

Great egret



vehicle-accessible areas and only on leash. All other areas beyond the parking lot and the two trails are closed to the public.

The existing trails lead to several different habitat types including freshwater wetlands, fields, oak-hickory forests, and the shores of the Great Bay Estuary. They are accessed from the visitor parking lot at the end of Arboretum Drive, adjacent to the refuge office building (map 3.6). The 2-mile Ferry Way Trail begins across from the parking lot and starts out as an asphalt path next to a chain link fence (the former Weapons Storage Area). A leisurely walk on this trail takes about 2 hours. The 0.5-mile Peverly Pond Trail begins to the east of the parking lot.

Three Service staff conducted a visitor services review of the refuge in fall 2009. The review is part of the CCP planning process and provides recommendations to improve the quality of the visitor services at the refuge. Given the lack of staff and closure of the refuge office in recent years, many people are unaware of the visitor services opportunities available on the refuge. The recommendations included modest improvements to the existing trails and interpretive materials and structures to enhance the existing wildlife viewing and photography experience at the refuge, as well as attract more visitors. This in turn offers an opportunity to reach more people with key stewardship messages.

Strategies

Continue to:

- Pursue funding to construct a boardwalk along the entire Peverly Pond Trail to meet accessibility standards.
- Maintain the view from the Ferry Way Trail observation deck by pruning shrubs and brush that grow in over time.

Within 3 years of CCP approval:

- Re-route the Peverly Pond Trail and modify Ferry Way Trail to improve wildlife viewing opportunities.
- Add benches and an interpretive sign to the wildlife observation blind.
- Highlight wildlife observation and photography opportunities on the Great Bay Refuge Web site.
- Improve trail sign location, including installing “No Dogs” and “No Bicycles” signs at trailheads.

- Construct an elevated observation platform overlooking the former Weapons Storage Area with interpretive panel, once the former Weapons Storage Area fencing and structures are removed.
- Remove roads around buildings in the former Weapons Storage Area once buildings are demolished
- Develop a bird or watchable wildlife checklist for the refuge.
- Create a hotspot for the refuge on eBird and encourage visitors to post their sightings. Include a link to eBird on the refuge's Web site.
- Conduct a refuge photo contest during June through August. Check with local businesses for potential prize donations.
- Work with area biking enthusiasts to develop a bike access onto McIntyre Road at juncture with the refuge entrance road underpass.
- Develop a more effective method for gathering visitor services data (e.g., number of daily visitors, visitor uses, and experiences at refuge).

Within 10 years of CCP approval:

- At Fabyan Point, pursue acquisition of public access right-of-way and upgrade road conditions to allow safe passage of public vehicles. If the right-of-way is acquired, we would use a staged approach to upgrading and constructing facilities. Within 15 years, if feasible and no safety concerns arise, we would
 - * first, make minor improvements to the road, create several parking places, and build an interpretive kiosk;
 - * second, construct a trail and viewing platform; and
 - * finally, construct car top-only boat launch.

**Objective 4.2
(Environmental Education
and Interpretation)**

Within 5 years of CCP approval, 90 percent of refuge visitors contacted will be able to identify the refuge's purpose, name at least one habitat and associated wildlife species of conservation concern, or know the regional importance of the refuge through their experiences at the refuge or with one of our partners around Great Bay.

Rationale

Great Bay Refuge is close to a highly populated area. Yet, due to the lack of staff, closed office, and history as a former military base, the perception of the local community is that the refuge projects a message of "hands-off" and "stay out." Yet the refuge has many unique natural resources and a diverse cultural history to share with visitors. The absence of dedicated visitor services staff for the refuge has resulted in few public interpretive programs or environmental education on or off the refuge. The refuge currently relies on volunteers to lead walks or other interpretive programs, which depends solely on their interest and availability. We continue to receive more requests than we can currently fill. Right now, our major interpretive materials consist of a general station brochure and one kiosk that provides information on the refuge, wildlife, and refuge management.

The refuge Web site also lacks information or links for teachers or students. Census estimates for 2008 indicate that 139,546 persons under 18 years old live in the three counties closest to the refuge: Rockingham and Strafford Counties in New Hampshire and York County in Maine. There is a tremendous opportunity for the refuge to help with environmental education in the area and to increase the appreciation and stewardship of the refuge through greater interpretation.

Strategies

Continue to:

- Provide limited environmental education and interpretation programs upon request
- Use volunteers, if available and interested, to conduct occasional guided walks along existing trails.

Within 2 years of CCP approval:

- Update exhibits and information panels and refuge Web site; improve visitor orientation.
- Set up a wildlife observation log book and a visitor register at the main kiosk.
- Re-route the Pevery Pond Trail and modify Ferry Way Trail to improve wildlife viewing opportunities. Once the former Weapons Storage Area fence is removed, shift the Ferry Way Trail as appropriate.
- Initiate guided interpretive walks that can be led by partners and volunteers.
- Investigate opportunities to engage more youth programs on the refuge and on partner lands.
- Investigate opportunities to expand relationship with faculty and student programs at Phillips-Exeter to expand research projects.

Within 5 years of CCP approval:

- Develop three to five key environmental education messages and activities associated with each message about the refuge flora, fauna, habitats, and ecosystems that can be used in environmental education programs with local school teachers, college faculty, and youth group leaders.
- Develop key interpretive themes and the major messages to convey about the refuge, its role in regional conservation, and how citizens can become better stewards of the environment. Use these themes and messages to update the interpretive panels at main kiosk at parking lot.
- Collaborate with GBNERR on creating shared stewardship messages and interpretive materials.
- Develop curriculum-based, multi-sensory, interdisciplinary, and learner-based environmental education activities that can be lead by volunteers; partner with others such as UNH Cooperative Extension Coverts Project, UNH Marine Docents, Seacoast Science Center, Great Bay Discovery Center, and others.
- Develop interpretive materials to highlight the prehistoric and historic land use history of the Great Bay area and the rich cultural history of refuge lands, including the history of Pease Air Force Base and its relationship to the Cold War.
- Replace the current paved parking lot with a permeable surface; consult with the UNH Stormwater Management Center to determine appropriate design and materials, and develop interpretive materials related to design.

Objective 4.3 (Hunting)

Continue to provide a quality annual deer hunt to manage the white-tailed deer population, protect habitat, and provide a priority, wildlife-dependent recreational opportunity. Within 3 years of CCP approval, evaluate the opportunity to expand hunting to include a wild turkey hunt and a fall bow season for deer.

Rationale

Prior to Service ownership, deer and waterfowl hunting were permitted by the Air Force, but it was limited to military personnel, retirees, and their dependents, and was only allowed in certain areas. From 1967 to 1989, the Air Force used hunting as a management tool, due to the need to minimize aircraft strikes on the runway. It was estimated that 8 to 10 deer were taken annually from throughout the former Pease Air Force Base. The Air Force also permitted waterfowl hunting only on Stubbs Pond and only for Air Force personnel, dependents, and retirees. The former base was closed to hunting from 1989 to 1993 in advance of the land transfer to the Service (USFWS 1995).

When the refuge was first proposed, the Service received public comments that deer hunting should continue, while others suggested that it be used only as a biological management tool. In response to these comments, a Hunt Plan was completed for the refuge in 1993 (USFWS 1993). In 1995, the Service completed an EA to evaluate establishing and conducting an annual public white-tailed deer hunting program and waterfowl hunting program on the refuge. The decision from this EA was to open the refuge to controlled hunting of white-tailed deer in accordance with all Federal, State, and local regulations (USFWS 1995).

The first white-tailed deer hunt on the refuge occurred in the fall of 1996 and has been held every year since then. The hunt is a 2-day, Saturday and Sunday hunt, by permit only. A maximum of 20 permits per day are drawn from a pool of applicants each year. From 1996 to 2007 the number of hunters has ranged from 13 to 22. The number of deer harvested during a given hunt has ranged from 8 to 22 deer, with a mix of does and bucks taken. The refuge is closed to all other public uses during the 2-day deer hunt.

The refuge shoreline is open to waterfowl hunting, with access by boat only. Land access for waterfowl hunting is not allowed on the refuge.

Both Pease Airport Authority and NHFG support offering a wild turkey hunt on the refuge. First, offering a wild turkey hunt will provide a priority, wildlife-dependent recreational opportunity to refuge visitors. According to NHFG, there is an adequate population of wild turkeys at the refuge to support a hunt (Bridges, pers. comm., 2011). Second, Pease Airport Authority believes a hunt would help reduce the airport's turkey population. Currently, turkeys are the greatest hazard to airport operations (i.e. bird-air strike hazard). Although we do not have a specific proposal, we will evaluate whether to offer either a spring or fall turkey hunt, or both. During the State's spring turkey season, hunters are only allowed to harvest males (gobblers). However, hunters are allowed to harvest females during the fall season, which would likely better control the turkey population. We would also consider developing a youth turkey hunting program, in cooperation with NHFG and other partners, to extent practicable and there is interest.

Strategies

Continue to:

- Work with NHFG to handle the permit applications for the existing refuge deer hunt.

- Maintain closure on recreational trapping on the refuge.

Within 3 years of CCP approval:

- Evaluate the opportunity to expand the hunt program to include a fall bow season for deer and a turkey season. Develop a youth turkey hunting program, in cooperation with NHFG and other partners, to the extent practicable and there is interest.

- Work with NHFG to evaluate closing the shoreline of the refuge, including Herods Cove, to waterfowl hunting to protect estuarine habitats and associated species.

Objective 4.4 (Fishing)

Provide maps and other information on off-refuge fishing opportunities to refuge visitors and continue to assess the potential to open the refuge to fishing in the future by annually monitoring the level of contaminants in refuge sediments and fish and assessing the potential health risks from consuming refuge fish.

Rationale

Upper Peverly, Lower Peverly, and Stubbs Ponds were historically stocked and fished by the Air Force as we detailed in chapter 2 under “Freshwater Impoundments.” The two Peverly Ponds were stocked with largemouth bass, rainbow trout, and brook trout. Upper Peverly Pond was also stocked with crayfish. Stubbs Pond was stocked with largemouth bass, crayfish, and alewife.

