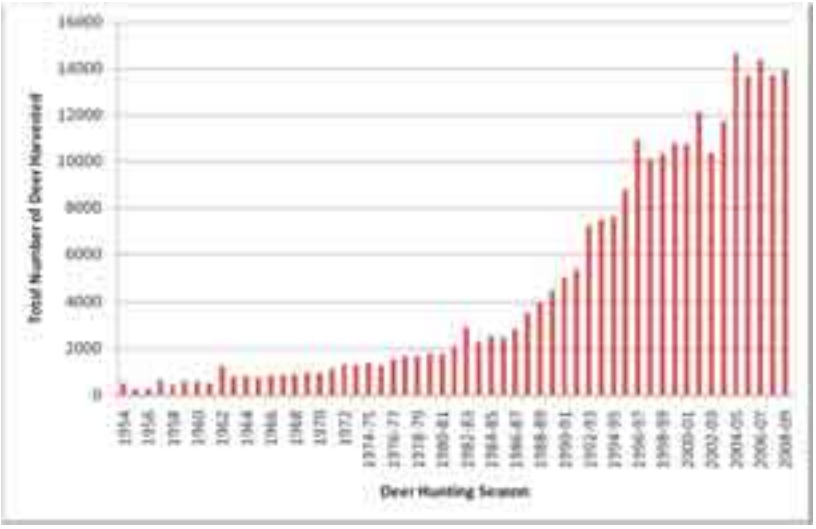


Table 1.11. Number of deer harvested and hunter visits on Prime Hook NWR compared to statewide harvest (Source: DNREC 2010b, refuge harvest data; http://www.dnrec.state.de.us/fw/deer.pdf)

Year	Statewide Deer Harvest	Refuge Deer Harvest	Refuge Hunter Visits
1988	3,998	141	1,289
1989	4,504	155	1,131
1990	5,066	178	1,689
1991	5,336	163	1,703
1992	7,245	257	1,608
1993	7,465	219	1,616
1994	7,615	169	1,568
1995	8,781	217	1,184
1996	10,915	221	1,326
1997	10,091	187	1,510
1998	10,312	138	1,335
1999	10,756	114	870
2000	10,741	125	941
2001	12,133	188	1,003
2002	10,357	160	913
2003	11,712	175	891
2004	14,669	143	841
2005	13,670	133	884
2006	14,401	120	825
2007	13,369	108	790
2008	13,926	106	670
2009	12,400*	107	552
2010	14,183	114	549
2011	13,559	66	513

*Data from DNREC (2010b).

Table 1.12. Cumulative impacts of existing deer hunting on Prime Hook NWR/State Deer Management Zone 9 (2011-2012 data) compared to Statewide Harvest.

Hunt Location & Type	Harvest
Prime Hook NWR	66
State Deer Management Zone 9	852
Statewide Harvest (all 17 Deer Management Zones)	13,559

The refuge will open 1,201 additional acres for deer hunting for a total of 5,221 acres. This additional acreage includes an area located north of Prime Hook Road commonly referred to as Oak Island, an area west of the existing Headquarters Area, an area north of Route 16 referred to as the Millman Tract, an expansion of the Headquarters Area and Jefferson Lofland Tract, and an area west of Petersfield Ditch in Unit IV (For more information about hunting on these areas, refer to Impacts to Public Use). Hunter numbers are expected to initially increase based on the opening of these areas and the opportunity for hunters to free-roam; however, cumulative impacts are expected to be negligible.

The current harvest of deer on the refuge (66) has a negligible impact on the statewide deer population, which was last estimated at 31,071 deer in 2009 (Table 1.12). Furthermore, hunting license sales in Delaware have declined from 29,994 in 1975 to 18,746 in 2007 (Rogerson 2010). Based on the decline in the number of hunters and the relatively few numbers of animals harvested from the refuge in respect to the total statewide harvest and deer population, no cumulative impacts to local, regional or statewide populations of white-tailed deer are anticipated from allowing hunting of the species on the refuge.

Wild Turkey

The refuge proposes to open 3,729 acres for wild turkey hunting, which was permitted on the refuge in Unit I west of Slaughter Canal from 1993 up until 1998. This additional acreage includes many of the areas for deer hunting under this alternative. Turkey is a resident game species that is managed by DNREC's Division of Fish and Wildlife. The refuge falls within Zone 9 of DNREC's Wild Turkey Management Regions and the refuge will work closely with DNREC to evaluate the status of the turkey population and its hunting potential. Zone 9, which includes the state-owned Prime Hook Wildlife Area that is adjacent to the refuge, is currently open during the spring turkey hunting season. To ensure a sustainable harvest of the state's turkey population, DNREC biologists track their health, distribution and reproductive success. Current efforts include a volunteer-based survey used to generate an index of annual turkey productivity and recruitment, monitoring turkey harvest and hunter efforts, tracking turkeys with radio transmitters to evaluate their reproductive ecology, habitat use, and survival, and evaluating the genetic diversity of turkeys. Impacts from turkey hunting, which occurs in April and May, are expected to be negligible since only a very small number of hunters (five or fewer) will be permitted to hunt. The number of permitted hunters may be adjusted (increased or decreased) based on changes in turkey population data.

1.2 Upland Game or "Small Game"

Cottontail rabbit is the primary small game species sought on the refuge and to a much lesser extent northern bobwhite quail, mourning dove, woodcock, snipe, and ring-necked pheasant. Mourning dove, woodcock, and snipe have been addressed in the migratory bird section of this analysis.

Hunting of resident game species such as quail, rabbit, red fox, and pheasant does not have any regional impact on their respective populations due to their restricted home ranges. Delaware Division of Fish & Wildlife periodically reviews populations of all harvested resident species, and has determined that populations are adequate to support hunting efforts throughout the state.

Hunter visits and harvest of upland and small game such as rabbit have been relatively low and the number of quail taken per year has been non-existent to no more than 14 per year on the refuge in recent years (Table 1.13). The refuge does not allow hunting of the eastern gray squirrel to minimize conflicts with the endangered Delmarva fox squirrel.

Table 1.13. Number of upland game, small game, and webless migratory birds harvested and hunter visits on Prime Hook NWR.

Year	Dove Harvest	Snipe Harvest	Woodcock Harvest	Quail Harvest	Rabbit Harvest	Refuge Hunter Visits*
1996	110	0	0	5	83	126
1997	77	0	0	0	117	169
1998	30	0	0	0	46	112
1999	90	0	0	0	98	123
2000	13	0	0	0	29	81
2001	6	0	0	0	65	128
2002	58	0	0	0	163	114
2003	13	0	0	0	79	81
2004	12	0	0		75	53
2005	6	0	0	0	257	129
2006	20	0	0	14	115	106
2007	22	0	0	11	145	178
2008	0	0	1	10	176	171
2009	0	0	6	1	163	149
2010	4	0	1	3	108	129
2011	9	0	1	0	76	100

*Hunter visits include all species combined; majority are hunting rabbits

Given the relatively few numbers of animals harvested from the refuge, no cumulative impacts to local, regional or statewide populations of small game are anticipated from allowing hunting of these species on the refuge.

Delaware permits hunting for red fox, which assists State management efforts in reducing the incidence of mange outbreaks to maintain a healthy population and reducing the predatory impact of this species on migrating and breeding birds, particularly State and federally endangered or threatened species. Hunting would be opportunistic in most cases. In other states, the incidental harvest of fox occurs during other open seasons, such as deer season, and the pelts are often retained for personal use. Though no county-specific data are available, healthy populations of fox exist in the State and anticipated harvest rates would result in negligible cumulative impacts to local or State populations (Reynolds, personal communication 2010).

1.3 Migratory Birds

Migratory birds are managed on a flyway basis by the U.S. Fish and Wildlife Service. The process of surveying populations and setting regulations is, inherently, a cumulative impact analysis. The following paragraphs describe this process.

The U.S. Fish and Wildlife Service annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow State selections of season and limits for recreation and sustenance; aid Federal, State, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the

Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which States may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. The refuge is in the Atlantic Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g. dove, woodcock, etc.); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl season not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Though not as detailed as that for waterfowl, relevant data are collected and summarized for migratory bird species such as dove, woodcock, etc. Bird monitoring data are available through the Service's Division of Migratory Bird Management Website (*http://www.fws.gov/migratorybirds/*; accessed October 2012).

Because the Service is required to take abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, State and Provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of State and Federal Governments. After Service establishment of final frameworks for hunting seasons, the States may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks

but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a national wildlife refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows.

National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14)," filed with the Environmental Protection Agency on June 9, 1988. The Service published Notice of Availability in the *Federal Register* on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate environmental assessment, in which the FONSI is published generally in August of that hunt year. Further, in a notice published in the September 8, 2005, *Federal Register* (70 FR 53376), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9. 2006, *Federal Register* notice (71 FR 12216). More information may be obtained from: Chief, Division of Migratory Bird Management., U.S._ Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

Waterfowl at Prime Hook NWR

Impacts to hunting waterfowl are further minimized from State and Federal frameworks by limiting hunting to four days per week during the hunting season with a 3pm closure.

At the refuge, the impacts of hunting of waterfowl are negligible when compared to the State's total waterfowl harvest. For example, from 1987 to 2011, the average annual waterfowl harvest at the refuge is 2.5 percent of Delaware's total waterfowl harvest (Table 1.14). Furthermore, in 2011, the refuge's harvest of ducks was only 2.3 percent of Delaware's total duck harvest, 0.06 percent of the Atlantic Flyway's duck harvest, and 0.01 percent of the entire United States' duck harvest (Table 1.15; Raftovich et al. 2012). Also in 2011, the refuge's harvest of geese (Canada and snow geese combined) was only 0.75 percent of Delaware's total goose harvest, 0.02 percent of the Atlantic Flyway's goose harvest, and less than 0.01 percent of the entire United States' goose harvest (Table 1.15; Raftovich et al. 2012).

The impacts of waterfowl hunting at the refuge are also negligible when compared to long-term trends in duck and goose populations at the refuge and across the state. Through monthly aerial surveys from October through November, the Delaware Division of Fish and Wildlife is able to evaluate long-term trends in duck and goose populations. The surveys give fairly accurate information about geese, but duck populations such as wood ducks and sea ducks are almost impossible to count. Furthermore, these surveys do not cover the entire state, but only the primary waterfowl habitat in Delaware which is approximately the eastern half of the state. These figures represent the numbers of ducks and geese at the time of the survey, but do not reflect an actual annual estimate for the waterfowl population in Delaware due to the transitory nature of birds migrating through the State during the fall and winter months.

Based on the findings of these monthly surveys from 1987 to 2011, the average annual waterfowl harvest at the refuge is only 1.8 percent of the estimated peak waterfowl survey findings on the refuge (Table 1.14). During an individual season, the percent of the refuge's harvest on statewide and refuge populations may range greatly depending on the timing of refuge hunting activity and peak waterfowl migration. For example, during the 2011-2012 hunting season, the refuge harvested between 0.58 percent and 1.61 percent of the State's estimated monthly duck population and between 0.02 percent

and 0.03 percent of the State's estimated monthly goose population (Table 1.16; October and November statewide waterfowl survey information was unavailable). Refuge hunters harvested between 1.60 percent and 7.04 percent of the refuge's estimated monthly duck population and between 0.04 percent and 0.08 percent of the refuge's estimated monthly goose population (Table 1.16).

Table 1.14. Waterfowl harvest and aerial survey estimates on Prime Hook NWR compared to statewide harvest. Waterfowl includes geese and ducks.

Year	Statewide Waterfowl Harvest*	Refuge Waterfowl Harvest	Refuge Waterfowl Survey**	Refuge Hunter Visits
1987	63,360	1,202	21,243	1,206
1988	62,160	771	21,814	826
1989	61,480	578	64,822	333
1990	59,510	1,241	49,611	1,065
1991	63,410	1,625	55,792	1,178
1992	46,600	1,155	55,238	1,291
1993	46,850	1,421	86,087	962
1994	53,290	2,053	155,096	1,604
1995	45,540	1,572	71,131	1,024
1996	44,170	1,980	104,447	1,630
1997	71,070	3,116	191,446	1,904
1998	118,560	2,964	193,617	1,530
1999	96,410	1,987	224,693	1,403
2000	94,610	2,047	134,156	1,250
2001	76,210	2,679	107,919	1,683
2002	95,170	1,936	102,690	1,330
2003	88,800	2,546	203,615	1,486
2004	73,190	1,573	69,737	1,422
2005	71,740	1,624	111,544	1,301
2006	64,630	2,389	132,088	1,750
2007	81,620	2,989	44,086	1,850
2008	107,120	1,634	90,875	1,253
2009	86,600	1,934	79,263	1,453
2010	84,130	1,604	58,960	874
2011	56,370	1,050	138,894	908

* Statewide waterfowl harvest data from: *http://www.flyways.us/regulations-and-harvest/harvest-trends*; accessed October 2012.

** Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Some monthly surveys were incomplete in 2007, 2010, and 2011, which may not have reflected the peak *(http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20Surveys.aspx;* accessed October 2012).

Table 1.15. Comparison of waterfowl harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2011 hunting season.

Waterfowl Harvest Area	Ducks	Geese
Prime Hook NWR	934	116
Delaware*	41,000	15,400
Atlantic Flyway*	1,672,900	580,400
United States*	15,931,200	2,879,900

*Harvest estimates from (Raftovich et al. 2012)

Table 1.16. Comparison of duck and goose (Canada & snow geese) harvest at Prime Hook NWR to State waterfowl surveys during the 2011-2012 hunting season.

Month	Refuge Duck Harvest	Refuge Duck Population Estimates*	Statewide Duck Survey Results*	Refuge Goose Harvest	Refuge Goose Population Estimates*	Statewide Goose Survey Results*
October 2011	219	6,236	Data Unavailable	11	16,823	Data Unavailable
November 2011	126	7,857	Data Unavailable	12	15,540	Data Unavailable
December 2011	217	8,707	37,185	45	99,869	174,992
January 2012	372	5,287	23,053	48	133,634	199,204

* Waterfowl estimates were derived from peak numbers found during aerial surveys. Zone 7 was used to estimate waterfowl numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1 *(http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20 Surveys.aspx;* accessed October 2012).

Managing Resident Canada Geese

Canada goose herbivory during the growing season is a relatively new impact upon wetlands. In 2002, a research study conducted at neighboring refuges, Bombay Hook and Chincoteague NWRs, suggested that higher levels of goose-use may cause a long-term change in wetland community structure (Laskoswki et al, 2002). The study measured the impact of foraging by resident Canada geese on biomass and species composition of wetland vegetation at Bombay Hook and Chincoteague National Wildlife Refuges in Delaware and Virginia, respectively. Resident geese reduced the amount of plant biomass that would be available to migrant birds at the end of the growing season. Biomass of several species of vegetation was significantly impacted by feeding resident Canada geese at both refuges.

Direct damage to agricultural resources by resident geese includes grain crops, trampling and spring seedlings. Heavy grazing by geese can result in reduced yields and in some instances a total loss of the grain crop. A single heavy grazing event by Canada geese in the fall, winter, or spring can reduce the yield of winter wheat by 13-30 percent (Allen et al. 1985, Flegler et al. 1987). In the mid-Atlantic, the Maryland Department of Natural Resources reported that 23 percent of all complaints were related to agricultural damage and estimated agricultural damage exceeds $200,000 per year (USFWS, FEIS, 2005).

To address well-documented concerns regarding the impacts of resident Canada geese on habitats as well as public property, the USFWS issued new regulations for control of resident geese [VOL#71 Fed. Reg.

PAGE#45964-45993 (2006)]. We expect that the use of resident Canada goose control and management activities; particularly lethal control methods would increase significantly. Such lethal and nonlethal activities would be expected to significantly decrease the number of injurious resident Canada geese in specific localized areas, thus reducing adverse impacts on vegetation. The long term viability of goose populations would not be affected, however. Over time, we expect the cumulative impacts to become less evident and significant as the goose populations are reduced.

The impact of refuge hunting on resident Canada geese is negligible. For resident Canada geese, hunters averaged 8.8 birds per year from 2001 to 2006 (Table 1.17).

Table 1.17. Resident Canada Goose Harvest in Prime Hook National Wildlife Refuge.

