

**Objective 1.1 Overwash,  
Dune Grassland and  
Atlantic Coast Interdune  
Swale**

Allow natural processes to affect the evolution and functioning of coastal landforms and habitats (including sandy beach, overwash tidal flats, dune and grasslands, and mudflats) along nearly 3.5 miles of shoreline in all refuge management units, as they naturally evolve in order to conserve spawning horseshoe crabs, American oystercatcher, and other State and federally listed beach nesting bird species, and provide feeding and staging habitats for sanderlings, whimbrel, and other migratory shorebirds.

**Rationale**

The Delaware Bay has been recognized by many scientists and conservation organizations as one of the most important and critical shorebird stopovers in the Western Hemisphere and world (USFWS-Shore Technical Committee 2003). Immediately parallel to the Delaware Bay, Unit I habitats have increasingly become more important for both migrating and breeding shorebirds in the face of beach development along bay shore areas. The highest quality dunes remaining along the Delaware Bayshore occur from Big Stone Beach south to Beach Plum Island (Clancy et al. 1997), with the refuge's barrier beach island habitats located just north of Beach Plum Island. Protecting some of the last undeveloped 3.5 miles of barrier beach island habitats along a critical shorebird migrational hot spot like the Delaware Bay will greatly benefit breeding and migrating shorebirds.

A distinctive dune system with overwash and ephemeral mini-inlets is still found from the last Prime Hook Beach home north to Slaughter Beach. Beach heather (*Hudsonia tomentosa*), beach plum (*Prunus maritima*), and dune panicgrass (*Panicum amarum*) are interspersed with several overwash habitats along Unit II and Unit I. In 2006, Hurricane Ernesto plus several nor'easter storms of 2007 and 2008 expanded the overwash habitats, flattened most dune areas, and increased tidal flows. These events increased habitat availability for beach nesters and provided greater amounts of invertebrate and fish food resources flowing in daily from the Delaware Bay for nesting and migrating birds. In 2009, fall storms breached the duneline in Unit II, south of Fowler Beach Road, creating two overwashes and inlets.

Refuge sandy beach and overwash dune grassland habitats are recording greater use by spring and fall migrating shorebirds since 2006, and we are consistently noting more beach-nesting attempts by the American oystercatcher, least terns, and common terns.

Both spring and fall migrating shorebirds and nesting shorebirds will benefit greatly if we close beaches from March 1 to September 1. Such beach closures would subject shorebirds to fewer disruptive events that interfere with foraging, preening, resting, and nesting shorebird activity budgets. Protecting these habitats from human disturbance through seasonal closures, not allowing dog walking, and proactively reducing predator problems could increase nesting attempts, improve nesting success, and provide better foraging habitats for red knot, ruddy turnstones, sanderlings, whimbrels, and other migrating birds.

**Strategies**

- Permit the natural processes of inlet openings and closings, sand migration, and overwash development along Unit I and Unit II.
- Monitor resources of concern and conduct baseline inventories and surveys as funding and staffing allows

- Conduct seasonal beach closures if and when Federal or State endangered shorebird species attempt to nest on refuge overwash habitat

### Objective 1.2 Maritime Shrub and Forested Habitats

Continue passive management of approximately 320 acres of existing successional maritime salt shrub and successional maritime forest and maritime red cedar woodland habitats, as well as any such additional habitat that may develop through passive succession within and adjacent to impounded wetland areas.

#### Rationale

We define passive management as monitoring resources of concern and conducting baseline inventories and surveys as funding and staffing allow. Passive management in this sense would increase our knowledge of the status of refuge resources to improve our information about the healthy ecosystem functioning of barrier beach island and maritime habitats and conserve what currently exists on the refuge.

Due to development, maritime shrub and maritime forested habitats are underrepresented in the State of Delaware. These natural communities are connected to coastal dune systems and are restricted by the natural processes that develop and enhance barrier beach island ecosystems. Maritime shrub and forested habitats are threatened by commercial and residential development, artificial dune stabilization, and lack of recognition that these vegetative communities represent unique communities within northeast coastal beach ecosystems.

*Importance to Migratory Landbirds:* Widespread population declines of many migratory songbird species are among the most critical issues in avian conservation today. Numerous studies have shown the critical role that maritime shrub, maritime red cedar woodland, and maritime forested habitats play for migrating passerines, especially on the refuge and along the mid-Atlantic and Delmarva peninsula coastal areas (Mizarhi 2006, Clancy et al. 1997, McCann et al. 1993). Conservation of these habitats and the natural resources associated with them is essential to perpetuate the migratory songbird resources of North America.

#### Strategies

- Control invasive species, especially *Phragmites* when significant patch sizes (more than 5 acres) are noted
- Allow natural processes like inlet formation, sand migration, and tidal flows from inlet formations, etc., to proceed unimpeded to enhance and protect the natural development of maritime shrub and forest habitat in Unit I.

### Objective 1.3 North Atlantic High and Low Salt Marsh

Protect approximately 2,200 acres of existing refuge salt marsh resources, primarily in Units I and IV, for the benefit of salt marsh-dependent species, which include a mix of high and low *Spartina* salt marsh, pool panne, and irregularly flooded eastern tidal salt shrub habitats. In addition, permit the natural conversion of up to an additional 4000 acres in Units II and III to a mix of salt marsh, mud flats, and open water.

### Rationale

Salt marsh communities along the East Coast are the most degraded of all wetland habitats, and within the mid-Atlantic region a substantial number of salt marshes have been lost or degraded in the last century (Kennish 2001). With the loss of greater than 50 percent of these habitats in the mid-Atlantic, remaining salt marsh areas are critically important for many salt marsh-dependent species that are experiencing major population declines.

Refuge salt marsh habitats were grid-ditched since the 1930s, and are highly altered systems compared to natural salt marsh environments (see HMP in appendix B for detailed history of refuge salt marsh habitat alterations). Current refuge salt marsh habitats consist of approximately 2,200 acres confined in Unit I (1,400 acres) and Unit IV (800 acres). Vegetation cover-types are represented by North Atlantic high salt marsh, North Atlantic low salt marsh, tidal creek shrubland, and salt panne communities dominated by *Salicornia* spp. and salt grasses, with various stands of *Phragmites* scattered around Units I and IV. The dominant community is North Atlantic low salt marsh consisting of approximately 1,700 acres.

Refuge salt marsh resources provide important breeding habitats for seaside and salt marsh sharp-tailed sparrow, black rail, clapper rail, willet, sedge wren, and wintering black ducks. Principal habitat management activities are vegetation and bird monitoring, invasive species control, prescribed burning, and the use of open marsh water management to control mosquitoes.

Although larvicides and adulticides have been used on the refuge, open marsh water management is the State of Delaware's preferred method to control mosquitoes as a source reduction technique that reduces the need for chemical insecticide treatments. It is a method for controlling salt marsh mosquitoes through physical alterations of marsh habitats. Ponds and ditches are selectively excavated in order to create an unsuitable environment for mosquito production while creating favorable habitat conditions for larvivorous fishes. Often, open marsh water management is applied in areas where historic grid-ditching was conducted in an attempt to restore features similar to natural pannes and channels in those areas while also controlling mosquitoes. Such biological controls are effective in reducing mosquito production by 95 percent in treated areas (DNREC 2008).

Extensive open marsh water management systems have been installed on approximately 1,350 acres from 1980 to 2002, effectively treating all of the refuge's salt marsh habitats. In 1980 a pilot study to demonstrate efficacy was initiated. Four years later a 90 to 99 percent reduction of mosquito breeding was recorded by the State in treatment sites. An environmental assessment to conduct open marsh water management on the refuge was completed in 1988 to treat 960 acres in Unit I and 430 acres in Unit IV. This work was completed in 1994, removing 1,880 acres from the mosquito spraying program. In 2001, an additional 362 acres were removed from the spray program upon the construction of 3.2 acres of ponds and 7.0 acres of radial ditches.

In 2009, fall storms breached the duneline in Unit II, south of Fowler Beach Road, creating two overwashes and inlets. These breaches have introduced daily tidal flow directly into Unit II, and therefore into Unit III through culverts that connect it to Unit II. This constant tidal regime resulted in the conversion of previous managed freshwater wetlands to a mix of open water, mudflats, and salt marsh. Over time, under this alternative of no action, additional salt marsh may be established in areas of Units II and III as the impounded wetlands respond naturally to the tidal regime.