Despite this fishing history, recreational fishing is not currently allowed on the refuge due to concerns with contaminant levels in the sediments and fish and potential risks to human health. Mercury is present in the fish in Upper Peverly Pond. Before any public fishing is allowed, additional fish studies should be done. We would continue to promote other off-refuge fishing opportunities around the Great Bay Estuary.

Strategies

Continue to:

- Keep refuge closed to fishing.
- Prohibit boats from landing on refuge shoreline.
- Conduct outreach and enforcement to ensure that fishing and boat landings do not occur.

Within 1 year of CCP approval:

- Promote fishing opportunities available at established fishing sites around Great Bay.
- Develop a fact sheet on why fishing is not allowed on the refuge and offering off-refuge sites where they can pursue fishing.
- Train volunteers to answer questions about fishing.

Within 5 years of CCP approval:

- In conjunction with water quality studies in the Peverly Brook system, establish a schedule to conduct periodic sampling of fish to determine whether they continue to pose a risk to human health if consumed. Establish conditions under which, over time, the refuge might consider opening up to recreational fishing.

GOAL 5.

Contribute to the recovery of the federally listed endangered Karner blue butterfly and other rare Lepidoptera through the conservation, protection, and restoration of the pine barrens habitat.

Objective 5.1 (Habitat Management)

Working with NHFG and other partners, protect, manage, and restore historic pine barren communities in the Concord area, including the refuge’s 29-acre easement, to benefit the federally listed endangered Karner blue butterfly, other rare Leiodoptera, and shrubland bird species.

Rationale

Great Bay Refuge also includes a 29-acre conservation easement in the pine barrens of Concord, New Hampshire, in Merrimack County (map 3.13). The property is managed primarily for the federally listed endangered Karner blue butterfly. The easement is approximately 45 miles west of Great Bay Refuge. The parcel abuts the Concord Airport and is within a fragmented, but important complex of remnant pine barrens habitat that supports rare moths and butterflies. The easement land is a mix of open pitch pine-scrub oak, pine-hardwood, and other scrubland (map 1.2).

Karner blue butterflies inhabit pine barrens, an early successional community composed of 4 distinct vegetative strata: herbaceous, heath, scrub, and canopy. Within the scrub and canopy strata, shade-providing pitch pine and scrub oak dominate. The lower strata include grasses, vascular plants, and heath. Throughout these layers little bluestem and big bluestem are the principle grass species. New Jersey tea, spreading dogbane, lowbush blueberry, and huckleberry, as well as State threatened wild lupine, blunt-leaved milkweed, and golden heather comprise the majority of the herbaceous and heath layer and provide a critical source of nectar (USFWS 2003).

Currently, Karner blue butterflies are restricted to fragmented pine barren remnants, highway and powerline rights-of-way, airports, military camps, and gaps in forest stands that support their obligate host plant, wild lupine (USFWS 2003). Karner blue butterflies, as well as other members of the family Lycaenidae, are highly susceptible to environmental changes and population declines. The limiting factors for Karner blue butterflies have been compounded by a severe loss of habitat. Nearly 90 percent of historic pine barren communities along the Merrimack River have been lost (Helmbolt and Amaral 1994). This makes the 29-acre Karner blue butterfly conservation easement especially important to the survival of this species in the Concord pine barrens.

Habitat restoration and management on the Karner blue butterfly conservation easement began in 1996 and has included removal of overstory vegetation using a hydroaxe, brontosaurus, pruning, and prescribed fire to create openings and grassy patches to allow wild lupine, the host plant of larval Karner blue butterflies, to thrive. The U.S. Department of Agriculture–Wildlife Services assisted with woodchuck removal and fencing to prevent browsing of lupine. Over time, most of the 29 acres has been managed.

In 2004, a spearhead was found on the easement, which changed the pace and process for active management. We have been cooperating with the SHPO to conduct surveys in areas they request. The SHPO has also reviewed the 5-year Lupine Restoration Plan and indicted several areas where they recommend testing occur. The Guard funds currently cover the cost of hiring a consultant to conduct these surveys. An old farm site dating to 1800s is also on the easement. NHFG is developing methods for planting native lupine seed that would avoid conflict with cultural resources.

Concord school kids have helped grow and plant lupine. “Kids for Karners” is a program started by National Wildlife Federation and NHFG around 2000. In the past 9 years, over 1,700 lupine plants have been grown by local school children and planted on the Service’s easement. The project includes a teachers training in the winter, classroom plantings in the spring and a field trip to the easement at the end of the school year to plant lupine and tour the Concord pine barrens.

As part of a mitigation agreement, the Guard has provided \$80,000 a year to NHFG for habitat management of the pine barrens around the airport, including



on the Karner blue easement. NHFG has also used funds from the State moose plate program, Section 6, and State Wildlife Grants to implement habitat management. In addition to habitat management on the 29-acre easement, NHFG also manages 320 acres within conservation management zone of 450 acres on city of Concord lands.

Strategies

Continue to:

- Compile current cultural resource inventories and, in cooperation with SHPO, identify additional survey work needed to protect cultural resources in conjunction with site plan implementation.
- Support NHFG with habitat management actions, including prescribed burning, when and where resources allow.
- Post and maintain easement boundary and protect habitat from adverse impacts.
- Identify funding sources or mechanisms to maintain sufficient funding for habitat management

Within 3 year of CCP approval:

- Work with Service's Ecological Services Concord, New Hampshire office to conduct programmatic Section 7 consultation to cover incidental take of Karner blue butterflies associated with habitat management on the easement and adjacent airport.
- Update HMP to include habitat management for the Karner Blue Butterfly easement. Include information such as which vegetation manipulations should occur, when they should occur, and/or under what conditions. Potential treatment methods including prescribed fire, hydroaxing or brushhogging, herbicides, manual pulling, planting or seeding of native lupine.
- Facilitate NHFG's efforts to seed native lupines and avoid conflict with cultural resources; schedule archaeological surveys as soon as practicable in high priority lupine seeding sites.
- Support NHFG and the Service's Ecological Services office efforts to protect and manage additional acreages to meet revised population and goals identified in latest population viability model.

Monitoring Components

- Prioritize monitoring needs in conjunction with site plan implementation.

Objective 5.2 (Species Management)

In collaboration with New Hampshire Fish and Game and the Karner Blue Butterfly Recovery Team, restore and sustain a viable Karner blue butterfly population for the entire Concord pine barrens recovery unit through captive rearing and release. The population goal for the refuge easement is a viable sub-population that produces at least 750 wild-born individuals in any one brood on the Service's conservation easement lands, sustained for at least 4 out of 5 consecutive years.

Rationale

In 1992, the Karner blue butterfly was listed as federally endangered. The population at the Concord pine barrens is the only population in New England. The distribution of Karner blue butterflies is largely dependent on the availability of wild lupine, the larval food source, and preferred native nectar

sources (Schultz and Dlugosch 1999). These plants occur in pine barrens communities, which occur primarily on glacially deposited sand, shale, and serpentine soil types in parts of eastern North America (NHFG 2006). In New Hampshire, this community type once spanned the Merrimack River valley from Canterbury to Nashua, occupying Windsor sandy loams and Hinckley cobbly sandy loams (VanLuven 1994). Today, only the Concord pine barrens supports a population of Karner blue butterflies. The Concord population represents the easternmost extent of this species' distribution and is separated from the nearest population in New York by over 140 miles (225 kilometers) (Helmbolt and Amaral 1994). This butterfly formerly occurred in a band extending across 12 states from Minnesota to Maine and in the province of Ontario, Canada.

Without enough suitable habitats to support a viable population, the Karner blue butterfly became extirpated in New England in 2000 (Amaral 2000), and was subsequently reintroduced. The PSNH lands off Pembroke Road, north of the refuge easement, was the site of the last remaining wild population. In 2000, TNC found only 6 eggs, none of which hatched. NHFG began a captive rearing program in 2000 to restore a viable population. The Karner blue butterfly captive rearing and reintroduction program is funded by the State and paid for with State Moose Plate Grants and Section 6 grants. The first adults from a population in New York were released in 2001. The first eggs and larvae were released in 2003. The program has focused primarily on the rearing and release of adult butterflies. Mark-recapture has been actively implemented since 2004 to track survival and breeding in the wild. The first mark-recapture surveys during the 2004 summer flight resulted in the observation of 22 "wild-born" unmarked Karner blue butterflies on the easement (out of 31 total including surrounding conservation lands on the airport). From 2001 to 2008, butterflies were only released on the refuge easement. The first release of butterflies on non-easement land occurred in 2009 due to a significant increase in captive reared adult numbers. In 2010, two releases of adult butterflies occurred (over 2,500 individuals in the Concord pine barrens).

Karner blue butterflies live only 4 days as adults. Each year, the population can produce two broods, with each brood being a separate generation. The highest population numbers from either brood in a particular year is used for recovery goal population estimates. The Karner Blue Butterfly Recovery Plan has a goal of one viable population in the Concord pine barrens recovery unit, consisting of 3,000 wild-born individuals. A viable population is further defined as a minimum 3,000 individuals (in either brood) that is sustained for at least 4 out of 5 consecutive years. Any year that does not meet 3,000 individuals, has to have a minimal population of at least 1,500 individuals, and the final year has to reach at least 3,000 individuals. Recent population viability analysis indicate that 3,000 individuals is not sufficient to sustain a viable population (Fuller 2008), and the recovery goal may be updated in the future.

In 2008, the easement produced 56 wild individuals. In 2010, the entire Concord pine barrens produced 313 wild individuals and a total of 3,749 captive-reared individuals were released (1,300 individuals in the first brood; 2,449 individuals in the second brood).

Strategies

Continue to:

- Support the Karner blue butterfly captive rearing and translocation program conducted by NHFG, through the partnership outlined in objective 5.5.
- Implement recovery plan actions when and where possible.
- Within in 2 years of CCP approval:

- Evaluate effectiveness of captive-rearing program and develop milestones for reaching recovery goals.
- Support NHTG and the Service's Ecological Service's efforts to update recovery population goals based on latest population viability model.
- Determine if easement lands are being managed sufficiently and effectively to contribute to Karner blue butterfly management and recovery.

Monitoring Components

Support NHTG monitoring program for the Karner blue butterfly on the refuge easement to document recovery as per the Federal Recovery Plan.