Year	Resident Canada Goose Harvest	Refuge Hunter Visits
2001	14	33
2002	6	15
2003	10	13
2004	14	10
2005	0	0
2006	9	2

Managing Snow Geese

In the nearly three decades since the original snow goose management plan of 1981, the greater snow goose population, as indexed by the spring survey, has undergone a five-fold increase to over one million birds. Various light goose populations in North America have experienced rapid population growth, and have reached levels such that they are damaging habitats on their Arctic and subarctic breeding areas (Abraham and Jefferies 1997, Alisauskas 1998, Jano et al. 1998, Didiuk et al. 2001). Habitat degradation in arctic and sub-arctic areas may be irreversible, and has negatively impacted light goose populations (Abraham and Jefferies 1997), and other bird populations dependent on such habitats (Gratto-Trevor 1994, Rockwell 1999, Rockwell et al. 1997). Natural marsh habitats on some migration and wintering areas have been impacted by light geese (Giroux and Bedard 1987, Giroux et al. 1998, Widjeskog 1977, Smith and Odum 1981, Young 1985). In addition, goose damage to agricultural crops has become a problem (Bedard and Lapointe 1991, Filion et al. 1998, Giroux et al. 1998, Delaware Div. of Fish and Wildlife 2000).

The increasing numbers of light-geese are viewed as a continental problem, but with real local consequences. A common feeding strategy of snow geese on refuge wetlands is to grub for underground roots and tubers. Primary marsh vegetation species exploited in this fashion are; salt marsh cordgrass (*Spartina alterniflora*), salt meadow cordgrass (*S. patens*),Olney's bulrush (*Scirpus americanus*), black needlerush (*Juncus romerianus*), and cattail (*Typha sp*). Grubbing for rhizomes of these species, especially in salt marshes, results in areas denuded of vegetation, typically referred to as "eat-outs". Presently, eat-outs occur on four NWRs within R5: Forsythe, Bombay Hook, Prime Hook, and Blackwater.

Snow goose eat-outs in salt marshes tend to re-vegetate during the subsequent growing season, however at a reduced vegetative density. Vegetation density at these eat-outs may increase after several years to pre-eat-out levels, if left alone. However, at most NWRs where eat-outs occur within salt marsh habitats, snow geese return each winter to the same areas to feed. This may be a result of the vegetative growth being at an earlier stage of development, being more nutritious, or having a less dense root mat and therefore easier to grub. It is also speculated that during the time snow geese are feeding in a salt marsh, much of the soil and sediment may be loosened and placed into suspension. This material may then be

washed away during high or flood tide periods. After several years of successive eat-outs at the same location, a lowering of ground elevation may occur causing a more permanent impact to the site.

Most agree that salt marsh eat-outs are detrimental to habitat integrity and other wildlife species. This is a result of the radical change of habitat structure from dense vegetation to mudflat. Undoubtedly, this conversion negatively impacts invertebrate communities as well as species such as rails, and waterfowl that feed on these invertebrates and rely on the dense vegetative structure for cover. However, some refuge staff report increased use of snow goose eat-outs by numerous shorebirds during migration, as well as, some species of waterfowl. This is particularly the case at the refuge, Forsythe NWR, and Bombay Hook NWR.

Reducing the acreage in cropland habitats in favor of more native vegetation also supports the preferred alternative for snow goose management on refuge lands identified in the final environmental impact statement for snow goose management along the Atlantic Flyway. Reducing the use by snow geese of these upland habitats will also benefit a variety of wildlife species that tend to be absent from agricultural habitats, and will also reduce the numbers of snow geese staying on the refuge. Reducing snow goose numbers on the refuge will also diminish adverse impacts of snow goose herbivory on salt marsh habitats.

Prior to the conservation order taking affect in late January, all snow goose hunting on-refuge will be isolated to the same areas/blinds and refuge specific hunting dates as other waterfowl hunting. A continuous period (except Sundays) from January 28 – April 13(for 2012-2013 hunting season) will be open for hunting snow geese during the Conservation Order which will open all emergent wetlands on-refuge to snow goose hunting only, once all other waterfowl seasons have closed. Snow geese present a fairly unique issue, finding themselves on the Service's Migratory Bird Program focal species list for actually being over abundant. It is the desire of the USFWS, Canadian Wildlife Service and all Provinces and States to drastically reduce the size of the current continental populations of light (snow) geese, primarily because of the dramatic damage excessive numbers of snow geese have inflicted on very fragile arctic breeding grounds, areas that are important to other breeding migratory species, as well. Seasons, bag limits and methods of take have been liberalized for the purpose. Opening all available habitats on the refuge from January 28 – April 13 is specifically designed to reduce damage sustained from overbrowsing of refuge saltmarshes.

Unfortunately, the Service projects, based upon documented history of similar hunts on-refuge, that very few hunters will take advantage of the snow goose hunting opportunity. The hunting season starts October 1, several weeks before any number of birds arrive on Delmarva, and while many hunters are more interested in deer hunting instead. Snow geese are difficult to hunt and there may be an incidental few killed during the regular duck and migratory Canada Goose season.

Over the period 2001 – 2006, when the refuge was open to late season snow goose hunting, 100 hunters harvested 96 snow geese over a shortened season extending from late January to mid-March and averaged 16.0 birds per year (Table 1.18). The hunter success rate averaged 0.96 birds per hunt. Because of the difficulty of hunting snow geese, hunting parties were likely composed of a minimum of two hunters. Thus a maximum of 50 total parties hunted over a combined total of approximately 216 days available over the 6 year period with each party potentially having several thousand acres upon which to hunt. From 2000 to 2009, refuge hunters harvested between 0.04 percent and 0.43 percent of the refuge's estimated monthly snow goose population (Table 1.18). The Service projects negligible impacts to other refuge resources from snow goose hunting.

In addition, non-refuge areas in Delaware will also be open to snow goose hunting during the same period. It appears anecdotally that the limited few hunters that attempt snow goose hunting during the late season are likely to do so from agricultural fields, alleviating most waterfowl hunting pressure on Delaware's tidal marshes and impoundments.

Table 1.18. Snow Goose Harvest and Aerial Survey Estimates at Prime Hook National Wildlife Refuge.

Year	Total Snow Goose Harvest*	Hunted in Late Season**	Snow Goose Harvested in Late Season**	Refuge Hunter Visits in Late Season**	Refuge Snow Goose Survey***
2000	174	No	n/a	n/a	96,112
2001	242	Yes	37	42	67,840
2002	48	Yes	7	9	72,200
2003	118	Yes	33	24	124,500
2004	121	Yes	3	5	55,330
2005	36	Yes	4	8	86,627
2006	73	Yes	12	12	132,088
2007	130	No	n/a	n/a	30,500
2008	56	No	n/a	n/a	84,520
2009	43	No	n/a	n/a	27,000
2010	15	No	n/a	n/a	52,451
2011	60	No	n/a	n/a	103,301

* Includes snow geese harvested in February/March when applicable
** Late season includes late January to mid-March
*** Snow goose estimates were derived from peak numbers found during aerial. Zone 7 was used to estimate snow goose numbers for the refuge, which covers the area from Big Stone Beach to the Broadkill River and east of Route 1. Some monthly surveys were incomplete in 2007, 2010, and 2011, which may not have reflected the peak *(http://www.fw.delaware.gov/Hunting/Pages/Waterfowl%20 Surveys.aspx;* accessed October 2012).

Managing Non-Native Mute Swans

Mute swans are highly invasive of wetland habitats, impact native species of fish and wildlife, damage commercial agricultural crops, and pose a threat to human health and safety. As such, they cause serious nuisance problems and property damage, including economic loss. Because of their consumption of large quantities of submerged aquatic vegetation and their aggressive behavior, mute swans compete directly with many other water birds and fisheries for critical habitats. Due to their strong territorial defense, some pairs will vigorously defend nest and brood sites from intrusion by other wildlife and have attacked humans, causing serious harm. They do provide some aesthetic value for public enjoyment. But, as populations of mute swans have grown in various states and expanded into new areas, there is a need to coordinate management actions among state/provincial and Federal wildlife agencies to reduce numbers to desirable levels (AFC 2003).

Consequently, the Atlantic Flyway Council has adopted the Atlantic Flyway Mute Swan Management Plan 2003-2013. The mute swan is not federally protected under the Migratory Bird Treaty Act, and is listed as an unprotected-invasive species by the State of Delaware. As such, mute swans, their nests, and eggs

have been routinely removed from national wildlife refuges, State wildlife management areas and (with landowner permission) from private lands since the early 1970s, in Delaware (AFC 2003).

Minimizing Hunting Disturbance

The refuge proposes to open 1,710 additional acres for waterfowl hunting for a total of 3,432 acres. This additional acreage includes an area between Slaughter Beach Road and Fowler Beach Road referred to as Unit I, an area located south of Prime Hook Beach Road, and a reconfiguration of the existing waterfowl hunt area in Unit III. Of these new areas, Unit I was already open to deer and upland game (including dove) hunting.

To minimize waterfowl disturbance, the refuge has designated about 3,185 acres as waterfowl sanctuaries that will be closed to hunting and other recreational uses on a seasonal or annual basis. Given the dominant role of the refuge in the Atlantic Flyway migration corridor, this closed area system was established to provide waterfowl with a network of resting and feeding areas and to disperse waterfowl hunting opportunities on the refuge. These sanctuaries lie in the Unit II (approximately 1,800 acres), the southern half of Unit III (approximately 390 acres), and in Unit IV (approximately 995 acres). The northern portion of Unit IV, which contains a proposed trail and observation platform, will be closed from the Monday before Thanksgiving to March 15 to minimize disturbance to wildlife in this area. The southern portion of Unit IV will not be open to any public use. Furthermore, all waterfowl hunt areas will be open four days per week until 3pm during the hunting season, which is the same as current management.

The term “sanctuary”, as used in the context of the CCP, indicates an area free from hunting and other uses. A key feature of a sanctuary is to make it large enough that intrusions on it’s borders do not unduly disturb the normal lifecycle functions, e.g. feeding, resting, preening, courtship or cause the birds to take flight. The Service believes the areas designated for sanctuary are sufficiently large to reduce the detrimental affects of all forms of disturbance, including those resulting from hunting activity.

Sanctuaries also allow birds to have adequate escape distances (ED), which are defined as the shortest distance at which they flush or otherwise move away from the approaching person or other disturbing stimulus. Many factors influence EDs such as hunting, flock size, hunger, migratory motivation, etc. Laursen et. al (2005) suggested providing a mean ED of the largest ED of a bird species plus one to two standard deviations to calculate the size of the core area or buffer zone. In their study, the largest ED was 1000 meters for wigeon (other species included mallard, etal, pintail, waders, and gulls) and would be approximately 1700 meters with two standard deviations. Based on this information, refuge sanctuary areas can accommodate the ED’s of most species.

Disturbance to waterfowl in or adjacent to the refuge is not a new phenomenon. The Service agrees, in part, there is virtually no area of the refuge that is not susceptible to auditory and visual disturbance. The refuge is relatively narrow and is crossed by several county roads. Some days auto traffic on Route 1 can be clearly heard a couple miles to the west, aircraft fly overhead, patrons of the refuge drive the county roads, birders walk the trails, refuge staff run tractors and airboats as part of their management program, residents drive to and from the neighboring communities to the east, beach enthusiasts travel to the public beaches, kayakers paddle the creek, crabbers park along the roads, neighbors hunt right up to the refuge border, and refuge hunters occasionally fire guns. Unfortunately, this is the nature of NWRs in the heavily populated eastern US. Most NWRs on the east coast do not harbor qualities that we generally think of as constituting “wilderness”, eg. quiet, or solitude. Under an official wilderness

designation, refuge staff would not be permitted the use of many of the standard management tools used on PHNWR. Even so, hunting is in fact permitted on areas designated as wilderness.

More specifically, hunting on adjacent private property causes disturbance to waterfowl every year in the following areas: Unit 1 along the western boundary, Unit 2 along Cods Road and Fowlers Beach Road, Unit 3 along the southeastern portion near Broadkill Beach, along Prime Hook Creek, and in the state managed Prime Hook Wildlife Area, and Unit 4 along the Broadkill River, Petersfield Ditch, and in salt marshes on the western boundary. Hunting has been open in all four units of the refuge and Unit 1 has been hunted for years by free-roaming hunters seeking deer and upland game in refuge saltmarshes. Despite disturbance of waterfowl from vehicular traffic, refuge staff observe visitors year after year viewing and photographing waterfowl within 20 yards of vehicle even during the hunting season. Adding additional sanctuary areas on the refuge will only increase areas of respite for waterfowl and other wildlife and further enhance opportunities to enjoy them by refuge visitors.

Hunter numbers are expected to initially increase based on the opening of these areas and the opportunity for hunters to free roam in the regular waterfowl areas; however, cumulative impacts are expected to be negligible. Hunting license sales in Delaware have declined from 29,994 in 1975 to 18,746 in 2007 (Rogerson 2010). Based on the decline in the number of hunters and the relatively low numbers of waterfowl harvested from the refuge with respect to the total Statewide, flyway, and national harvests, no cumulative impacts to local, regional or flyway waterfowl populations are anticipated from allowing hunting of waterfowl on the refuge. Impacts to waterfowl using the refuge would be localized to the area being hunted (which can be no more than 40 percent of the refuge) and, due to the short temporal nature of these types of disturbance (from hunting day and time restrictions), no cumulative indirect impacts from shooting, walking, boats, or vehicles are anticipated.

Other Migratory Birds at Prime Hook NWR

Other migratory birds hunted at the refuge include mourning dove, woodcock, and snipe. For mourning dove, an estimated 14,700 birds were harvested in Delaware during the 2011 season (Table 1.19; Raftovich et al. 2012) when only nine were taken on the refuge. Similarly, very few snipe and woodcock were harvested (Tables 1.13 & 1.19).

Table 1.19. Comparison of mourning dove, woodcock, and snipe harvest at Prime Hook NWR to State, Flyway, and United States harvest in the 2011 hunting season.

Harvest Area	Dove	Woodcock	Snipe
Prime Hook NWR	9	1	0
Delaware*	14,700	500	500
Eastern Management Unit*	6,666,900	77,000	57,500
United States*	16,580,900	308,700	136,300

*Harvest estimates from (Raftovich et al. 2012); Estimates for snipe are from the Atlantic Flyway

Given the low numbers of birds harvested from the refuge, no cumulative impacts to local, regional/ flyway, or nationwide populations of other migratory birds are anticipated from allowing hunting of these species on the refuge.

1.4 Non-Hunted Wildlife

Non-hunted wildlife would include resident and migratory birds (songbirds, wading birds, shorebirds, etc.); small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, turtles, salamanders, frogs and toads; and invertebrates such as butterflies, moths, insects, and spiders). Except for migratory birds and some species of butterflies, moths, and bats, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

Disturbance to non-hunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. The continual effects of disturbance to non-hunted migratory birds under this plan are expected to be negligible for the following reasons. The hunting season would not coincide with the nesting season except for the spring turkey hunt. Turkey hunting will negligibly affect non-target wildlife since only a very small number of hunters (no more than five) will be permitted to hunt on the 3,729 designated acres of the refuge. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities of birds might occur, such as feeding and resting.

Disturbance of resident birds would increase slightly, but displacement is usually brief, infrequent, and short distance. Disturbance would be unlikely for many small mammals, such as bats, which are inactive during fall and winter when hunting season occurs, and/or are nocturnal. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during the hunting season when temperatures low, making encounters with reptiles and amphibians infrequent and inconsequential to local populations. Invertebrates are also not active during cold weather and will have few interactions with hunters during the hunting season. The Service anticipates no measurable negative cumulative impacts to resident non-hunted wildlife populations locally, regionally, or globally. The cumulative impact of wildlife and habitat management when considered at the flyway scale may in fact, benefit the health of migratory birds by maintaining the diversity and native components of the habitats they use. In summary, hunting has little or no impact on non-hunted wildlife due to temporal and spatial separation due to timing of the season and migration.

1.5 Threatened and Endangered Species

Disturbance factors resulting from public use are always considered for all listed species. The Delmarva fox squirrel (*Sciurus niger cinereus*) and piping plover (*Charadrius melodus*) are listed as endangered and threatened by the U.S. Fish and Wildlife Service and the red knot was designated as a candidate species in 2006 for possible listing. Several other species listed as endangered by the Delaware Division of Fish & Wildlife include American oystercatcher (*Haematopus palliates*), common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), least tern (*Sterna antillarum*), and bald eagle (*Haliaeetus leucocephalus*). Of these, the piping plover, red knot, American oystercatcher, common tern, Forster's tern, and least tern will not be impacted by hunting because they would be unlikely to use the refuge's forested habitats and/or their occurrence on the refuge is outside of the hunting season for deer, upland game, and waterfowl. Impacts on the piping plover, American oystercatcher, common tern, Forster's tern, and least tern will be minimized through the seasonal closure of designated beach dunes and overwash areas from March 1 through September 1 to all visitors. A Section 7 Evaluation has been conducted as part of this review and it was determined that proposed activities would not likely affect the Delmarva fox squirrel or piping plover. Furthermore, the hunting of any squirrel species is prohibited on the refuge to further minimize impacts to this endangered species.

