

Chapter 4



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The Marsh Master is a versatile tool for moving in wet areas on the refuge.

Management Direction and Implementation

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- Refuge Goals, Objectives and Strategies

Introduction

This CCP includes an array of management actions that, in our professional judgment, work toward achieving the refuge purposes, the vision and goals for the refuge, and state and regional conservation plans. In our opinion, it will effectively address the key issues. We believe it is reasonable, feasible, and practicable.

In all program areas, this CCP will enhance the quality and sustainability of current resource programs, develop long-range and strategic step-down plans, promote partnerships, and restore grasslands for the species of management concern that are dependent on this habitat type.

Relating Goals, Objectives and Strategies

We presented our goals in chapter 1; this chapter describes them in more detail as objectives and strategies. The relationships among goals, objectives, and strategies follows. Goals are intentionally broad, descriptive statements of the desired future condition of the refuge. By design, they define less quantitatively than prescriptively the targets of our management. They also articulate the principal elements of refuge purposes and our vision statement, and provide a foundation for developing specific management objectives.

Objectives are incremental steps toward achieving a goal; also, they further define the management targets in measurable terms. They also provide the basis for determining more detailed strategies, monitoring refuge accomplishments, and evaluating our success. The Service guidance in “Writing Refuge Management Goals and Objectives: A Handbook” (January 2004) recommends that objectives possess five properties. They should be “SMART”: (1) specific; (2) measurable; (3) achievable; (4) results-oriented; and (5) time-fixed.

A rationale accompanies each objective to explain its context and importance. We will use the objectives in this CCP in writing refuge step-down plans, including its habitat management plan. We will measure our success by how well we achieve those objectives.

For each objective, we developed strategies: specific actions, tools, techniques, or a combination of those that we may use to achieve the objective. In the process of developing refuge step-down plans, we may revise some of the strategies, but most will translate directly into those plans.

General Refuge Management

We primarily developed our management direction hierarchically, from goals to objectives to strategies. We also found, however, that many actions we wanted to highlight either relate to multiple goals or represent general administrative or compliance activities. We present those below.

Refuge Operational Plans (“Step-Down” Plans)

The U.S. Fish and Wildlife Service Manual, Part 602, Chapter 4 (Refuge Planning Policy) lists more than 25 step-down management plans that generally are required on refuges. Those plans “step down” general goals and objectives to specific strategies and implementation schedules. Some require annual revisions; others on a 5- to 10-year schedule. Some require additional NEPA analysis, public involvement, and compatibility determinations before we can implement them.

The following step-down plans are complete and up-to-date:

- Hunt Plan (reviewed annually)
- Sport Fishing Plan (reviewed annually)
- Fire Management Plan
- Zebra Mussel Control Plan

- Safety Plan
- Continuity of Operations Plan
- Chronic Wasting Disease Plan
- Hurricane Plan
- Avian Influenza Response Plan
- Nexus Statement (Law Enforcement area of jurisdiction)

The following step-down management plans are scheduled for completion. That schedule depends on obtaining the staffing and budgets identified in appendixes E and F:

- Mosquito Management Plan (highest priority to complete)
- Habitat Management Plan (second highest priority plan to complete)
- Visitor Services Plan
- Inventory and Monitoring Plan
- Law Enforcement Plan
- Integrated Pest Management Plan (including annual furbearer management program plan)
- Habitat and Species Inventory and Monitoring Plan (HSIMP), within 2 years of CCP approval
- Facilities Plan
- Sign Plan

Active Management of Bog Turtle Sites on the Walkkill River Refuge

The northern population of the bog turtle was federal-listed as a threatened species in 1997. Therefore, this CCP complies with the Endangered Species Act, and provides strategies that will protect and manage land to support our 2001 Bog Turtle Recovery Plan. Also, an intra-Service Section 7 consultation on all actions related to bog turtles was conducted by refuge staff in conjunction with our New Jersey Field Office (appendix H).

One of the greatest threats to bog turtles is the loss of long-lived adults in the wild to a lucrative, illegal wildlife trade (USFWS 2001). Another serious threat is the continued loss, alteration, or fragmentation of the species' highly specialized wetland habitat (USFWS 2001). Strategies in this CCP follow the recommendations in the recovery plan for tasks that will lead to the species' delisting. Those include the following strategies to help achieve the objective for bog turtle management (see refuge goal 1).

- Monitor known bog turtle sites continually to prevent the illegal collection of individual animals.
- Monitor the status of and threats to known sites.
- Survey known, historical, and potential bog turtle habitat.

- Control invasive plants and set back succession by using biological control agents, girdling red maple stems, grazing goats or other livestock, and mowing or mulching.
- Allow beaver ponds to progress through the natural stages of succession and provide potential bog turtle habitat, where beaver populations do not conflict with private landowners or public roads.

Habitat Management Tools

We will use several management tools on varying scales to help maintain, enhance or create wildlife habitat. Those management tools include the following.

- Use prescribed burns to enhance habitat for upland migratory birds, waterfowl, and federally threatened species. Periodic burning of these areas reduces encroaching vegetation.
- Use farmers to hay, mow or graze approximately 500 acres of cool season grassland in order to maintain grassland conditions to support nesting for grassland-dependent birds.
- Remove larger trees and shrubs, making way for contiguous, larger grassland parcels.
- Graze livestock on the refuge's active bog turtle site to control invasive plant species and arrest succession while maintaining the fluid mud substrate preferred by bog turtles.

These and other habitat management tools specified in the CCP will help achieve goal 1 by restoring and enhancing habitats for federal trust species and other species of special management concern.

Non-Indigenous Invasive Plant Species

The Service-adopted policy that defines biological integrity, diversity, and environmental health also provides refuge managers with guidance for ensuring that those elements are maintained and, where appropriate, restored on refuge lands to the extent compatible with refuge purposes (601 FW 3). It states, "The highest measure of biological integrity, diversity and environmental health, is viewed as those intact and self-sustaining habitat and wildlife populations that existed during historic conditions."

The presence and continued expansion of non-indigenous invasive plant species significantly compromises the biological integrity of all habitats. Biological diversity decreases because invasive species out-compete and replace native species. That process yields degraded wildlife habitat and ecosystem function.

Our objective for non-indigenous invasive plants on the refuge is to treat 700 acres of invasive plant species over a period of 10 years, so that those 700 acres will no longer be dominated (<50-percent cover) by invasive species such as purple loosestrife, multiflora rose and Japanese stiltgrass. The strategies we will use to accomplish this objective include the following.

0–5 years after CCP approval:

- Control invasive plants such as purple loosestrife and Phragmites by mowing, using biological control, and applying herbicides.
- Continue the annual monitoring of *Galerucella sp.* beetles and *Hylobius sp.* weevils as a biological control agent for controlling purple loosestrife.
- Continue the cooperative study with Cornell University on monitoring the effects of rhizidra larvae as a biological agent for controlling Phragmites.

- Continue the Region 5 Invasive Plant Species Inventory and Mapping Initiative.
- Control tree-of-heaven (*Ailanthus*) mechanically and chemically on the refuge.
- Conduct research on biological control agents for use on woolly adelgid invasions on eastern hemlocks and for *Phragmites*.
- Work with utility and pipeline companies to use wildlife-friendly land management techniques such as enhancing habitats for migratory birds and controlling invasive plant species.

5–10 years after CCP approval:

- Develop an Invasive Plant Management Plan to improve the native biological diversity on Service-owned land within the current and expanded refuge boundaries. Include the following components in the Invasive Plant Management Plan.
 - Control invasive plants on habitats containing threatened and endangered species.
 - Emphasize biological control agents whenever feasible.
 - Evaluate control methods (biological, mechanical, prescribed fire, and chemical) before significant new investments occur.
 - Incorporate experimental designs into the plan to test different combinations of treatment types (i.e., spraying and burning plots of *Phragmites*).
- Release biological control agents in eastern hemlocks to control woolly adelgid.
- Focus on mapping and eradicating invasive plant species in Atlantic white cedar swamps due to that habitat's regional significance.
- Evaluate future habitat management projects (e.g., a water drawdown project on bare or open soil) for their potential to facilitate the spread of invasive plants.
- Develop an HMP and a Habitat and Species Inventory and Monitoring Plan with specific strategies for controlling invasive plant species.

Controlling invasive species will help achieve goal 1 by restoring and enhancing habitats for federal trust species and other species of special management concern.

Overabundant Wildlife

The Refuge Manual (7 RM 14.1) sets out Service policy on controlling wildlife and plants in the Refuge System to assure balanced wildlife and fish populations that are consistent with the optimum management of refuge habitat. Control measures become necessary when native or nonnative wildlife populations interfere with our ability to attain refuge objectives or pose a threat to human health.

Canada geese and mute swans can cause severe damage to refuge land by feeding on seedlings, roots and large amounts of vegetation. High numbers of resident Canada geese selectively browsing on moist soil units during the growing season also can degrade habitat quality for subsequent migrant

waterfowl use. The droppings from Canada geese can threaten animal and environmental health by contaminating water.

White-tailed deer often overpopulate due to the abundance of agricultural food sources and the absence of natural predators. Large populations of deer can cause severe damage to refuge trees and shrubs by heavy browsing. Deer also cause damage to crops by feeding on winter and summer plantings.

Beavers have caused flooding on neighboring properties, and muskrats have burrowed into the dikes at Liberty Marsh, threatening to compromise the water control system there. Fox and coyote prey upon birds, reptiles and their eggs, potentially reducing their numbers on the refuge.

Control programs are designed to maintain environmental quality and conserve and protect wildlife resources. The techniques are based on a broad, systematic approach using all the information available on the ecology of the pest animal or plant. Population reduction methods are chosen based on their effectiveness, cost, and minimal ecological disruption.

Our objective for controlling nuisance wildlife is to develop, within 3 years of CCP approval, an integrated Animal Population Management Plan for Service-owned land within the current and expanded refuge boundaries to ensure nuisance wildlife populations stay at levels that do not threaten the viability of federal trust species or other species of special management concern. We will use the following strategies to accomplish that objective.

0–5 years after CCP approval:

- Manage resident Canada goose and white-tailed deer populations through hunting.
- Addle mute swan eggs on the refuge so there is no population increase.
- Manage beaver and muskrat populations, as needed, at the Liberty Marsh property through trapping.
- Provide information to private landowners on techniques to control flooding caused by beavers.
- Use non-lethal means of addressing beaver impacts, to the extent practicable, in areas where they are flooding adjacent landowners or affecting sensitive refuge habitats. Remove problem animals through lethal means when necessary. Trapping will occur only to accomplish specific management objectives.
- Provide technical information annually to adjacent private landowners on methods to discourage resident Canada geese.
- Expand furbearer management program on refuge land, as needed, where sensitive refuge habitats, such as impoundment structures, are impacted.
- If the refuge staff observes signs of predation by fox, coyote or other predators on bird or reptile nests, we will consult scientific literature and subject experts to determine an acceptable level of predation. If predation on those nests rises above identified threshold levels, then the refuge will manage predator populations using legal methods that have proven effective. Those may include trapping and shooting.

Within 5–10 years of CCP approval:

- If the Canada goose population on the refuge exceeds a threshold density to the point where geese are causing damage to refuge habitats, we will obtain the appropriate permits, if required, to reduce the Canada goose population on the refuge by means other than traditional hunting.
- If necessary, eradicate mute swans on the refuge.
- Develop an integrated Animal Population Management Plan.

Managing nuisance wildlife will help achieve goal 1 by restoring and enhancing habitats for federal trust species and other species of special management concern. It will also help achieve goal 3 by providing wildlife-dependent recreation opportunities for hunting and trapping.

Dog Walking

The Service will now allow dog walking on the Liberty Loop Nature Trail, which coincides with the Appalachian Trail (AT) for much of its length through the refuge. The AT, which allows dog walking along the majority of its 2,100-mile length, enters the refuge at the Liberty Loop Nature Trail and follows it for about 1.5 miles. The AT then continues along Oil City Road to where it crosses the Wallkill River, continues on State Line Road and then onto Carnegie Street and reenters the forest.