Objective 5.3 (Outreach and Education)

Within 3 years of CCP approval, install new and expanded interpretive signs and trail on the Karner blue butterfly conservation easement, establish a program of guided walks, create additional Web-based information, and work with partners to improve enforcement on easement lands.

Rationale

The Karner blue butterfly conservation easement is within walking distance of many businesses and residential homes. An unpaved right-of-way runs through the center of the easement, which is gated at each end. A kiosk at the west entrance explains about the ecology of the Karner blue butterfly, but needs updating.

As we described in chapter 2, the easement has a 0.4-mile hiking trail for visitors; however, there is no interpretive signage along the trail to make the public more aware of the pine barrens ecosystem and associated management issues, and to protect the sensitive areas within the easement. Under alternative B, we propose to develop a 0.1-mile addition to the trail and provide quality self-guided interpretive panels along the entire length.

In addition, more information on the Karner blue, pine barrens, and the easement is needed on the Service's Web site, with links to NHTG and other partners. Law enforcement is a concern given the sensitivity of the resource, proximity to a human population, and lack of any regular onsite staff.

Strategies

In addition to alternative A, and within 3 years of CCP approval:

- Add approximately 0.1-mile to the existing 0.4 mile trail and establish self-guided interpretive panels along its length. Panels will explain butterfly ecology and management, to enhance the visitor's understanding and experience. The trail will be clearly designated as the approved footpath to reduce impact on sensitive resources off-trail.
- Upgrade existing kiosk with interpretive information about butterfly recovery efforts, pine barrens ecology, and warnings about Lyme disease. Construct an additional kiosk on east end of property with similar information.
- Provide volunteer-led group tours and interpretive talks onsite.
- Work with NHTG to develop interpretive materials and information.
- Improve Web site information and link to refuge and NHTG Web sites.
- Develop brochure that describes pine barrens ecology, other dependent species and aspects of biological diversity, in addition to butterfly ecology.

- Have Service law enforcement officers contact NHFG Conservation Officers and Service Special Agents to coordinate on visiting the site and enforcing against unauthorized uses.

Monitoring Components

- Monitor and evaluate the number of violations and take appropriate action to discourage future infractions.

Objective 5.4 (Land Protection)

In collaboration with New Hampshire Fish and Game and interested landowners, protect and manage approximately 850 additional acres of pine barrens habitat south of the city of Concord airport to augment the Service's Karner blue butterfly conservation easement.

Rationale

Historically, natural disturbances and Native American settlement patterns maintained open habitat for Karner blue butterflies in the Northeast. The Karner blue and its obligate host plant, wild lupine, have persisted in some developed areas, such as airports, utility rights-of-way, and road edges because moderate human disturbances mimic beneficial natural disturbances. However, urbanization and fragmentation by roads and development in parts of the butterfly's range may have already degraded populations beyond what is needed to maintain viable populations (USFWS 2003, Fuller 2008). The butterfly can disperse across roads but may be hampered by traffic and wind. Also, small, isolated habitat patches do not seem to retain these butterflies (Fuller 2008). Preventing further fragmentation of existing habitats and connecting corridors is an important management priority.

Although intense development and habitat fragmentation continues in the region around the Concord pine barrens, the remaining undeveloped lands from the airport south to the Merrimack River are still mostly pine barrens habitat. Historically, the Concord area has always been an important patch of habitat for the Karner blue butterfly population along the Merrimack River corridor. Major development in the corridor has degraded or eliminated habitat; the exclusion of fire has also degraded pine barrens, which is fire-dependent.

The NHFG has identified potentially restorable areas between the powerline, which extends through the refuge's Karner blue easement, and the Merrimack River. This was identified as the best location to focus effort on Karner blue butterfly recovery. Karner blue butterflies have been observed traveling up to 1 mile along the powerline corridor. The Army National Guard is in the process of acquiring the remaining potentially good undeveloped Karner blue habitat south of the current management area. They plan to construct a classroom-training facility in the front section of the property, with a lighter footprint in the back of the property. The NHFG intends to work with the Guard on maintaining as much Karner blue butterfly habitat as possible.

Strategies

Within 2 years of CCP approval:

- In partnership with NHFG, the Service's Ecological Services, city of Concord, landowners, and other partners, evaluate role of the refuge in acquiring additional lands—in fee simple or conservation easement—from interested landowners within the focus area, to expand protection and management for the federally endangered Karner blue butterfly.
- If determined that refuge has a role, then proceed with necessary administrative process. The Service will only acquire lands from willing sellers, either in fee simple or as conservation easements.

Objective 5.5 (Partnerships) Establish a formal partnership with New Hampshire Fish and Game to continue and enhance the existing collaboration on Karner blue butterfly species and habitat management and develop new partnerships with local businesses, land trusts, and other entities to enhance and expand Karner blue butterfly population and pine barrens habitat restoration.

Rationale

The Karner blue butterfly conservation easement was established in July 1992 through a cooperative agreement between the Service, the city of Concord, the CCDC, the U.S. Postal Service, and TNC. From 1992 to 1999, TNC carried out most of the management on the easement, which included removal of unwanted vegetation by mechanical methods and with prescribed burns and planting of wild lupine. Since 2000, NHFG has conducted the onsite management which has continued with vegetation removal, plantings, moth and butterfly surveys, and a captive rearing program.

The refuge has administrative responsibility for the easement. Given that Great Bay Refuge is unstaffed, these responsibilities lie with the refuge manager at Parker River Refuge. The Service has maintained an



Greg Thompson/USFWS

Great Bay Refuge welcome sign

informal partnership with NHFG, as they implement onsite management and captive rearing of the Karner blue butterflies. A more formal agreement is needed to ensure that continued funding and support for habitat management, captive rearing, and law enforcement. The Service also seeks to expand other partnerships including with TNC and the New Hampshire Prescribed Fire Council in relation to the use of prescribed fire. Local land trusts and area businesses may be able to help the Service advance its goals of restoring healthy populations of Karner blue butterflies to the Concord pine barrens.

Strategies

Within 5 years of CCP approval:

- Participate in New Hampshire Prescribed Fire Council to enhance safety and share resources while implementing prescribed burning on the easement.
- Develop a memorandum of understanding (MOU) with NHFG regarding cooperation and funding for species and habitat management, monitoring and law enforcement of easement lands.
- Develop stronger partnerships with local land conservation groups to assist with recovery of Karner blue butterflies and pine barrens habitat in the area.
- Engage at least 20 percent of the corporate business employees in adjacent industrial park in developing and implementing a volunteer/community service program within the next 5 years.

Alternative C— Emphasis on Natural Processes

Alternative C relies primarily on ecosystem processes—such as natural disturbances—to maintain or restore the biological integrity, diversity, and ecological health of the refuge. Under this alternative, we envision the refuge as a place that retains its capacity to regenerate, reproduce, sustain, adapt, and evolve with minimal human influence (Karr 2004). Most active management under this alternative would be implemented to restore self-sustaining natural communities and ecological processes. Some active management or restoration would be needed to address human-induced threats such as invasive species control and removal of water control structures and other infrastructure. We would evaluate the role of natural processes such as fire in restoring and maintaining oak-hickory forests. Grasslands and shrublands would be allowed to naturally succeed to forested conditions.

All three impoundments in the Peverly Brook drainage would be removed and the brook restored to stream habitat. Prior to removal of each dam we would remove invasive plants and contaminated sediments. Our objective is to improve water quality and habitat for migratory fish and other aquatic organisms. We would work with partners to restore oysters and eelgrass to the Great Bay Estuary to improve the bay's environmental health.

We would remove all remaining structures in the former Weapons Storage Area and any other remaining structures. Under alternative C, we would create more public access into the refuge, since we anticipate a reduction in sensitive grassland, shrubland, and waterfowl breeding areas. These areas would succeed to forest, or be restored to estuarine habitat, accordingly. A proposed new trail out to Woodman Point would use a portion of an existing management road. Most of the other existing management roads would be retired and restored to natural habitat. Similar to alternative B, structures at Fabyan Point would be removed and a new trail constructed that provides a view of the bay.

Our proposal for managing the Karner blue butterfly easement would be similar to alternative B.

Map 3.14 shows the habitat management proposed under alternative C, while map 3.15 depicts the proposed public use facilities.

GOAL 1.

Perpetuate the biological integrity, diversity, and environmental health of estuarine and freshwater habitats on Great Bay Refuge to protect water quality and sustain native plant communities and wildlife, including species of conservation concern.

Objective 1.1 (Salt Marsh)

Maintain the quality and natural function of the existing 36 acres of salt marsh and restore up to an additional 44 acres of salt marsh and other estuarine habitats through the removal of Stubbs Pond dike to support a mix of native high and low marsh plant species including smooth cordgrass, salt meadow cordgrass, spikegrass, and black grass for breeding salt marsh sparrow, wintering American black ducks, foraging wading birds, fish, and rare plants.

Develop an index of ecological integrity for the refuge's salt marsh habitat and establish a baseline for future monitoring of its biological integrity in order to sustain quality habitat for breeding salt marsh sparrow, wintering American black ducks and other waterfowl, foraging wading birds, fish, shellfish, and rare plants. Implement strategies, as warranted by monitoring results, to ensure no degradation of integrity occurs and that the salt marsh continues to support a mix of native high and low marsh plant species with less than 1 percent overall cover of invasive plants.





Rationale

In addition to alternative B, the removal of the Stubbs Pond Dam would provide the opportunity to restore up to 44 acres of additional salt marsh and associated estuarine habitat; potentially up to 80 acres of contiguous salt marsh habitat. An analysis of a 1916 topographic map shows Peverly Brook draining into a large salt marsh complex connected to Herods Cove (TNC, Ray Konisky, personal communication). According to TNC, this was the largest contiguous expanse of salt marsh on Great Bay proper and as such would offer the greatest potential for restoration with removal of the Stubbs Pond Dam. While we propose that up to 44 acres might be restored to salt marsh, further evaluation would be necessary before we could provide an accurate estimate of restoration potential. It is possible that the developments that have occurred in the Peverly Brook might have affected the hydrology of the system, and the elevation of the pond bottom, e.g., deposition might have occurred, to the point that it would difficult to reestablish salt marsh without a lot of earth moving. We are also concerned about creating a disturbance that would improve conditions for *Phragmites* to dominate. Similar to alternative B, we would want to conduct a bathymetry study to establish what the elevations are in the pond relative to the existing salt marsh and the brook. This information would help us determine the potential for salt marsh migration, whether naturally occurring or actively manipulated.