While the bald eagle is no longer a federally listed species, the refuge uses the National Bald Eagle Management Guidelines for bald eagle management to implement time-of-year restrictions for nesting eagles. The guidelines do not permit any activity within 330 feet of an active nest during the breeding season, particularly where eagles are unaccustomed to such activity (U.S. Fish and Wildlife Service 2007).

Hunting near Turkle Pond was an existing activity prior to nesting by bald eagles on the adjacent Horse Island. When bald eagles were listed as endangered, the Section 7 Evaluation conducted on the refuge concluded that this activity in Turkle Pond would not likely affect this species and the use was permitted. The Service will continue to monitor use in Turkle Pond to determine if there is an impact on the eagle nest on Horse Island, which is currently abandoned.

1.6 Anticipated Direct and Indirect Impacts of Proposed Action on Refuge Programs, Facilities, and Cultural Resources

1.6.1 Other Wildlife-Dependent Recreation

The opportunities for recreational sport hunting, a wildlife-dependent priority public use, would be available to the hunters, meeting a demand. Hunting on the refuge would contribute to the State's wildlife management objectives and allow a traditional use to continue.

Expanded hunting opportunities are expected to have adverse impacts on a certain segment of the public that does not desire any change in public use programs and regulations, or that may hold differing views on the course of action. In addition, while new visitors become familiar with those changes, violations could increase. Some conflict between wildlife observers, photographers, students, and other refuge users is expected to be short-term and negligible and will be managed through seasonal closures. Negative reactions by some visitors may be caused by the closure of the eastern end of Prime Hook Creek from September 1 through March 15 and the temporary closure of the general public use area near the refuge headquarters to conduct deer and turkey hunts. The closure of the eastern end of Prime Hook Creek in September is only one month earlier than current management. In fact, for the last few years, the eastern end has been closed in early September for safety reasons due to the opening of the early teal hunting season on the adjacent state-owned Prime Hook Wildlife Area. The deer hunts in the refuge headquarters are the same as current management and only portions of this area will be closed for one-half day for turkey hunting. Seasonal closures for hunting occur during the fall and winter months, which is typically a slower period of use due to weather conditions. Law Enforcement Officers would enforce these and other current refuge regulations, where appropriate, and would seek the assistance and cooperation of Delaware Division of Fish and Wildlife in enforcing common regulations to provide a safe environment for refuge visitors and promote activities that are compatible with protecting the resources.

At first glance, these seasonal closures give the appearance that opportunities for wildlife observation and photography are being significantly reduced or totally eliminated for over eight months during the proposed expanded hunting activities. To the contrary, the majority of the refuge would remain open to wildlife observation and other non-consumptive uses and provide more opportunities and open areas than under current management. More specifically, opportunities for wildlife observation and photography have been expanded to include seven new trails totaling 3.7 miles throughout the refuge in all four management units on existing maintained trails or interior refuge roads, bringing the total number of trails to 14 and 9.9 miles. The Headquarters area, which contains six trails covering six of the nine total miles of refuge trails, remains available 363 days a year for non-consumptive uses, but portions may be closed for turkey hunting. All other areas except for the Deep Branch Trail, Fowler Beach Road trail (southside), and Prime Hook Creek are open on every Sunday during the hunting seasons. The Deep

Branch Trail, the Fowler Beach Road trail (southside), and Prime Hook Creek are open with seasonal closures of every day from September 1 through March 15 and if necessary during the snow goose conservation order or turkey hunting seasons. If and when the photography blind is available on the southside of Fowler Beach Road, this portion of the trail will be open year round and open every Sunday during the hunting season. The majority of the hunting will occur during the main hunting season, which typically runs for five months from September through January, with additional hunting opportunities for rabbit through the end of February. Hunting during the snow goose conservation order, which will occur for 2 ½ months from late January through mid-April, will take place mostly in the wetland areas, leaving the upland areas open to other uses. This hunt is not anticipated to bring large numbers of hunters, but is beneficial to the species and other wildlife due to overpopulation. With five or less turkey hunting permits issued in April and May, a vast majority of the refuge would still remain open to wildlife observation and other non-consumptive uses.

We anticipate some conflict between concurrent hunting programs (e.g., waterfowl, deer, and upland game hunting seasons overlapping). For the majority of the hunting seasons, the Delaware Division of Fish and Wildlife has made efforts to avoid these overlaps in the various hunting programs. As public use levels expand across time, unanticipated conflicts between user groups may occur. The refuge's visitor use programs would be adjusted as needed to eliminate or minimize each conflict and provide quality wildlife-dependent recreational opportunities. The Service's law enforcement efforts will be increased. Conflicts among hunters over desired hunting locations are expected and we will continue to encourage proper hunting ethics.

1.6.2 Refuge Facilities

Minimal infrastructure, which includes the addition of two to three parking areas, enhancement of existing boat ramps, and placement of informational signs, is anticipated in support of this priority public use. There would be some costs associated with these programs in the form of road maintenance, law enforcement, and boat ramp maintenance. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs. Impacts to refuge resources are expected to be negligible.

1.6.3 Cultural Resources

With a relatively small number of hunters dispersed across the refuge during the hunting season, direct or indirect cumulative impacts would be negligible on the refuge's cultural resources based on our observations of past hunting impacts. Refuge lands are vulnerable to looting, despite our best efforts at outreach, education, and law enforcement. Upland areas adjacent to wetland areas have been identified for high potential for cultural resources. In addition, refuge visitors may inadvertently or even intentionally damage or disturb known or undiscovered cultural artifacts or historic properties. Law enforcement and outreach will be utilized to minimize this problem.

For compliance with section 106 of the National Historic Preservation Act, the refuge staff will provide the regional historic preservation officer a description and location of all projects, activities, routine maintenance and operations that affect ground and structures, details on requests for compatible uses, and the range of alternatives considered. That office will analyze those undertakings for their potential to affect historic and prehistoric sites, and consult with the State Historic Preservation Officer and other parties as appropriate. The State and local government officials will be notified to identify concerns about the impacts of those undertakings.

1.7 Anticipated Impacts of Proposed Hunt on Refuge Environment and Community

The refuge expects no sizeable adverse impacts of the proposed action on the refuge environment which consists of soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur in areas used by hunters; however impacts would be negligible. Hunting would benefit vegetation as it is used to keep many resident wildlife populations in balance with the habitat's carrying capacity.

The refuge expects impacts to air and water quality to be negligible. The effect of these refuge-related activities, as well as other management activities, on overall air and water quality in the region are anticipated to be relatively negligible, compared to the contributions of industrial centers, power plants, and non-refuge vehicle traffic on nearby public roads.

Cumulative impacts to vegetation communities resulting from hunter access are expected to be negligible, as most species will have already undergone senescence or become dormant. Salt marsh habitats were found to be the most resistant to human trampling when compared to other habitats such as a natural dune, a man-made dune, and man-made coastal grasslands (Anderson 1995). This study analyzed the vegetation of five paths (one in each of the habitats) created and sustained by human trampling and reported that trampling of vegetation (estimated to be 1,815-3,630 passages per year) can be considered as very light. Even though it created paths and reduced vegetation cover and species diversity, the paths still retained a persistent vegetation (Anderson 1995). Additional impacts to vegetation are minimized by not permitting hunters to cut vegetation for shooting lanes or for use as camouflage. Impacts to vegetation are further minimized because hunting from a stand that has been attached with nails, wire, screws, or permanently attached to a tree in any other way is prohibited.

Increases in proposed hunting acreages will provide a net gain in public hunting opportunities positively affecting the general public, nearby residents, and refuge visitors. Many of these proposed "new" hunting areas are currently open to some type of hunting or have been previously open either under refuge management or private ownership. For example, Unit I is currently open for deer and upland game hunting (including dove hunting) and is now proposed to be open for waterfowl hunting - same land, but with a new opportunity. The only refuge land proposed to be open for any type of hunting that is not currently being hunted for any species includes: an area located north of Prime Hook Road commonly referred to as Oak Island (deer only), an area north of Route 16 referred to as the Millman Tract (deer and turkey), an expanded area of the existing Jefferson Lofland Area and Headquarters Area (deer & turkey), an expanded area of the Unit III waterfowl hunt area (waterfowl only), and an area west of Petersfield Ditch in Unit 4. Of these areas, Oak Island was previously hunted under refuge management up until 1995 and the Millman Tract was hunted under private ownership up until the Service purchased it in 2001. The expanded areas of the Jefferson-Lofland Area, Headquarters Area, and nearly all of the proposed Unit III waterfowl hunt area were previously hunted under refuge management. No prior hunting of the area west of Petersfield Ditch is known.

Due to an increase in new hunting areas and by allowing hunters to free roam, an increase in violations may occur until hunters become familiar with the refuge boundaries and regulations. As a result, short-term minor adverse impacts may occur with some landowners due to hunter trespassing. These impacts will be minimized through enhanced law enforcement efforts. We anticipate some conflict between concurrent hunting programs (i.e., waterfowl, deer, and upland game hunting seasons overlapping). For the majority of the hunting seasons, the Delaware Division of Fish and Wildlife has made efforts to avoid these overlaps in the various hunting programs.

Although the refuge provides hunting maps and refuge-specific regulations, it is ultimately the responsibility of the hunter to know and obey them. Unfortunately, not all do. The Service will ensure that refuge boundaries are and continue to be properly posted to notify both refuge visitors and private landowners. Private landowners will be encouraged to contact either refuge and/or state law enforcement when these trespassing incidents occur and every effort will be made to respond in an efficient and timely manner. The Service also encourages private landowners to post their own property. Restricting hunter access within a 100 yard buffer to private property was discussed and it was concluded that too much hunting area would be lost by this zone and that there are already sufficient laws and regulations in place to discourage boundary shooting. Furthermore, neighboring landowners would benefit by having easy access to designated areas open to hunting on the refuge.

Visitor safety at refuges is a high priority when developing compatible wildlife-dependent recreation programs, such as hunting; however, it is ultimately the responsibility of every hunter to be safe. An accident involving hunter safety results from either a lack of hunting ethics or a violation of hunting regulations. Use of portable deer climbing stands will be recommended but not required. For hunters who may be unable to climb trees using portable deer stands or who may wish to hunt from permanent deer stands or duck blinds, the state-owned Prime Hook Wildlife Area, which adjacent to the Refuge, will continue to provide these opportunities.

Provision of elevated deer stands, and to a lesser degree waterfowl blinds, is relatively unique to Delaware. There are many areas on the Delmarva Peninsula, other than Prime Hook NWR, that offer public hunting opportunities in free-roam areas where the hunter is required to provide the blind or stand, if desired.

The Service conducted a web-search for public lands within the three states making up the Delmarva Penninsula in order that we evaluate the prevalence of permanent waterfowl blinds or deer stands on public hunting lands. A wide assortment of ownership and management regimes was evident across 215 tracts managed or described by 19 different designations, e.g. State Park, National Park Service, State Forest, Chesapeake Forest Lands, Natural Resources Management Area. For waterfowl hunting, 131 of the 215 tracts examined permitted waterfowl hunting. Of the 131, only 36 provided either a pit or standup blind somewhere on the tract. The Service makes this qualifying statement because some areas, Tuckahoe State Park for example, provide four pit blinds but also allow free roaming along the Tuckahoe River. Of the 36, 28 were located in Delaware, 8 in Maryland, and none in Virginia. Twenty tracts required hunters to hunt at a stake or within some designated distance from a blind site where the hunter would provide the blind (if desired), including nine in Delaware, 11 in Maryland, and none in Virginia. A total of 84 tracts permitted free-roam hunting where the hunter would provide the blind (if desired), 17 in Delaware, 60 in Maryland, and seven in Virginia.

For deer hunting, of the 215 tracts examined, 181 permitted some form of deer hunting. Unfortunately, the Service did not make a distinction between the various methods, i.e. some tracts may be limited to bow hunting only. Of the 181 tracts, 95 were located in Delaware, 77 in Maryland and nine in Virginia. A total of 51 of the 181 tracts required hunters to use stands that were provided, all of which were located in Delaware. Free-roam hunting was permitted on 165 tracts, including 80 in Delaware, 76 in Maryland, and nine in Virginia. The Service acknowledges that some free roam areas were for bow hunting only, however such a distinction would only apply in Delaware; all deer hunting tracts in Maryland and Virginia permitted free-roam hunting regardless of hunting method.

For the 85 tracts located in Maryland and Virginia where no stands are provided, only two require an elevated stand, which the hunter must provide. For areas immediately adjacent to the building complex on Blackwater NWR, the hunter must use an assigned blind site where the hunter erects a stand with a platform minimum of eight feet above the ground. All other tracts on Blackwater NWR are free-roam where ground-hunting is permitted.

The second site where elevated deer hunting is required is on Chincoteague NWR, around the tour loop. Here the hunter must erect his/her own stand with a platform minimum of 14 feet above the ground. All other areas on Chincoteague NWR permit free-roam hunting. The Service should also add that rifle hunting, as well as deer drives, are permitted on most public hunting lands on the lower eastern shore of Maryland and the eastern shore of Virginia.

The refuge expects a minimal increase in visitation, but any additional use will add some revenue to local communities. The elimination of nearly all hunting permit fees (except for lottery hunts) should be well received by hunters and changes to the hunting program reduce the administrative burden and minimize the amount of staffing resources needed to conduct the hunt by 54 staff days and $17,890 from current management. The benefit to the hunter is a reduction in their cost to hunt.

1.8 Other Past, Present, Proposed, and Reasonably Foreseeable Actions and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The hunt plan has been designed to be sustainable through time given relatively stable conditions.

Due to hunting history of low hunter use and harvest for resident geese and late season snow geese, the refuge has been closed during these seasons but will consider reopening if demand and opportunity exist and conflicts are minimized.

Greater snow geese (*Chen caerulescens atlantica*) have undergone a dramatic increase in recent decades, to current population estimates of over 1 million birds. Natural marsh habitats on some migration and wintering areas have been impacted by the destructive feeding strategies of overabundant light geese (Giroux and Bedard 1987, Giroux et al. 1998, Widjeskog 1977, Smith and Odum 1981, Young 1985). In addition, goose damage to agricultural crops has become a problem (Bedard and Lapointe 1991, Filion et al. 1998, Giroux et al. 1998, Delaware Div. of Fish and Wildlife 2000). Snow geese use the refuge wetland habitats extensively, and are not subjected to any hunting disturbance or mortality on the refuge. Impacts to refuge wetlands and impacts to wetland-dependent wildlife compound over time as long as the population is not adequately controlled at the flyway level, through the coordinated efforts of individual agencies.

Similarly, resident Canada geese have been shown to cause changes in wetland community structure (Laskoswki et al. 2002). Resident geese can reduce the amount of plant biomass that would be available to migrant birds at the end of the growing season. Direct damage to agricultural resources by resident geese includes grain crops, trampling and spring seedlings. Heavy grazing by geese can result in reduced yields and in some instances a total loss of the grain crop (Allen et al. 1985, Flegler et al. 1987). Thus uncontrolled Canada goose populations on the refuge can impact migratory bird populations utilizing the refuge as well as contribute to agricultural losses on lands surrounding the refuge.

The refuge will consider participating in additional deer hunting seasons if an overabundance of deer arises, as determined the Delaware Division of Fish & Wildlife and concurrence by the refuge (Refer to Resident Wildlife Section for impacts of deer overabundance).

If visitation levels expand in the unforeseen future, unanticipated conflicts between user groups may occur. Service experience has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) and limiting visitations are effective tools in eliminating conflicts between user groups.

1.9 Anticipate Impacts if Individual Actions are Allowed to Accumulate

National wildlife refuges, including the refuge, conduct hunting programs within the framework of State and Federal regulations. Hunting at the refuge is at least as restrictive as the State of Delaware and in some cases more restrictive. By maintaining hunting regulations that are as, or more, restrictive than the State, individual refuges ensure that they are maintaining seasons which are supportive of management on a more regional basis. Additionally, the refuge coordinates with the DFW annually to maintain regulations and programs that are consistent with the states' management programs.

The cumulative impact of hunting on migratory and resident wildlife populations at the refuge is negligible. As described in the previous sections, the proportion of the refuge's harvest of waterfowl, deer, and small game is negligible when compared to local, regional, and flyway populations and harvest.