Findings of Appropriateness and Compatibility Determinations

Federal law and policy provide the direction and planning framework to protect the Refuge System from incompatible or harmful human activities and ensure that Americans can enjoy its lands and waters. The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act), is the key legislation on managing public uses and compatibility.

Before we can allow any activity or use on a national wildlife refuge, we must determine first that it is an appropriate use. The determination of an appropriate use precedes the analysis of its compatibility. A compatible use is one “that will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.” Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety. We may revisit compatibility determinations sooner than their mandatory review date if new information reveals unacceptable impacts or incompatibility with refuge purposes.

The following findings of appropriateness are new; we wrote them as part of this CCP process:

Findings of Appropriateness

- Cross-Country Skiing and Snowshoeing to Promote Priority Public Uses
- Livestock Grazing for Habitat Management
- Motorized and Non-Motorized Boating to Promote Priority Public Uses
- Haying for Habitat Management
- Mosquito Control according to Service Policy
- Research Conducted by Non-Service Personnel

- Furbearer Management to Protect Trust Resources
- Dog Walking on Liberty Loop Nature Trail

We are revising and/or recertifying, the following findings of appropriateness and compatibility determinations as part of this CCP process:

Compatibility Determinations

- Public Hunting for Deer, Turkey and Woodcock
- Public Hunting for Migratory Birds
- Public Fishing
- Wildlife Observation & Photography and Environmental Education and Interpretation
- Cross-Country Skiing and Snowshoeing to Promote Priority Public uses
- Livestock Grazing for Habitat Management
- Motorized and Non-Motorized Boating to Promote Priority Public Uses
- Haying for Habitat Management
- Mosquito Control according to Service Policy
- Research Conducted by Non-Service Personnel
- Furbearer Management to Protect Trust Resources

The following compatibility determinations are new; we wrote them as part of this CCP process.

- Public Hunting for Black Bear
- Dog-Walking on the Liberty Loop Nature Trail

Compatibility determinations help to achieve all goals because they ensure that any use of the refuge does not conflict with its legislated purpose.

Refuge Hours of Operation

To ensure visitor safety and protect refuge resources, the refuge is open one hour before official sunrise to one hour after official sunset. At the refuge manager's discretion, organized night activities, if determined to be compatible, could be allowed under a special use permit.

Hunting at night will not be allowed at the refuge. Opening the refuge to night hunting would create the potential for unsafe encounters between hunters, increase the disturbance of adjacent landowners, and increase the likelihood of poaching and other illegal activities. Those adverse conditions would not contribute to the "quality hunt program" defined in Service policy.

Permitted hunters can access the refuge two hours before sunrise to two hours after sunset.

No Pursuit Hounds, No Game Stocking

Pursuit hounds in support of hunting will not be allowed on the refuge. Hunting areas are small enough that pursuit hounds, and the game they are chasing, could easily venture off the refuge and onto private land. That is especially likely, given the current number of privately owned inholdings within the approved refuge acquisition boundary. In addition, within such small areas, pursuit hounds are likely to detract from the quality of other visitors' wildlife-dependent recreational opportunities, especially those of other hunters.

We will not stock non-native fish or wildlife. Generally, refuge management strives to promote intact, self-sustaining habitats and species populations that existed during historic conditions. We define a "native" species as one that historically occurred within the ecosystem.

In the past, however, the refuge has stocked ponds with native fish for National Fishing Day, and we would continue to do so in the future. We recognize the need to protect the current, native genetic strains of fish. We will not allow the stocking of genetically modified strains. The refuge will work with hatcheries to ensure that the stocked native fish have not been genetically manipulated.

Refuge Law Enforcement

Law Enforcement officers provide protection for refuge wildlife and people visiting the refuge.

The Refuge System and the International Association of Chiefs of Police began working together in 2003 on a law enforcement staffing and deployment model. The goal was to develop a defensible staffing model to quantify law



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enforcement resource needs for the Refuge System, help refuge managers deploy law enforcement resources, and justify budget requests. The result was a "Deployment Model for the National Wildlife Refuge System" (International Association of Chiefs of Police), completed in May 2005 and slated for updating every 5 years.

Among other things, the deployment model recommended a law enforcement staff of four full-time officers for the Great Swamp National Wildlife Refuge, which includes the Wallkill River refuge. That

is based on an analysis of 25 separate factors detailed in appendix B of the deployment model.

Refuge Revenue Sharing Payments

We pay one Orange County township and several Sussex County townships a refuge revenue sharing payment based on the acreage and value of refuge land in each jurisdiction. The payments, which are calculated by formula, come primarily from revenues collected by the Refuge System for timber sales and oil and gas leases, etc. Congress may appropriate additional funds. The Service will continue those payments in accordance with the law, commensurate with changes in the appraised market values of refuge land or new appropriations by Congress. The total of those funds is about \$80,000 per year.

Maintenance of Existing Facilities

Periodic maintenance and renovation of existing facilities is necessary to ensure safety and accessibility for refuge staff and visitors. Existing facilities include the Wallkill River refuge headquarters, the large building at Owens Station,

and numerous parking areas, observation platforms, kiosks and trails. Until we make a final determination about environmental education at the building at Owens Station, we will continue our minimal maintenance of that facility. Appendix E displays the fiscal year (FY) 2007 Service Asset Maintenance Management System (SAMMS) database list of backlogged maintenance entries for the refuge.

Refuge Special Use Permits

We will evaluate separately all requests for special use permits for their appropriateness and compatibility. Generally, we approve requests with the potential to provide a benefit to the refuge, once we determine that they are appropriate and compatible. To maintain the natural landscapes of the refuge, we would not allow any proposals for permanent or semi-permanent structures, except under extenuating circumstances unforeseen at this time. Existing approved special use permits will continue.

Wilderness Review

Our wilderness inventory of this refuge determined that no areas meet the eligibility criteria for a Wilderness Study Area as defined by the Wilderness Act. Therefore, we do not need to analyze further the refuge's suitability for wilderness designation (see appendix C). The refuge will undergo another wilderness review in 15 years as part of the next planning process. We will evaluate all newly acquired refuge land that meets Service criteria for their wilderness potential within 2 years of acquiring them.

Mosquito Management

On October 15, 2007, the Service published in the Federal Register its "Draft Mosquito and Mosquito-Borne Disease Management Policy Pursuant to the National Wildlife Refuge System Improvement Act of 1997." Until the draft policy is finalized, we will follow the "Interim Guidance for Mosquito Management on National Wildlife Refuges," prepared in spring 2005. This document provides refuges with interim guidance on addressing mosquito-associated health threats in a consistent manner. Like the draft policy, the guidance states that refuges will not conduct mosquito monitoring or control unless it is necessary and compatible to protect the health of a human, wildlife, or domestic animal population. If there is a declared health emergency, the Service will work with local and state mosquito managers to minimize any risks to human health.

The Sussex County Health Department has determined that there are endemic mosquito-borne diseases in the vicinity of the Refuge. The major mosquito-borne disease of concern at Wallkill River refuge is West Nile Virus. Since its discovery in North America in 1999, WNV has spread across the continent, and is considered endemic/enzootic throughout most of the continental U.S. Identification of WNV infected mosquitoes in Sussex County nearly every year since 2000 indicates that the virus is locally maintained within the wildlife cycle.

Based on these findings, the Sussex County Office of Mosquito Control (Division) is responsible for monitoring larval and adult mosquitoes on the refuge. The purpose of monitoring is to detect changes in mosquito populations that indicate an increased risk to human or wildlife health. In addition, adult mosquitoes collected from the refuge can be tested for the presence of pathogens. The Division will monitor mosquito populations from April through October. Additional details and restrictions on monitoring and management within refuge boundaries will be described in a mosquito management plan and an annual special use permit.

Research

The Service will encourage and support research and management studies on refuge land that will improve scientific knowledge and contribute to natural resource management decision-making. The refuge manager will encourage and seek research relative to approved refuge objectives that clearly improves land management and promotes adaptive management. Priority research is

important to the agencies of the Department of the Interior, the U.S. Fish and Wildlife Service, the Refuge System, and state fish and game agencies, because it addresses important management issues or demonstrates techniques for managing species or habitats that will enhance our management of the nation's biological resources.

We will also consider research for other purposes, which may not relate directly to specific refuge objectives, but contributes to the broader enhancement, protection, use, preservation or management of native populations of fish, wildlife, plants, and their natural diversity in the region or flyway. Those proposals must comply with the Service compatibility policy.

Each refuge will maintain a list of research needs that it will provide to prospective researchers or organizations upon request. Refuge support of research directly related to refuge objectives may take the form of funding, in-kind services such as housing or the use of other facilities, direct staff assistance with the project in collecting data, providing historical records, conducting management treatments, or providing other appropriate assistance.

All researchers on national wildlife refuges, present and future, will be required to submit a detailed research proposal following Service policy in Refuge Manual chapter 4, section 6. The proposals will be prioritized based on need, benefit, compatibility, and funding required. Special use permits must also identify a schedule for annual progress reports, on which we will base our decisions for continued research activities. We will ask our regional refuge biologists, other Service divisions, and state agencies to review and comment on proposals.

Monitoring and Adaptive Management

The Service has adopted the strategy of adaptive management to keep our management of refuges relevant and current through scientific research and management. We acknowledge that our information on species and ecosystems is incomplete, provisional, and subject to change as our knowledge base improves.

Our objectives and strategies must be adaptable in responding to new information and spatial or temporal changes. We will continually evaluate our management actions, both formally and informally, through monitoring or research, to reconsider whether our original assumptions and predictions are still valid. In that way, management becomes an active process of learning what works best. Public understanding and appreciation of the adaptive nature of natural resource management is important.

The refuge manager is responsible for changing management actions or objectives if they do not produce the desired conditions. Significant changes may warrant additional NEPA analysis; minor changes will not, but we will document them in our annual monitoring, project evaluation reports, or annual refuge reports.

We can increase monitoring and research in support of adaptive management generally without additional NEPA analysis. Although we have tried to identify monitoring elements for each objective of this plan, we cannot always predict the subject, scope, and duration of future monitoring.

Managing State-Owned Land

Through a series of agreements signed in 2007, the Service has management authority over about 150 acres of state-owned lands within the original refuge acquisition boundary and about 70 acres outside the original refuge acquisition boundary. We will manage state-owned land in compliance with the policies of the Service and the Refuge System. Lands outside of the refuge boundary will need to be added through the process of a Categorical Exclusion.

Land Protection and Refuge Expansion

We will continue Service acquisition of land from willing sellers within the approved refuge boundary to ensure long-term protection of refuge resources and to maximize the effectiveness and efficiency of refuge administration. We have acquired 5,106 acres within the original refuge acquisition boundary. We will also continue to work with conservation partners to identify important habitats in need of protection and management, and will support our partners' land protection and acquisition.

Refuge Goals, Objectives and Strategies

Introduction

We designed the following goals, objectives and strategies to enhance the quality, effectiveness, and sustainability of our management priorities. They include an array of management actions that, in our professional judgment, work toward achieving the refuge purposes, vision, and goals, and would make a significant contribution to conserving natural resources in the Kittatinny Valley, where the refuge lies.

The Land Protection Plan expands the refuge's acquisition boundary by 9,550 acres. Of that total, we recommend acquiring 4,763 acres in fee title and 4,585 acres in conservation easements. (Note: Those numbers may not add up to the total acres proposed for acquisition because we based them on a different set of GIS calculations.) The rest of the land we propose to acquire in either fee or easement. As always, the ability of the Service to acquire land depends on the availability of funds; and, the method of acquisition depends on the needs and desires of each willing seller.