**Strategies**

- Control *Phragmites* encroachment onto refuge salt marsh habitats through the use of fire, mechanical means, and herbicides.
- Continue or resume snow goose hunting to discourage snow goose use of salt marsh habitats to prevent destruction of salt marsh vegetation.
- Permit the State of Delaware Mosquito Control Section to maintain open marsh and water management systems for source reduction of mosquito breeding to reduce the amount of insecticide treatment on the refuge.
- Permit the use of the larvicides Bti and methoprene, and the adulticide naled, to control mosquitoes.
- Permit the natural development of additional salt marsh, mud flats, and/or open water within Units II and III in response to tidal flow through breaches along the refuge shoreline.

**GOAL 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, increase quality habitat for the endangered Delmarva fox squirrel, breeding and wintering landbirds, reptiles, amphibians, and other resident wildlife.

**Objective 2.1 Upland Forested Habitats**

Continue protecting more than 750 acres of existing oak forest and mixed hardwood cover-types using prescribed fire in appropriate stands to improve habitat conditions for the Delmarva fox squirrel and migratory birds.

**Rationale**

Extensive upland forest loss and fragmentation provided the impetus for the State to designate upland forested blocks greater than 250 acres in size as key wildlife habitats. Exotic species are another great conservation concern. Of the 115 tree species found in Delaware, only 60 are native species. The loss of native upland forested habitats has taken a large toll on migratory song birds and forest interior dwelling breeding birds that all require large contiguous blocks of forested habitats. These include black-and-white warbler, whip-poor-will, cerulean warbler, hooded warbler, and American redstart. Severe forest loss and habitat fragmentation were also responsible for the extirpation of the Delmarva fox squirrel from Delaware (ELI 1999).

The reintroduction of Delmarva fox squirrels to Sussex County in the mid-1980s included two locations, one of which was the refuge. The purpose of these reintroductions was to restore the squirrel to its historic range. To provide more optimal habitat for the fox squirrel before and after its introduction, increased forest management treatments (low intensity understory prescribed fire and hydro-axe removal of dense understory thickets in mixed hardwood stands) were recommended by recovery team members as good management practices to benefit the squirrel. These conservation actions were performed several times in various timber stands from 1987 to 1995.

The first bald eagle nest was established on the refuge in 1991 on Second Hill. A single bird was produced and banded by State biologists and fledged that summer. The same pair has produced two young and built an additional nest on First Hill in Unit II. The nest on Second Hill was blown away in a storm but the pair produced eggs in 2007 and 2008 in a First Hill nest.

In 2006, a second bald eagle pair established a breeding territory on Horse Island in Unit III adjacent to Turkle Pond and has produced a pair of birds each breeding season up to and including 2008. Refuge breeding territories have proven successful due to plentiful food supplies, minimal human disturbance, and adequate habitat features. New juveniles recruited each year have increased the numbers of summer roosts on the refuge. Roost sites typically offer isolation and good food resources nearby. Bald eagles remain designated as a State endangered species, despite Federal delisting in 2008.

**Strategies**

- Use prescribed fire where appropriate to maintain or restore habitat for Delmarva fox squirrel.
- Monitor migratory bird use in forested habitats.
- Perform early detection/rapid response of invasive species and treat accordingly using integrated pest managements strategies.
- Follow the bald eagle management guidelines.
- Support Service and State efforts to monitor local populations.

**Objective 2.2 Mixed  
Hardwood Forest  
Restoration**

In the next 15 years, permit reforestation through natural succession on approximately 500 acres of old fields and cropland areas to increase habitat for the Delmarva fox squirrel and focal forest interior dwelling birds.

**Rationale**

Same as Objective 2.1

**Strategies**

- Permit natural establishment of forest vegetation in previously managed refuge fields
- Monitor and treat for invasive plant species.

**Objective 2.3 Wetland  
Forested Habitats**

Continue passive management of approximately 1,200 acres of forested wetland cover-types on the refuge.

**Rationale**

The mid-Atlantic Coastal Plain forested wetlands include a highly diversified gradient of forest types. These habitats are dominated by woody species that are adapted to tolerate saturation of the root zone for varying duration and frequency during the growing season. Nationally and on a State level, forested wetlands have experienced dramatic fragmentation and losses. Much of this loss has been due to clear cutting, filling, or draining of forested wetlands for conversion to agriculture or urban development (Cowardin et al. 1979, ELI 1999) leading to sharp declines in prothonotary warbler, Acadian flycatcher, yellow-throated warbler, and other migratory birds dependent on forested wetlands (PIF 44 and BCR 30 plans).

**Strategies**

- Monitor bird use.
- Map vegetation communities.
- Monitor and treat for invasive plant species.

**GOAL 3.****Refuge Impounded Marsh Complex**

Maintain, create, and enhance the quality of managed wetland habitats within and surrounding the refuge's impoundment complex for migrating shorebirds, breeding rails, wading birds, American black ducks, and migrating and wintering waterfowl. Support obligate amphibians and other native wetland-dependent species, provide fish passage and nursery habitats for anadromous fish species, and protect and conserve rare native flora and fauna dependent on refuge-managed hydrology.

**Objective 3.1 Refuge Impoundment Management**

Allow natural processes to create wetland and open water habitats across up to 4,200 acres of impounded wetland habitats to meet the needs of a wide variety of wetland-dependent migratory birds, including rails, bitterns, terns, migrating shorebirds, and migrating and wintering waterfowl.

**Rationale**

Under this "no action" alternative, there is no active management of the refuge impounded wetlands. This alternative permits the system to respond naturally to ongoing sea level rise and more frequent coastal storms. As described later under alternative B, objective 3.1, the refuge convened a group of world-renowned wetland management and restoration experts from outside Delaware for a meeting with refuge staff and a number of State scientists and managers. It was the conclusion of this group that the elevation within Units II and III would require years, perhaps centuries, to fully recover from the impacts of the decades of tidal restriction and the rapid peat collapse that followed the reintroduction of saltwater. Although salt marsh communities have already formed in portions of Unit II, it may be a much longer timeframe before healthy salt marsh communities are established throughout the entire impoundment. Large portions of the wetland complex will persist as open water until salt marsh vegetation returns naturally. Challenges associated with historic freshwater impoundment management are described in detail under alternative B, objective 3.1

**Strategies**

- Permit natural coastal processes, such as overwash, breaching, and inlet formation, to continue unhindered
- Conduct no management or construction of dunes on private or refuge coastal land.
- Continue to implement some water level management and vegetation control strategies, to the extent conditions warrant and permit.
  - \* Keep manipulated Unit III water levels, in accordance with deed restrictions, at or below a level of 2.8 ft mean sea level between October and March 10th. (Storm events and other high water events may cause uncontrollable higher water levels beyond the refuge's control.)
  - \* Control invasive species using chemical control, prescribed fire and other techniques as appropriate so that 95 percent native vegetation is achieved. The exact number of acres treated will depend on funding and management capability.

**Objective 3.2 Fisheries Resources and Water Quality**

Manage impounded wetlands for interjurisdictional fish species and improve water quality to perpetuate fish and migratory bird resources.

**Rationale**

Because of their wide geographic distribution and migratory patterns, many fish populations are dependent on freshwater, coastal, and marine areas that are managed by multiple states. The Service's Northeast Region Fisheries Program has identified the need to work with partners to restore and manage interjurisdictional fish species along the Atlantic Ocean. The Atlantic State Marine Fisheries Commission manages 22 species of Atlantic coastal fish; several of these species depend on refuge habitats, especially populations of freshwater, coastal, and anadromous fish.

For example, shad and river herring are anadromous fish that spend the majority of their adult lives at sea, only returning to freshwater areas in the spring to spawn. Historically, shad and river herring supported the largest fishery populations in the Atlantic Coast, but due to habitat degradation and impediments of passage to freshwater resources, shad and river herring populations are severely depleted. Other species of management concern include American eel, striped bass, and horseshoe crabs. Maintaining fish passage for spawning and nursery habitats and improving water quality are key management actions to address declines of anadromous fish populations and ensure healthy ecosystems to perpetuate interjurisdictional fish species. Through these actions, the refuge can contribute potential habitat to meet the needs of interjurisdictional fish species that occur throughout the Delaware Bay.