Because of the regulatory process for harvest management of migratory birds in place within the Service, the setting of hunting seasons largely outside the breeding seasons of resident and migratory wildlife, the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, and the wide geographic separation of individual refuges, no direct or indirect cumulative effects on resident wildlife, migratory birds, and non-hunted wildlife of hunting on the refuge are anticipated.

AUDIENCES

Based on visitor and community surveys conducted by the U.S. Geological Survey in 2004 and 2005 (Sexton et al. 2007), most refuge visitors are local to the area (72 percent). Of those local visitors, about half (56 percent) are considered consumptive users (participating in hunting, fishing, or crabbing). About 35 percent of visitors indicated that they had hunted on the refuge, with an average of 11 years spent hunting at the refuge. The estimated percentage of non-local visits for big game hunting was higher (83%) than for migratory birds (25%) and upland game (10%) (Sexton et al. 2007). The average consumptive visitor to the refuge is male, 47 years old, works full-time, has attended two years of college or technical school, and makes $50,000 to $74,999 per year.

Just over half of the visitors rated hunting activities as moderately to very important and 85 percent felt that the refuge provides a quality hunting experience. Hunting ducks, hunting deer with muzzleloaders, and hunting deer with a shotgun were rated the most important hunting activities among hunters. Hunting rabbit, squirrel, and trapping were rated least important among hunters. For all surveyed visitors and community residents, hunting deer, waterfowl, and upland game were rated the least three important activities at the refuge. The most important activities among all surveyed visitors and

community residents were being in a natural, undeveloped area, experiencing a serene environment, and hiking (Sexton et al. 2007).

Hunting activities directly related to refuge operations would generate an estimated $93.8 thousand in local output, 0.8 jobs, and $26.9 thousand in labor income in the local economy (USGS. Including direct, indirect, and induced effects, overall refuge hunting activities would generate total economic impacts of $132.1 thousand in local output, 1.2 jobs and $38.5 thousand in labor income. A further breakdown of hunting activities on the refuge, including direct, indirect, and induced effects, reveals that big game hunting on the refuge would generate total economic impacts of $47.8 thousand in local output, 0.4 jobs, and $13.7 thousand in labor income. Waterfowl hunting on the refuge would generate total economic impacts of $82.3 thousand in local output, 0.8 jobs, and $24.3 thousand in labor income. Small game hunting on the refuge would generate total economic impacts of $2.0 thousand in local output, 0.02 jobs, and $500 in labor income.

The refuge will provide hunting opportunities for local and non-local hunters. Preseason drawings using online technology will provide hunters greater flexibility and efficiency in choosing their hunts in advance of the hunt date. Programs encouraging youth hunting will continue and other opportunities such as mentored hunt programs will be explored to enhance their experience. Hunting areas with wheelchair accessible ground blinds will be established specifically for non-ambulatory disabled hunters with limited mobility. Hunting opportunities for hunters with other disabilities abound in areas open to free-roam hunting where the hunter has the option to hunt anywhere in the designated hunt area.

DESCRIPTION OF THE HUNTING PROGRAM

Guidelines for Hunt Program

The following guiding principles for the Refuge System's hunting programs can be found in Part 605 FW 2 of the U.S. Fish & Wildlife Service Manual:

1. Manage wildlife populations consistent with Refuge System-specific management plans approved after 1997 and, to the extent practicable, State fish and wildlife conservation plans;

2. Promote visitor understanding of and increase visitor appreciation for America's natural resources;

3. Provide opportunities for quality recreational and educational experiences consistent with criteria describing quality found in 605 FW 1.6;

4. Encourage participation in this tradition deeply rooted in America's natural heritage and conservation history; and

5. Minimize conflicts with visitors participating in other compatible wildlife-dependent recreational activities.

Areas Open to Hunting & Support Populations of Target Species

The following designated areas (Maps 2, 3, 4, and 5) will be open to hunting on the refuge for the following game species:

Area	Species	Acres	Seasons**
Regular Deer Hunt Area	Deer	3,659	Sept-Feb
Regular Waterfowl Hunt Area	Waterfowl (& webless migratory birds)	1,891*	Sept- Feb
Lottery Waterfowl Hunt Area	Waterfowl	1,515*	Sept-Feb
Lottery Deer Hunt Area	Deer	841	Nov & Jan
Disabled Waterfowl Hunt Area	Waterfowl	26*	Sept-Feb
Disable Deer Hunt Area	Deer	721	Oct & Nov
Upland Game Hunt Area	Upland game & webless migratory birds except 110 acres closed to dove hunting	1,995	Sept-Feb
Lottery Turkey Hunt Area Snow Goose Conservation Order	Turkey Snow Geese	3,729 Refuge-wide***	Apr-May Late Jan-April

* A total of 3,432 acres is open to migratory bird hunting. This is the maximum amount of land allowed by law (40% rule). Lands purchased with Land and Water Conservation Funds do not apply.

**Follow State hunting seasons that include seasonal closures and time restrictions (see hunting objectives and strategies in this section for more information)

***40% rule does not apply because taking of snow geese in the conservation order has been determined to be beneficial to the species.

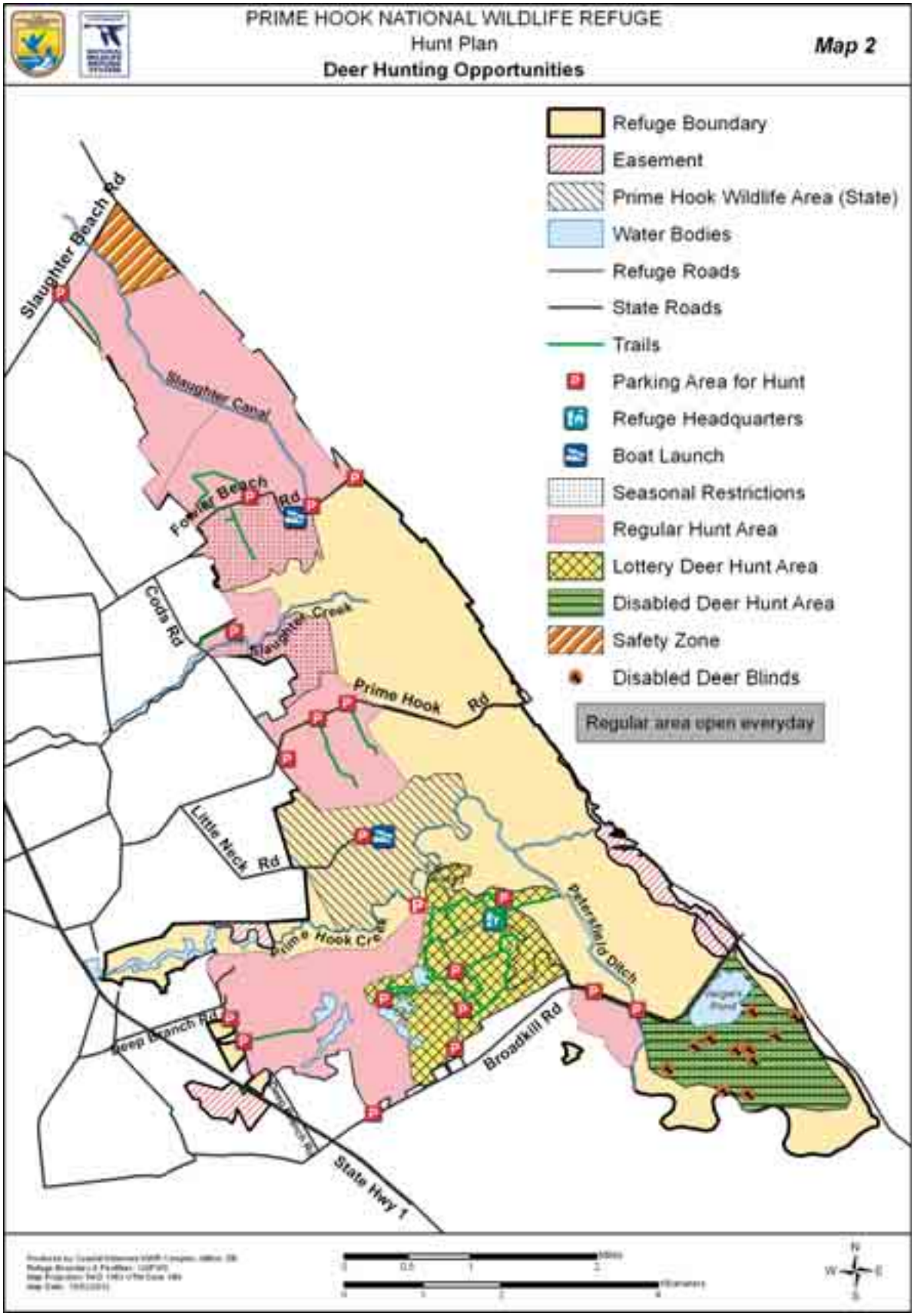
Future land acquisitions will be evaluated and if appropriate will be included in the refuge's hunting program.

Species to be Taken & Other Hunting Information

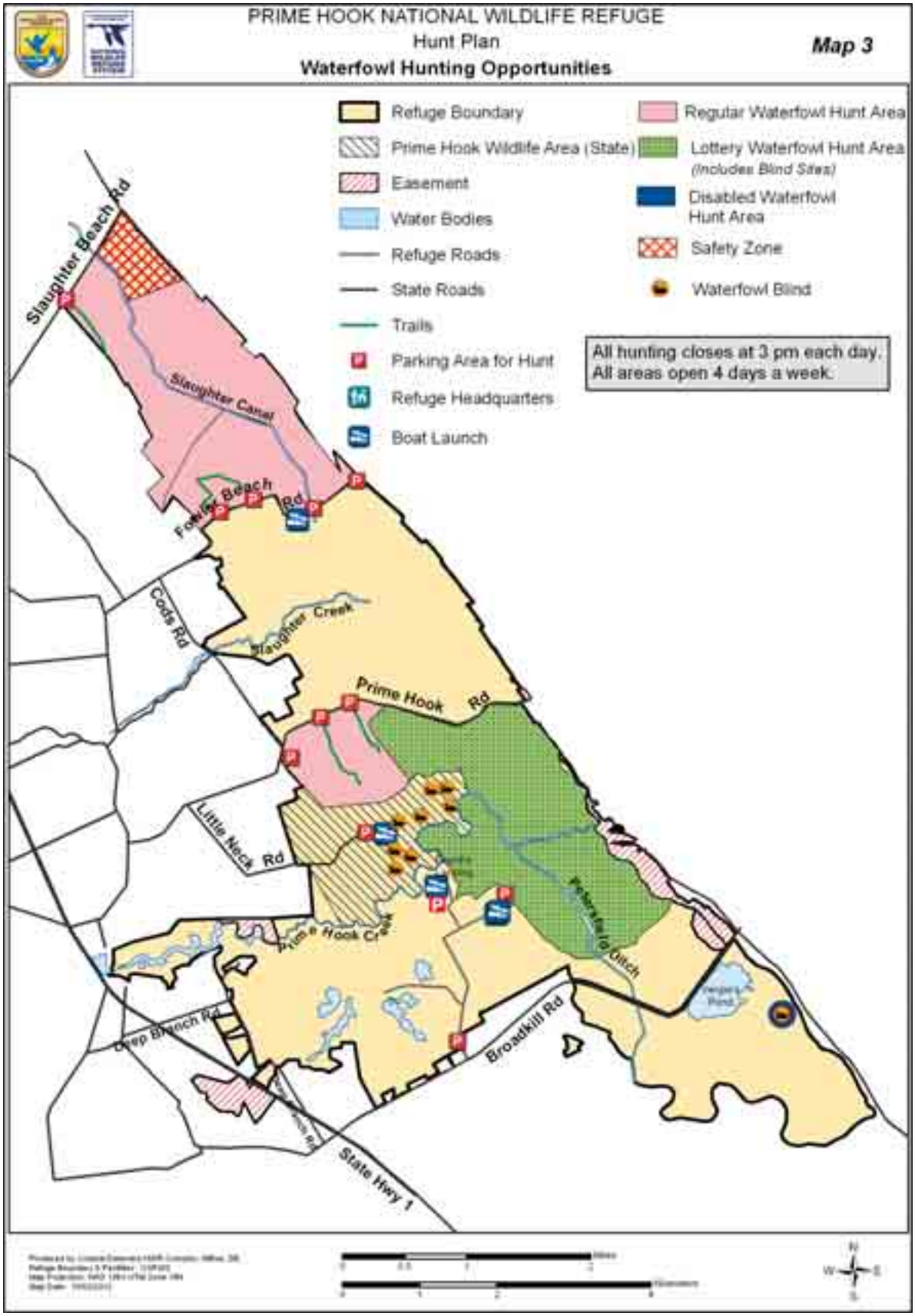
The refuge offers a wide diversity of hunting opportunity. Programs will include big game (white-tailed deer), upland game (rabbit, quail, pheasant, and red fox), waterfowl (including coot), wild-turkey, and other migratory game birds (mourning dove, snipe, & woodcock). Below are specific goals and objectives and their complementing strategies for the hunting program these species. These goals, objectives, and strategies can also be found under Goal 5 in the CCP.