The expansion area lies in the Wallkill River Valley, part of the Kittatinny Valley. The Kittatinny Valley lies in Sussex and Warren counties, between the Kittatinny Ridge and the northern extent of the Hudson Highlands. The Wildlife Action Plan (WAP) of the State of New Jersey recognizes the Kittatinny Valley as important for dozens of species in a variety of habitats. Among the species most relevant to the Service are the bald eagle, peregrine falcon, various hawks, bog turtle, wood turtle, dwarf wedgemussel, wood duck, vesper sparrow, arogos skipper, bobolink, grasshopper sparrow, and savannah sparrow. The 9,550 acres is divided among four focus areas: Papakating Creek (7,079 acres), Beaver Run (849 acres), Wallkill Adjoining West (1,092 acres) and Wallkill Adjoining North (530 acres).

The Papakating Creek Focus Area, the largest of the four, encompasses a major tributary to the Wallkill River, and includes significant wetlands associated with bog turtle habitat. Other important habitats in the expansion area include forested and emergent wetlands, large grassland complexes, upland forests, floodplain forests, and farmlands that are regionally important for migratory waterbirds, waterfowl, raptors, grassland birds, and rare reptiles. Rare calcareous wetlands are also present in some of the focus areas. Appendix G, "Land Protection Plan," explains in more detail the contribution of each focus area in protecting wildlife habitat and enhancing the biological integrity of the refuge.

Protecting habitat for trust resources, including by preserving land in northwest New Jersey and southeast New York, is critical and challenging. With real estate values increasing due to migrations of people from the New York metropolitan area, there is an acute need to act quickly to preserve key remaining habitat parcels in Sussex and Orange counties. For that reason, the Service recognizes the need to collaborate with other conservation organizations in the region.

In July 2005, the Service met with representatives from the State of New Jersey, The Nature Conservancy, Trust for Public Land, New Jersey Audubon Society, New Jersey Conservation Foundation, Morris Land Conservancy, as well as municipal, county and state officials to discuss and define the role each agency could play in protecting wildlife habitat in the Kittatinny Valley. Each partner uses its agency's individual mission statement to focus protection efforts. Taken together, those mission statements cover the protection of farmland, threatened and endangered species, scenic areas, grassland habitats, and open space that the local community has identified as significant.

After each agency outlined areas of protection interest on a map, we had identified 61,743 acres worthy of protection in the Kittatinny Valley. As mentioned above, we will focus our limited resources on 9,550 acres of the Wallkill River Valley adjacent to the refuge's original acquisition boundary. Our partners would lead in protecting an additional 52,193 acres in the larger Kittatinny Valley. Only with partners working to preserve the uplands and tributary valleys along the expansion area will the refuge be able to maximize the valley's potential to function as a viable ecosystem.

By adding the four focus areas to its original acquisition boundary, the refuge will become a catalyst for land conservation in the Kittatinny Valley. For the Service to lead this land conservation is appropriate because the acquisition area will further the refuge purposes by preserving and enhancing lands and waters that will conserve the natural diversity of fish, wildlife, plants, and their habitats for present and future generations. The wetlands along Beaver Run and Papakating Creek will allow the refuge to conserve and enhance fish and wildlife populations, including populations of black ducks and other waterfowl, raptors, passerines, and marsh and water birds. By re-establishing healthy forests and reducing erosion, sedimentation, and non-point source pollution, the Service will be able to maintain and enhance habitats for migratory birds, fish, and state and federal-listed species. In addition, the opportunities for wildlife-dependent recreation will increase through additional trails, wildlife observation areas, fishing and hunting access points and lands, and interpretation and education. Without that protection, those lands no doubt would no longer support fish and wildlife populations and, by default, would no longer support opportunities for wildlife-dependent recreation.

Expanding the refuge boundary will spur land protection efforts in and around the refuge. Some of our partners focus expressly on helping the Service acquire land within our approved acquisition boundaries. Those partners have a great interest in the expansion area, particularly because the Service has acquired much of the land in its original acquisition boundary: 5,106 acres of the GIS-calculated 7,100-acre original acquisition boundary. The county farmland protection program owns and protects an additional 590 acres of land within the refuge's original acquisition boundary. New Jersey's Green Acres owns and protects 175 acres. That leaves only 1,245 acres unprotected in the original acquisition boundary.

Much of the land in the expansion area is used for private agriculture or woodlots, or functions as early successional habitat associated with previous agriculture and silviculture. Although we will assess each opportunity on its merits at the time, many private land owners within the expansion area have shown interest in selling all or part of their property. In almost all cases, lands sold to the Service by willing sellers will be turned over to the Service in full or via management rights. In that way, the Service and many organizations in the conservation field will gain significant cost savings.

The Papakating Creek Focus Area is the most significant of the focus areas. The creek, a major tributary of the river, heads generally westward from the Wallkill River, winding through farmland, forest, and a few small developments before dispersing along the Kittatinny Ridge and its state-protected land. Primary among the benefits of the expansion for wildlife, wildlife habitats, and the region would be the establishment of a preserved corridor running from the Kittatinny Ridge to the Hudson Highlands. The original refuge acquisition boundary borders the Hudson Highlands' western edge. Such an uninterrupted band of land exists nowhere else in New Jersey; it presents the last opportunity to create this kind of preserved set of wildlife corridors. With a band of natural habitats spanning the Kittatinny Valley, species will be able to better migrate from the large population production areas of the Allegheny Plateau, which extends across Pennsylvania and New York, to the more developed and isolated natural lands of the Hudson Highlands and the igneous (largely undeveloped) ridges of northern New Jersey.

With the growing understanding of the importance of corridors for the flow of individual animals as well as entire animal populations, this expansion area represents a prime opportunity to strengthen wildlife populations at the edge of the New York metropolitan area. Through the establishment, management and maintenance of this corridor, the Service will help support populations of forest and wetland migratory birds, larger mammals, and reptiles and amphibians. Many of the species identified in the New Jersey WAP, such as northern harriers, wood turtles and bobcats, will benefit from the refuge expansion. Maintaining those species and habitats will help offset some of the less desirable effects of species that may overpopulate, such as coyotes and deer, despite the fragmented, low-quality wildlife habitats of the region. The Papakating Creek also supports a warm-water fishery, and the upper tributaries could support native brook trout populations.

Most of the land in the focus areas contains the same habitat types as those found in the refuge's original acquisition boundary. Our management objectives address these habitat types: namely, forested and non-forested wetlands, upland forest, grassland habitat and scrub-shrub habitat. One of our highest priority habitat projects will be to restore forested and non-forested wetlands. Over the past couple centuries, many of the wetlands around the Wallkill River have been deforested, drained, ditched, and converted to agricultural fields. In the CCP we use ditch plugging as a low-cost, low-maintenance tool for restoring wetlands.

The refuge will also give priority to managing for early successional and grassland habitat conservation. We will focus limited resources on providing high quality, sustainable, and reasonably manageable grassland habitat on three priority, large (>150-acre) grassland complexes. Smaller grassland fields across the refuge that formerly were managed would not be maintained, unless needed to support an administrative or priority public use. Those fields will likely revert to shrub habitat over the next 15 years.

Under this CCP, we will identify, map and field-survey all suitable bog turtle sites, develop a site management and monitoring plan for potential sites, and start experimenting with different habitat management techniques on current sites. We will also begin surveying for other listed species that may occupy certain habitat types.

We predict visitation to the refuge will increase by 15 percent under this CCP, because public use opportunities will increase. We will expand the hunting opportunities to include bear hunting, and improve the quality of interpretive materials at existing trails. The Wood Duck Nature Trail will be expanded,

providing additional opportunities for wildlife observation, photography, and interpretation. Map 4-2 illustrates the proposed public use strategies.

Because the habitat types in the original acquisition boundary and the expansion area are similar, we calculated and mapped projected habitat types for the original acquisition boundary, and used those same calculations for habitat type projections in the expansion boundary. For example, we project that both the original acquisition boundary and the expansion boundary will have 33 percent of their total acres in forested wetland habitat. We did not, however, have the resources to map projected habitat types for the entire 9,550-acre expansion area; therefore, Map 4-1 shows projected habitat types for the original acquisition boundary and actual habitat types for the newly expanded boundary.

Following are the goals, objectives and strategies for the Wallkill River refuge.

GOAL 1:

Protect and enhance habitats for federal trust species and other species of special management concern, with particular emphasis on migratory birds and bog turtles.

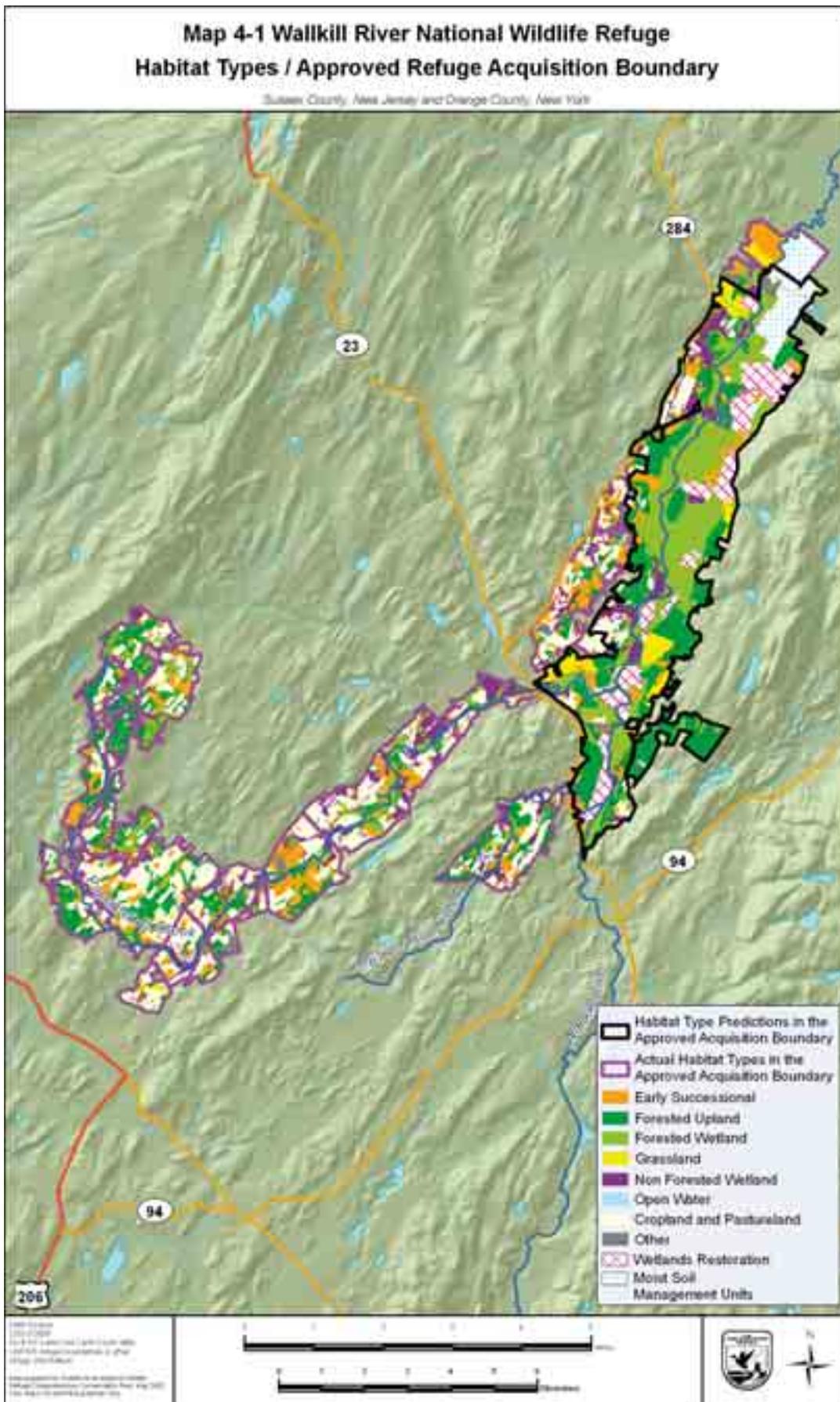
Objective 1.1 (Scrub-Shrub Habitat)