**Strategies**

- Conduct fisheries inventories and water quality assessments to evaluate resource conservation needs and receive direction from fisheries biologists regarding management recommendations to protect and enhance refuge fish and other aquatic species.
- Maintain fish weir passages in Unit II and III water control structures to allow unimpeded passage of river herring and other anadromous trust species.
- Improve or restore water quality by restoring water circulation within refuge impoundments by ditch cleaning and maintaining approximately 7.5 miles of ditch-network in Unit III and 3,300 linear feet in Unit IV.

**GOAL 4.**

**Early Successional Upland Habitats**

Maintain and enhance, or restore the native vegetation, biological diversity, and ecological integrity of early successional habitats to create a mosaic of native grassland and herbaceous scrub-shrub 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.

**Objective 4.1**

Within the next 15 years, allow early successional areas representing the historic range of variability for upland transitional communities to occur through natural processes in the absence of active management. Habitats will be dominated by native grassland and shrubland vegetation reflecting assorted cycles of diverse seral stage distributions that mimic historic conditions. Transitional habitats will usually be small in size and imbedded within a habitat matrix dominated by wetland and upland forested habitats.

Allow a continuum of natural habitats to include a mosaic of grassland, transitional, young and old shrublands, and young forest habitats on 2,000 acres undergoing restoration to native vegetation (including those areas previously planted in trees or transitioning through natural succession for Delmarva fox squirrel management purposes). These habitats will support high priority breeding and migrating birds identified in BRC 30, Partners in Flight 44, the State wildlife action plan (2005), and Birds of Conservation Concern (USFWS 2008a), and include prairie warbler, blue-winged warbler, Northern bobwhite, brown thrasher, whip-poor-will, willow flycatcher, eastern towhee, field sparrow, and Henslow's sparrow.

### **Rationale**

Early successional grassland and shrub-dominated habitats were historically widely distributed throughout the Northeast but are rare today. Shrub-dominated habitats are the most rapidly declining habitat type in the Northeast (Litvaitis et al. 1999, Litvaitis 2006). National breeding bird survey data indicate that populations of thicket specialists (thickets are defined as sites dominated by persistent shrubs or seedling-to-sapling sized trees) continue to decline in the Northeast (Askins 1995). Bird species that rely on open grasslands and shrublands for breeding are among the highest priority conservation targets due to the greatest rates in population declines both in the BCR 30 and Partners in Flight 44 regions.

Most early successional habitats are temporary and dynamic in nature, constantly changing as more shade-tolerant trees replace sun-loving shrub species. Given the highly ephemeral and disturbance-dependent nature of these successional communities, many shrubland habitats within the next 15-year time horizon will likely revert to young forest as alternative C will rely mostly on allowing natural succession to dictate the future conditions of refuge habitats. Shrubland cover-types will represent less acreage than alternative B, and naturally succeeding areas will ultimately result in higher acreages of forested habitats on the refuge than alternatives A and B.

Passive management consists of allowing natural succession to occur across the refuge's upland landscape to approximate native plant species composition and natural ecological processes, including natural disturbance regimes characteristic of a mixed forest matrix in the Delmarva Coastal Plain within a natural range of variation. The overall objective of allowing natural succession is to create a diverse mosaic of native upland habitat types to be sustained through natural ecological processes with minimal management intervention.

### **Strategies**

- Develop GIS monitoring layers needed to document natural succession and habitat management conditions as they progress annually by field number, along with refuge management actions database to tract shifting mosaics of transitioning habitats.
- Develop monitoring protocols for targeted breeding and migratory birds dependent on early successional habitat condition assessments, and monitor how natural succession proceeds and how bird use shifts with shift annual habitat conditions in annual habitat wildlife plan.
- Increase shrubland and forested buffered areas adjacent to refuge creeks, emergent wetland, and depressional habitats, and restore prior converted wetlands, with the side benefits of conserving soil resources and improving water quality throughout the refuge.

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

**Objective 5.1 Hunting**

Maintain a hunting program that offers high-quality hunting opportunities for white-tailed deer, waterfowl, upland game (rabbit, pheasant, quail), and webless migratory birds (mourning dove, snipe, and woodcock) on the refuge. Use hunting to manage wildlife populations, where appropriate.

**Rationale**

Same as rationale listed under Actions Common to All Alternatives.

**Strategies**

In addition to those strategies listed under Actions Common to all Alternatives affecting this program:

- Continue a permit-based hunt program for able-bodied and disabled hunters (see additional program details in Chapter 3, Affected Environment, Refuge Administration – Refuge Visitor Services Program).
  - \* Maintain permit fee structure (per hunter per stand or blind per day – \$3 pre-season application fee for deer; \$10 permit for firearms deer; \$5 permit fee for waterfowl; and \$2 permit fee for upland game, webless migratory birds, and archery deer). A 50 percent discount is available to interagency senior passport and interagency access passport holders.
  - \* Continue to offer a pre-season lottery drawing for deer, daily standby lottery drawings for firearms deer and waterfowl, and daily self-service for upland game, webless migratory birds, and archery deer during designated days and times.
  - \* Continue to require hunters to report their harvest for targeted species.
- Continue to provide 136 permanent hunting structures for deer and waterfowl.
  - \* Deer – 94 elevated stands for able-bodied hunters (34 in headquarters area and 60 in other areas) and 11 wheelchair-accessible ground blinds for disabled hunters in Unit IV.
  - \* Waterfowl – 27 blinds (19 Federal and 8 State-owned), 1 wheelchair-accessible blind for disabled hunters, and 3 blinds for the young waterfowler program.
- Hunters may not be on the refuge any earlier than three hours before shooting time.

**Objective 5.1a White-Tailed Deer Hunting**

Provide high-quality hunting opportunities for white-tailed deer.

**Rationale**

Much of the basis for hunting deer is described under Actions Common to All Alternatives.

Map 4-7 depicts deer hunting opportunities and infrastructure under alternative A.

**Strategies**

In addition to objective 5.1 strategies under alternative A,

- Maintain deer hunting opportunities on 3,876 acres of refuge lands.
  - \* Continue to provide opportunities for able-bodied and disabled hunters for approximately 36 archery hunt days from September through January, 12 firearms hunt days including the muzzleloader and shotgun hunting seasons, and 1 youth hunt.
  - \* In addition to permanent hunting stands, continue to provide free-roam hunting opportunities for hunters in the party zone areas, which allow two to ten hunters to access designated areas to free roam during the archery and firearms hunting seasons. Archery hunters are also permitted to hunt from portable stands on designated dates.
  - \* Continue to provide opportunities to hunt the headquarters area for two days (one in November and one in January).
  - \* Continue to allow scouting on Sundays from August 15 through the end of the hunting season.

**Objective 5.1b Waterfowl Hunting**

Provide high-quality hunting opportunities for waterfowl.

**Rationale**

Much of the basis for hunting waterfowl is described under Actions Common to All Alternatives.