See alternative B, objective 1.1 for more details on the importance of salt marsh habitats and the development of an index of ecological integrity.

Strategies

In addition to alternative B:

- Work with partners to develop a restoration plan for this site and initiate removal of the Stubbs Pond Dam and associated infrastructure. See also objective 1.3.

Objective 1.2 (Intertidal and Shallow Estuarine Waters)

Work with partners to protect and restore the health and function of Great Bay Estuary's intertidal habitats, and sustain up to 2 acres of oyster beds around Nannie Island and Woodman Point and restore and maintain eelgrass beds within Herods Cove, contributing to the restoration of these populations within the Great Bay Estuary and maintaining healthy habitats for horseshoe crabs, softshell clams, and other estuarine life.

Rationale

See rationale for alternative B, goal 1, objective 1.2.

Strategies

Same as alternative B

Objective 1.3 (Peverly Brook System)

Restore the 1.52 miles of Peverly Brook on the refuge to stream habitat by removing the three impoundment infrastructures and restoring native freshwater wetland, salt marsh, and riparian vegetation, to improve water quality, enhance natural flow regimes, improve migratory and resident fish habitat, and estuarine habitats for salt marsh sparrows, horseshoe crabs, and other species of concern.

Rationale

The refuge maintains three freshwater impoundments on Peverly Brook: Lower Peverly, Upper Peverly, and Stubbs Ponds. All three impoundments are interconnected and fed by springs and small tributaries. Restoring these impoundments to more natural stream habitat coincides with efforts throughout the State to remove dams and restore rivers and streams to benefit fish,

freshwater mussels, and other aquatic organisms. The Peverly Brook system, if restored, could benefit migratory fish that are currently barred by the dams and dikes from moving up- and downstream. Although the initial investment in time and resources to restore these habitats would be high, in the long term, removal of the dams will eliminate the time-intensive water level manipulations currently used to manage the impoundments. Natural processes, including an active beaver population, will create a diversity of microhabitats along the Peverly Brook drainage that will benefit migratory fish, waterfowl, and waterbirds, although we anticipate that the numbers of waterfowl and waterbirds using these habitats will be less than the numbers currently documented for the existing impoundments.

According to the NHDES, sediments from Upper Peverly Pond exceeded acceptable limits for nickel and cadmium in the past. Currently the contaminant levels are near acceptable levels, but are still not safe for fish consumption. Prior to the removal of each of the impoundments, we would develop and implement methods to control existing invasive aquatic plant populations (including brittle waternymph) and remediate any remaining contaminated sediments to ensure that downstream habitats are not adversely affected by the dam removals. In addition, we would develop restoration plans for each impounded area prior to initiating removal of impoundment infrastructures.

Strategies

Within 1 year of CCP approval:

- Prior to dam removal evaluate the presence of the invasive brittle waternymph in Lower Peverly Pond and Stubbs Pond to assess potential for infesting Herods Cove. Eradicate prior to dam removal, if needed.
- Conduct sediment and water quality (for metals) monitoring in Lower Peverly and Stubbs Ponds to establish pre-dam removal baseline. One year after the removal of the Lower Peverly Dam, conduct post-dam removal monitoring of Stubbs Pond.
- Begin required permitting process to remove the earthen dam and associated structures on Lower Peverly Pond, following sediment and water quality monitoring. Grade, contour, and restore the natural streambed, bank, and riparian area. Seek technical and financial assistance from potential partners including Department of Defense, Ducks Unlimited and/or others. Consult with the SHPO to determine if Lower Peverly Dam is eligible for the National Register and to minimize any potential impacts of its removal on cultural resources.
- Begin required permitting process for removal of the Stubbs Pond dike.
- Evaluate the presence of environmental contaminants in the sediments of Upper Peverly Pond and evaluate the impact of dam removal on downstream water quality. If determined to be high, then remediate/remove sediment, then begin permitting process for the removal of the Upper Peverly Pond dam.
- Discontinue use of roads to impoundments that are no longer needed for management access and restore to natural vegetation.
- Establish and implement protocol to monitor fish response to dam removals.
- Monitor water quality for contaminants in conjunction with airport operations in particular de-icing.

- Every 3 years, map invasive plants in the Peverly Brook system for 15 years after restoration.

Within 3 years of CCP approval:

- Develop monitoring plan to assess whether restoration objectives are met, and their effects on biological integrity, diversity, and environmental health.

Within 5 years of CCP approval:

- Establish and implement a protocol for routine monitoring of seaside mallow in restored salt marsh areas.

GOAL 2.

Perpetuate the biological integrity, diversity, and environmental health of upland and forested wetland habitats on Great Bay Refuge to sustain native plant communities and wildlife, including species of conservation concern.

Objective 2.1 (Appalachian Oak-Hickory Forests)

Restore and maintain 852 acres of Appalachian oak-hickory forests to sustain the suite of characteristic species including red, black, and white oak, and shagbark hickory and less than 5 percent cover of invasive plant species, to provide breeding habitat for birds of conservation concern including scarlet tanager, Baltimore oriole, and wood thrush among other mixed-forest dependent species, and to maintain the exemplary natural communities of Appalachian oak-hickory forest on the refuge.

Rationale

The rationale for alternative B, goal 2, objective 2.1 explains the significance of this habitat type for many Federal trust species and other species of conservation concern. Under alternative C, we propose to further expand this habitat by allowing grasslands and shrublands to succeed to forest, and by restoring riparian habitat along Peverly Brook in conjunction with the proposed dam removal. Alternative C would rely primarily on ecosystem processes—such as natural disturbances—to maintain or restore the biological integrity, diversity, and ecological health of the refuge.

Strategies

In addition to alternative B strategies:

- Remove all roads east of the Peverly Brook drainage and rehabilitate former road sites.
- Allow grasslands and shrublands to succeed naturally, resulting in a total of 852 acres of forest.
- Evaluate the historic role of fire in maintaining upland forests in this area. Implement prescribed fire (natural or prescribed) as determined to be suitable and feasible.

Objective 2.2 (Forested and Scrub-Shrub Wetlands, and Vernal Pools)

Maintain 169 acres of forested wetlands, scrub-shrub wetlands, and vernal pools within the larger matrix of oak-hickory forests and Peverly Brook drainage, to sustain high water quality and native shrub vegetation such as speckled alder, spicebush, silky dogwood, and winterberry and less than 10 percent invasive plant species. This mosaic of wet forests and shrublands, including some that function as vernal pools, will benefit obligate amphibians such as the wood frog, foraging woodcock, breeding willow flycatcher and other birds of conservation concern, and native plant communities.

Rationale

See rationale for alternative B, goal 2, objective 2.2.

Strategies

In addition to alternative B:

- Remove the small water control structure on the road to Stubbs Pond and restore wetland community.
- Maintain the small water control structure on the Ferry Trail that prevents flooding from beaver activity.
- Monitor the reptile, amphibian, and bird communities and monitor water quality and quantity to ensure environmental health of these wetland communities
- Monitor the hydro-period of the vernal pools and evaluate their ability to provide breeding habitat for amphibians and reptiles under climate change.

Objective 2.3 (Upland Shrubland)

Allow natural succession of upland shrub communities to forest habitat, while continuing to control invasive plant species to ensure less than 25 percent cover among native plants. Over the next 15 years, no shrub habitat would be managed.

Rationale

Our emphasis under this alternative is to reduce the human management footprint and allow natural ecosystem processes to create and modify native plant communities. Many native shrubs occur on the refuge—highbush blueberry, black huckleberry, dogwoods, arrowwood, bayberry, meadowsweet, raspberry, sensitive fern, sumac, elderberry. Many of these species would continue to occur in the forest understory for the life of this plan and natural disturbance (e.g., wind and ice storms, disease, etc.) would continue to create small patches of shrublands (5 acres or less). However, we anticipate losing large shrub blocks (greater than 20 acres). Additional shrub habitat, such as alder thickets, would be maintained in wetland areas. We recognize that some animal species of concern require larger blocks of shrub habitat and would likely become less common on the refuge.

If we pursue additional land acquisition in Dover/Concord area, we anticipate using active management under this alternative to manage for New England cottontail and Karner blue butterfly as that is the primary purpose of those land protection efforts.

Strategies

Within 2 years of CCP approval:

- Complete the inventory and mapping of invasive plant species. Prioritize invasive species to be controlled and implement control using biological, ecological, mechanical, or chemical as needed.
- Stop active management (e.g., “brontosaurus”, hydro-ax, prescribed fire) of shrub habitat, except as needed to control invasive plant species.

Objective 2.4 (Grassland)

Allow 169 acres of existing grasslands to transition through natural succession to oak-hickory forest or other natural community types, based on site capability. Allow natural disturbances to occur, while continuing to control invasive plant species to ensure less than 15 percent cover among native plants. Over the next 15 years, no grassland habitat would be managed.

Rationale

Although grassland-dependent wildlife species are in decline in the Northeast, the historical record is unclear on which species were successfully breeding here prior to extensive land clearing by settlers. Under this alternative we

are managing for site capability, with reliance on natural processes primarily. Grasslands require intensive management to maintain and therefore are not consistent with this alternative. Likely some natural disturbances—such as small lightning fires, wind storms, hurricanes, beaver activity—will continue to occur and create patches of grassy habitat. We are also uncertain if the refuge lands can provide a large enough grassland habitat complex (e.g., greater than 120 acres) to entice upland sandpipers to breed here. Furthermore, the upland sandpiper has probably always been rare in New Hampshire, and perhaps did not arrive until after 1800. Other wildlife species that utilize disturbed sites, such as fields, would continue to find patches of habitat across the landscape resulting from natural disturbances.