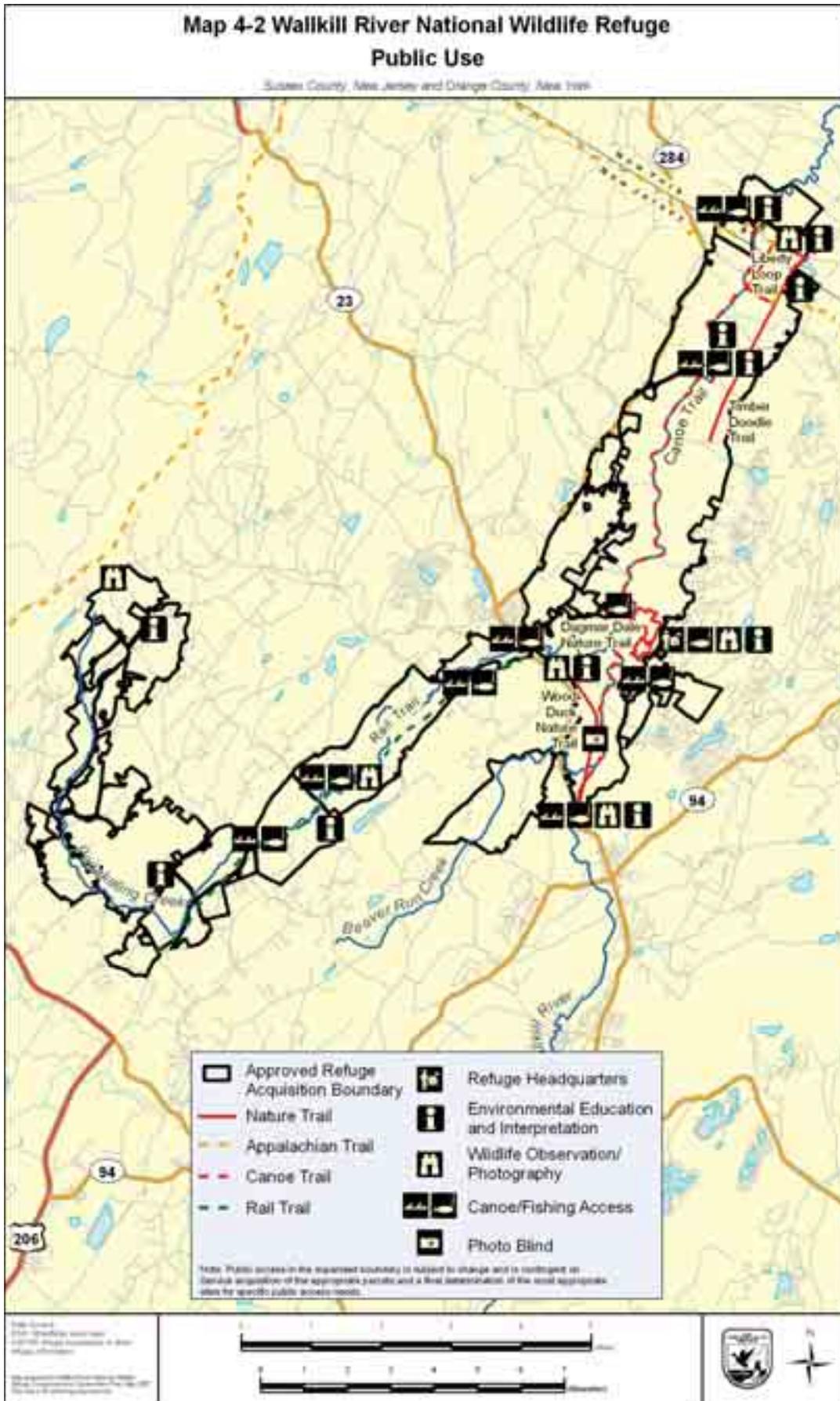
Within 10 to 15 years of CCP approval, actively maintain a rotational mosaic of 1,708 acres in scrub-shrub habitat within the 17,050-acre approved refuge acquisition boundary to provide habitat for shrub nesting land birds of concern, such as the golden winged warbler, prairie warbler, field sparrow, eastern towhee, gray catbird (Dettmers 2000) and woodcock. Depending on the spatial characteristics of the land, some scrub-shrub parcels will total less than 10 acres in size.

Rationale

The Wallkill River refuge is located in one of the more unforested landscapes in the Northern Ridge and Valley physiographic area, made up of the Kittatinny Ridge to the west, the Hudson Highlands to the east, and the Kittatinny Valley in the middle. Much of the land already managed or protected in this physiographic area is forestland. Therefore, the refuge holds a unique position of being a large tract of public land with non-forested habitats that we could manage for grassland or shrub land birds, and lies within a landscape that has a significant proportion of open land where it makes ecological sense to manage for those types of species (Dettmers 2000). There has been a shift in focus from grassland management to scrub-shrub habitat in refuges in the east. This is due in part to a report on grassland bird breeding use of managed grasslands on National Wildlife Refuges within Region 5 (Runge et. al., 2004), which did not list Mid-Atlantic Coastal Plain refuges as the ideal place for grassland birds. Grassland species were a focus at one time in the east because of the amount of abandoned agricultural land that has the potential to be managed for grassland birds. Recently, however, due to southern New Jersey's questionable matrix of habitats for grassland birds, the Grassland Study Preliminary Report recognizes scrub-shrub habitat as increasingly more important. Factors such as topography, habitat, soils, and surrounding upland forest make conditions at Wallkill better suited for scrub-shrub and forest interior-dependent species.

The refuge also lies within Bird Conservation Area 17, as defined by the PIF Bird Conservation Plan (Rosenberg 2003). This plan also identifies shrub-scrub habitat as high priority because of its importance to breeding populations of golden-winged warblers, but also because many other shrub land species have undergone significant population declines in this physiographic area (Dettmers 2000). The Area 17 targets for shrub land acres and bird populations are considerably higher than are those for the grassland suite, so it will be more difficult for the refuge to make as large a contribution to the PIF goals. The PIF





Scrub-shrub habitat often grows in former grasslands.



USFWS

plan calls for 71,000 ha (175,500 ac) of shrub land habitat to support the entire suite of birds using this habitat. However, although the refuge may not be able to make a large contribution to the overall PIF goal for this habitat-suite, some management for shrub land birds could fit rather easily into the overall plans and spatial configuration of habitats on Service-owned land, within the current and expanded refuge boundaries.

Within the refuge boundary, we will allow grassland and scrub-shrub habitats along the 100-meter riparian corridor of the Wallkill River to succeed to forest. We will maintain as scrub-shrub habitat the areas outside that corridor with substantial populations of scrub-shrub-dependent birds. Most birds that depend on shrub land do not require as large and as contiguous patches of appropriate habitat as many of the high-priority grassland- and woodland-dependent birds. Most of the shrubland species readily use small (2- to 5-acre) patches of scrub-shrub forest habitat. If we allow the small fields that would not be very beneficial for grassland birds on the refuge to continue their succession, they will make good habitat for shrub land birds. We will manage a complex of those small fields on a longer rotational basis to provide a variety of scrub-shrub habitats. The refuge will also make a greater effort to establish scrub-shrub habitat if golden-winged warblers are breeding on or near its land. This species is one of the highest-priority species, and if it is breeding in the area, the refuge could potentially provide good habitat for it. The PIF plan considers managing for this species as high priority wherever it is feasible. Golden-winged warbler territories have been described as having thick, brushy habitat interspersed with patches of relatively open, herbaceous vegetation (grasses or sedges), often with a forested edge or perimeter. Nests are often located along field-forest edges where brushy and herbaceous patches meet. Some of this type of habitat already exists on currently owned refuge land. By allowing some small fields to succeed, we could provide more of that type of habitat on Service-owned lands.

The New Jersey WAP also identifies golden-winged warbler and woodcock as important species to manage for in this area of the state. The state hopes to increase and stabilize population numbers for both these species of scrub-shrub-dependent birds.

Strategies

- Continue to acquire from willing sellers 100 acres of scrub-shrub habitat still in private ownership within the original refuge acquisition boundary and manage according to objective 1.1 (above).
- Allow natural succession to occur on existing grasslands less than 40 acres in size.
- Conduct annual woodcock surveys refuge-wide.
- Continue partnership with the Ruffed Grouse Society to maintain scrub-shrub habitat.
- When habitat measurements indicate succession has caused a degradation of quality scrub-shrub habitat, the refuge staff will use prescribed fire, mowing or other appropriate action to maintain habitat quality.

Within 5 years of CCP approval:

- Manage a total of 730 acres of land within the original approved acquisition boundary as scrub-shrub habitat.
- Inventory and map all existing scrub-shrub habitats >2 acres.
- Conduct bird surveys of scrub-shrub habitats to determine which species are using these habitats. Determine whether golden-winged warblers, a high-priority species within the PIF plan and the New Jersey WAP, are breeding on or near refuge land. If found, we would likely tailor scrub-shrub management strategies towards the golden winged warbler in some areas of the refuge.
- Convene a group of specialists to evaluate each shrub-scrub habitat field and determine which fields could be effectively managed over the long-term to benefit focus species, such as those mentioned in the objective above.

Within 15 years of CCP approval:

- Determine which of the existing shrub-scrub fields (less than 25 acres) we will allow to grow into mature forest, and which we will manage on a 10- to 15-year rotation (or, once the height of the prevalent vegetation reaches 10 feet). In general, we will allow small fields within the 100-meter floodplain of the Wallkill River to succeed to forested habitat in order to establish the floodplain forest. For the fields that will remain as shrub-scrub, we will use accepted management practices such as mechanical control, management ignited prescribed fire, livestock grazing, and herbicides to maintain fields in desired vegetated stages.
- Incorporate plans for shrubland habitat management into a larger Habitat Management Plan (HMP). Establish shrubland management areas in the HMP.
- Acquire from willing sellers 978 acres within the expansion area and manage fee land as scrub-shrub habitat.

Objective 1.2 (Non-Forested Wetlands)

Manage 3,324 acres of non-forested wetland habitat within the 17,050-acre approved refuge acquisition boundary, including 335 acres of moist soil units at Liberty Marsh, to provide spring and fall migratory waterfowl habitat for species such as black duck, wood duck, mallard and green-winged teal; to provide shorebird habitat for species such as greater and lesser yellowlegs and spotted



Kevin Holcomb

Non-forested wetlands on the refuge provide stopover habitat for many migratory birds.

sandpiper; and, to provide wintering raptor foraging habitat for species such as short-eared owls, northern harrier and rough-legged hawk.

Rationale

The refuge falls within the Atlantic Coast Joint Venture (ACJV) Northern New Jersey Limestone Focus Area. That area is centered on valuable inland freshwater wetlands of Northwestern New Jersey stretching southeast of the Kittatinny Mountains into Warren and Sussex counties. These wetlands in the northeastern section of the focus area drain into the Hudson River Drainage Basin via the Wallkill River. According to the New Jersey Governor’s Skyland Greenway Task Force, the Upper Wallkill River Valley is considered crucial land, and the New Jersey State Natural

Heritage Program has identified several areas (most of which are wetlands) within the focus area as a Priority Site for Biodiversity. Waterfowl such as the Atlantic population Canada goose, American black duck, mallard, wood duck, hooded merganser, and the common merganser use the focus area in breeding, migrating and wintering. Additional migratory birds of significance are the common snipe (whose limited breeding sites include the Wallkill River), more than 170 species of passerines, and several nests of bald eagle pairs (ACJV-Focus Area Report Draft quoting Walsh et al. 1999). In addition, the New Jersey WAP identifies non-forested wetland habitat in this area as important for increasing and stabilizing the populations of four state-listed endangered species and three state-listed threatened species. The endangered species include the American bittern, Northern harrier, pied-billed grebe and sedge wren. The threatened species include the black-crowned night heron, osprey, and long-tailed salamander.