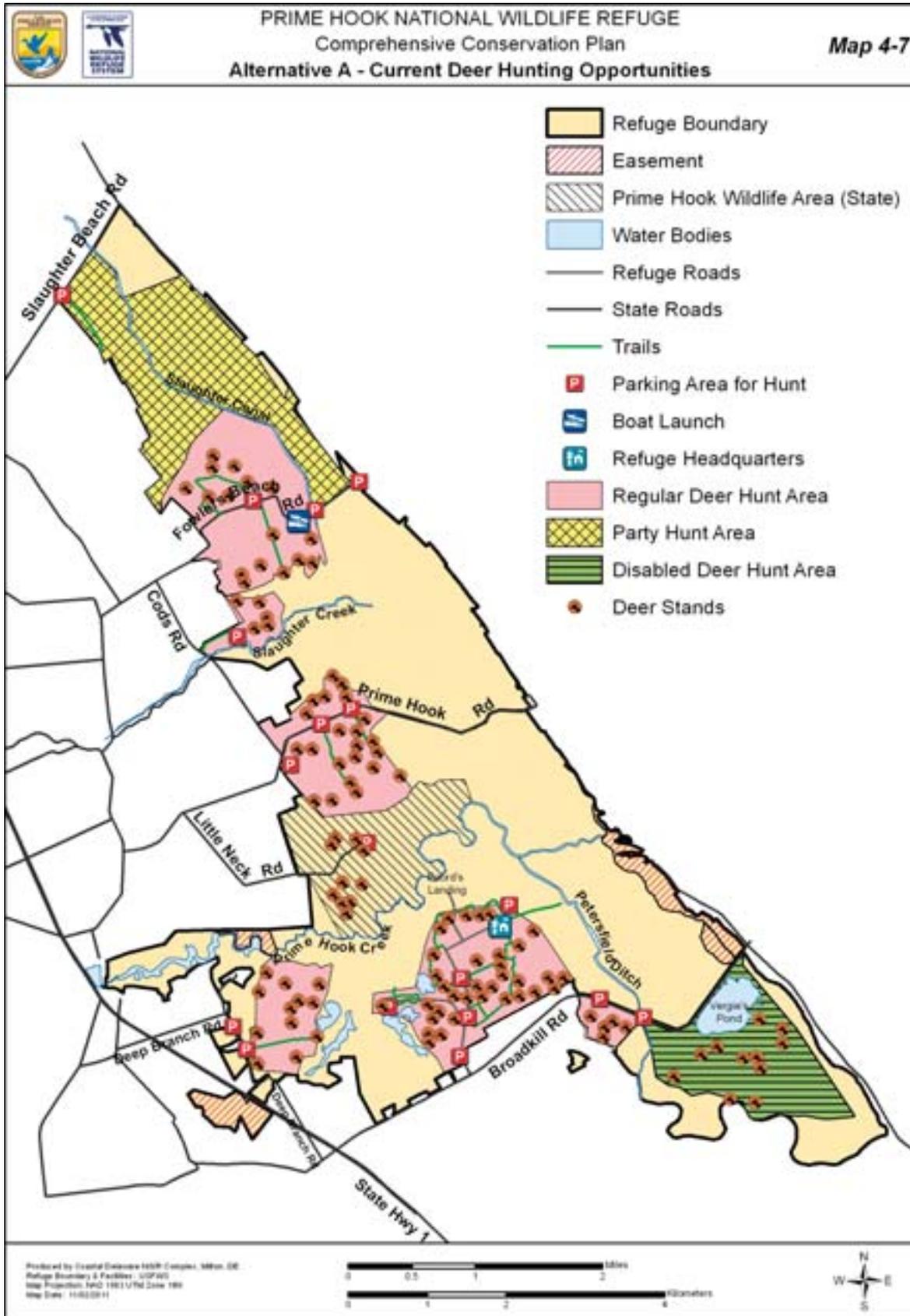
Map 4-8 depicts waterfowl hunting opportunities and infrastructure under alternative A.

**Strategies**

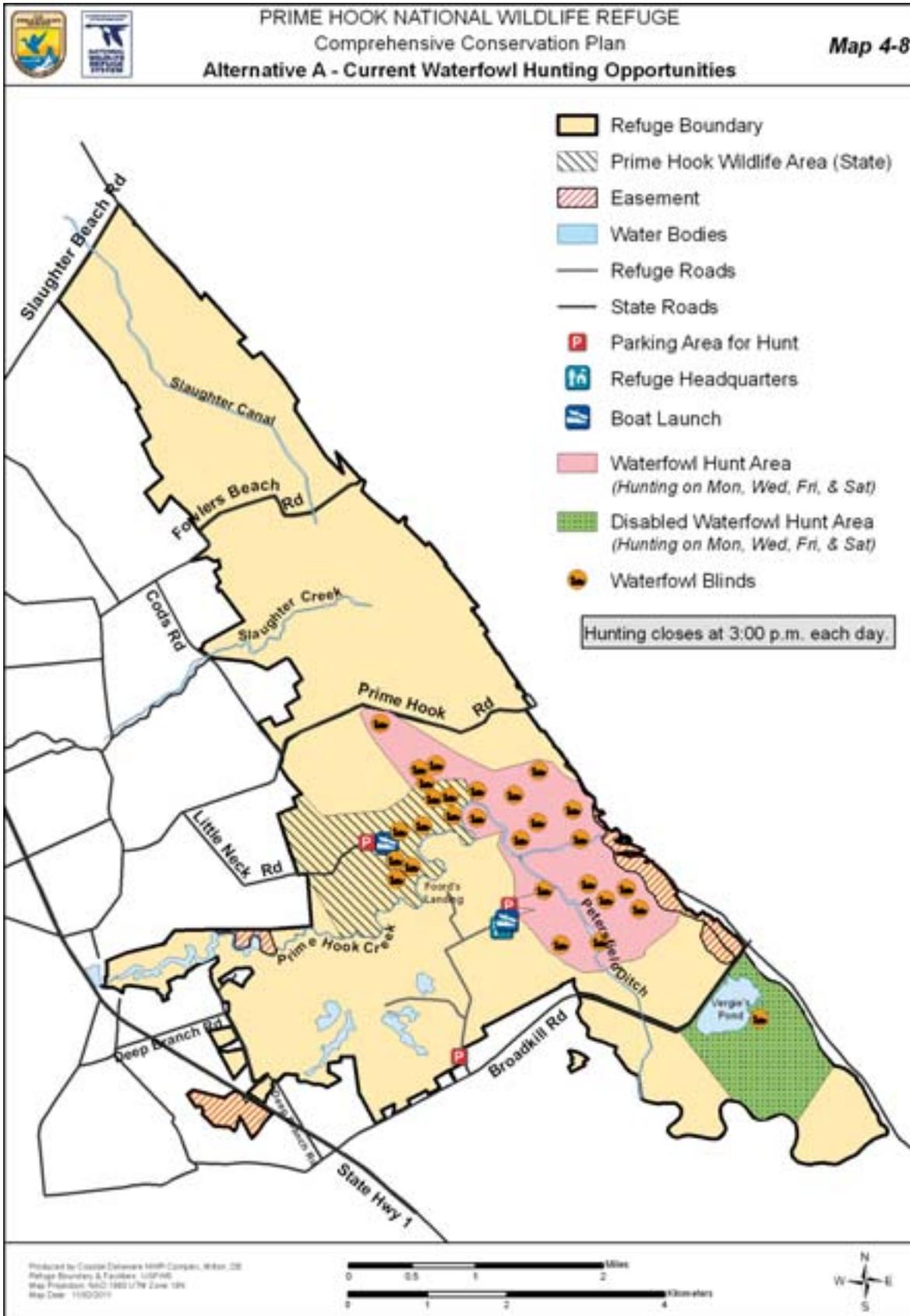
In addition to objective 5.1 strategies under alternative A:

- Maintain waterfowl hunting opportunities on 1,723 acres of refuge lands.
  - \* Provide opportunities for approximately 40 hunt days on Monday, Wednesday, Friday, and Saturday throughout the State hunting seasons and 1 youth hunt. The refuge does not participate in the early teal season.
  - \* Young waterfowler blinds are only hunted one to two times per year.
  - \* Shooting hours are limited from one-half hour before sunrise to 3:00 pm.
  - \* Three people maximum are permitted per blind, and all blinds except for the disabled blind and young waterfowler blinds are accessible only by boat.

Map 4-7. Deer hunting opportunities under alternative A



Map 4-8. Waterfowl hunting opportunities under alternative A



- The refuge will participate in all State hunting seasons except the early teal season. Due to history of low hunter use and harvest for resident geese and late season snow geese, the refuge is closed during these seasons.
- Close the eastern end of Prime Hook Creek from the old maintenance facility at Foord's Landing to the headquarters boat ramp from October 1 through March 15

**Objective 5.1c Upland Game and Webless Migratory Bird Hunting**

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

**Rationale**

Much of the basis for hunting upland game and webless migratory bird hunting is described under Actions Common to All Alternatives. Map 4-9 depicts upland game and webless migratory bird hunting opportunities and infrastructure under alternative A.