Strategies

Within 5 years of CCP approval:

- Complete the inventory and mapping of invasive plant species. Prioritize control of woody invasive species using biological, ecological, mechanical, or chemical methods, as needed.
- Except as discussed elsewhere under historic resources, remove any remaining structures, including those within the former Weapons Storage Area.
- Stop active management (e.g., “brontosaurus,” hydro-ax, prescribed fire) of grassland habitat, except as needed to control invasive plant species.
- Discontinue use of refuge management roads to grassland areas that are no longer needed and restore roads to natural vegetation.

GOAL 3.

Foster and maintain conservation, research, and management partnerships to promote protection and stewardship of the ecological resources of the Great Bay Estuary.

Objective 3.1 (Great Bay Resource Conservation, Research, and Management Partnerships)

Expand key partnerships to promote land conservation, stewardship, research and management of resources of concern within the Great Bay Estuary. These include the Great Bay Resource Protection Partnership, Piscataqua Region Estuaries Partnership, Coastal Watershed Invasive Plant Partnership, Pease Development Authority Wildlife/Bird Strike Hazard Committee, and the New England Cottontail Working Group, among others.

Rationale

See rationale for alternative B, goal 3, objective 3.1.

Strategies

Same as alternative B, except that:

- The research and management topics will be more focused on restoring and maintaining natural communities, understanding ecosystem processes, and controlling invasive plant populations.

Objective 3.2 (Landscape-Scale Conservation Partnerships)

Over the next 15 years, expand partnerships to address the refuge’s role in landscape-scale conservation issues including climate change, regional population trends, research priorities, land use changes, and water quality.

Rationale

See rationale for alternative B, goal 3, objective 3.2.

Strategies

Same as alternative B, except that:

- The research and management topics will be more focused on restoring and maintaining natural communities and understanding ecosystem processes.

Objective 3.3 (Education and Outreach Partnerships)

Within 5 years of CCP approval, support and coordinate with area environmental education facilities such as the Great Bay Discovery Center and the Seacoast Science Center, as well as area schools, to advance wildlife conservation and refuge goals.

Rationale

See rationale for alternative B, goal 3, objective 3.3.

Strategies

Same as alternative B.

GOAL 4.

Promote enjoyment and awareness of the Great Bay Refuge and Great Bay Estuary by providing high-quality, compatible, wildlife-dependent public uses on refuge lands and on partner lands and waters around the refuge.

Objective 4.1 (Wildlife Observation and Photography)

Provide enhanced high quality wildlife observation and photography opportunities, including new, quality, self-guiding opportunities by enhancing the refuge's two existing trails, and creating two new trails through forested habitats.

Rationale

See rationale for alternative B, goal 4, objective 4.1.

Strategies

In addition to alternative A, and within 3 years of CCP approval:

- Develop new interpretive materials that describe the Service's goal of restoring natural communities on the Great Bay Refuge.
- Create a new trail out to Woodman Point using the existing management access road.
- Highlight wildlife observation and photography opportunities on the refuge Web site.
- Improve trail sign location, including installing "No Dogs" and "No Bicycles" signs at trailheads.
- Develop a bird or watchable wildlife checklist for the refuge.
- Create a hotspot for the refuge on eBird and encourage visitors to post their sightings. Include a link to eBird on the refuge's Web site.
- Conduct a refuge photo contest during June through August. Check with local businesses for potential prize donations.
- Establish a hiking trail and observation deck at Fabyan Point.

Objective 4.2 (Environmental Education and Interpretation)

Within 5 years of CCP approval, 90 percent of refuge visitors contacted will be able to identify the refuge's purpose, name at least one habitat and associated wildlife species of conservation concern, or know the regional importance of the refuge to the health of the Great Bay Estuary through their experiences at the refuge or with one of our partners around Great Bay.

Rationale

See rationale for alternative B, goal 4, objective 4.2.

Strategies

Same as alternative B.

Objective 4.3 (Hunting)

Continue to provide a quality annual deer hunt to manage the white-tailed deer population, protect habitat, and provide a priority, wildlife-dependent recreational opportunity. Within 3 years of CCP approval, evaluate the opportunity to expand hunting to include a wild turkey hunt and a fall bow season for deer.

Rationale

See rationale for alternative B, goal 4, objective 4.3.

Strategies

Same as alternative B, with the addition of the following, within 3 years of CCP approval:

- Evaluate need to vary deer hunt locations, given greater public access proposed under this alternative.
- Explore expansion of hunting opportunities to include wild turkey hunting and fall bow season for white-tailed deer.
- Evaluate the program through staff observation and hunter contacts.
- Partner with other organizations, such as the National Wild Turkey Federation, to conduct hunter education classes.

Objective 4.4 (Fishing)

Provide maps and other information about off-refuge fishing opportunities to refuge visitors.

Rationale

Under alternative C, we would remove all dikes on the refuge. Because of this the refuge would no longer support open water habitat. Therefore, we do not anticipate that there would be any fishing opportunities on the refuge. There are many other opportunities for fishing near the refuge and we would continue to promote and provide information these off-refuge opportunities to refuge visitors.

Strategies

Same as alternative B.

GOAL 5.

Contribute to the recovery of the federally listed endangered Karner blue butterfly and other rare Lepidoptera through the conservation, protection, and restoration of the pine barrens habitat.

Objective 5.1 (Habitat Management)

Maintain and manage the Service's 29-acre Karner blue butterfly conservation easement, comprised of pine barrens habitat, for the Karner blue butterfly and other rare Lepidoptera in collaboration with the New Hampshire Fish and Game and other partners.

Rationale

See rationale for alternative B, goal 5, objective 5.1.

Strategies

Same as alternative B.

Objective 5.2 (Species Management)

In collaboration with New Hampshire Fish and Game and the Karner Blue Butterfly Recovery Team, restore and sustain a viable Karner blue butterfly population for the entire Concord pine barrens recovery unit through captive rearing and release. The population goal for the refuge easement is a viable sub-population that produces at least 750 wild-born individuals in any one brood on the Service’s conservation easement lands, sustained for at least 4 out of 5 consecutive years.

Rationale

See rationale for alternative B, goal 5, objective 5.2.

Strategies

Same as alternative B.

Objective 5.3 (Outreach and Education)

Within 3 years of CCP approval, install new and expanded interpretive signs and trail on the Karner blue butterfly conservation easement, establish a program of guided walks, create additional Web-based information, and work with partners to improve enforcement on easement lands.

Rationale

See rationale for alternative B, goal 5, objective 5.3.

Strategies

Same as alternative B.

Objective 5.4 (Land Protection)

In collaboration with New Hampshire Fish and Game and interested landowners, protect and manage approximately 850 additional acres of pine barrens habitat south of the city of Concord airport to augment the Service’s Karner blue butterfly conservation easement.

Rationale

See rationale for alternative B, goal 5, objective 5.4.

Strategies

Same as alternative B.

Objective 5.5 (Partnerships)

Establish a formal partnership with New Hampshire Fish and Game to continue and enhance the existing collaboration on Karner blue butterfly species and habitat management and develop new partnerships with local businesses, land trusts, and other entities to enhance and expand Karner blue butterfly population and pine barrens habitat restoration.

Rationale

See rationale for alternative B, goal 5, objective 5.5.

Strategies

Same as alternative B.

Comparison of Objectives and Strategies for Great Bay Alternatives

Table 3.2 highlights the actions that distinguish each of the alternatives we present in detail above for Great Bay Refuge and the Karner blue butterfly easement. The table is organized to show how the objectives and strategies proposed under each alternative relate to refuge goals, resources, programs, and key issues to allow easy comparison of the alternatives. We have not included management actions that would not differ among the alternatives in this table. For more information on these activities, please refer to the “Actions Common to All of the Alternatives” discussion earlier in this chapter.

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
<p>Goal 1 Perpetuate the biological integrity, diversity, and environmental health of estuarine and freshwater habitats on Great Bay Refuge to protect water quality and sustain native plant communities and wildlife, including species of conservation concern.</p>			
<p>Issues Addressed: How will we balance the management of aquatic habitats for wetland-dependent birds, fisheries, and biological integrity? How will we manage the impoundments? Should we pursue restoration of wetland habitats through dam removal? How will we ensure the integrity of water quality to protect freshwater and saltwater-dependent species? How will we address environmental contaminants on the refuge? What role should the refuge have in helping to restore oysters and eelgrass beds to the Great Bay Estuary? How will the refuge manage exemplary natural communities and protect rare plant populations?</p>			
<p>Objective 1.1 Salt Marsh</p>	<p><u>Continue to:</u></p> <ul style="list-style-type: none"> ● Maintain the existing quality and function of 36 acres of salt marsh, including a mix of high and low marsh vegetation, with less than 1 percent cover of invasive plants ● Prohibit public access in salt marsh habitats ● Control any existing and new invasive plant species ● Participate in CWIPP's ongoing identification, monitoring, and eradication efforts for invasive plants in seacoast marshes 	<p><u>In addition to alternative A, and within 3 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Develop an index of ecological integrity to: <ul style="list-style-type: none"> ◆ Determine current baseline conditions ◆ Prioritize management actions ◆ Ensure no degradation of integrity ● Collaborate with partners to assess the Great Bay salt marsh sparrow population and the relationship of the bay's population to regional populations ● Work with GBRPP to identify and address sources of mercury into Great Bay, to extent possible ● Collaborate with GBNERR to track local sea level rise and anticipate effects on the Great Bay ecosystem ● Provide refuge visitors with information on the importance of salt marsh to the health of the Great Bay Estuary ● Implement an "early detection rapid response" program to prevent new invasive species from becoming established by immediately addressing newly detected populations ● Conduct waterfowl surveys with volunteers and partners 	<p><u>In addition to alternative B:</u></p> <ul style="list-style-type: none"> ● Work with partners to develop a restoration plan for this site and initiate removal of the Stubbs Pond Dam and associated infrastructure (see also objective 1.3)
<p>Objective 1.2 Intertidal and Shallow Estuarine Waters</p>	<p><u>This objective is not part of our current management</u></p>	<p><u>Within 3 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Work with NHFG and other Great Bay partners to restore oyster beds near Nannie Island and Woodman Point, and eelgrass beds in Herods Cove ● Work with NHFG and other Great Bay partners to reduce nutrient and sediment loading into Great Bay, which affects water quality, oysters, eelgrass, and other aquatic life ● Work with NHFG to protect the clam flats in Herods Cove from overharvest, through State regulation of shellfish harvesting ● Work with partners to study the importance of Great Bay Refuge shoreline as spawning/nursery habitat for horseshoe crabs; partner on assessing the health of horseshoe crab population in the Estuary ● Assess the need for additional protection of nesting bald eagles from human disturbance 	<p><u>Same as alternative B</u></p>