We will continue to manage 335 acres of freshwater impoundments at Liberty Marsh. Depending on the results of the impoundment study, the refuge may convert additional non-forested wetlands within the 17,050-acre approved acquisition boundary to moist soil management units. The acreage and location of habitats may vary somewhat each year, depending on wetland dynamics, vegetation management, and successional changes in each wetland. The primary effort within impoundments will be to provide productive annual vegetation communities to meet the feeding requirements for a variety of shorebirds and waterfowl that depend on this habitat. At Liberty Marsh, this means that for 3 to 4 weeks during the peak migration times in the spring and fall, the refuge staff will flood those impoundments, after which drawdowns will allow vegetative reproduction in the summer. Recent management actions, however, have revealed that the soils in Liberty Marsh may be unable to retain water for extended periods. For that reason, holding water in these impoundments for extended periods makes them ineffective. Therefore, the refuge is reconsidering the value of impoundments in its management goals.

We will base the decision to convert wetlands to moist soil management units on a set of criteria laid out in the strategies below. We will try to avoid duplicating habitat composition that occurs in natural wetlands outside the impoundment system. Moist soil management units are highly managed systems, and require significant amounts of staff time and maintenance to oversee water level manipulation and vegetation control.

We will consider restoring other wetlands to a more natural drainage regime. Many areas along the Wallkill River and its tributaries have been used extensively for agriculture for the past two centuries. If the Service were to acquire lands that are no longer being used for agriculture, we could increase their benefit to migratory birds and fish by removing dikes and plugging drainage ditches. The return of more natural water flows can reduce the prevalence of invasive species. Often, those areas require little active management. See Goal 2, Objective 2.1 for specific strategies related to wetland restoration.

Strategies

- Continue to acquire from willing sellers 523 acres of non-forested wetland habitat still in private ownership within the original refuge acquisition boundary and manage similar to land under objective 1.2.
- Continue to manage water levels in seven impoundments at Liberty Marsh and record weekly gauge readings. Use drawdown, flooding, soil manipulation and other techniques to provide quality habitats at appropriate times to meet the migration chronology of the wildlife in the objective. We will manage the habitats as a combination of 18- to 36-inch shallow water habitat (about 75 acres) for waterfowl such as common mergansers, 3- to 18-inch shallow water habitat (about 125 acres) for species such as black duck, and mudflat habitat (about 130 acres) for shorebirds such as sandpipers.
- Continue to participate in the Regional Impoundment study and follow-up from 2005-2008. Based on the results of this study, we will implement adaptive management strategies in the refuge impoundment system. Participate in future wetland management studies in order to continue refinement of refuge management practices. Physical and structural limitations of the impoundments will play a role in how the refuge will manage them.
- Continue to conduct waterfowl and shorebird surveys to evaluate response to management.

Within 15 years of CCP approval:

- Manage a total of 1,420 acres within the original refuge acquisition boundary as non-forested wetland habitat.
- Acquire from willing sellers 1,904 acres within the expansion area, and manage fee land as non-forested wetland habitat according to objective 1.2 above.
- Use the following criteria to determine whether newly-acquired non-forested wetlands would qualify for conversion into moist soil management units and, therefore, would be managed similarly to Liberty Marsh, as stated in the rationale above. We expect that new impoundments would be managed in a similar proportion and in a similar way to our current impoundments.
 - The area must be located near a direct water source (creek, river, runoff or some other water source).
 - The area must be located in a low area in relation to the water source so gravity can work with the water control structure to adjust water levels for the spring and fall bird migrations.
 - The area ideally would be deforested when the Service acquires it.
 - The site must contain soils suitable for holding water for moderate to extended periods.
 - Berms, dikes or other impediments to water flow should be preexisting.

- Evaluate waterways within the refuge to determine whether excessive erosion is occurring. Develop restoration plans if the erosion falls outside the range of natural variability.
- Evaluate areas that have been drained, ditched, and diked along the Wallkill River and its tributaries for restoration to more natural drainage patterns.

Objective 1.3 (Grassland Habitat)

Within 10 to 15 years of CCP approval, refuge staff will manage a mosaic of 1,382 acres of grassland habitat within the 17,050-acre approved refuge acquisition boundary for bobolink, grasshopper sparrow and savannah sparrow, including three grassland focus areas of at least 100 acres each within the original refuge acquisition boundary, and additional parcels >100 acres likely to be identified and managed within the expansion area. Half the total acreage would be managed as short, sparse grassland (<50 cm tall; <75-percent vegetative cover) to provide habitat for grasshopper sparrows and the other half would be managed as medium height, dense grassland (50–100 cm tall; 75–95-percent vegetative cover) to provide habitat for bobolink. Both types of grassland would also support savannah sparrows.

Rationale

As stated above in objective 1.1, the refuge holds a unique position of being a large tract of public land with non-forested habitats that we could manage for grassland or shrub land birds. Although scrub-shrub-dependent birds are a higher priority than are grassland birds in many of the regional bird conservation plans, and although the refuge cannot provide the quantity and quality of grassland habitat that refuges to the north and south are able to, the Wallkill River refuge can still play a role in providing habitat for grassland-dependent birds.

For the grassland habitat suite, the PIF Bird Conservation Plan for Area 17 focuses on setting objectives for bobolinks, grasshopper sparrows, and upland sandpipers. The New Jersey WAP also identifies those three bird species as state-listed (threatened). We use bobolinks as a grassland generalist, and assume that, if sufficient habitat is provided for this species, then many of the other species in this habitat suite also will be provided for. Grasshopper sparrows and upland sandpipers are two more specialists, so we set specific objectives for them. Grasshopper sparrows require larger patches of grassland with fairly short and sparse vegetation. Upland sandpipers have the largest area requirements of all the grassland birds, and need a mixture of both tall and short grasses. Therefore, managing for upland sandpipers is not a realistic goal at the refuge. Instead, the refuge will focus its grassland management goals on bobolinks, grasshopper sparrows, and savannah sparrows. A 3-year study of grassland birds at the Wallkill River refuge also recommended managing for those three bird species (Gore 1998).

In his report on how the Wallkill River refuge can best contribute to PIF objectives, Dettmers (2000) suggested as a reasonable short-term goal (5–8 years) that the refuge support 1 percent of the target population/acres for the three grassland birds mentioned above within the original refuge acquisition boundary. For bobolinks, the PIF Area 17 goals are 13,000 ha of grassland to support 12,000 pairs. One percent of 12,000 pairs is 120 pairs; 1 percent of 13,000 ha is 130 ha (320 acres). Dettmers suggested a long-term goal (10–15 years) for the refuge would be to double these numbers and support about 250 pairs of bobolinks with 650 acres devoted to management for grassland birds within the original refuge acquisition boundary. The assumption being that within those 650 acres, the population objectives for bobolinks, grasshopper sparrows, and savannah sparrow could also be met. About half of those acres should be managed specifically to support 1 percent of the Area 17 grasshopper sparrow objectives, or 45 pairs of grasshopper sparrows, and 160 acres managed for the short-term

goal, and 90 pairs and 300 to 350 acres managed for the long-term goal. Savannah sparrows are sufficiently general in their habitat needs that the acres managed for grasshopper sparrows and bobolinks should be sufficient to achieve the target numbers. See table 4.2 below for a summary of recommendations for grassland management on the refuge. Management for all of these species should focus in fields that are at least 50 acres in size, with larger being better. As mentioned in the grassland objective, the refuge will manage three grassland focus areas of 100 acres or more, while allowing grassland fields smaller than 100 acres to succeed to shrub-scrub habitat, as mentioned in objective 1.1.

We used the recommendations above as a guideline for setting the objectives for grassland habitat management in the original refuge acquisition boundary. We would use the same guidelines as the Service acquires land in the expansion boundary.

Table 4.1. Summary of recommendations for Wallkill River refuge grassland management.

Species	Short-term Goals (5–8 years)		Long-term Goals (10–15 years)	
	Population goal	Acreage goal	Population goal	Acreage goal
Bobolink	120 pairs	320 ac	250 pairs	650 ac
Savannah Sparrow	87 pairs		150 pairs	
Grasshopper Sparrow	45 pairs	160 ac (of 320)	90 pairs	300-350 ac (of 650)

Strategies

- Continue to acquire from willing sellers 23 acres of this cover type still in private ownership within the original refuge acquisition boundary and manage according to objective 1.3 above.
- Continue mowing, haying, prescribed burns, herbicides, and livestock grazing as grassland maintenance tools.
- When agricultural fields >50 acres in size are acquired, maintain by mowing and haying or restore to warm season native grasslands.
- Each year, maintain the 50-acre, early-successional cool season grassland on Tract 43 to provide nesting habitat for bobolinks.
- Exchange information with local farmers on Best Management Practices for land within the acquisition boundary, such as grazing fields on a rotational basis, herbicide application and prescribed fire.
- Continue annual breeding grassland bird surveys following Regional protocol to help assess larger-scale population and other trends.
- Continue annual mid-winter raptor surveys.

Within 5 years of CCP approval:

- Within the original refuge acquisition boundary, manage a total of 590 acres of grassland habitat divided into three grassland focus areas. Apply a rotational treatment schedule every 1 to 5 years, depending on site characteristics, which will create a variety of successional stages and vegetation diversity. Treatments would include haying and mowing, igniting management-

prescribed fire, applying herbicides, and grazing livestock. Large fields (≥ 100 acres) could be divided in half or thirds, with each section managed on a rotational basis. Smaller fields (50–100 acres) could be managed as a complex, especially if they are close to each other. Use Mitchell's Grasslands Report for overall strategy as to grass species/structure/etc. (Mitchell 2000).

- Establish criteria and monitor effectiveness of haying and grazing to ensure these operations benefit nesting or wintering grassland-dependent bird habitat as defined by Mitchell (USFWS 2000).
- Consult with NRCS when planting native grasses to ensure the selected species will grow well under the soil type and moisture conditions of a given field. Contact grassland bird experts about the value of grass species to wildlife.
- Annually conduct breeding and wintering grassland-dependent bird surveys, documenting the use of different successional stages by nesting and wintering grassland birds. Identify vegetation parameters that will be monitored along with bird response. Use this information to adjust habitat management techniques on grassland.
- Incorporate plans for grassland management into the larger Habitat Management Plan (HMP).

Within 10–15 years of CCP approval:

- Acquire from willing sellers 791 acres within the expansion area and manage land acquired in fee as grassland habitat according to objective 1.3 above.
- Create grassland focus areas in the expansion area where appropriate conditions exist. Some of the criteria we will use for deciding whether future land would be appropriate for inclusion in grassland focus areas include the following:
 - Several old fields that are adjacent or close to each other, and total at least 50 acres.
 - Fields that contain soils that are conducive to growing grassland plant species for the target bird species mentioned above.
 - Fields that refuge staff can access easily for management purposes.
 - Fields that have a site history conducive to grassland plant species.
- Two areas within the Papakating Creek Focus Area that could fit the above criteria are at the intersections of Plains Road, Meyer Road and Davis Road, continuing in each direction along Plains Road, and at Klimans Road and Route 519.
- Work with neighboring landowners to promote privately-owned grasslands that will benefit grassland species of conservation concern.
- Initiate a study on tracts 15b and 79a (26 acres) to assess the effectiveness of livestock grazing to maintain nesting grassland bird habitat and reduce the percent cover of invasive plant species such as purple loosestrife and multi-flora rose.

- Develop a Habitat Management Plan (HMP) and a Monitoring and Inventory Plan, emphasizing grassland to maintain the existing diversity of nesting and wintering grassland birds.