**Strategies**

In addition to objective 5.1 strategies under alternative A,

- Maintain upland game and webless migratory bird hunting opportunities on approximately 1,957 acres of refuge lands.
  - ✱ Scouting is permitted on Sundays from August 15 through the end of the hunting season.

**Objective 5.2 Wildlife Observation and Photography**

Provide high-quality wildlife observation and photography opportunities.

**Rationale**

Much of the basis for wildlife observation and photography is described under Actions Common to All Alternatives. Map 4-6 depicts wildlife observation and photography opportunities and infrastructure under alternative A.

**Strategies**

In addition to those strategies listed under Actions Common to all Alternatives affecting this program:

- The eastern portion of Prime Hook Creek (Unit III) is closed from the old maintenance facility at Foord's Landing to the headquarters boat ramp from October 1 through March 15.
- Allow visitors to use the existing trail and observation platform overlooking Vergie's Pond on the south side of Broadkill Beach Road.

**Objective 5.3 Recreational Fresh and Saltwater Fishing and Crabbing**

Provide high-quality fishing and crabbing opportunities.

**Rationale**

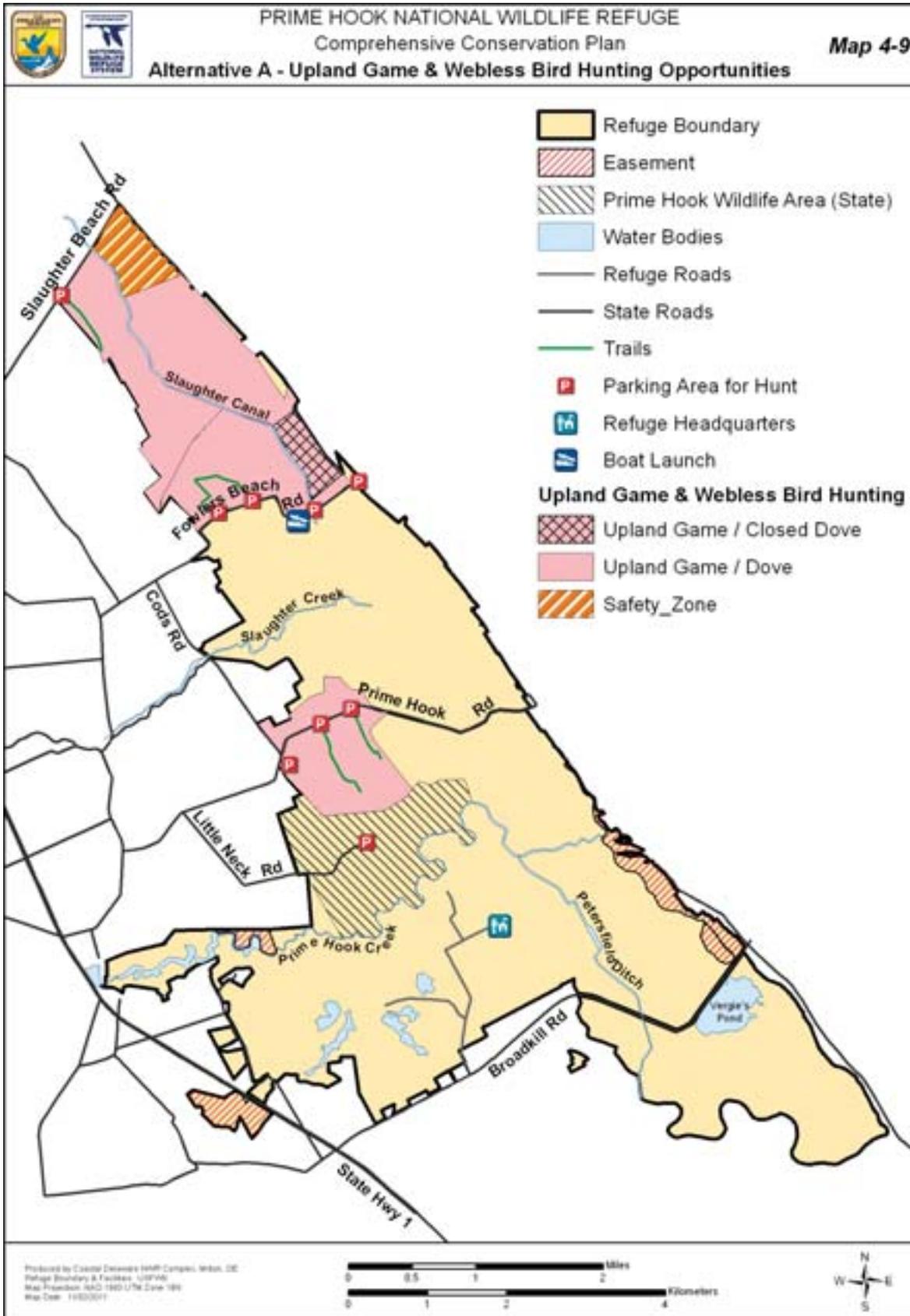
Much of the basis for recreational fishing and crabbing is described under Actions Commons to All Alternatives. Map 4-6 depicts fishing and crabbing opportunities and infrastructure under alternative A.

**Strategies**

In addition to those strategies listed under Actions Common to all Alternatives affecting this program:

- No refuge permit is required.

Map 4-9. Upland game and webless migratory bird hunting opportunities under alternative A.



- The eastern portion of Prime Hook Creek (Unit III) is closed from the old maintenance facility at Foord's Landing to the headquarters boat ramp from October 1 through March 15.
- Maintain the boat launching fee of \$1.00 per boat at refuge boat ramps in the headquarters area.

**Objective 5.4 Environmental Education and Interpretation**

Provide high-quality environmental education and interpretation opportunities.

**Rationale**

Much of the basis for environmental education and interpretation is described under Actions Common to All Alternatives. Map 4-6 depicts facilities and infrastructure used to support environmental education and interpretation.

**Strategies**

Refer to strategies listed under Actions Common to all Alternatives affecting this program.

**Objective 5.5 Other Recreational Use**

Provide opportunities for the public to use and enjoy the refuge for traditional and appropriate non-wildlife-dependent recreation that is compatible with the purpose for which the refuge was established and the mission of the Refuge System.

**Rationale**

Much of the basis for other recreational use is described under "Actions Common to All Alternatives."

**Strategies**

In addition to those strategies listed under Actions Common to all Alternatives affecting this program:

- Allow the following non-priority uses that have been formally evaluated and documented: commercial fishing, commercial trapping of muskrat, raccoon, etc., turtle trapping, picnicking, 5k road race, beekeeping, and waterfowl retrieval permits.
- Allow the following uses that were never formally evaluated and documented under current management: dog walking (required a ten-foot leash), roller blading, competitions or organized group events, non-competitive organized events.
  - \* It is the professional judgment of current and former refuge staff that these uses are allowed.

**GOAL 6.**

**Outreach and Community Partnerships**

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

**Objective 6.1 Community**

**Outreach**

Continue to provide community outreach by conducting programs or events each year, and initiate news articles to increase community understanding and appreciation of the refuge's significance to natural resource conservation and its contribution to the Refuge System, and to garner additional support for refuge programs.

**Rationale**

Much of the basis for community outreach is described under Actions Common to All Alternatives.

**Strategies**

Refer to strategies listed under Actions Common to all Alternatives affecting this program.

**Objective 6.2 Private Landowner Assistance**

Continue existing levels of technical assistance to private landowners to enhance their land management to improve wildlife habitat.

**Rationale**

Much of the basis for private landowner assistance is described under Actions Common to All Alternatives.

**Strategies**

Refer to strategies listed under Actions Common to all Alternatives affecting this program.

**Objective 6.3 Regional and Community Partnerships**

Continue existing partnerships with Federal, State, and local government agencies and regional and community organizations to fulfill natural resource conservation mandates and help us meet our wildlife, habitat, and visitor services objectives.

**Rationale**

Much of the basis for regional and community partnerships is described under Actions Common to All Alternatives.

**Strategies**

Refer to strategies listed under Actions Common to all Alternatives affecting this program.