Detail Information of Hunting Program Objectives

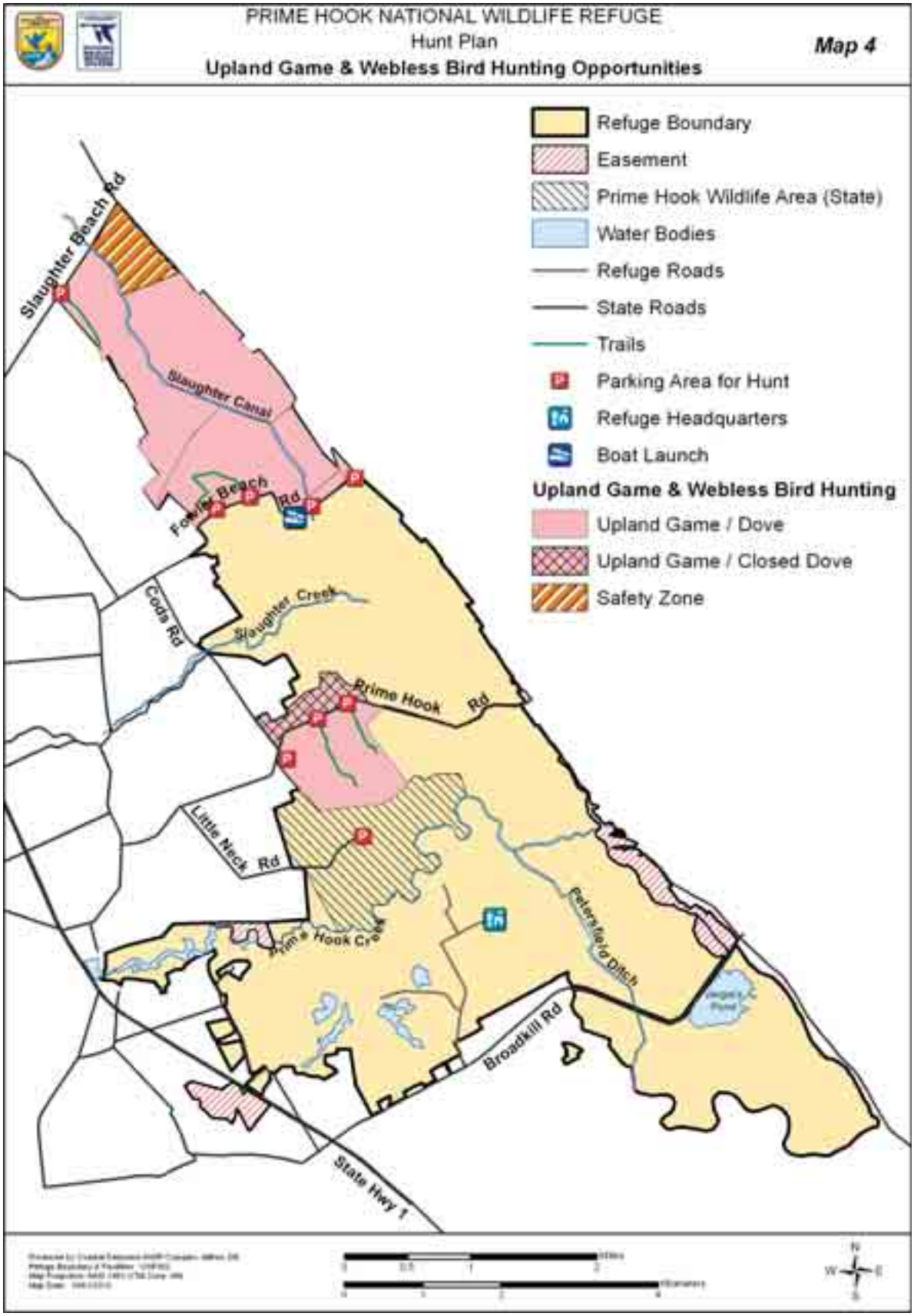
Map 2. Deer Hunting Opportunities



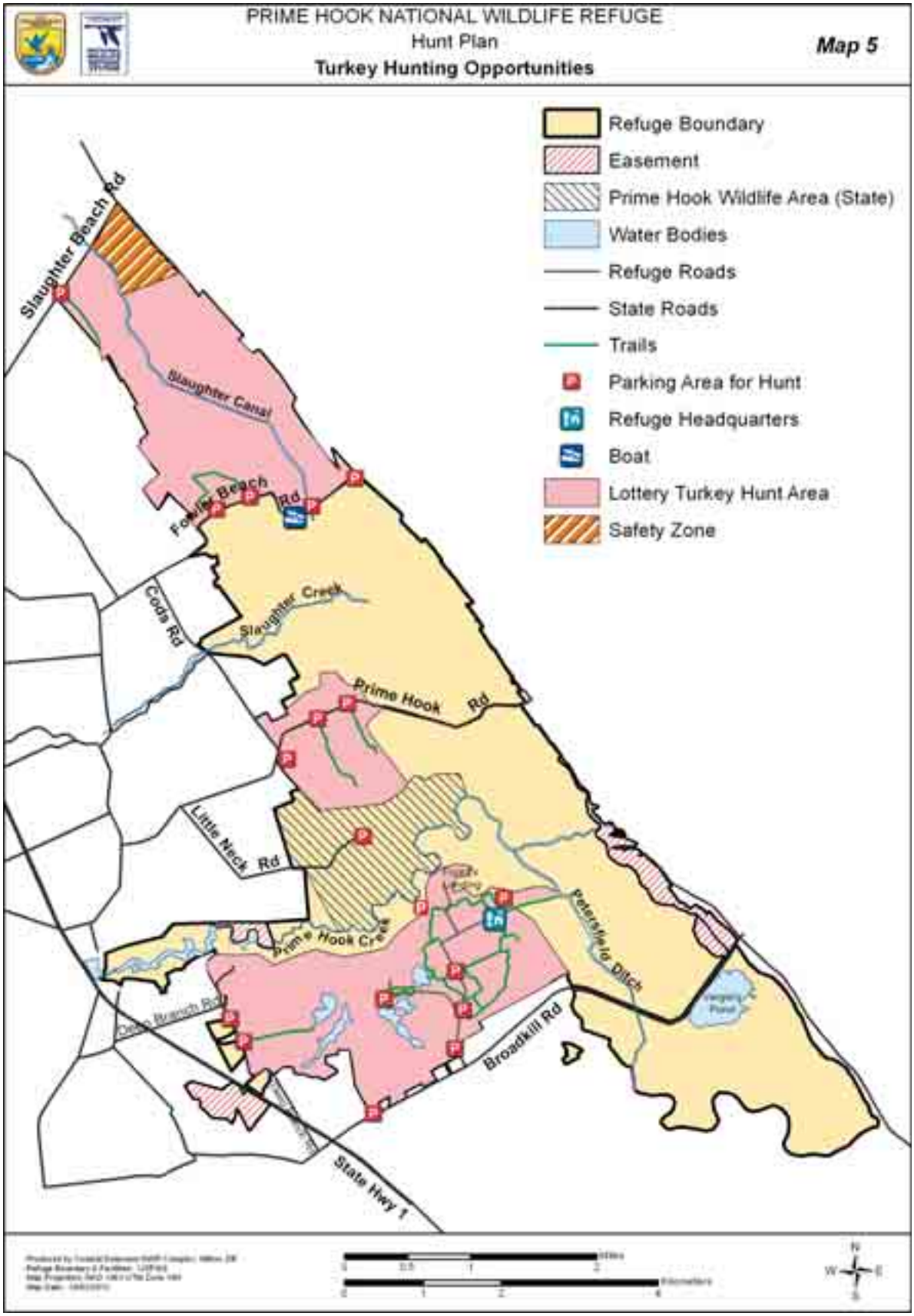
Map 3. Waterfowl Hunting Opportunities



Map 4. Upland Game and Webless Migratory Bird Hunting Opportunities



Map 5. Turkey Hunting Opportunities



Visitor Services

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 other public uses as may be allowed without interfering with refuge purposes and objectives for wildlife.

The National Wildlife Refuge System Improvement Act was passed in 1997 that established hunting, fishing, wildlife observation and photography, and environmental education and interpretation as "priority public uses" when compatible with the System mission and purpose of an individual refuge. Refuge managers use sound professional judgment in determining compatible public uses, and the Refuge System Improvement Act established a formal process for determining what a compatible use on the refuge is.

Prime Hook National Wildlife Refuge provides opportunities for all six of these priority recreational uses. We believe we are offering quality programs that meet public demand and our wildlife population and habitat goals. In chapter 3 (affected environment), we describe in detail the facilities and programs we offer to support hunting and wildlife observation and photography. As always, we look to our partners, Friends Group, and volunteers to assist with our public use programs. We will provide these opportunities in ways that do not adversely impact wildlife resources.

Objective 5.1 Hunting

Provide a high quality hunting program that is administratively efficient and is used to maintain healthy habitats through the management of wildlife populations, where appropriate.

Rationale

Hunting on the Delmarva Peninsula is a traditional outdoor past time and is deeply rooted in our 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 Fish & Wildlife 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. After careful review and consideration, we have determined that the previous hunting program was inefficient, overly complex, and required a significant amount of staff resources. A recently conducted Regional Visitor Services Review found our hunt program to be "out of balance with other priority refuge needs and services," such as habitat management, maintenance, and public use programs such as environmental education. Another finding from the review identified that "the amount of station resources going into this activity (hunting) seem to far exceed what is necessary to provide for a quality hunting program." The Review also mentioned that the "care and maintenance of refuge blinds and tree stands….seems to put an undue burden on staffing resources."

The opinions by the visiting public and community landowners were surveyed in 2004 and 2005 by the United States Geological Survey (USGS) on behalf of the refuge (Sexton et al. 2007). About 35 percent of visitor respondents indicated that they hunted on the refuge and had been hunting there an average of 11 years. When asked about the importance of hunting activities, more than half of the responses were rated as moderately to very important and most hunters (85 percent) feel the refuge provides a quality hunting experience. Dove hunting and upland game hunting appear much less important than other

hunting activities according to hunters surveyed. Hunting ducks and hunting deer with a muzzleloader and shotgun were more important than other hunting activities.

In the USGS survey, hunters were also asked about the desirability of changing some hunting services or regulations, but did not appear to be very interested in making changes. The most desirable of the suggested changes was the provision of more areas where portable deer stands could be used as well as areas where individuals could set up their own waterfowl blinds. Some were only slightly interested in adding a preseason drawing for waterfowl hunting. Consumptive use visitors also asked to see increases in hunting and fishing areas and access.

To improve the refuge's program, we evaluated hunting on the refuge, incorporated the opinions of hunters, and developed this plan in collaboration with our State partners in the Delaware Division of Fish and Wildlife. These program changes, which reflect a diversity of hunting preferences and opportunities, strive to meet the guiding principles for a quality refuge hunting program identified in Service policy 605 FW 2. They also support Presidential Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation.

The hunting program has been adjusted, both expanded and reduced, to allow for more effective consumptive recreation opportunities along with an increase in opportunities for non-consumptive users to appreciate the refuge while avoiding conflicts with hunters. Hunting opportunities would be increased, where possible, to include additional days and acres throughout the hunting seasons established by the State Delaware Division of Fish and Wildlife. Expanded hunting on refuge lands will enhance quality opportunities for hunting deer, waterfowl, upland game, webless migratory birds (dove), and turkey. Deer hunting would increase from 4,020 to 5,221 acres, waterfowl hunting from 1,722 to 3,432 acres, upland game & migratory bird hunting remains at 1,995 acres, and turkey hunting from zero to 3,729 acres.

Increases in proposed hunting acreages will provide new hunting opportunties from current management; however, many of these proposed "new" hunting areas are currently open to some type of hunting or have been previously open either under refuge management or private ownership. For example, Unit I is currently open for deer and upland game hunting and is now proposed to be open for waterfowl hunting - same land, but with a new opportunity. The only refuge land proposed to be open for any type of hunting that is not currently being hunted for any species includes: an area located north of Prime Hook Road commonly referred to as Oak Island (deer only), an area north of Route 16 referred to as the Millman Tract (deer and turkey), an expanded area of the existing Jefferson Lofland Area and Headquarters Area (deer & turkey), an expanded area of the Unit III waterfowl hunt area (waterfowl only), and an area west of Petersfield Ditch in Unit 4. Of these areas, Oak Island was previously hunted under refuge management up until 1995 and the Millman Tract was hunted under private ownership up until the Service purchased it in 2001. The expanded areas of the Jefferson-Lofland Area, Headquarters Area, and nearly all of the proposed Unit III waterfowl hunt area were previously hunted under refuge management. No prior hunting of the area west of Petersfield Ditch is known.

Other changes to the hunting program would lower administrative burdens to staff resources and improve hunting quality. More specifically, these changes include eliminating permanent hunting structures and allowing hunters to free roam in most areas that can tolerate pedestrians or navigation without adverse impacts on a first-come, first-served basis following State regulations, adopting one-time seasonal permits for all hunting areas except lottery hunts, enhancing youth and disabled hunting opportunities, establishing seasonal closures to minimize wildlife disturbance and avoid conflicts with

other uses, establishing preseason lottery drawings for high demand deer, waterfowl, and turkey hunt areas, eliminating daily standby permit drawings, and eliminating permit fees except for lottery hunts.

All persons hunting on the refuge would be required to obtain the necessary State licenses, tags, and stamps. Waterfowl hunters would be required to have a Federal migratory bird hunting and conservation stamp (duck stamp). Each hunter would also be required to have a signed copy of the current Prime Hook NWR hunting regulations brochure, which would serve as the refuge hunting permit. In addition, hunters participating in the lottery hunts for deer, waterfowl, and turkey would also be required to have a daily permit issued in advance of the hunt date through a contractor. Hunters would not be required to check-in or check-out on the day of any hunt.

For most areas, hunter numbers would not be limited to a specific hunt location. Hunters would have the ability to free roam for deer, waterfowl, upland game, and turkey in designated areas on a first-come, first-served basis. Non-ambulatory hunters are allowed to hunt in all hunt zones in accordance with refuge policy and regulations. Only non-ambulatory hunters may hunt in the Island Farm Unit, where we have provided non-ambulatory hunt blinds to accommodate hunters with this need. For the Statewide youth hunts, all designated hunt areas would be open for waterfowl, deer, or turkey hunting on a first-come, first-served basis. We don't know the number of hunters who will participate in refuge hunting opportunities; however, we do anticipate a slight increase from current levels.

Preseason lottery drawings are proposed for high demand areas, including the lottery deer hunt area (headquarters area), disabled deer and waterfowl hunt areas, lottery waterfowl hunting area (described previously in this section), and lottery turkey area to reduce hunter conflicts, lessen administration, and provide equal opportunity for all hunters. For daily drawings on opening days under current management, it is common to see more than 100 deer hunters show up for 32 available shotgun hunting opportunities and 80 waterfowl hunting parties (with up to 3 people per party) show up for 25 to 27 available hunt blinds. This illustrates how inefficient and frustrating it is for a group of hunters to get up early in the morning when they have less than a one in three chance of getting a hunting spot. As a national wildlife refuge, Prime Hook NWR will provide hunting opportunities through these preseason drawings for local, in-State, and out-of-State hunters. Knowing in advance allows hunters to prepare, plan, and scout, which ultimately improves the quality of their hunting experience.

Preseason lottery drawings would be administered by a contracted company that will feature online and telephone services to collect hunter information and required fees (covered later in this section), and issue permits. These services would provide hunters with the ability to apply, pay for, and receive hunting permits in advance of the hunting dates. All fees must be paid prior to the issuance of a permit. Refuge staff would work with the contractor to provide the highest level of customer support.

For the preseason drawing for the lottery deer hunt area, hunters will be selected for a hunt date based on their date preferences. If selected, a limited number of hunters (no more than 30 hunters) would have access to the hunt area and may choose their hunting location on a first-come, first-served basis on the day of the hunt. For the lottery waterfowl hunt area and disabled deer and waterfowl hunt areas, hunters would be selected for a hunt date and hunting blind site based on their date preferences during the preseason drawing. Hunters could be picked for multiple dates. Only the first two days of each of the state's seasonal splits for waterfowl will be includeed in the preseason drawing for the disabled waterfowl area and will be first-come, first-serve thereafter. For the lottery waterfowl hunts, the selected hunter may take two additional people on that hunt day. Federal blind sites in addition to eight State blinds will be available each day. Everyone in the lottery drawing has an equal chance of being selected multiple times. The lottery turkey hunt may be administered by the Delaware Division of Fish and Wildlife.

For any vacant hunting opportunities not selected during the preseason lottery drawing, hunters would have the flexibility to go to the contractor's Web site at any time (24 hours a day) during the hunting season, view available hunt dates, and select and pay for these permits at any time. For those individuals who do not have computer access, customer representatives would be available by telephone during business hours on weekdays to assist. Hunters will be allowed to claim only one permit per day to prevent someone from claiming all available vacancies at one time. The licensing contractor would supply refuge staff with a list of permitted applicants. No daily standby lottery drawings would be conducted.

Permanent hunting structures, such as deer hunting stands and duck hunting blinds, would be phased out over a 5-year period in all areas except the disabled hunting areas. We will limit the number of permits in the lottery hunt areas to minimize hunter conflict in areas historically known to attract large hunter numbers. In the case of deer hunting, the phasing out of permanent deer stands would require hunters to find a suitable hunting location within designated hunting areas through effective scouting. Use of portable deer climbing stands is recommended, but not required. In the case of waterfowl hunting, the phasing out of permanent waterfowl hunting blinds in the lottery hunt area will require hunters to provide their own means to camouflage themselves (boat blind, pop-up blind, etc.). Waterfowl hunters would be required to hunt within a defined area around a designated blind site (marker) in the lottery waterfowl hunt area. For any type of hunting, we feel that allowing hunters to scout and have the flexibility to adjust their hunting locations for weather conditions enhances the quality of their hunt. Maintenance mowing will no longer occur to provide trails to facilitate deer hunting. Some conflict among hunters over desired hunting locations is expected and we will continue to encourage proper hunting ethics.

Visitor safety at refuges is a high priority when developing compatible wildlife-dependent recreation programs, such as hunting; however, it is ultimately the responsibility of every hunter to be safe. An accident involving hunter safety results from either a lack of hunting ethics or a violation of hunting regulations. Use of portable deer climbing stands will be recommended but not required. For hunters who may be unable to climb trees using portable deer stands or who may wish to hunt from permanent deer stands or duck blinds, the state-owned Prime Hook Wildlife Area, which adjacent to the Refuge, will continue to provide these opportunities. There are many areas on the Delmarva Peninsula, other than Prime Hook NWR, that offer public hunting opportunities in free-roam areas or from designated permanent structures. Additional information about free roam hunting and the use of deer stands and duck blinds on the refuge and on the Delmarva Peninsula can be found in the visitor services section in chapter 3 of the refuge's CCP and in the Impacts on Public Use and Access in this plan.

The refuge offers opportunities for all disabled individuals. Areas will be reestablished for non-ambulatory wheelchair hunters to ensure that these individuals have opportunities for quality hunting experiences. Non-ambulatory wheelchair hunters have limited mobility; opportunities to hunt on the refuge are limited unless refuge staff provides them with accessible infrastructure such as ground blinds and vehicular access to them. Other disabled, yet ambulatory hunters are provided opportunities to hunt in the free roam areas, are not required in any fixed location, and may choose how far they are capable or willing to travel to hunt. Because these proposed changes do not exclude hunters with other types of disabilities from the refuge's hunting program, these methods are in compliance with the intent of the Americans with Disabilities Act.

Non-ambulatory hunters have commented about their frustration with the current hunting system. The number of non-ambulatory hunters on the refuge has decreased since 2005, when access was granted

to all individuals with any permanent disability (not just non-ambulatory hunters) to hunt in the disabled hunting area along with additional hunting days. Hunter success rates for deer have also decreased from an average of 32% from 2000-2005 to an average of 18% from 2005 to present.