Objective 1.4 (Forested Communities)

Sustain 9,761 acres of forested wetlands and uplands within the 17,050-acre approved refuge acquisition boundary to maintain overall habitat diversity in Sussex County. Approximately 5,474 acres would be maintained as palustrine, mature (80+ years) deciduous floodplain forest and 4,286 acres in mixed upland forest, both in habitat patches over 100 acres, to support a suite of nesting interior forested land birds of concern, such as cerulean warbler, worm eating warbler, wood thrush, eastern wood peewee, Baltimore oriole, Louisiana water thrush, Kentucky warbler, and scarlet tanager.

Rationale

The PIF Bird Conservation Plan for Area 17 calls for almost 2.5 million acres of mature hardwood forest to support mature forest habitat-species suite in Area 17 (Rosenberg 2003); however, because mature hardwood forest is the top conservation priority in Area 17, any contributions to the overall conservation goals for this habitat are significant. Many of the refuge's forested uplands connect to the larger blocks of forest covering the surrounding uplands. Within these upland forests, with their more fertile soils and gentler slopes, mature trees often will have greater height, health and biomass. Many migratory bird species such as red-eyed vireo and rufous-sided towhee will use those habitats. Vernal pools are an important component of those areas, and the refuge has more than 25 of those sites. Salamanders, frogs and toads all use them.

With much of the forestland in this physiographic area occurring on ridges, bottomland forests are a rare commodity (Dettmers 2000). Managing for forested bottomland corridors along the Walkkill River and its tributaries would constitute a significant contribution to the overall goals for Area 17, especially with a focus on cerulean warblers and Louisiana water thrushes. Cerulean warblers will occupy late successional bottomland forests, especially those with sycamore as a prominent component. Water thrushes require late successional hardwood forests along rocky, flowing streams. Both species are more common in larger patches of forest. Forest bottomlands and riparian corridors also would benefit most of the other high-priority species in this suite. Wood thrushes and Baltimore orioles, in particular, will readily occupy those habitats. Pewees and scarlet tanagers will also use them.

Connecting and consolidating existing large blocks of mature forest wherever possible will also benefit the suite of bird species mentioned above. Whether more active management of existing forestland would be needed depends on its condition. Many of the priority mature forest species prefer late successional woodlands with small gaps scattered throughout. The gaps create structural vegetation diversity that these birds require or at least prefer. Even-aged forests that are densely stocked and have little horizontal diversity in their vegetation layers will not support as many species or individuals as a forest with well-developed layers of understory, mid-story, and canopy. Selective cutting could be used to create small gaps if the existing woods lack sufficient structural diversity.

Large blocks of forested habitat would also benefit the state-listed threatened and endangered species identified in the New Jersey WAP. The state-listed endangered species include the Allegheny woodrat, bobcat, northern goshawk, red-shouldered hawk, and timber rattlesnake. The state-listed threatened species in this area include the barred owl, Cooper's hawk, long-eared owl, red-headed woodpecker, and wood turtle. New York's Comprehensive Wildlife Conservation Strategy (CWCS) identified the Shawangunk mountain range, located northwest of the refuge, as containing forested habitats that are

important migratory corridors for raptors and other migratory birds. Those habitats contain a forest matrix of chestnut-oak forest (chestnut oak, red oak), hemlock, northern hardwood forest, and pitch pine-oak heath rocky summit interspersed with vernal pool and wetland habitat.

Strategies

- Continue to acquire from willing sellers 356 acres of forested wetland habitat and 439 acres of upland forested habitat still in private ownership within the original refuge acquisition boundary and manage according to the strategies below.
- Allow natural succession to occur in existing forested communities.
- Continue annual land bird surveys following Regional protocol in the forested habitats of the refuge.
- Continue long-term monitoring of the refuge’s 26 or more vernal pools and their associated amphibian populations. This monitoring effort is part of the USGS “Amphibian Research and Monitoring Initiative.” That region-wide study aims at determining the regional distribution of vernal pools in parks and refuges in the northeast.

Within 5 years of CCP approval:

- Within the original refuge acquisition boundary, manage a total of 2,339 acres of forested wetland habitat and 1,831 acres of forested upland habitat.
- Map and inventory stand conditions in all mature deciduous forested stands greater than 10 acres. Identify core patches (>100 acres) of forest and options to increase the size of these core patches by allowing small fields to revert to forest.
- Where appropriate, increase the connectivity of core forest patches by creating forested travel corridors between them.
- Begin to establish and manage a minimum 100-meter mature forested riparian corridor on both sides of the Wallkill River. That corridor will comprise silver maple, eastern cottonwood, ash, black willow, sycamore, pin oak, river birch, and elm. Land may be exempt that makes up parts of the three grassland focus areas, the moist soil management units (see objectives above) or threatened and endangered species habitat.
- Monitor hemlock woolly adelgid outbreaks on the refuge and implement control methods when impacts are outside the range of natural variability. Monitor the occurrence of objective land bird species (Louisiana water thrush and cerulean warbler), and relate species occurrence to habitat conditions. Use that information to guide future decisions about forest management to improve forest contributions to these species.

Within 15 years of CCP approval:

- Develop an HMP and Monitoring and Inventory Plan for refuge land to maximize forest health and support mature (>80-year-old) forest-dependent species on the existing refuge forest. Use the PIF plan (Area 17) mature forested bird priorities and recommended management techniques. Also, look for upland species identified in the New Jersey WAP that would benefit from joint management on that land. A few areas in the Papakating Creek expansion area are good candidates for that, including the area around Roy Road, and numerous corridors around Armstrong Bog and along Gunn Road.

- Incorporate the Atlantic white cedar swamp into the HMP.
- Acquire from willing sellers 5,590 acres within the expansion area. Manage 3,135 acres of fee land as forested wetland and 2,455 acres as forested upland. Identify upland forest tracts with significant ecological connections with other preserved tracts around the refuge. Also, identify core patches (>100 acres) of forest and options to increase their size by allowing small fields to revert to forest. A few areas in the Papakating Creek Focus Area fit those criteria: the Armstrong Bog; the area between Roy Road, Lewisburg Road and Route 565; Gunn Road near and north of its intersection with South Dory Road; and the hemlock forest along George Hill Road between the Pines and Plains roads.
- Use the results of the “Amphibian Research and Monitoring Initiative” to assess threats to the refuge’s vernal pools and their associated amphibian populations. By estimating the trends, extinction and turnover rates of populations in vernal pools, the refuge will have baseline monitoring information. If amphibian populations drop significantly, the refuge will take steps to identify factors related to that drop in population, and will manage for eliminating those factors when possible. Work with the USGS to establish adaptive management techniques and develop long-term management plans with suitable goals and objectives for managing vernal pools.
- Use accepted forestry practices to maximize horizontal diversity within these large forested blocks. That would reduce even-aged stands and produce a wider variety of habitats through better-developed layers of understory, mid-story and canopy.

Objective 1.5 (Bog Turtle Management)

In support of recovery efforts, pursue long-term monitoring and maintenance of bog turtle sites within the approved refuge acquisition boundary by developing site management and monitoring plans for occupied, historical, or potential sites. Recovery tasks 3.1, 3.5, and 6.1 through 6.4 should be incorporated into each site plan as appropriate.

Rationale

One bog turtle site is known on refuge-owned land, and another within the original refuge acquisition boundary. Federal-listed threatened bog turtles also inhabit the Papakating Creek Focus Area in sedge fens. Those fens are often small (<5 acres) habitat patches that generally occur as part of larger calcareous wetland complexes, including shrub and forested swamp, dwarf shrub bogs, marsh, and beaver ponds. Up to five Bog Turtle Population Analysis Sites (PAS) within the expansion area must be protected to meet the recovery objectives for the bog turtle (USFWS 2001). The New Jersey WAP and the New York CWCS identify the bog turtle as a “species of greatest conservation need.” The New York strategy identifies the lower Hudson River Valley, wherein the northern portion of the approved refuge boundary lies, as a hot spot for amphibian and reptile biodiversity in New York State. That area contains high quality habitat for wetland-dependent species, and some of the best bog turtle habitat in the Hudson River Valley. Important habitats include red maple-hardwood swamp, floodplain forest, fens, and shallow emergent marsh.

Surveys are needed to monitor the status of bog turtles at known sites, re-evaluate the presence of turtles at historical locations, and locate additional sites for conservation and recovery. Working with the Wallkill Watershed Management Group, and using maps available from federal and state sources, including the New Jersey WAP, we looked at areas within the expansion area for their long-term value as bog turtle habitat. We also used maps developed by the Service and the state’s endangered non-game species program to locate potential and actual bog turtle sites.

Strategies

- Work with the Service's New Jersey and New York Field Offices and the states of New Jersey and New York to screen the projects or permits that may affect bog turtles and their habitats on and near the refuge.
- Work with the Service's New Jersey and New York Field Offices and the states of New Jersey and New York to improve the effectiveness of regulatory reviews in protecting bog turtles and their habitats, specifically to address agencies working at cross-purposes when permitting activities in wetlands.
- Conduct surveys of known, historical and potential bog turtle habitat.
- Monitor the status of and threats to populations and habitat, including changes in hydrology, encroachment of development, successional changes, and the introduction and spread of invasive native and exotic plants. Monitor population trends, signs of recruitment and reproduction, seasonal movements, and home range using methods such as radio telemetry, trapping and foot searches.
- Each year, refuge staff will coordinate with the Bog Turtle Recovery Team, states (NYSDEC and NJDEP), and conservation partners to ensure the best available science is employed for management decisions.
- Continue efforts to acquire the one known bog turtle site on private land within the original refuge acquisition boundary.
- Deter poaching of bog turtles by conducting routine and random site visits.
- Evaluate report on freshwater turtle management, written by Dr. Kurt Buhlmann in 2005, to assess new bog turtle habitat management techniques.

Within 5 years of CCP approval:

- Develop a site management and monitoring plan for occupied sites on Service-owned land. The plan will stipulate actions needed to sustain and/or improve habitat for bog turtles such as annually collecting information on population characteristics and movement patterns.
- Complete a field survey, using Service protocol, of all suitable refuge habitat sites for the presence of bog turtles.
- Work with the Service's New Jersey Field Office to conduct an intra-Service section 7 consultation on all actions related to bog turtles in this CCP (See Appendix H) and in future management plans.

Within 15 years of CCP approval:

- Based on surveys, develop site management and monitoring plans for potential refuge sites that could support the reintroduction of bog turtles with active management (e.g., manipulating trees or simulating beaver ponds flooding regime sequence). Selectively cut or girdle red maple trees to maintain a 70-percent open canopy.
- Evaluate the pond by refuge headquarters to determine if natural hydrology can be restored to benefit bog turtles; implement if feasible.

- Work with partners to implement a tagging program for local bog turtles that would help identify them if they are captured illegally. Encourage the use of PIT tags so that illegal collectors will not know the turtle has been tagged, but law enforcement officials will be able to read the tag and determine where the turtle was collected.

Objective 1.6 (Other Threatened and Endangered Species)

In cooperation with the Service's New Jersey Field Office, establish survey and monitoring protocol for dwarf wedgemussels, Indiana bats, Mitchell's satyr butterfly and small-whorled pogonia within the approved refuge acquisition boundary.

Rationale

The dwarf wedgemussel, Indiana bat, and Mitchell's satyr butterfly are three of the five species the New Jersey WAP identifies as "wildlife of greatest conservation need" within the Skylands Landscape, where the refuge is located. The other two species are the bog turtle, mentioned in the objective above, and the bald eagle.

The Papakating Creek Focus Area contains potential habitat for the federal-listed endangered dwarf wedgemussel. The New Jersey WAP identifies the dwarf wedgemussel as a "species of greatest conservation need" within the Kittatinny Valley. State biologists have surveyed the refuge for dwarf wedgemussels, and although they did not find that species, the habitat conditions are ripe for its introduction.