## **Alternative B. The Service-preferred Alternative**

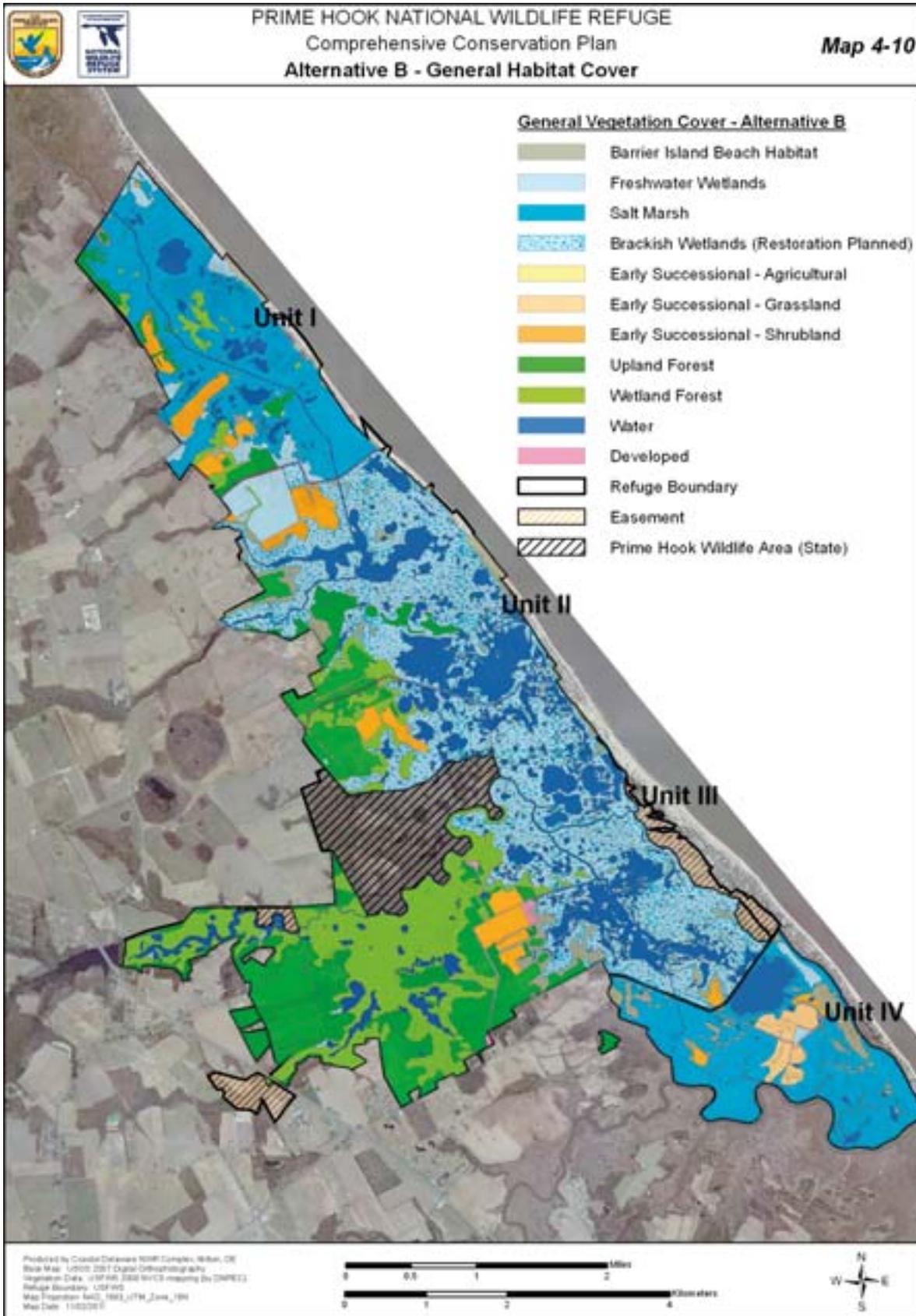
Alternative B is the alternative our planning team recommends to our Regional Director for implementation. It includes an array of management actions that, in our professional judgment, work best towards achieving the refuge's purposes, vision and goals, and would make an important contribution to conserving Federal trust resources of concern on the Delmarva Peninsula and in the Northeast region. It is the alternative that would most effectively address the issues identified in chapter 1. We believe it is reasonable, feasible, practicable, and the most timely, sustainable, and efficient alternative within a 15-year timeframe to achieve the desired future habitat conditions for the conservation of the greatest number of fish, wildlife, and plant resources, while enhancing biological resources of Delmarva coastal plain ecosystems. This alternative involves direct human actions and manipulations to restore degraded and manipulated habitats onto a trajectory that will ultimately allow them to persist naturally.

The biological and habitat goals, objectives, and management strategies of alternative B are based on the following underlying hypotheses and assumptions that were used to decide the future management direction for the refuge, including the desired habitat conditions depicted in Map 4-10 to Map 4-14:

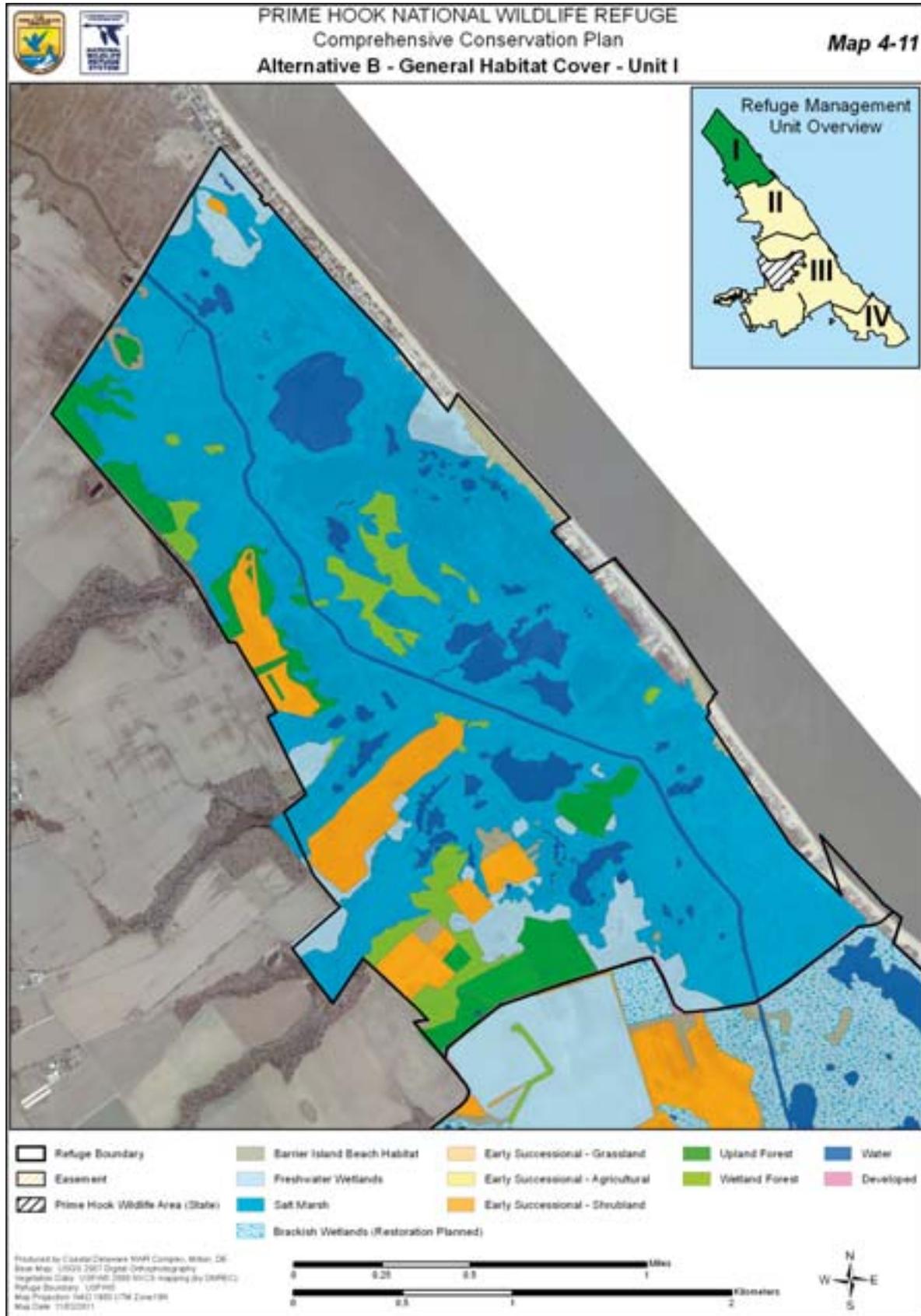
- Focal species management would be the best approach to conserve continental migratory bird populations, while maintaining, enhancing, and restoring biological integrity, diversity, and environmental health of refuge lands.
- Managing upland habitats and improving refuge forest management are the best approaches to optimize Delmarva fox squirrel and forest interior bird conservation.
- Increasing avian diversity and abundance on refuge habitats is best accomplished by conserving, protecting and restoring native plant community cover types.
- Selecting certain focal bird, fish, and insect species as indicator and umbrella species and yardsticks to gauge ecosystem function, biological diversity, integrity, and environmental health, improves environmental health monitoring.
- Increasing avian diversity on refuge lands to augment capacity for disease prevention (e.g., West Nile virus). Modifying mosquito and integrated pest management (IPM) strategies to advance pollinator conservation and protection and reduce negative non-target impacts on refuge invertebrate resources.
- Restoring healthy salt marsh systems in Units II and III, as well as degraded areas of Units I and IV, along with conserving appropriate vegetation communities in brackish and freshwater areas closer to streams and freshwater sources, will foster sustainable coastal habitats and contribute to biological integrity.