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 1 Perpetuate the biological integrity, diversity, and environmental health of estuarine and freshwater habitats on Great Bay Refuge to protect water quality and sustain native plant communities and wildlife, including species of conservation concern. (cont.)			
Objective 1.3 Freshwater Impoundments and Peverly Brook System	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Maintain and manage 62 acres of freshwater impoundments for migratory waterfowl fish and nesting birds; continue to address structural deficiencies in the dams ● Prioritize and control invasive plants impacting the impoundments ● Provide and manage alewife habitat in Stubbs Pond and ensure passage through the dike’s fish ladder for migratory fish, including alewife, American eel, and river herring ● Use adaptive management to maintain optimal mix of approximately 50 percent open water and 50 percent aquatic vegetation to benefit breeding waterfowl, marsh and wading birds, fish, and rare plants ● Control nonnative mute swans 	<p><i>In addition to alternative A (with exception of Lower Peverly Dam removal project noted below), and within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Annually maintain and inspect impoundment structures ● Facilitate movement of migratory fish through Stubbs Pond fish ladder from late April to mid July; work with NHFG and the Service’s Fisheries Program to evaluate effectiveness of the ladder ● Work with Service’s New England Field Office to monitor contamination and identify remediation options for Upper Peverly Pond ● Work with NHFG, NHDES, and NEFO to plan/design removal of Lower Peverly Dam impoundment structure and restoration of brook. Begin all requirements to obtain permits for the work ● Complete bathymetry study of Stubbs and Upper Peverly Ponds to help refine impoundment management ● Re-locate or construct additional osprey platform in new location at Stubbs Pond; move away from dike <p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Remove Lower Peverly Pond Dam and restore the existing 7-acre pond to stream habitat. Prior to dam removal: <ul style="list-style-type: none"> ◆ Evaluate the extent of brittle waternymph in the impoundments and determine control methods ◆ Assess Lower Peverly Pond for water and sediment contamination. If levels do not pose a concern for refuge resources, begin permitting process for dam removal ◆ Seek technical and financial assistance for partners 	<p><i>Within 1 year of CCP approval:</i></p> <ul style="list-style-type: none"> ● Conduct sediment and water quality (for metals) monitoring in Lower Peverly and Stubbs Ponds to establish pre-dam removal baseline; 1 year after the removal of the Lower Peverly Dam, conduct post-dam removal monitoring of Stubbs Pond ● Begin required permitting process to remove the earthen dam and associated structures on Lower Peverly Pond, following sediment and water quality monitoring; grade, contour, and restore the natural stream bed, bank, and riparian area; seek technical and financial assistance from potential partners including Department of Defense, Ducks Unlimited and/or others. ● Consult with the SHPO to determine if Lower Peverly Dam is eligible for the National Register and to minimize any potential impacts of its removal on cultural resources ● Prior to dam removal evaluate the presence of the invasive brittle waternymph in Lower Peverly Pond and Stubbs Pond to assess potential for infesting Herods Cove; eradicate prior to dam removal if needed. ● Begin required permitting process for removal of the Stubbs Pond dike.

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 1 Perpetuate the biological integrity, diversity, and environmental health of estuarine and freshwater habitats on Great Bay Refuge to protect water quality and sustain native plant communities and wildlife, including species of conservation concern. (cont.)			
Objective 1.3 Freshwater Impoundments and Peverly Brook System (cont.)			<ul style="list-style-type: none"> ● Evaluate the presence of environmental contaminants in the sediments of Upper Peverly Pond and evaluate the impact of dam removal on downstream water quality; if determined to be high, then remediate/ remove sediment, then begin permitting process for the removal of the Upper Peverly Pond Dam ● Discontinue use of roads to impoundments that are no longer needed for management access and restore to natural vegetation ● Establish and implement protocol to monitor fish response to dam removals ● Monitor water quality for contaminants in conjunction with airport operations in particular de-icing ● Every three years, map invasive plants in the Peverly Brook system for 15 years post restoration <p><i>Within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Develop monitoring plan to assess whether restoration objectives are met, and their effects on biological integrity, diversity, and environmental health. <p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Establish and implement a protocol for routine monitoring of seaside mallow in restored salt marsh areas.

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 2 Perpetuate the biological integrity, diversity, and environmental health of upland and forested wetland habitats on Great Bay Refuge to sustain native plant communities and wildlife, including species of conservation concern.			
<p>Issues Addressed: What is the appropriate contribution of the refuge to regional landscape goals of upland habitats including grassland and shrubland habitats? Which upland forest habitats and forest-dependent species should be management priorities? How should we manage the Weapons Storage Area? How will we manage nonnative invasive plants on the refuge? What role, if any, should the refuge play in restoring New England cottontail? How can the refuge manage exemplary natural communities?</p>			
<p>Objective 2.1 Appalachian Oak and Pine Forests</p>	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Manage 659 acres of Appalachian oak-hickory forest to maintain native plants, with less than 10 percent cover invasive plants, habitat for breeding birds of concern and exemplary natural communities ● Assess habitat potential for bat species including federally listed endangered Indiana bats, State-listed bat species ● Complete a vegetation map for Fabyan Point and Thomas property and update the natural community map for the rest of the refuge ● Complete inventory and mapping of invasive plants 	<p><i>In addition to alternative A and within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Allow an additional 41 acres of refuge habitat to naturally succeed to forest (for a total of 700 acres) ● Monitor natural succession of the four conifer plantations to oak-hickory forest ● Develop a comprehensive management program to prioritize and control invasive species ● Work with forest ecologists to determine appropriate management techniques to sustain species diversity, forest structure, and ecological integrity of oak-hickory forest community ● Develop management strategies for scattered patches of red pine (approximately 25 acres) on the refuge ● Survey for and locate potential roosting sites for bats species known to breed on the refuge (northern myotis, red bats, big brown, and eastern small-footed bat) using acoustic monitoring and radio tracking 	<p><i>In addition to alternative B:</i></p> <ul style="list-style-type: none"> ● Allow grasslands and shrublands to succeed naturally, resulting in a total of 852 acres of forest ● Remove all roads east of the Peverly Brook drainage and rehabilitate former road sites ● Evaluate the historic role of fire in maintaining upland forests in this area; implement prescribed fire (natural or human ignited) as determined to be suitable and feasible

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 2 Perpetuate the biological integrity, diversity, and environmental health of upland and forested wetland habitats on Great Bay Refuge to sustain native plant communities and wildlife, including species of conservation concern. (cont.)			
Objective 2.2 Forested and Scrub-Shrub Wetlands, Vernal Pools	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Maintain 149 acres of forested and scrub-shrub wetlands and vernal pool habitats to maintain high water quality and benefit obligate amphibians, foraging woodcock, breeding birds of conservation concern, and native plant communities ● Complete inventory of invasive species and prioritize control efforts ● Evaluate the existing amphibian and reptile monitoring data to determine future monitoring needs 	<p><i>In addition to alternative A and within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Maintain 158 acres of forested wetlands scrub-shrub wetlands, and vernal pools (the increase in forested wetlands over alternative A is due to the removal of Lower Peverly Pond and subsequent habitat restoration) ● Maintain water control structure off Ferry Way Trail to prevent flooding by beaver ● Inventory, map, and assess the quality of forested and scrub-shrub wetlands as vernal pool habitat and for rare plants ● Remove the water control structure from the 1-acre impoundment in the former Weapons Storage Area and plug the ditches to create wet shrub meadow habitat. ● If rehabbing access road to Stubbs Pond, install culvert to restore hydrological flow 	<p><i>In addition to alternative B:</i></p> <ul style="list-style-type: none"> ● Maintain 169 acres of forested wetlands; this is an increase in forested wetlands due to restoration of Upper and Lower Peverly Pond impoundments ● Remove the small water control structure on the road to Stubbs Pond and restore to wetland community ● Maintain the small water control structure on the Ferry Trail that prevents flooding from beaver activity ● Monitor the reptile, amphibian, and bird communities and monitor water quality and quantity to ensure environmental health of these wetland communities ● Monitor the hydro-period of the ephemeral vernal pools and evaluate their ability to provide breeding habitat for amphibians and reptiles under climate change

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 2 Perpetuate the biological integrity, diversity, and environmental health of upland and forested wetland habitats on Great Bay Refuge to sustain native plant communities and wildlife, including species of conservation concern. (cont.)			
Objective 2.3 Dry Shrubland	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Manage 26 acres of shrub habitat using mechanical tools to provide nesting, foraging, and migrating habitat for birds of conservation concern ● Complete inventory of invasive species and prioritize control efforts 	<p><i>In addition to alternative A and within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Maintain and manage at least 54 acres of shrub habitat (at least 28 additional acres over alternative A) ● Determine desired vegetation composition and ecological integrity components of the managed shrub community ● Develop a management plan that will sustain shrubland on a 15-year rotation ● Develop a restoration and monitoring plan for 25 acres of shrubland in the bunker areas at the south end of the Weapons Storage Area and the areas abutting this site outside the fenced WSA. ● Collaborate with NHFG and UNH to determine feasibility of a New England cottontail captive propagation program on the refuge for re-introduction to other areas in the region; if feasible, maintain the existing WSA fence around the proposed native shrub management area to provide safe habitat (free of mammalian predators) for New England cottontails. Shift rest of fence to create enclosure at north end of shrub management area ● Develop a shrub restoration partnership propagating native species and also working with local contractors to select and transfer dominant shrubs from development sites ● Modify one to two former bunkers to create conditions suitable for use as bat hibernacula. Evaluate conditions every 2 to 3 years and modify design as necessary. If successful, consider creating 2to 3 additional bat bunkers ● Determine the distribution and management needs of northern blazing star and hairy hudsonia, and evaluate potential habitat for reintroduction of northern blazing star. If potential habitat is located and reintroductions are possible, develop survey and monitoring protocol for reintroduced populations ● If upland sandpipers do not nest in the grassland portion of the former Weapons Storage Area within 3 years of creating suitable habitat, let majority of grassland (30 to35 acres) revert to shrub habitat ● Complete inventory of invasive species and prioritize control efforts 	<p><i>Within 2 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Allow all shrubland on refuge to naturally succeed to forest ● Complete inventory of invasive species and prioritize control efforts