The refuge first conducted mist net surveys for Indiana bats in August 2008. Surveyors found three Indiana bats, including one post-lactating female and one juvenile, which indicates the presence of a maternity colony nearby. The refuge had previously suspected the presence of Indiana bats, in part because they have been documented in several nearby locations. A maternity colony was found in the summer of 2007 in Wantage, about 2.25 to 4 miles from refuge lands; and since the mid-1990's, Indiana bats have been known to hibernate in three areas near Hibernia, N.J., about 20 miles south of the Wallkill River refuge. Also, the bats' summer focus area—where bats could potentially occur between April 1 and September 30—includes the entire refuge. Furthermore, the refuge provides riparian, forested and upland habitat types typically used by Indiana bats in summer for roosting and foraging.

Two well-known sites in Sussex and Warren counties recently supported the Mitchell's satyr butterfly (USFWS 1998). The approved acquisition boundary is located within Sussex County. Warren County is located immediately to the south. The confirmed sites are both fens located in areas of limestone bedrock, which is similar to the habitat type used by bog turtles. The recovery plan goal for New Jersey is to establish one metapopulation in the state.

The small-whorled pogonia is a plant that occurs in upland sites in mixed-deciduous or mixed-deciduous coniferous forests in second- or third-growth successional stages. Two confirmed extant sites of the plant are in Sussex County, New Jersey. The long-term goal for the species is to delist it by ensuring its long-term viability.

Strategies

- Continue land acquisition within the original refuge acquisition boundary to maintain undeveloped river shoreline and reduce continued degradation of water quality.

- Continue to work with state biologists and with the Service's New Jersey Field Office to conduct surveys of the Wallkill River and its tributaries for dwarf wedgemussel. State biologists have suggested using aquascopes during underwater searches, searching a 300-meter segment of the river bottom at a time, conducting shoreline inspections for shells and relics, and recording bivalve species, habitat information, current speed and depth of water at each location.
- If we find a population of dwarf wedgemussels on the refuge, we will establish and implement a monitoring and management plan for this listed species.

Within 5 years of CCP approval:

- Work with our New Jersey Field Office to hire a private contractor to conduct mist net surveys for Indiana bats on the refuge.
- Collaborate with Great Swamp refuge to recruit students to conduct research on Indiana bats on the refuge. The students could study the various life cycles of the bats, such as when and where they forage, hibernate and roost.
- Survey the expansion area for other potential habitat for federal-listed species.

Within 15 years of CCP approval:

- Determine the feasibility of re-establishing populations of dwarf wedgemussel within that species' historic range and, if feasible, introduce it into those areas.
- Collaborate with local colleges and universities to aid the refuge with research on dwarf wedgemussels.
- Begin surveys for Mitchell's satyr butterfly on the refuge in appropriate habitat types, such as calcareous fens. If found, implement the tasks in the recovery plan.
- Begin surveys for small-whorled pogonia on the refuge in appropriate habitat types, such as upland forest. If found, implement the tasks in the recovery plan.
- Encourage the protection of endangered and threatened species by developing an educational awareness program.

GOAL 2:

Objective 2.1 (Wetland Restoration)

Promote actions that contribute to a healthier Wallkill River.

Restore approximately 843 acres within the 17,050-acre approved refuge acquisition boundary to wetland habitat to facilitate the natural hydrologic flow of the Wallkill River and provide high quality habitat for migratory waterfowl and shorebirds.

Rationale

The bottomland wetlands associated with the Wallkill River offer some of the last undeveloped, large areas of habitat in northwestern New Jersey, and are important contributors to the water quality of the river. Emergent marshes act as natural filtration systems for the watershed, and support diverse marsh-nesting birds. Many of the wetlands surrounding the Wallkill River have been drained, ditched and converted to agricultural fields over the past 200 years. Identifying and mapping impediments to hydrologic flow will provide us with the information we need to decide where and how to restore wetland habitat. Then, we will use that information to restore or recreate a more natural



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Cows provide a microtopography beneficial to bog turtles.

hydrology. We would either restore wetlands by implementing non-intensive wetland restoration techniques or by creating moist soil management units (see objective 1.2). Wetland restoration would take place primarily on land adjacent to the Wallkill River, Papakating Creek, or other local stream. We would use site-specific criteria for determining the management actions to employ on any parcel.

Many species of marsh-dependent birds would benefit from wetland restoration at the refuge, including state-listed birds such as the American bittern, least bittern, king rail and black rail. Wetland restoration would also benefit the more than 150 species of land birds, including neotropical migrants that a recent State Breeding Bird Atlas recorded for the upper Wallkill River Valley as probable or confirmed breeders.

Strategies

- Identify and map in GIS impediments to historic hydrologic flow, including flooding regimes, on all Service-owned land. Include all drainage ditches, impoundments, farmed lands, dikes, excavations, tertiary roads, and berms affecting flow.
- Restore 25 acres of adjacent wet meadow habitat at Bassett's Bridge and allow natural hydrology to maintain the site.

Within 5 years of CCP approval:

- Evaluate non-forested wetlands on a parcel-by-parcel basis to determine which restoration technique to use. Criteria for evaluation would include:
 - Areas adjacent to a water source, such as the Wallkill River or Papakating Creek
 - Intensity of management
 - Seasonality of natural flooding
 - Sites containing soils suitable for holding water for moderate to extended periods
- Work with Ducks Unlimited to restore seasonal wetlands near the Wallkill River and its tributaries.

Within 15 years of CCP approval:

- Plant native hardwood species to help establish a forested floodplain corridor at least 100 meters wide from the riverbank on either side of the Wallkill River wherever other habitat types (e.g., grassland, scrub-shrub) do not take precedence because of specific management goals. Use forest regrowth to assist in the management and reduction of invasive plants.
- Reestablish a native grassland or scrub-shrub vegetative cover in areas where the hydrologic disturbance regime would inhibit forest establishment.

Objective 2.2 (Improve Water Quality through Partnerships)

Each year, work in partnership with local communities to improve the biological integrity and environmental health of the Wallkill River and its tributaries through restoration projects and activities that promote river stewardship and protection.

Rationale

Healthy water quality is essential if the Wallkill River is going to continue to provide habitat to riverine species like the dwarf wedgemussel and bog turtle. Non-point-source pollutants pose the largest threat to water quality. Most non-point-source pollutants (e.g., phosphorous, fecal coliform, nitrogen, sediments, metals, oils and greases) come in the form of runoff from land surfaces. In a 2004 report on the Papakating Creek Watershed (Sajdak, et al. 2004), the Wallkill River Watershed Management Group identified phosphorus and fecal coliform as the two pollutants of prime interest for assessment and testing in Papakating Creek. Point-source pollution can also be of concern, depending on the source and the amount of pollution discharged directly into the waterway.

Individual households can contribute to healthy water quality by using environmentally friendly cleaners and updating septic systems. Businesses can educate employees on best management practices. The future health of the Wallkill River and its tributaries depends on the collective effort of everyone who lives and works in the watershed.

Working with the Wallkill River Watershed Management Group and Trout Unlimited, we used federal and state maps to identify land within the expansion area that could be used for long-term studies on monitoring water quality. We also worked with those groups to identify recreational opportunities along the Papakating Creek and the Wallkill River, and explored ways to promote those opportunities.

Strategies

- Continue to work with the Wallkill River Watershed Coordinator to measure water quality through various studies and tests.
- Continue to work with the states of New Jersey and New York to promote healthy water quality.
- Continue to work with local governments, agencies, agricultural organizations and other partners to reduce non-point source pollution and sedimentation.
- Maintain Ducks Unlimited partnership and continue to restore and enhance wetlands.
- Integrate a water quality message in public use programs.

Within 5 years of CCP approval:

- Work with New Jersey Field Office and the Wallkill River Watershed Coordinator to establish a water quality monitoring protocol. Potential areas to be used for establishing that protocol include road junctions between the Papakating Creek and Gunn Rd./Wykertown Rd., Plains Rd., Armstrong Rd., Pelletown Rd., Roy Rd., McCoys Corner, Route 565 and State Route 23.
- Using GIS, map the Wallkill River, Papakating Creek and other main tributaries within the approved refuge acquisition boundary to identify each area’s need for restoration and monitoring. Identify areas for chemical inputs, sedimentation, and erosion.
- Establish a cooperative agreement with the Wallkill River Watershed Management Group to implement jointly a DEP Action Now grant, which includes building canoe ramps, conducting riverbank restoration, and controlling invasive species. Also, implement a joint auto tour project.

- Work with Trout Unlimited to promote recreational use and wetland restoration on the refuge.
- Work with the Trust for Public Land and N.J. Green Acres to protect habitat along the river.
- Work with our Ecological Service Program and the Wallkill River Management Group to implement a water-quality monitoring program on wetlands in the current and expanded acquisition boundaries, in voluntary partnership with private landowners.

Within 15 years of CCP approval:

- Begin restoration on the most sensitive and most accessible areas of the waterways in and near the refuge.
- Develop partnership models that will result in multi-agency efforts to protect and restore the floodplains in and around the refuge.

Objective 2.3 (Private Lands Biologist)

A private lands biologist stationed at the refuge will work through the Partners for Fish and Wildlife Program and other federal programs to find at least two private landowners annually who will manage portions of their properties within the approved refuge acquisition boundary in conformance with the purposes and goals of the refuge.

Rationale

The refuge is not a closed system. Ecological communities continue across refuge boundaries and onto private and other public land. Federal programs, such as the Partners for Fish and Wildlife Program, enable refuges to work with private landowners to manage adjacent land in concert with refuge land to create the effect of large, contiguous blocks of significant ecological communities. Through that program, the Service works in cooperation with other government agencies, public and private organizations and private landowners to restore, create, or enhance fish and wildlife habitat for federal trust resources. Among other things, the program concentrates on restoring drained or otherwise degraded freshwater wetlands, restoring riparian habitats, restoring habitats of endangered and threatened species, and restoring fish habitats.

Although the area within and around the refuge has seen a moderate amount of residential development, hundreds of acres of privately owned abandoned agricultural land remain. We could convert these acres into significant wildlife habitat. Large blocks of wildlife habitat tend to support a larger diversity of wildlife species by reducing edge effects and maintaining a larger core, or interior, habitat.

Strategies

Within 10 years of CCP approval:

- Hire a private lands biologist to work with partners to create, restore or enhance regionally significant ecological communities (specifically, those identified in goal 1), focusing on landowners with large acreages or farmlands.
- A private lands biologist will cooperate with federal, state and local partners to provide technical information to private landowners interested in managing their lands as wildlife habitat. For example, a private landowner could learn about methods for eradicating invasive species.

- A private lands biologist will provide technical assistance to landowners and municipalities on how to raise awareness of human impacts on significant wetlands (e.g., groundwater withdrawal) and on the importance of vernal pools.
- A private lands biologist will work with landowners to conduct wetland inventories and riparian restoration along the Wallkill River and its tributaries within the acquisition boundary.

GOAL 3:

Increase or improve opportunities for hunting, fishing, environmental education, interpretation, wildlife observation and wildlife photography.

Objective 3.1 (Hunting)

The refuge will provide high-quality opportunities for hunting on Service-owned land within the approved acquisition boundary (New Jersey only), subject to specific refuge regulations.

Rationale

The Refuge Improvement Act identifies hunting as a priority public use. Priority public uses are to receive enhanced consideration when developing goals and objectives for refuges if they are determined to be compatible. Furthermore, the Service’s Regional Office designated hunting as one of the refuge’s “areas of emphasis.” Providing opportunities for the public to engage in these activities on the refuge promotes visitor appreciation and support for refuge programs and helps raise public awareness for the need to protect wildlife habitat.

Opportunities for hunting continue to decrease as land throughout northern New Jersey is subdivided and developed. Consequently, the demand for hunting on public land has increased. Refuge hunt programs should promote positive hunting values and hunter ethics such as fair chase and sportsmanship. In general, hunting on refuges should be superior to that available on other public or private land and should provide participants with reasonable harvest opportunities, uncrowded conditions, fewer conflicts between hunters, relatively undisturbed wildlife and limited interference from or dependence on mechanized aspects of the sport. The refuge may issue hunt permits and create hunt zones to accomplish some of these objectives. We will open the refuge to bear hunting to assist the State of New Jersey in its bear population management and offer more wildlife-oriented recreational opportunities on the refuge. The refuge will only be open to bear hunting in New Jersey if the State has a bear hunt in any given year.