The Service proposes to enhance youth hunting opportunities by collaborating with State partners and NGO hunting organizations to develop hunter training programs that instruct beginning hunters in the knowledge and skills necessary to become responsible, respected individuals who strive to learn all they can about the species being hunted and to become knowledgeable in firearms safety, hunter ethics and wildlife conservation. The Service will also develop mentored hunting programs for both youth and adults and offer programs developed by NASP, or National Archery in the Schools program, to encourage family participation in archery shooting. Portions of any area open to hunting may be used to facilitate these mentored hunts and these areas will be temporarily closed to the general hunting public during those times.

Season dates, bag limits, and harvest methods for the hunting program at Prime Hook NWR will be consistent with State and Federal hunting frameworks and regulations. However, restrictions to these frameworks are listed below in the strategies and refuge-specific regulations to minimize user conflicts, address natural resource impacts, reduce administrative complexity, and ensure a quality hunting experience. The refuge manager will evaluate and make necessary adaptations to the hunting program to ensure that the refuge is meeting resource management objectives and continuing to offer quality experiences. Therefore, the refuge manager may extend or close hunting opportunities on the refuge within the established hunting seasons of the Delaware Division of Fish and Wildlife. The hunt program would apply to lands now a part of the refuge and lands added to the refuge in the future.

Strategies

- Expand hunting opportunities for deer, waterfowl (including snow geese), upland game, webless migratory bird, and turkey (For details, refer to Objectives 5.1a through 5.1d)
    - Supports Presidential Executive Order #13443: Facilitation of Hunting Heritage and Wildlife Conservation
    - Adopt all State of Delaware hunting seasons and regulations, except as restricted in refuge-specific regulations
    - Provide additional hunting days and areas over the current program
    - Seasonal closures in effect for some areas to minimize wildlife disturbance and/or avoid conflicts with other public recreational programs
    - Provide high quality hunting opportunities for turkey

- Adopt a one-time issued seasonal permit except for lottery hunts
    - Permit must be signed and in possession of hunter
    - Permits are non-transferable

- Remove all permit fees except for lottery hunts
    - Adjust the fee schedule for lottery deer hunt area, lottery waterfowl hunt area, disabled deer and waterfowl hunt areas, and lottery turkey hunt area
        a. Increase the application fee for preseason lottery drawing ($5/hunter)
        b. Require a processing fee of $2-3 per hunt for vacancies remaining after the preseason lottery drawing

c. Adjusted permit fees are as follows:
   i. Deer & Turkey - $10 per daily permit (per blind for non-ambulatory disabled hunters; application and permit fees for turkey hunting may be waived if the lottery drawing is administered by the State)
   ii. Waterfowl - $15 per daily permit per blind site
   iii. The 50 percent discount on permit fees to Interagency Senior & Access passholders does not apply
   iv. Youth hunters age 15 years and younger must obtain a free seasonal permit. Only hunters aged 16 years and older can apply or obtain lottery hunt area permit.

The refuge collects boat ramp launching fees and hunting permit fees under the guidance of the Federal Lands Recreation Enhancement Act (REA), 16 U.S.C. 6803©, Consolidated Appropriations Act (PL 108-447). This law grants the Secretary authority to collect recreation fee revenues for public recreation. REA provides for a nationally consistent interagency program, additional on-the-ground improvements to visitor services sites across the nation, a new national pass for use across interagency federal recreational sites and services, and more public involvement in the program. REA replaces the Recreation Fee Demonstration Program and authorizes the Recreation Fee Program for 10 years through 2014. At least 80% of the funds raised from user fees on a particular refuge in this region stay at the refuge and are used to enhance visitor services and reduce the backlog of maintenance needs for recreation facilities. Recreation fees may not be used to pay for biological monitoring on Federal recreational lands and waters under the Endangered Species Act of 1973 for listed or candidate species or to pay for employee bonuses. The other 20 percent is sent to the region to be distributed to other refuges. In previous years, PHNWR has received money from these regional funds for visitor services (Refer to Appendix I).

Due to reduced staffing, this plan reduces the administrative burden and minimizes the amount of staffing resources needed to conduct the hunt by 54 staff days and $17,890. The benefit to the hunter is a reduction in their cost to hunt. Therefore, the refuge will eliminate permit fees to hunt on the refuge (except for lottery hunts).

Fees will be required to manage the lottery hunts for deer, waterfowl, and turkey. Application and permit fees for turkey hunting may be waived if the lottery drawing is administered by the State. The Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation. The permit fee ($10 for deer & turkey; $15 for waterfowl), preseason application fee ($5/hunter), and processing fee for permits acquired after the preseason drawing ($2-3 per hunt) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and manage the lottery hunts. Due to the uncertainty in the level of hunter participation with these new program changes, permit fees may need to be adjusted (increased or decreased), and therefore will be evaluated during the first five years of the CCP plan. Preseason lottery drawings will be administered by a contracted company which will collect information and required fees, conduct the drawing, and issue the permits. This may reduce our costs by over $3,000 and application and processing fees will be paid to the contractors for administering this permitting process. Refuge staff will work with the contractor to provide the highest level of customer support. Signs for posting hunting areas, trails, etc., will have an initial, one-time cost.

- Provide lottery hunts in the lottery waterfowl hunt area, lottery deer hunt area, disabled deer and waterfowl hunt areas, and lottery turkey hunt area.
    - Permits are non-transferable.

- Conduct a preseason drawing to issue permits and collect fees for all available hunting dates.
- Drawings will be administered by a contracted company which will collect information and required fees, conduct the drawing, and issue the permits. Hunting opportunities for these lottery hunts will be available to hunters through the preseason drawing and throughout the season by going to the contractor's Web site or calling a customer service representative. For vacant hunting opportunities after the preseason drawing, hunters will be allowed to claim only one permit per day to avoid someone from claiming all available vacancies at one time. Hunters would have the option to forfeit their permit to the contractor if circumstances prevented them from hunting on that day, without compensation, i.e. no refunds, to make their reservation available to other hunters.
- No daily standby drawings will be conducted; however, permits would be available from the contractor online or by telephone throughout the hunting season.
- Permit and application fees apply.
- Preseason drawings for turkey hunting may be conducted by the Delaware Division of Fish and Wildlife and if so, application and permit fees may be waived.
- See discussion earlier in this section or Objectives 5.1a, 5.1b, or 5.1d for more info.

- Enhance disabled hunting opportunities, particularly for non-abulatory wheelchair hunters (See Objectives 5.1a and 5.1b for more information).

- Enhance youth hunting opportunities
  - Collaborate with State partners and NGO hunting organizations to develop hunter training programs that instruct beginning hunters in the knowledge and skills necessary to become responsible, respected individuals who strive to learn all they can about the species being hunted and to become knowledgeable in firearms safety, hunter ethics and wildlife conservation.
  - Develop mentored hunting programs for both youth and adults and offer programs developed by NASP, or National Archery in the Schools program, to encourage family participation in archery shooting.
  - Portions of any area open to hunting may be used to facilitate these mentored hunts and these areas will be temporarily closed to the general hunting public during those times.

- Seasonal closures apply to non-consumptive users during the hunting season, which is typically a slower period of use due to weather conditions, and are highlighted below:
  - Deep Branch Road Trail (includes Goose and Flaxhole Ponds; Unit III), Eastern Prime Hook Creek (from Foord's Landing to headquarter ramp) (Unit III), and hiking trail on Fowler Beach Road (southside of Unit II): Closed every day from September 1 through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order or turkey hunting. If and when the photography blind is available on the southside of Fowler Beach Road, this portion of the trail will be open year round and open every Sunday during the hunting season.
  - Headquarters area (includes Turkle and Fleetwood Ponds) (Unit III): Closed only for a maximum of two days for deer hunts and portions may be closed for turkey hunts.
  - Island Farm Area in Unit IV (includes trail overlooking Vergie's Pond): Closed from the Monday before Thanksgiving through March 15. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order.

  - Hiking trails on Fowler Beach Road (Unit I), Prime Hook Road (Unit III), and Slaughter Beach Road and Slaughter Canal (Unit I): Open only on Sundays from September 1 through the deer and waterfowl hunting seasons, which typically end in February. Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order or turkey hunting.

- Evaluate newly acquired refuge lands for potential quality hunting opportunities if deemed compatible.

- Provide effective outreach and communication for and about the refuge's hunting program
  - Coordinate with state and other partners to develop and/or participate in host programs that encourage new user groups, e.g., Becoming an Outdoors Woman, youth hunts.
  - Monitor and evaluate the hunting program through staff observation and hunter contact.
  - Continue yearly review of refuge hunting regulations with staff and State partners to ensure clarity and to address any emerging issues or concerns.
  - Develop one brochure that contains all refuge hunting regulations to inform the public of hunting opportunities and refuge-specific regulations.
  - Ensure public notification of hunting program changes through news releases and other means well before the hunting season.

- Add a new law enforcement officer to enforce regulations and continue to collaborate with enforcement officers from the Delaware Division of Fish & Wildlife.

- Clearly sign all areas closed to hunting.

- Evaluate the future management of the Prime Hook Wildlife Area with the Delaware Division of Fish & Wildlife.

Refuge staff has issued hunting permits and collected fees for the eight waterfowl hunting blinds on the Prime Hook Wildlife Area, which is managed and owned by the Delaware Division of Fish and Wildlife, through the refuge's permitting system. State and Federal personnel maintain the facilities (duck blind construction & grassing) every year. No formal agreement such as a MOU exists. An evaluation of the cooperative management of the State area should occur and if necessary, a formal agreement should be developed.

- Improve access at boat launching areas.
  - Enhance boat ramp access on Fowler Beach Road for access to Slaughter Canal.
  - Work with private landowners to improve access to western end of Prime Hook Creek.
  - Within 5 years of the plan, open a boat ramp for access to Prime Hook Creek at Foord's Landing.

- General Regulations for All Hunting Programs (refer to "Conduct of Hunt" section for a complete list of state and refuge-specific regulations for hunting).
  - Areas may be closed on the refuge without prior warning.
  - Digging for any reason is prohibited.
  - Overnight camping and open fires are prohibited.
  - Non-toxic shot is required for all hunting except lead slugs are permitted for deer and fox hunting.

- The refuge manager will monitor, evaluate, and make necessary adaptations to the hunting program to ensure that the refuge is meeting resource management objectives and continuing to offer quality experiences. The refuge manager has the authority to extend or close hunting opportunities on the refuge within the established hunting seasons of the Delaware Division of Fish and Wildlife, while ensuring compatibility.

Objective 5.1a White-Tailed Deer Hunting

Provide high quality hunting opportunities for white-tailed deer.

Rationale

In addition to the information presented under Objective 5.1, deer hunting would be increased to include an additional 1,201 acres beyond current management for a total of 5,221 acres. We would open these acres for archery (to include the use of crossbows), muzzleloader, or shotgun hunting (to include the use of handguns), where appropriate, and would phase out permanent deer stands. Seasonal closures would occur to not only protect wildlife, but also to minimize conflicts between different hunting activities and/or other non-consumptive recreational uses (e.g., minimize conflict with anglers on Prime Hook Creek and close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance). The disabled hunting areas in Unit IV would provide access to non-ambulatory wheelchair users only.

In addition to being a traditional outdoor pastime, deer hunting aids statewide efforts to control deer populations and complements habitat management on the refuge. We would continue to consult with the Delaware Division of Fish & Wildlife to maintain the deer population at a level commensurate with available habitat, to maintain the health of the herd, and prevent the habitat degradation that accompanies overpopulation. Map 2 depicts deer hunting opportunities and infrastructure.

Strategies

In addition to objective 5.1 strategies:

- Hunting will be on a first-come, first-serve basis except for lottery hunts.

- Check in and check out by hunters would not be required for any deer hunt.

- Expand deer hunting opportunities from 4,020 acres to 5,221 acres, an increase of 1,201 acres (See Map 2).
    - The refuge has adopted State hunting regulations and seasons for the Regular Deer Hunt Area with the following restrictions:
        a. No access by boat from Slaughter Creek on Cods Road
            i. There is no infrastructure to support boat launching.
        b. Seasonal closures to deer hunting from the Monday before Thanksgiving through March 15 will occur on the designated area north of Prime Hook Road (Oak Island) and south of Fowler Beach Road to minimize disturbance to waterfowl and/or nesting bald eagles. The disabled deer hunt area in the Island Farm will be closed following the November shotgun season to minimize wildlife disturbance.

- Phase out permanent deer hunting stands over a five year period or when they become unsafe; whichever comes first.

- Hunters may free roam in hunting areas except in the Island Farm area.
- Portable stands are permitted.
- Eliminate maintenance mowing except for disabled hunt areas.

- Hunters will not be required to report their harvest data to the refuge. Refuge staff will collect harvest information from the existing reporting system administered by the State Delaware Division of Fish & Wildlife.

- Enhance hunting opportunities for individuals with disabilities, particularly for non-ambulatory wheelchair users.
    - Reestablish areas for non-ambulatory wheelchair hunters only in a designated area in Unit IV.
    - Provide a limited number of hunting days during the early muzzleloader hunting season, the Statewide non-ambulatory hunt in November, and the early shotgun hunting seasons in the disabled hunt area to minimize deer disturbance and maximize quality hunting experience. A total of 11 ground blinds are currently available and required. Additional sites in this area may be provided.in designated areas to minimize deer disturbance and maximize quality hunting experience.
    - The refuge may evaluate the regular deer hunting area for the potential to incorporate hunting opportunities for non-ambulatory hunters.

- Provide lottery hunts in the lottery deer hunt area and the disabled deer hunt area for a limited number of days during the firearms deer hunting seasons
    - A limited number of permits (no more than 30 for the lottery deer hunt area) will be issued for each hunt day to reduce conflict and maintain quality hunting experiences.
    - Hunters may hunt anywhere within the lottery deer hunt area on a first-come, first-serve basis. Hunters in the disabled deer hunt area must hunt from one of 11 ground blinds in the area.
        a. The areas will be gated to minimize conflict with the general public and times will be designated for ingress and egress to the area
    - The refuge will participate in the Statewide non-ambulatory deer hunting. The lottery deer hunt area will not be open for this hunt.

- The refuge will continue to participate in all State hunting seasons and bag limits except the October Antlerless Deer Season and January Handgun Season. State hunting seasons and harvest limits for deer are based on guidelines found in the Delaware Deer Management Plan 2010-2019 (Rogerson 2010), written by the Delaware Division of Fish and Wildlife.
    - The refuge will consider participating in the October Antlerless Season if the refuge can provide a quality hunting experience, if an overabundance of deer arises as determined by the Delaware Division of Fish and Wildlife and concurrence by the refuge, and conflicts are minimized with other user groups.

- The refuge will participate in the statewide youth deer hunt and promote and establish youth and adult mentored hunting programs.

- General Regulations for Deer Hunting (refer to “Conduct of Hunt” section for a list of state and refuge-specific regulations for hunting).

- Enhanced opportunities for scouting will be allowed two weeks before the start of archery season and throughout the deer hunting season.

Objective 5.1b Waterfowl Hunting

Provide high quality hunting opportunities for waterfowl.

Rationale

In addition to the information presented under objective 5.1, waterfowl hunting would be increased to include an additional 1,710 acres from current management for a total of 3,432 acres. Seasonal closures would occur to protect wildlife and minimize conflicts between different hunting activities or other non-consumptive recreational uses (e.g., close hunting in late November in designated areas to minimize bald eagle and waterfowl disturbance). We would phase-out permanent waterfowl hunting blinds. In all hunt areas, hunting is proposed to remain at four days per week and to cease at 3pm to minimize wildlife disturbance and provide quality hunting experiences. Non-ambulatory hunters are allowed to hunt in all hunt zones in accordance with refuge policy and regulations. Only non-ambulatory hunters may hunt in the Island Farm Unit, where we have provided non-ambulatory hunt blinds to accommodate hunters with this need.

The addition of new free-roam waterfowl hunting areas in salt marsh habitats in Unit I will provide quality opportunities, particularly when refuge impoundments freeze. Sanctuaries totaling 3,185 acres are provided as disturbance free areas for wildlife on a seasonal or annual basis where no recreational activity is permitted. Map 3 depicts waterfowl hunting opportunities and infrastructure.

Like deer hunting, waterfowl hunting is an established, traditional use on the Delmarva Peninsula. CCP Map 3 depicts waterfowl hunting opportunities and infrastructure.

Strategies

In addition to objective 5.1 strategies:

- Create waterfowl sanctuaries (disturbance free areas) in Unit II (approximately 1,800 acres), Unit III (approximately 390 acres), and Unit IV (approximately 995 acres)
    - The Unit II impoundment area will be closed annually to all public use.
    - Except for the disabled waterfowl hunt area (approximately 25 acres), most of Unit IV will be closed from the Monday before Thanksgiving through March 15 to all public use.
    - Additional seasonal closures may apply through the second Saturday in May for hunting during the snow goose conservation order or for wild turkey.