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 2 Perpetuate the biological integrity, diversity, and environmental health of upland and forested wetland habitats on Great Bay Refuge to sustain native plant communities and wildlife, including species of conservation concern. (cont.)			
Objective 2.4 Grassland	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Manage 169 acres of grassland habitat to benefit nesting grassland birds of conservation concern ● Manage large grassland fields (greater than 25 acres) through mowing or burning after July 15 ● Maintain several other patches of open field: <ul style="list-style-type: none"> ◆ The fields along the Ferry Way Trail as wildlife viewing sites ◆ The area around old apple trees and historic sites at Woodman Point ◆ The leach field (for administrative purposes) ● Complete inventory of invasive species and prioritize control efforts 	<p><i>Within 2 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Reduce grassland management to 98 acres ● In conjunction with completing the HMP, develop best management prescriptions for maintaining grasslands with consideration of : <ul style="list-style-type: none"> ◆ Maintain the two larger grassland habitats (39 acre Thomas Field and 38 acre former Weapons Storage Area Field) through annual mowing or burning after grassland bird breeding season (July 15) or later to benefit upland sandpiper, grassland bird species of conservation concern, and pollinators ◆ Maintain through mowing the (6 acres) fields along the Ferry Way Trail as wildlife viewing sites ◆ Manage the Woodman Field (15 acres) as nesting habitat for bobolink, singing grounds for woodcock, and as migration habitat for Lepidoptera. ◆ Allow eight patches of grassland to revert to forest ● Partner with New Hampshire Audubon to develop methods for attracting upland sandpipers to the refuge. <ul style="list-style-type: none"> ◆ Evaluate site capacity of grassland units to determine ideal species composition and structure, fire regime and needed restoration ● Evaluate managing the Woodman Point Field and the red pine plantation area for grassland species <p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Remove remaining Weapons Storage Area fence and remaining military structures in the grassland management area. Remove hedgerows at and small woodlots at the Thomas Field to enlarge the grassland area. ● Complete inventory of invasive species and prioritize control efforts 	<p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Allow all grassland on refuge to naturally succeed to forest ● Complete inventory of invasive species and prioritize control efforts <ul style="list-style-type: none"> ◆ Except as discussed elsewhere under historic resources, remove any remaining structures, including those within the Weapons Storage Area ● Discontinue use of refuge management roads to grassland areas that are no longer needed and restore roads to natural vegetation

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 3 Foster and maintain conservation, research, and management partnerships to promote protection and stewardship of the ecological resources of the Great Bay Estuary.			
<p>Issues Addressed: What role should the Service play in conserving lands and habitats in the Great Bay watershed? How can the refuge enhance its partnerships within the region? How can the refuge work with partners to improve the water quality of the Great Bay Estuary? What actions can the refuge take, in partnership with others, to minimize impacts from and adapt to climate change? What role should the refuge have in research collaborative that address management issues of concern to the Service? How will we work with the Pease Airport Authority to protect water quality and address potential airport/wildlife conflicts?</p>			
<p>Objective 3.1 Great Bay Resource Conservation, Research, and Management Partnerships</p>	<p><u>Continue to:</u></p> <ul style="list-style-type: none"> ● Be an active member of GBRPP and serve on the land protection and management committees ● Serve on the Pease Development Authority Wildlife/ Bird Airstrike Hazard Committee and PREP committees ● Participate in oil spill response training and coordination ● Partner with the town of Newington, NHFG, and regional Service personnel on law enforcement on and around the refuge ● Attend CWIPP meetings and actively participate in coordinated invasive species control and outreach efforts. 	<p><u>In addition to alternative A and within 2 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Work with the New England Cottontail Working Group to implement habitat improvements and opportunities for their recovery. ● Support and facilitate research by partners on conservation and management of eelgrass and oyster restoration, Great Bay water quality, and other topics linked to refuge’s goals and objectives ● Identify refuge research needs and partners to assist in researching specific management questions ● Work with the Service’s Ecological Services Private Lands Program to identify and evaluate projects that would support or enhance refuge goals and objectives <p><u>Within 5 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Work with partners around Great Bay to create habitat management demonstration areas on the refuge and elsewhere to demonstrate invasive species control, grassland and shrubland management, dam removal, and oyster bed restoration ● Strengthen collaboration with UNH’s Jackson Lab to research and restore Great Bay Ecosystem ● Facilitate technical workshops pertaining to the demonstration areas ● Become a signatory to the CWIPP agreement <p><u>Within 10 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Establish partnership with Pease and Great Bay Country Clubs to develop management plans for their lands that contributes to the goals and objectives of the refuge and local conservation partnerships 	<p><u>Same as alternative B, except that:</u></p> <ul style="list-style-type: none"> ● The research and management topics will be more focused on restoring and maintaining natural communities, understanding ecosystem processes, and controlling invasive plant populations

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 3 Foster and maintain conservation, research, and management partnerships to promote protection and stewardship of the ecological resources of the Great Bay Estuary. (cont.)			
Objective 3.2 Landscape- scale Conservation Partnerships	<i>This objective is not part of current management</i>	<p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Conduct a research needs assessment for the refuge, emphasizing projects related to the assumptions, objectives, strategies of our species and habitat management ● Develop information exchange for research and seek research partnerships to foster regional collaborations ● Collect information that contributes to regional information needs such as winter banding of waterfowl to help determine population numbers ● Identify the role of the refuge in contributing to the Service’s 5-Year Action Plan on climate change and support similar initiatives in the State Wildlife Action Plans and Coastal Programs ● Participate in and support the priorities of the North Atlantic Landscape Conservation Cooperative ● Collaborate with GBNERR on monitoring sea level rise as part of national effort ● Work with PREP to support the EPA climate ready estuary project; work with GBNERR and Great Bay Stewards to develop and outreach impacts of human land use and climate change on the bay’s resources, and facilitate implementation of mitigation measures by the bay’s residents and visitors 	<p><i>Same as alternative B, except that:</i></p> <ul style="list-style-type: none"> ● The research and management topics will be more focused on restoring and maintaining natural communities and understanding ecosystem processes.

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 3 Foster and maintain conservation, research, and management partnerships to promote protection and stewardship of the ecological resources of the Great Bay Estuary. (cont.)			
Objective 3.3 Education and Outreach Partnerships	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> • Support programs that engage youth and young adults in activities that advance conservation goals including the YCC, STEP, SCEP, and Phillips-Exeter Sustainable programs 	<p><i>In addition to alternative A, and within 2 years of CCP approval:</i></p> <ul style="list-style-type: none"> • Work with GBRPP to create regional maps and other resources that show locations of recreational opportunities around Great Bay Estuary; update refuge Web site to provide links to key resources and partnerships • Collaborate with the Great Bay Discovery Center and GBRPP on educational and interpretive programs, materials, and maps • Develop collaborations with Great Bay Stewards and volunteers and Friends group to develop and conduct programs; seek new potential volunteers • With partners, develop stewardship outreach material and program to reduce pollution and fertilizer runoff from residential and commercial facilities • Collaborate with local schools, GBNERR, and Gulf of Maine Institute, to establish a coastal environmental stewardship and advocacy team with high school students in NH; emphasize programs that would engage more youth on the refuge and on partner lands • Expand relationship with faculty and student programs at Phillips-Exeter to expand research projects • Seek a volunteer willing to coordinate the volunteer program to improve organization, recruit new volunteers, and help prioritize and implement work • Create an orientation program for all volunteers; expand volunteer corps. • Work with the Pease Development Authority and Great Bay Stewards to establish a Friends of Great Bay Refuge group. • Partner with the New Hampshire Office of Tourism, New Hampshire Department of Transportation, Pease Development Authority, and others to provide information on the refuge, including signs, maps, and directions to the refuge 	<p><i>Same as alternative B</i></p>

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 4 Promote enjoyment and awareness of the Great Bay Refuge and Great Bay Estuary by providing high-quality, compatible, wildlife-dependent public uses on refuge lands and on partner lands and waters around the refuge.			
<p>Issues Addressed: What is the appropriate type and level for wildlife-dependent public uses on the refuge? How will the refuge manage compatible non-priority public uses on the refuge? What partnership opportunities exist to increase environmental programs, interpretation, and outreach? How will we build and maintain an active volunteer program? How will the refuge cultivate an informed and educated public to support the mission of the Refuge System and the purposes for which the refuge was established? What staffing levels are needed to enhance onsite interpretation and education and outreach programs?</p>			
<p>Objective 4.1 Wildlife Observation and Photography</p>	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Maintain two existing trails <ul style="list-style-type: none"> ◆ Ferry Way Trail (2 miles) ◆ Peverly Pond Trail (0.5 miles) ◆ Pursue funding to construct a boardwalk along the entire Peverly Pond Trail to meet accessibility standards ◆ Maintain the view from the Ferry Way Trail observation deck by pruning shrubs and brush ◆ Maintain kiosk and the parking lot 	<p><i>Similar to alternative A</i></p> <ul style="list-style-type: none"> ● Pursue funding to construct a boardwalk along the entire Peverly Pond Trail to meet accessibility standards ● Maintain the view from the Ferry Way Trail observation deck by pruning shrubs and brush ● Maintain kiosk and the parking lot <p><i>Within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Re-route the Peverly Pond Trail and modify Ferry Way Trail to improve wildlife viewing opportunities ● Add benches and an interpretive sign to the wildlife observation blind ● Highlight wildlife observation and photography opportunities on the Great Bay Refuge Web site ● Improve trail sign location, including signs for “No Dogs” and “No Bicycles” for trailheads ● Construct an elevated observation platform with an interpretive panel overlooking the former Weapon Storage Area ● Develop a bird/watchable wildlife checklist for the refuge ● Create a hotspot for the refuge on eBird and encourage visitors to post their sightings; include a link to eBird on the refuge’s Web site ● Conduct an annual refuge photo contest between June and August <p><i>Within 10 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● At Fabyan Point pursue acquisition of a public access right-of-way and upgrade road. ● If right-of-way is acquired: <ul style="list-style-type: none"> ◆ Construct a trail and viewing platform ◆ If feasible, construct a car top-only boat launch 	<p><i>In addition to alternative A, and within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Develop new interpretive materials that describe the Service’s goal of restoring natural communities on the Great Bay Refuge ● Create a new trail out to Woodman Point using the existing management access road ● Highlight wildlife observation and photography opportunities on the refuge Web site ● Improve trail sign location, including installing “No Dogs” and “No Bicycles” signs at trailheads ● Develop a bird or watchable wildlife checklist for the refuge ● Create a hotspot for the refuge on eBird and encourage visitors to post their sightings. Include a link to eBird on the refuge’s Web site ● Conduct a refuge photo contest during June through August. Check with local businesses for potential prize donations ● Establish a hiking trail and observation deck at Fabyan Point