The Service is aware that physical forces in the changing climatic environment, and the biological responses that they generate, are rapidly altering our ability to follow management prescriptions designed just a few years ago. Accelerating climate change and its coastal manifestations—sea level rise, increased coastal storm activity and force, changes in plant and animal population distributions associated with changing temperature regimes—will necessitate revising management strategies for the long term, particularly where management of coastal wetlands and impoundments is concerned. This preferred alternative

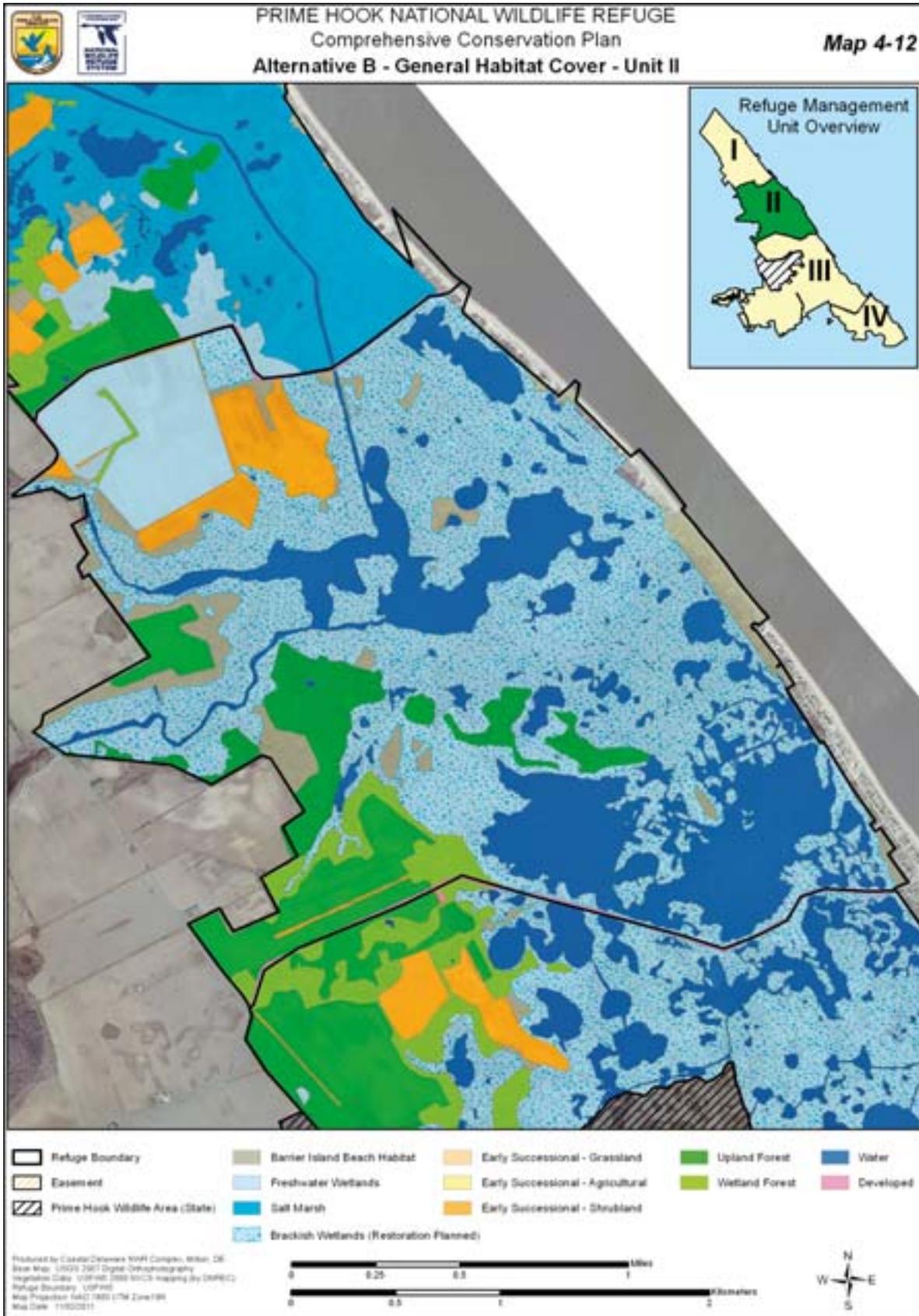
Map 4-10. Overview of general habitat cover under alternative B



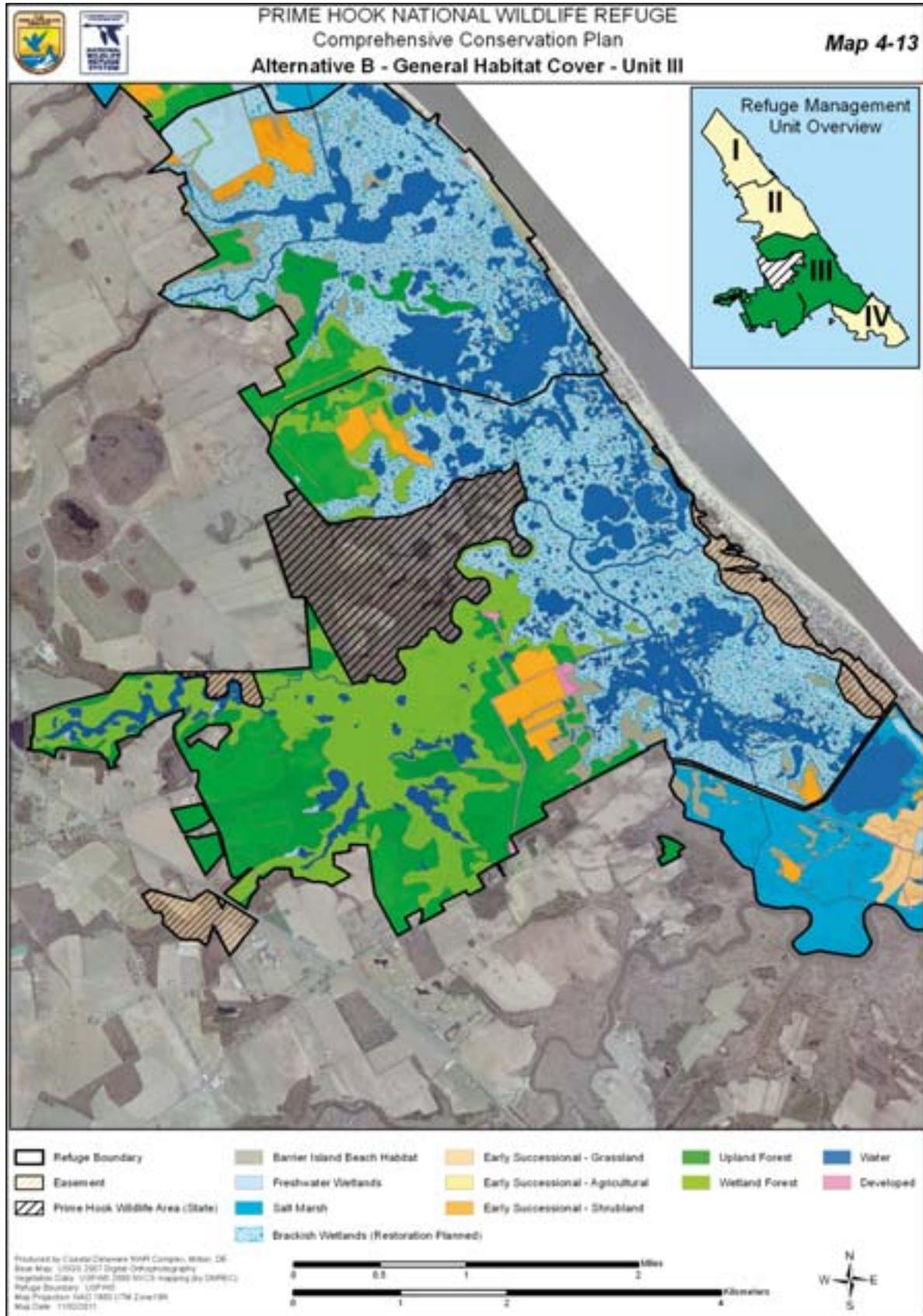
Map 4-11. General habitat cover in Unit I under alternative B