To support waterfowl conservation efforts, the refuge has designated about 3,185 acres as waterfowl sanctuaries that will be closed to hunting and other recreational use on a seasonal or annual basis. These sanctuaries lie in Unit II (1,800 acres), the southern half of Unit III (390 acres), and most of Unit IV (995 acres) and provide resting and feeding habitat for waterfowl to concentrate rather than dispersing throughout the refuge. These sanctuaries function to:

1. Provide migrating waterfowl a more balanced and effective network of feeding and resting areas
2. Minimize disturbance to feeding and resting waterfowl
3. Provide waterfowl hunters with more equitable hunting opportunities throughout the refuge
    a. Establish hunter spacing limits

4. Reduce hunter competition and improve hunting quality
   a. Managed hunts in the lottery waterfowl hunt area will provide opportunities for a limited number of hunters and allow them to choose their hunting location
   b. Expanded hunting areas will provide greater opportunity for hunters

- Expand hunting opportunities from 1,722 acres to 3,432 acres or 40 percent of the refuge to include new hunting opportunities in Unit I and III. We must follow the guidelines of the 40 percent rule. All areas approved for purchase by the Migratory Bird Conservation Commission prior to 1978 are inviolate sanctuaries and thus subject to the 40% limitation, meaning only 40 percent of the area or areas can be open to migratory bird hunting. In 1978, the Fish and Wildlife Improvement Act amended Section 6 of the Refuge Administration Act of 1966 to provide the opening of all or any portion of an inviolate sanctuary to the taking of migratory birds if the taking is determined to be beneficial to the species. In addition, the act amended Section 5 of the Migratory Bird Conservation Act to include the provision that areas could be acquired for other management purposes.
    - The refuge has adopted State hunting regulations and seasons with the following restrictions:
      - Hunting will be on a first-come, first-served basis that includes jump shooting (except for lottery hunts and disabled hunts).
      - In all waterfowl hunting areas, hunting is permitted four days per week until 3pm during the state waterfowl hunting seasons (except everyday during the snow goose conservation order).
      - Check-in and check-out by hunters would not be required for any waterfowl hunt.

- Phase-out permanent waterfowl hunting blinds over a 5-year period or when they become unsafe; whichever comes first.
    - Hunters may free roam in the regular waterfowl hunting areas (except the lottery waterfowl hunt area and disabled waterfowl hunt area).
    - Hunters would be required to hunt from hunting blind site areas in the lottery waterfowl hunt area and disabled waterfowl hunt area.
    - Blind site areas are subject to change due to changing habitat conditions, to improve the quality of hunting, or for safety considerations.

- Hunters will not be required to report their harvest data to the refuge. Harvest information will be collected through the harvest information program system.

- Enhance hunting opportunities for individuals with disabilities, particularly for non-ambulatory wheelchair users.
    - Reestablish areas for nonambulatory wheelchair hunters only in a designated area in Unit IV.
    - One disabled, wheelchair accessible, and camouflaged waterfowl hunting blind is available.

- Provide lottery hunts in the lottery waterfowl hunt area and disabled waterfowl hunt area.
    - Through a preseason lottery drawing, hunters must choose their hunt dates and blind site locations from among the designated blind locations.

- Only the first two days of each of the state's seasonal hunting splits for waterfowl will be included in the preseason drawing for the disabled waterfowl area and will be first-come, first-serve thereafter.
- Within 5 years of CCP signing, we will open boat ramp access at Foord's Landing for all public recreational access.

- The refuge will participate in all State of Delaware waterfowl hunting seasons unless otherwise restricted. This includes the duck seasons, early teal season, youth waterfowl hunts, resident Canada goose season, and snow goose season (early and snow goose conservation order).
    - Provide hunting opportunities during the resident Canada goose season and the early teal season in all areas designated as open to waterfowl hunting. In the lottery waterfowl hunt area, all regulations apply as stated in earlier strategies of this objective, except hunting will be on a first-come, first-serve basis and no preseason drawing will occur. In the regular waterfowl area, all regulations apply as stated in earlier strategies of this objective.
    - Provide hunting opportunities during the State of Delaware's snow goose conservation order season in all four management units throughout the refuge on a first-come, first-served basis everyday of the season during legal shooting hours.
        - The light goose conservation order is an action implemented under the final environmental impact statement on the management of light geese (USFWS 2007a) to help reduce overabundant greater snow goose populations. Although the refuge has been closed recently to late snow goose hunting, the conservation order presents an opportunity to reopen to snow goose hunting during the late season in coordination with the State Delaware Division of Fish and Wildlife. This will be pursued as an option whenever the conservation order is in effect. All special harvest methods permitted by the conservation order apply.
        - Hunting is not permitted in upland areas.
    - The youth hunts will occur in all designated hunting areas on a first-come, first-served basis.
    - In the lottery hunt area and disabled waterfowl hunt area, snow geese may only be taken when already open for duck hunting or during the snow goose conservation order.

- General information for waterfowl hunting (refer to "Conduct of Hunt" section for a list of state and refuge-specific regulations for hunting).
    - Enhanced opportunities for scouting will be allowed during designated dates and times.

Objective 5.1c Upland Game & Webless Migratory Bird Hunting

Provide high quality hunting opportunities for upland game (rabbit, quail, pheasant, and red fox) and webless migratory birds (mourning dove, snipe, & woodcock).

Rationale

In addition to the information presented under Objective 5.1, upland game and webless migratory bird hunting will remain the same at 1,995 acres. However, the dove hunting acres will be decrease by 110 acres. The hunting of red fox will assist State management efforts in reducing the incidence of mange outbreaks to maintain a healthy population and reduce the predatory impact of this species on migrating and breeding birds, particularly State and federally endangered or threatened species. Map 4 depicts upland game and webless migratory bird hunting opportunities and infrastructure.

Strategies
In addition to objective 5.1 strategies:

- Continue upland game and webless migratory bird hunting opportunities on 1,995 acres (110 of the total acres would not be open to dove hunting). See objective 5.1b for explanation of 40 percent migratory bird hunting rule.
    - The refuge has adopted State hunting regulations and seasons for the upland game hunting area with the following restrictions:
        - a Provide new hunting opportunities for red fox.
        - b Hunting of red fox is permitted only when concurrently hunting deer and is only permitted in areas open to deer hunting.
        - c Chase hunting is prohibited.
        - d Rimfire or centerfire rifles are prohibited.
    - Dove hunting is open in the upland game hunting area except the designated area north of Prime Hook Beach Road.
    - Hunters will not be required to report their harvest data to the refuge.
    - Hunting will be on a first-come, first-served basis. Check-in and check-out by hunters would not be required for any upland game and webless migratory bird hunt.

Objective 5.1d Wild Turkey Hunting

Provide high quality hunting opportunities for turkey

Rationale
Wild turkey is a resident game species that is managed by DNREC's Division of Fish and Wildlife. Prime Hook NWR falls within Zone 9 of DNREC's Wild Turkey Management Regions. Zone 9, which includes the state-owned Prime Hook Wildlife Area that is adjacent to the refuge, is currently open during the spring turkey hunting season. To ensure a sustainable harvest of the state's turkey population, DNREC biologists track their health, distribution and reproductive success. Current efforts include a volunteer-based survey used to generate an index of annual turkey productivity and recruitment, monitoring turkey harvest and hunter efforts, tracking turkeys with radio transmitters to evaluate their reproductive ecology, habitat use, and survival, and evaluating the genetic diversity of turkeys.

We would provide new opportunities for hunting wild turkey on 3,729 acres. We recognize turkey hunting as a traditional outdoor pastime. When managed responsibly, it can instill a unique appreciation of wildlife, their behavior, and their habitat needs. Turkey hunting was initiated on the refuge in 1993. After two seasons of hunting and only one harvested turkey, this opportunity was discontinued. In recent years, hunter and staff observations indicate that a huntable population of turkeys may exist on the refuge, particularly in the Headquarters Area and in areas near Deep Branch Road. Limited opportunities exist on public lands to hunt turkey and the refuge may contribute to providing additional opportunities. Seasonal closures and time and space zoning among user groups may change on an annual basis to adapt to changing State of Delaware hunting seasons, federal or state regulations, user conflicts, and/or impacts to natural resources. Map 5 depicts turkey hunting opportunities and infrastructure.

Strategies
In addition to objective 5.1 strategies:

- Collaborate with the Delaware Division of Fish and Wildlife to evaluate the status of the wild turkey population on the refuge. Hunting will be permitted if State and refuge personnel determine that the turkey population in the area is sufficient to support hunting on the refuge.
    - Consult with the Delaware Division of Fish and Wildlife on an annual basis to determine the status of the turkey population and whether to allow turkey hunting on the refuge.
- Hunting of turkey will be permitted to a limited number of hunters (no more than five) in the designated lottery turkey hunt area in accordance with State hunting regulations and seasons.
    - Provide lottery hunts in the lottery turkey hunt area, which may be administered by the Delaware Division of Fish and Wildlife and if so, application and permit fees may be waived.
    - Conduct a preseason lottery drawing. No daily standby drawings will be conducted.
    - During hunts, all public access will be closed in designated hunt areas during legal hunting hours.
    - Participate in the statewide youth/non-ambulatory disabled turkey hunt.
    - The number of permitted hunters may be adjusted (increased or decreased) based on changes in turkey population data.
    - Enhanced opportunities for scouting will be allowed during designated dates and times.

Justification for Requiring Permits

When hunting on Prime Hook National Wildlife Refuge, hunters will be required to have in their possession a copy of the current Prime Hook National Wildlife Refuge Hunting Regulations brochure which they have signed, and if applicable, a lottery hunt permit. The brochure will serve as a refuge hunting permit and will be updated each year. It will inform hunters of current refuge regulations, safety zones, and other pertinent information for the current year's hunt. It will be available in the information boxes at the refuge entrance, from the refuge office, or on the refuge's Web site.

Except for the lottery hunts, permits will be free and not limited in number. For the lottery deer, turkey, and waterfowl hunts, permit, application, and processing fees will be charged and the number of permits will be limited to reduce potential hunter conflict, ensure a high-quality hunt, and/or achieve a management objective. Turkey hunting application and permit fees may be waived if the lottery drawing is administered by the State.

Staffing and Funds

Administrative changes reflected in the hunt plan were developed to ease the administrative burden on staff resources. These changes reflect a decrease in estimated staff time to conduct the hunt by 54 staff days or approximately $17,890 (see cost analysis below). The majority of the cost savings is a result of phasing out the use of permanent hunting structures and eliminating the need to have staff conduct daily lottery drawings for permits. The benefit of these changes to the hunter is a reduction in their cost to hunt. Therefore, the refuge will eliminate permit fees to hunt on the refuge (except for lottery hunts).

Fees will be required to manage the lottery hunts for deer, waterfowl, and turkey. Application and permit fees for turkey hunting may be waived if the lottery drawing is administered by the State. The Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of

the permitted forms of recreation. The permit fee ($10 for deer & turkey; $15 for waterfowl), preseason application fee ($5/hunter), and processing fee for permits acquired after the preseason drawing ($2-3 per hunt) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and manage the lottery hunts. Due to the uncertainty in the level of hunter participation with these new program changes, permit fees may need to be adjusted (increased or decreased) and therefore will be evaluated annually. Preseason lottery drawings will be administered by a contracted company which will collect information and required fees, conduct the drawing, and issue the permits. This may reduce our costs by over $3,000 and application and processing fees will be paid to the contractors for administering this permitting process. Refuge staff will work with the contractor to provide the highest level of customer support. Signs for posting hunting areas, trails, etc. will have an initial, one-time cost. Maintenance of facilities used by hunters (roads, parking lots, trails, and boat launching ramps) will be addressed with the refuge's deferred maintenance budget.

Refuge staff will prepare and edit the refuge hunting regulations brochure annually, make changes to the hunt plan and regulations as needed, prepare annual output reports, and respond to public inquiries about the hunt program.

Law enforcement staffing is essential. Currently, the refuge has no authorized law enforcement staff, but is scheduled to receive a full time officer. The law enforcement position currently at Bombay Hook NWR covers Prime Hook. Additional Service law enforcement staff may have to be brought in from other field stations or rely more on personnel from the Delaware Division of Fish and Wildlife Law Enforcement, who are already working with an undersized staff.

Below is a cost analysis and breakdown of the funding required to administer and manage each hunting program.

Big Game Hunting - Deer

Item	Staff Days	Cost
Planning	3	$1,000
Processing applications	1	$400
Printing costs-handouts	0.5	$800
Law Enforcement	7.5	$1,350
Inquiries	5	$1,190
Facilities maintenance supplies	1	$600
Hunt operations	-	$0
Fuel, electricity	-	$60
Toilet rental	-	$0
Total	**18**	**$5,400.00**

Cost Breakdown for Deer Hunting Program:
Staff Time ($4,235) & Actual Expenditures ($1,165) = $5,400

Volunteer Contributions for Deer Hunting Program ($20.25 per hour):
(mowing of non-ambulatory hunt areas, HQ hunt operations): 32 hrs = $648

Upland Game Hunting

Item	Staff Days	Cost
Planning	0.5	$150
Law Enforcement	0.75	$200
Inquiries	1	$250
Hunt operations	-	$0
Fuel, electricity	-	$60
Printing Costs	0.25	$220
Total	**2.50**	**$880.00**

Cost Breakdown for Upland Game Hunting Program:
Staff Time ($600) & Actual Expenditures ($280) = $880

Waterfowl Hunting

Item	Staff Days	Cost
Planning	3	$1,000
Processing Applications	1	$400
Printing costs-handouts	1	$1,250
Law Enforcement	3.5	$650
Inquiries	5	$1,200
Hunt operations	-	$0
Facilities maintenance (incl. supplies)	1	$800
Fuel, electricity	-	$60
Toilet Rental	-	$0
Total	**14.5**	**$5,360.00**

Cost Breakdown for Waterfowl Hunting Program:
Staff Time ($3,385) & Actual Expenditures ($1,975) = $5,360

Volunteer Contributions for Waterfowl Hunting Program ($20.25 per hour):
(blind stake placement and maintenance): 16 hrs = $324

Hunting - Other Migratory Game Birds

Item	Staff Days	Cost
Planning	0.5	$150.00
Law Enforcement	0.75	$200.00
Inquiries	1	$250.00
Printing Costs	-	$0
Total	**2.25**	**$600.00**

Cost Breakdown for Other Migratory Game Bird Hunting Program:
Staff Time ($600) & Actual Expenditures ($0) = $600

Turkey Hunting

Item	Staff Days	Cost
Planning	0.50	$150.00
Processing applications	0.5	$150.00
Printing costs-handouts	0.50	$150.00
Law Enforcement	0.5	$125.00
Inquiries	1	$250.00
Facilities maintenance supplies	-	$0
Hunt operations	-	$0
Total	**3**	**$825.00**

Cost Breakdown for Turkey Hunting Program:
Staff Time ($675) & Actual Expenditures ($150) = $825

Hunter Visit Estimates

	Deer	Non-Ambulatory Deer	Waterfowl	Turkey	Upland Game
# Preseason Applicants	200*	10	250	50	n/a
Total # Visits	1,000	50	2,000	4	200

* Preseason drawing only applies to Lottery Deer Hunt Area (HQ)

HUNTING PROGRAM COST SUMMARY

Program	Staff Days	Cost	Recovery*
Big Game - Deer	18	$5,400	$1,790
Big Game - Turkey	3	$825	$300
Upland Game**	2.5	$880	$0
Waterfowl	14.5	$5,360	$5,570
Other Migratory Birds**	2.25	$600	$0
Total	**40.25**	**$13,065**	**$7,660***

***$** Returned to Refuge (80 percent)
Of $7,660, $2,870 is for contractor for application fees; 80 percent of remainder ($4,790) is $3,832 (Refuge's share)
** Total revenue for upland game and other migratory birds combined.

Cost Breakdown for All Hunting Programs Combined:
Staff Time ($9,495) & Actual Expenditures ($3,570) = $13,065

Volunteer Contributions for All Hunting Programs Combined ($20.25 per hour):
48 hrs = $972

Recovery is the revenue generated by permit and application fees from hunters participating in refuge hunting activities. Regulations for the fee program allow the refuge to retain 80 percent of the total fees collected. Of the total recovery, the contractor administering the preseason lottery drawing will collect $2,870 in application fees. Of the remaining balance of $4,790, 80 percent or $3,832, is the refuge's share.