	Alternative A– Current Management	Alternative B–Service-preferred Emphasis on Habitats and Focal Species	Alternative C– Emphasis on Natural Processes
Goal 4 Promote enjoyment and awareness of the Great Bay Refuge and Great Bay Estuary by providing high-quality, compatible, wildlife-dependent public uses on refuge lands and on partner lands and waters around the refuge. (cont.)			
Objective 4.2 Environmental Education and Interpretation	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> ● Provide limited environmental education and interpretation programs upon request ● Use volunteers, when available, to conduct guided walks on refuge trails 	<p><i>Within 2 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Update exhibits and information panels and refuge Web site ● Set up a wildlife observation logbook and a visitor register at the main kiosk ● Re-route the Peverly Pond Trail and modify Ferry Way Trail to improve wildlife viewing opportunities; once the former Weapons Storage Area fence is removed, shift the Ferry Way Trail as appropriate ● Initiate guided interpretive walks led by partners and volunteers ● Investigate opportunities to engage more youth programs on the refuge and on partner lands ● Investigate opportunities to expand relationship with faculty and student programs at Phillips-Exeter to expand research projects <p><i>Within 5 years of CCP approval:</i></p> <ul style="list-style-type: none"> ● Develop three to five key environmental education messages and activities related to refuge wildlife, plants, and habitats that can be used in environmental education programs with local school teachers, college faculty, and youth group leaders ● Collaborate with GBNERR on creating shared stewardship messages and interpretive materials ● Develop curriculum-based, multi-sensory, interdisciplinary, and learner-based environmental education activities that can be lead by volunteers; partner with others such as UNH Cooperative Extension Coverts Project, UNH Marine Docents, Seacoast Science Center, Great Bay Discovery Center, and others ● Develop interpretive materials to highlight the cultural history of refuge lands, including historic buildings, Weapons Storage Area, air force history ● Change the current paved parking lot to a permeable surface; consult with the UNH Stormwater Management Center to determine appropriate design and materials, and develop interpretive materials related to design 	<p><i>Same as alternative B</i></p>

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 4 Promote enjoyment and awareness of the Great Bay Refuge and Great Bay Estuary by providing high-quality, compatible, wildlife-dependent public uses on refuge lands and on partner lands and waters around the refuge. (cont.)			
Objective 4.3 Hunting	<ul style="list-style-type: none"> Continue to: Offer a quality annual deer hunt to manage the white-tailed deer population and provide recreational opportunity Work with NHFG to handle the permit applications for the existing refuge deer hunt 	<p><i>In addition to alternative A, and within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> Evaluate the opportunity to expand the hunt program to include a fall bow season for deer and a turkey season Work with NHFG to evaluate closing the shoreline of the refuge, including Herods Cove, to waterfowl hunting to protect estuarine habitats and associated species 	<p><i>Same as alternative B, with the addition of the following, within 3 years of CCP approval:</i></p> <ul style="list-style-type: none"> Evaluate need to vary deer hunt locations, given greater public access proposed under this alternative. Explore expansion of hunting opportunities to include wild turkey hunting and fall bow season for white-tailed deer Evaluate the program through staff observation and hunter contacts Partner with other organizations, such as the National Wild Turkey Federation, to conduct hunter education classes
Objective 4.4 Fishing	<p><i>Continue to:</i></p> <ul style="list-style-type: none"> Keep refuge closed to fishing Prohibit boats from landing on refuge shoreline Conduct outreach about and enforcement of fishing closure 	<p><i>In addition to alternative A, and within one year of CCP approval:</i></p> <ul style="list-style-type: none"> Promote fishing opportunities available at established sites off-refuge around Great Bay; develop outreach materials to explain fishing closure and identify other regional opportunities Train volunteers to answer questions about fishing Within 5 years of CCP approval: In conjunction with water quality studies in the Peverly Brook system, establish a schedule to conduct periodic sampling of fish to determine whether they continue to pose a risk to human health if consumed. Establish conditions under which, over time, the refuge might consider opening up to recreational fishing 	<p><i>Same as alternative B</i></p>

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 5 Contribute to the recovery of the federally listed endangered Karner blue butterfly and other rare Lepidoptera through the conservation, protection, and restoration of the pine barrens habitat.			
Objective 5.1 Habitat Management	<p><u>Continue to:</u></p> <ul style="list-style-type: none"> • Support NHFG management activities on the 29-acre Karner blue butterfly easement, when resources allow • Post and maintain easement boundary • Identify funding sources to continue habitat management • Identify additional inventories needed to protect cultural resources 	<p><u>In addition to alternative A, and within 3 years of CCP approval:</u></p> <ul style="list-style-type: none"> • Work with Ecological Services to conduct programmatic Section 7 consultation to cover incidental take associated with habitat management on the easement and adjacent airport • Update HMP to include habitat management for the Karner blue butterfly easement. Potential treatment methods including prescribed fire, hydroaxing or brushhogging, herbicides, manual pulling, planting, or seeding of native lupine • Facilitate NH Fish and Games’s efforts to seed native lupines and avoid conflict with cultural resources; schedule archaeological surveys as soon as practicable in high priority lupine seeding sites • Support NHFG and Ecological Service’s efforts to protect and manage additional acreages to meet revised population and goals identified in latest population viability model 	<u>Same as alternative B</u>
Objective 5.2 Species Management	<p><u>Continue to:</u></p> <ul style="list-style-type: none"> • Support NHFG in the captive rearing and translocation of Karner blue butterflies • Implement recovery plan actions when and where possible 	<p><u>In addition to alternative A and within 2 years of CCP approval:</u></p> <ul style="list-style-type: none"> • Evaluate effectiveness of captive-rearing program and develop milestones for reaching recovery goals • Support NHFG and the Service’s Ecological Service’s efforts to update recovery population goals based on latest population viability model • Determine if easement lands are being managed sufficiently and effectively to contribute to Karner blue butterfly management and recovery 	<u>Same as alternative B</u>

	Alternative A— Current Management	Alternative B—Service-preferred Emphasis on Habitats and Focal Species	Alternative C— Emphasis on Natural Processes
Goal 5 Contribute to the recovery of the federally listed endangered Karner blue butterfly and other rare Lepidoptera through the conservation, protection, and restoration of the pine barrens habitat. (cont.)			
Objective 5.3 Outreach and Education	<p><u>Continue to:</u></p> <ul style="list-style-type: none"> ● Maintain existing kiosk ● Partner with “Kids for Karners” program in Concord schools ● Partner with the New England Zoo and Aquarium Association to engage volunteers 	<p><u>In addition to alternative A, and within 3 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● Add approximately 0.1-mile to the existing 0.4 mile trail and establish self-guided interpretive panels along its length. Panels will explain butterfly ecology and management, and thereby enhance the visitor understanding and experience. The trail will be clearly designated as the approved footpath to reduce impact on sensitive resources off-trail ● Upgrade existing kiosk with interpretive information about butterfly recovery efforts, pine barrens ecology, and warnings about Lyme disease. Construct an additional kiosk on east end of property with similar information ● Provide volunteer-led group tours and interpretive talks onsite ● Work with NHFG to develop interpretive materials and information ● Improve Web site information and link to refuge and NHFG Web sites ● Develop brochure that describes pine barrens ecology, other dependent species and aspects of biological diversity, in addition to butterfly ecology ● Have Service law enforcement officers contact NHFG Conservation Officers and Service Special Agents to coordinate on visiting the site and enforcing against unauthorized uses 	<u>Same as alternative B</u>
Objective 5.4 Land Protection	<p><u>This objective is not part of current management</u></p>	<p><u>Within 2 years of CCP approval:</u></p> <ul style="list-style-type: none"> ● In partnership with NHFG, the Service’s Ecological Services, city of Concord, landowners, and other partners, evaluate role of the refuge in acquiring additional lands—in fee simple or conservation easement—from interested landowners within the focus area, to expand protection and management for the federally endangered Karner blue butterfly ● If determined that refuge has a role, then proceed with necessary administrative process; the Service will only acquire lands from willing sellers, either in fee simple or as conservation easements. 	<u>Same as alternative B</u>

	Alternative A– Current Management	Alternative B–Service-preferred Emphasis on Habitats and Focal Species	Alternative C– Emphasis on Natural Processes
Goal 5 Contribute to the recovery of the federally listed endangered Karner blue butterfly and other rare Lepidoptera through the conservation, protection, and restoration of the pine barrens habitat. (cont.)			
Objective 5.5 Partnerships	<i><u>This objective is not part of current management</u></i>	<i><u>Within 5 years of CCP approval:</u></i> <ul style="list-style-type: none"> ● Participate in NH Prescribed Fire Council to enhance safety and share resources while implementing prescribed burning on the easement ● Develop an MOU with NHFG regarding cooperation and funding for species and habitat management, monitoring and law enforcement of easement lands ● Develop stronger partnerships with local land conservation groups to assist with recovery of Karner blue butterflies and pine barrens habitat in the area ● Engage at least 20 percent of the corporate business employees in adjacent industrial park in developing and implementing a volunteer/community service program within the next 5 years 	<i><u>Same as alternative B</u></i>