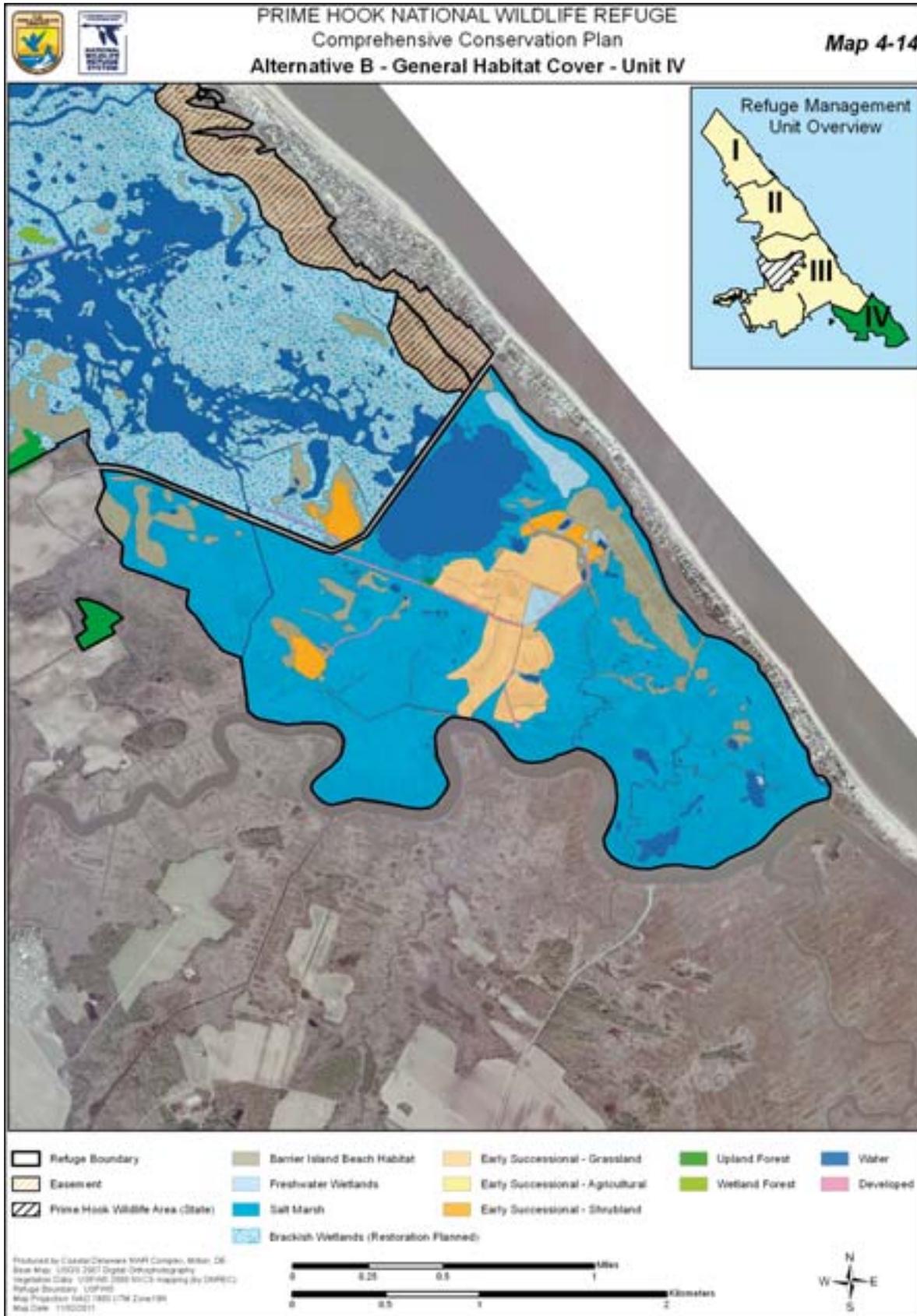
Map 4-12. General habitat cover in Unit II under alternative B



Map 4-13. General habitat cover in Unit III under alternative B



Map 4-14. General habitat cover in Unit IV under alternative B



outlines a proactive habitat management approach in response to these changing conditions.

Most notably, for salt marsh enhancement where intrusion of tidal waters and the collapse of the peat substrate has occurred, we will pursue strategies to compensate for lost marsh platform elevation, in order to support the growth of salt marsh vegetation. This may include the addition of dredged sediment through a carefully planned restoration project, and/or smaller actions to encourage natural accretion of sediment. Additional sediments may also be needed to enhance overwash flats and to potentially create low dunes or islets within the marsh. However, the purpose of these actions is not to rebuild a barrier island in the same alignment as the former barrier island but to allow for a diverse array of maritime habitats which would naturally occur in a mid-Atlantic bay, marsh, and beach/spit system. In upland habitats, there will be an emphasis on restoring native forest cover in previously farmed or otherwise open fields.

For public use under alternative B, we would expand existing opportunities for all six priority public uses, with additional emphasis on hunting and wildlife observation and photography. Map 4-15 depicts the public use facilities proposed under Alternative B.

As compared to Alternative A, which represents current hunting and fishing opportunities, opportunities for hunting and fishing will be enhanced under Alternative B. These enhancements consist of expanding fishing and hunting areas, increasing the number of hunt days, reducing the administrative burden of the hunts, eliminating permit hunting fees except for lottery hunts, providing better outreach and information materials, phasing out the permanent hunting structures, and providing opportunities for preseason lottery hunts for waterfowl and deer. We will provide opportunities for wildlife viewing, photography, and interpretation primarily by opening trails and providing new infrastructure such as viewing areas. In addition, a photography blind overlooking a restored wetland site is proposed. Furthermore, new visitor infrastructure, including additional building space for environmental education programs, an interpretive auto tour route using advanced technology, and additional guided field trips would be developed.

- Concerning other refuge uses, we would continue to allow wildlife observation, wildlife photography, hunting, fishing, environmental education, environmental interpretation, limited mosquito control, research, and use of the Federal Aviation Administration tower. Commercially guided birding and canoeing trips and commercial photography would be permitted with a signed special use permit and fee. Activities evaluated by the refuge manager and determined not to be appropriate on refuge lands can be found in appendix E.

We would also enhance local community outreach and partnerships, continue to support a friends group, and continue to provide valuable volunteer experiences. As described under goal 6, we would pursue establishing demonstration areas on the refuge to promote research, and developing applied management practices to benefit the species and habitats identified in this alternative.

Under this alternative, we propose to achieve a staffing level that meets minimum requirements for a refuge of this size and stature, potentially adding five new positions (clerk, biological technician, maintenance worker, law enforcement officer, and public use specialist). Any staffing increases would be based on available permanent funding sources, and would be considered in the context of regional and refuge priorities.

Map 4-15. Public use facilities under alternative B