Description of Facilities and Infrastructure

Minimal infrastructure, which includes the addition of two to three parking areas, enhancement of existing boat ramps, and placement of informational signs, is anticipated in support of hunting on the refuge. There would be some costs associated with a hunting program in the form of road maintenance, law enforcement, and boat ramp maintenance. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs. Approximately one dozen ground blinds for non-ambulatory hunters and waterfowl blind stakes for the lottery hunt area will need to be maintained.

CONDUCT OF THE HUNT

Federal Regulations

Hunting on the refuge would be contingent on general federal regulations for all refuges and specific regulations for the refuge. These are in addition to state regulations and would take precedence where they are more restrictive than the state regulations. General stipulations for refuge hunting as contained in the Code of Federal Regulations (50 CFR Part 32) state that hunters must have a valid state license,

valid Migratory Bird Hunting and Conservation Stamp ("Duck Stamp") while hunting migratory waterfowl, comply with all current federal hunting regulations including the migratory bird regulations (50 CFR Part 20), and comply with all state hunting and safety regulations. Additionally, hunters must comply with the terms and conditions established by the refuge for access to the refuge itself and for its hunting program. Some, not all, of the more pertinent federal regulations for hunting on refuge lands are as follows:

1. The use or possession of lead shot while hunting migratory birds or small upland game (including turkey) is prohibited.

2. The use of all-terrain vehicles (ATVs) or other vehicles on refuge lands is prohibited.

3. The use of nails, wire, screws, or bolts to attach a stand to a tree, or hunting from a tree into which a metal object has been driven to support a hunter is prohibited.

4. The unauthorized distribution of bait and the hunting over bait is prohibited.

5. The use or possession of alcoholic beverages while hunting is prohibited.

State Regulations

All state regulations will apply to hunting on the refuge, and all state licenses, tags and stamps will be required.

Refuge-Specific Hunting Regulations

In addition to the foregoing state and federal regulations, the refuge-specific hunting regulations listed below will govern the hunting program on the refuge. These will be enforced by both Service law enforcement agents and designated Delaware Division of Fish and Wildlife conservations officers.

A. Migratory Game Bird Hunting. We allow the hunting of waterfowl, coot, mourning dove, snipe, and woodcock on designated areas of the refuge during designated seasons in accordance with State regulations subject to the following conditions:
   1. Only hunters aged 16 years and older may apply for or obtain a lottery hunt area permit (Waterfowl Lottery Application; FWS Form 3-2355).
   2. All hunters must have in their possession a signed and current refuge hunt permit (signed brochure) and government-issued picture ID on the refuge. All permits are non-transferable. Hunting brochures containing hunting application procedures, permits, seasons, scouting times, methods of hunting, maps depicting areas open to hunting, and the terms and conditions under which we issue hunting permits are available at the refuge office and on the refuge's website.

3. Hunting in violation of any Delaware State law is a violation of refuge hunting regulations.
4. When requested by Federal or State enforcement officers, hunters and assistants must display for inspection all permits, game, equipment, weapons, and ammunition.
5. Cutting or damaging vegetation for any purpose is prohibited. The use of natural vegetation for camouflaging a blind is prohibited.
6. Hunting blinds, stands, steps and equipment must be portable and removed at the end of each day.
7. Practice or target shooting is prohibited.
8. All public entry is prohibited in designated safety zones.
9. Hunters may not be on the refuge any earlier than two hours before the legal morning shooting time.
10. All boaters are required to operate their craft and possess all safety equipment in accordance with Delaware State and U.S. Coast Guard regulations during refuge hunts. The maximum horsepower allowed for boat motors is 30 HP. The Slaughter Canal and Headquarters' Canal are slow, no wake zones. Designated launching sites must be used to launch boats. We prohibit the use of air-thrust and inboard water-thrust boats on all waters within the refuge boundaries.
11. Only 3 individuals are allowed per blind site in the lottery hunting areas.
12. Motor vehicles are prohibited off of designated routes and parking areas.
13. We allow the use of dogs to assist in hunting and retrieval of harvested game in accordance with State law. Dog training is prohibited.
14. Only non-ambulatory hunters may hunt in the Island Farm Unit, where we have provided non-ambulatory hunt blinds to accommodate hunters with this need. All disabled hunters must obtain an Interagency Access Passport to receive a hunting permit for the disabled hunting areas. Wheelchair hunters are required to have an assistant in the disabled hunting areas, and must hunt from a government provided blind.
15. We allow up to two individuals assisting a disabled hunter to hunt waterfowl with the disabled hunter.
16. Waterfowl hunters must stop hunting at 3:00pm and be off of the refuge by 4:00 pm on hunting days except when snow goose hunting during a snow goose conservation order.
17. We prohibit the use or possession of toxic shot for hunting (see §32.2(k)).

B. Upland Game Hunting. We allow the hunting of rabbit, quail, pheasant, and red fox on designated areas of the refuge in accordance with State regulations subject to the following conditions:
1. The hunting of squirrel is prohibited.
2. Red fox hunting is only allowed while concurrently hunting deer in areas open to deer hunting. Hunting by chase is prohibited. Rimfire or centerfire rifles are prohibited.
3. We prohibit the use or possession of toxic shot for hunting (see §32.2(k)) with the following exception: while hunting red fox concurrently with deer we allow the use of shot approved for deer hunting in accordance with state and refuge regulations.
4. Hunters must be out of the hunting area one half hour after the legal evening shooting time.
5. Conditions A2 through A13 apply.

C. Big Game Hunting. We allow the hunting of white-tailed deer and turkey on designated areas of the refuge during designated seasons in accordance with State regulations subject to the following conditions:
   1. Only hunters aged 16 years and older may apply for or obtain a lottery hunt area permit (Quota Deer Hunt Application; FWS Form 3-2354, Big/Upland Game Hunt Application; FWS Form 3-2356).
   2. Access by boat is prohibited from Slaughter Creek on Cods Road.
   3. We prohibit the driving or pushing of deer by any means.
   4. All deer hunters must be out of the hunting areas one and one-half hours after the legal evening shooting time. All turkey hunters must be out of the hunting areas one hour after the legal closing time for turkey hunting.
   5. We prohibit the use or possession of buckshot while hunting. Only slugs may be used for hunting deer.
   6. Assistants for wheelchair hunters are prohibited from hunting in the disabled hunting area.
   7. Any time the State hunting regulations require that hunters display hunter orange, the material must be solid-colored. We prohibit the use of hunter-orange camouflage materials to meet state minimum hunter orange requirements.
   8. We prohibit the use or possession of toxic shot for hunting (see §32.2(k)) turkey.
   9. Conditions A2 through A12, and A14 apply.

Anticipated Public Reaction

The Service conducted public meetings as part of the refuge's CCP. The public voiced support for hunting on the refuge, since hunting is a traditional activity in Sussex County. Service staff has assured the public that hunting would be considered on the refuge where and when it was compatible with refuge objectives.

To improve the refuge's program, we evaluated hunting on the refuge, incorporated the opinions of hunters, and developed this plan in collaboration with our State partners in the Delaware Division of Fish and Wildlife. These program changes, which reflect a diversity of hunting preferences and opportunities, strive to meet the guiding principles for a quality refuge hunting program identified in Service policy 605 FW 2. They also support Presidential Executive Order #13443: Facilitation of Hunting Heritage and Wildlife Conservation. Additional opportunities included increased days, expanded and new hunt areas, and flexibility of the hunter to adapt to changing hunting conditions. Changes that will most likely draw criticism initially from refuge veteran hunters will include: 1.) the implementation of a preseason lottery drawing for waterfowl; 2.) the implementation of an online/telephone permitting process through a contractor for deer and waterfowl hunts; 3.) the elimination of daily standby drawings for deer and waterfowl hunts; 4.) the phasing out and elimination of permanent hunting structures; 5.) conflicts with adjacent landowners; and 6.) relocation of disabled but ambulatory hunters from using infrastructure for non-ambulatory wheelchair users in the disabled hunt areas. However, some of these changes were requested by hunters participating in the surveys conducted the U.S. Geological Survey (Sexton et al. 2007). The elimination of permit fees (except for lottery hunts) should be well received. Ultimately, any change to the existing program will draw skepticism and unfavorable comments as reported by the visitor surveys (Sexton et al 2007). In these surveys, hunters did not appear to be very interested in making changes when asked about the desirability of changing some hunting services or regulations. A well thought outreach plan is essential in explaining to the hunting public the rationale for the changes to the hunting program.

There may be reaction to the refuge hunts by anti-hunter groups. Response to any demonstrations or protests will be coordinated through the Service's Northeast Regional Office, and may require assistance from refuges who have dealt with these situations in the past. If necessary, state and local law enforcement officials may be asked to assist.

For more information about anticipated public reaction, see the "Impacts on Public Use and Access" section of this document.

Hunter Application and Registration Procedures

All persons hunting on the refuge will be required to obtain the necessary state licenses, tags and stamps. Waterfowl hunters will be required to have a Federal Migratory Bird Hunting and Conservation Stamp ("Duck Stamp"). Each hunter is also required to have a signed copy of the current refuge Hunting Regulations brochure, which will serve as the refuge hunting permit. In addition, hunters participating in the lottery hunts for deer, waterfowl, and turkey will be required to also have a daily permit. Hunters would not be required to check-in or check-out on the day of any hunt. All disabled hunters must obtain an Interagency Access Passport to receive a hunting permit for the disabled hunting areas.

Description of Hunter Selection Process

For most areas, hunter numbers would not be limited to a specific hunt location. Hunting regulation brochures will be available in brochure boxes at the refuge check station, refuge office, refuge Web site, or upon request from the refuge manager. Hunters will be required to have in their possession a signed copy of the hunting regulations. Hunters would have the ability to free roam for deer, waterfowl, and upland game in designated areas on a first-come, first-serve basis. Non-ambulatory hunters are allowed to hunt in all hunt zones in accordance with refuge policy and regulations. Only non-ambulatory hunters may hunt in the Island Farm Unit, where we have provided non-ambulatory hunt blinds to accommodate hunters with this need. For the Statewide youth hunts, all designated hunt areas would be open for hunting on a first-come, first-serve basis.

Preseason lottery drawings will occur for high demand areas, including the lottery deer hunt area (headquarters area), disabled deer and waterfowl hunt areas, lottery waterfowl hunting area, and lottery turkey area to reduce hunter conflicts, lessen administration, and provide equal opportunity for all hunters. For daily drawings on opening days under current management, it is common to see over 100 deer hunters show up for 32 available hunting opportunities and for 80 waterfowl hunting parties (with up to three people per party) show up for 25-27 available hunt blinds. As a national wildlife refuge, the refuge will provide hunting opportunities through these preseason drawings for local, in-state, and out-of-state hunters. Knowing in advance of a hunting opportunity allows hunters to prepare, plan, and scout, which ultimately improves their quality hunting experience.

Preseason lottery drawings would be administered by a contracted company which will feature online and telephone services to collect hunter information, required fees, and issue permits. These services would provide hunters with the ability to apply, pay for, and receive hunting permits in advance of the hunting dates. Contracting the administration of the permitting process may reduce our costs by over $3,000 and the application and processing fees will be paid to the contractors for performing this service. The permit fee ($10 for deer & turkey; $15 for waterfowl), preseason application fee ($5/hunter), and processing fee for permits acquired after the preseason drawing (a minimum of $2-3 per hunt) are

the minimal amounts needed to offset the cost of facilitating the preseason drawings and manage the lottery hunts. Application and permit fees for turkey hunting may be waived if the lottery drawing is administered by the State. All fees must be paid prior to the issuance of a permit. Due to the uncertainty in the level of hunter participation with these new program changes, permit fees may need to be adjusted (increased or decreased) and therefore will be evaluated annually. Refuge staff will work with the contractor to provide the highest level of customer support.

For the preseason drawing for the lottery deer hunt area, hunters will be selected for a hunt date based on their date preferences. If selected, a limited number of hunters would have access to the hunt area and may choose their hunting location on a first-come, first-serve basis on the day of the hunt. For the lottery waterfowl hunt area and disabled deer and waterfowl hunt areas, hunters would be selected for a hunt date and hunting blind site based on their date preferences during the preseason drawing. Only the first two days of each of the state's seasonal hunting splits for waterfowl will be included in the preseason drawing for the disabled waterfowl area and will be first-come, first-serve thereafter. Hunters could be picked for multiple dates. For the lottery waterfowl hunts, the selected hunter may take two additional people on that hunt day. Everyone in the lottery drawing has an equal chance of being selected multiple times. The lottery turkey hunt may be administered by the Delaware Division of Fish and Wildlife.

For any vacant hunting opportunities not selected during the preseason lottery drawing, hunters would have the flexibility to go to the contractor's Web site at any time (24 hours a day) during the hunting season, view available hunt dates, and select and pay for these permits at any time. For those individuals who do not have computer access, customer representatives would be available by telephone during business hours on weekdays to assist. Hunters will be allowed to claim only one permit per day to avoid someone from claiming all available vacancies at one time. The licensing contractor would supply refuge staff of a list of permitted applicants. No daily standby lottery drawings would be conducted. Hunters may forfeit their permits to the contractor without compensation to make available for other hunters.

Procedure for Proper Storage and Disposal of Paper & Electronic Hunter Records

For the preseason lottery drawings for deer, turkey, and waterfowl, hunters will be required to complete the appropriate OMB approved applications, unless the State conducts the lottery drawing. If selected, accepting hunters will be issued a refuge hunting permit. All information collected from hunters either by refuge staff or a licensed contractor will be destroyed at the end of the hunting season. The licensing contractor will assume responsibility for confidentiality and privacy related issues. Lists of selected applications given to refuge staff will be destroyed at the end of the hunting season.

For hunting areas that do not require a preseason lottery drawing, hunters will be required to sign the permit on the cover of the hunting regulation booklet and keep in their possession while hunting.

Harvest Data Requirements

Harvest data will not be collected through refuge staff. Deer harvest data will be available through the State Division of Fish and Wildlife's harvest reporting system. Migratory bird harvest data will be available through the Harvest Information Program, or HIP. Other harvest related information will be obtained through informal hunter feedback throughout the hunting season.

Media Selection for Announcing and Publicizing Hunts

The public will be informed of refuge hunting regulations through news releases and refuge hunting regulation brochures. Contact information for the refuge will be included in the Delaware Hunting and Trapping Guide for interested hunters. An annual program update will be filed each year as required, outlining any changes in the current hunt program. Rules and regulations will be published in the *Federal Register* as required.

FUTURE ACTIONS

Long term plans for administering and maintaining the hunting program are to follow the guidelines outlined in this plan and to make future adaptations only in an effort to maintain or increase program efficiency, provide quality experiences to hunters, and maintain healthy wildlife habitats.

EVALUATION

The refuge will evaluate the hunting program on a regular basis along with the Delaware Division of Fish and Wildlife to ensure that we are meeting resource management objectives and continuing to offer quality experiences. In cooperation with our State partners, we will evaluate the hunting program based on hunter harvest, hunter participation and feedback, state and federal wildlife surveys, and staff observations. In addition, the refuge plans to evaluate the following areas:

Fee Structure – Refuge staff will ensure that permit and application/processing fees are adequate to cover expenses to administer the hunting program. Due to the uncertainty in the level of hunter participation with these new program changes, permit fees may need to be adjusted (increased or decreased).

Lottery Waterfowl Hunt & Waterfowl Sanctuaries– Through staff observations and informal feedback from hunters, the refuge will evaluate waterfowl behavior in and adjacent to designated waterfowl sanctuaries and evaluate hunter success in lottery hunt areas to determine impacts of hunting on wildlife populations and on hunter success. OMB approved harvest information surveys may be used if needed to adequately assess hunter harvest rates.

Disturbance to Sensitive Areas & Wildlife – Through staff observations and occasional site visits, the refuge will evaluate public use patterns for short and long-term disturbance to sensitive habitat areas.

Turkey Hunting – The refuge will collaborate with the Delaware Division of Fish & Wildlife to evaluate the status of the wild turkey population on the refuge. Hunting will be permitted if State and refuge personnel determine that the turkey population in the area is sufficient to support hunting on the refuge. The refuge will consult with the State on an annual basis to determine the status of the turkey population and whether to continue to allow turkey hunting on the refuge.

Conflicts Among Hunters and Other Refuge Visitors – The refuge will evaluate the concurrent hunting opportunities of deer, waterfowl, and upland game in hunting areas for conflicts between different hunter user groups. Additional seasonal restrictions (days of week) or spacing may be required to minimize these conflicts.