Strategies

- Pursuant to refuge regulations, continue the hunt program for deer in the New Jersey portion of the refuge, according to New Jersey state seasons.
- Pursuant to refuge regulations, continue the hunt program for spring and fall turkey, migratory bird, woodcock, and resident Canada geese in the New Jersey portion of the refuge during New Jersey state seasons.
- Continue youth hunting programs according to New Jersey state seasons.
- Continue to provide barrier-free hunting opportunities to disabled hunters upon request, pursuant to refuge and state regulations. A special hunt will include use of special parking areas.
- Continue to collect a refuge permit fee from all refuge hunters except youth, Golden Age and Golden Access hunters.
- Continue to prohibit night hunting and stocking of game species.
- Continue to keep the New York portion of the refuge closed to hunting.

Within 5 years of CCP approval:

- Complete the remaining components of an opening package that are required to open the New Jersey portion of the refuge to black bear hunting consistent with New Jersey state seasons and regulations. These remaining components include issuing a Finding of No Significant Impact for the final CCP, publishing a final regulation, revising 50 C.F.R. § 32.49.C, and issuing a new annual hunt plan. The refuge will only be open for bear hunting if the State is open for bear hunting.
- Open Service-owned land in the expansion area to public hunting, including black bear hunting, when appropriate conditions exist. Hunting will be prohibited where the refuge identifies it as a threat to public safety, when it poses an unacceptable disturbance to wildlife, or when the acquired area is too small. We will also continue to prohibit hunting in the 335-acre Liberty Marsh complex. Annual hunt plans and updated maps will identify closed areas. An Annual Hunt Plan will also reflect anticipated funding and staffing levels to administer the hunt. Potential hunting areas within the expansion area include the area along Madison Road, Papakating Preserve, and the land south of Wykertown and Meyers roads.
- Expand accessible hunting opportunities at Owens Station.

Objective 3.2 (Fishing)

The refuge will increase fishing opportunities and monitoring of fisheries on Service-owned land within the approved refuge acquisition boundary for able-bodied and disabled anglers.

Rationale

The Refuge Improvement Act identifies fishing as a priority public use. As explained in the rationale for objective 3.1, priority public uses are to receive

enhanced consideration when developing goals and objectives for refuges if they are determined to be compatible. The Service permits sport fishing on refuges where it contributes to or is compatible with refuge purposes. Sport fishing is an acceptable, traditional form of wildlife-oriented recreation. Where practical, fishing should be permitted according to state regulations and seasons. Fishing and watercraft launch sites are located on the refuge at Oil City Road, Bassett's Bridge and County Route 565. A pond adjacent to the refuge headquarters is open for public fishing.

The Refuge holds an annual fishing event to introduce more youth to the sport.



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Strategies

- Maintain fishing and/or canoe access at Oil City Road, Bassett's Bridge, and County Route 565, on the pond adjacent to refuge headquarters and on the Dagmar Dale Nature Trail.
- Complete the development of a parking area at Wallkill River on Route 565.
- Continue to allow anglers to fish anywhere from the river shoreline, which can be accessed from boats on the river or from designated footpaths.
- Continue to stock the pond near refuge quarters no. 5 (285 Lake Wallkill Road) with native fish only for National Fishing Day or other youth/family events.

Within 5 years of CCP approval:

- Post signs stating fishing regulations at canoe/boat launch areas.
- Expand fishing opportunities by providing fishing access to the Wallkill River from County Route 565 and adding an access site along Lake Wallkill Road, behind refuge quarters no. 5.
- Provide universal access for fishing at Bassett’s Bridge.

Within 15 years of CCP approval:

- Institute a voluntary census of anglers.
- Provide fishing opportunities (some with universal access) in the expansion area on Service-owned land by building five boating/fishing access sites where major roads intersect with Papakating Creek. Potential sites include Route 23, where it crosses Papakating Creek; Route 565, where it crosses the creek in the northern part of the Papakating Creek Focus Area, and then again farther south; Roy Road, where it crosses the creek; McCoys Corner; Pelletown Rd., and Plains Rd. Plains Rd. has been used as a trout stocking area.

Objective 3.3 (Wildlife Observation and Photography)

Within 15 years of CCP approval, visitation will increase by 15 percent as the refuge increases opportunities for wildlife observation and photography on Service-owned land within the approved refuge acquisition boundary by opening new trails and increasing opportunities for access. The refuge will provide the infrastructure for a quality program by constructing parking areas, observation platforms and photo blinds.

Rationale

During scoping meetings, members of the public expressed concern that, during the hunt season, hunters were permitted to access many non-maintained and informal trails that the general public was prohibited from accessing. Therefore, during state hunting seasons, when hunters are permitted off-trail access from Monday through Saturday, we will allow the public off-trail access on Sundays, when hunting is prohibited. We also propose to extend some existing refuge trails, create a canoe trail along the Wallkill River, and create a new wildlife observation trail in the north section of the refuge. We will provide additional opportunities for wildlife observation and photography in the expansion boundary.

Strategies

- Continue to provide opportunities for wildlife observation and photography by allowing foot access to the refuge through the Wood Duck Nature Trail (1.5 miles), Dagmar Dale Nature Trail (loops of 1.2 and 1.7 miles) and Liberty Loop Nature Trail (2.5 miles). Snowshoeing and cross-country skiing are permitted in order to facilitate wildlife observation and photography in the winter, when access on foot is difficult.
- Continue to provide access to the Wallkill River at Oil City Road, Bassett’s Bridge, and Route 565. Canoes, kayaks, and other small boats are allowed on the river.
- Maintain photography blind on Wood Duck Nature Trail.
- Maintain observation platform at Liberty Loop Nature Trail.

- Complete plans for parking area for canoe access on Route 565 and Bassett's Bridge. On the refuge, maintain the current wildlife observation and photography opportunities provided by the existing three-trail network.
- Each year, maintain Tract 43 as a 50-acre, early successional cool season grassland to promote an exceptional wildlife viewing opportunity.

Within 5 years of CCP approval:

- Allow off-trail access to Service-owned land on Sundays from September 1 through March 31. Parking at designated refuge parking areas will require the payment of a fee for the parking permit. The refuge will maintain the ability to restrict access in certain areas, such as around the Liberty Loop Nature Trail, to minimize disturbance to migrating and wintering birds.
- Using grant funds already secured, build a boardwalk and barrier-free canoe/kayak access site at Bassett's Bridge.
- Work with the current owners of the former Lehigh and New England railroad bed to obtain a right-of-way or in-fee acquisition of the railroad bed south of Judge Beach Road for use by the public as a nature trail for wildlife observation.
- Allow dog walking on the entire 2.5-mile Liberty Loop Nature Trail. The Appalachian Trail (AT) runs concurrent with a portion of the Liberty Loop Nature Trail. We believe that permitting dog walking on the AT portion of the Liberty Loop Nature Trail would allow through-hikers with dogs to continue on the AT rather than forcing them to walk on public roads with limited shoulder space. More importantly, because dogs are leashed and because the trail follows a dike system that isolates the activity from the surrounding wildlife habitats, the potential impacts are minimal. We will also allow dog walking on the portion of the Liberty Loop Nature Trail that does not run concurrent with the AT because we feel this will not result in any additional impacts beyond those of allowing it only on the AT portion of the trail, and because it will go a long way to avoid confusion on the trail. We discuss dog walking further in Chapter 4. The Appropriate Use Finding and Compatibility Determination for dog walking can be found in Appendix B.

Within 15 years of CCP approval:

- Construct a photography blind on the Liberty Loop Nature Trail.
- Extend the Wood Duck Nature Trail approximately 0.75 miles with a footbridge over the Wallkill River.
- Open the former Lehigh and New England railroad bed to foot access from Kelly Road up to Bassett's Bridge to create the 0.75-mile Timberdoodle Trail.
- After completion of restoration on Tract 15r (the former Mt. Bethel property), extend the Timberdoodle Trail north to connect with the Liberty Loop Nature Trail.
- To facilitate wildlife observation, provide boat/canoe access to Papakating Creek on Service-owned lands in the expansion area where major roads cross the creek, as mentioned in objective 3.2.
- Provide wildlife observation and photography opportunities in the expansion area, on Service-owned land, using pullouts and interpretive panels. Potential locations include Route 565; Plains Road; where the proposed expansion area reaches north to Stokes and High Point state parks; Armstrong Bog; Papakating Preserve; and along Gunn Road.

**Objective 3.4
(Interpretation)**

Within 15 years of CCP approval, create and enhance opportunities for interpretation on the refuge so that 90 percent of visitors engaged in those activities report they have a greater understanding of the Wallkill River refuge, the Refuge System, and the Service. More specifically, visitors will recognize the Service as the agency managing the refuge, and will be able to identify the importance of the Wallkill River and its valley to wildlife habitat. Also, increase the number of visitors by 15 percent within 15 years.

Rationale

The Refuge Improvement Act identifies interpretation as a priority public use. It is one of the most important ways we can raise the visibility of the refuge, convey its mission, and identify its significant contribution to wildlife conservation. Public understanding of the Service and its activities in the State of New Jersey is currently very low. Refuge visitors often confuse our agency with the New Jersey Division of Fish and Wildlife. Many are unaware of the Refuge System and its scope, and most do not understand the importance of the refuge in conserving migratory birds or its role in protecting wetland habitats along the Wallkill River.

Our proposed future programs will achieve our objectives through increased visitor contacts, on-site programs, and new and improved infrastructure. We want people to recognize that the refuge has a priority to manage a variety of habitats to benefit migratory birds and endangered species, with particular emphasis on restoring colonies of nesting birds and the federal-listed threatened bog turtle. Through an expanded interpretive program, visitors will gain a better understanding of the unique, important contribution of this refuge to wildlife and their habitats.

Strategies

- Continue to provide training opportunities for college students through a refuge internship program.
- Continue to conduct public events such as National Fishing Day.
- Continue to maintain five kiosks with up-to-date information about the refuge and refuge system.
- Continue to provide and update a Wood Duck Nature Trail brochure, general refuge brochure, bird checklist and other Service brochures.

Within 5 years of CCP approval:

- Increase involvement with local Boy Scout and Girl Scout programs. Provide opportunities on the refuge for awards for skill in performing activities on the refuge.
- Develop new interpretive materials, including animal and plant checklists and trail guides.
- Plan, fund, and install interpretive signs on all refuge nature trails and on the proposed Bassett's Bridge accessible boardwalk.
- Work with Refuge Friends and other refuge partners to increase interpretive programs.
- Continue to develop the refuge website to provide interpretive self-guiding programs and links to sites that offer maps and virtual tours of the refuge and surrounding area.

Within 15 years of CCP approval:

- Hire a visitor services professional, as noted in our proposed organization chart, to implement Visitor Services programs.
- Sponsor a series of speakers at the refuge for the public to learn about wildlife and nature.
- Create self-guided pamphlets for the major public access areas to the refuge, including those to be open on Sundays.
- Develop a series of roadside/parking lot displays to interpret the refuge, its resources and the system.
- Prepare handouts that illustrate natural resources and wildlife on the refuge and assist visitors in observing and photographing wildlife.
- Provide river access with signs for increased interpretive activities along the Wallkill River at Scenic Lakes Drive. Develop a permanent parking area and restroom facilities.
- Develop a Wallkill River canoe trail, install signs, and prepare trail brochure.
- Conduct guided walks on refuge trails and the former Lehigh and New England railroad bed south of Kelly Road. Access to the former railroad bed on this section will be only through guided walks or by special use permit to conservation and bird groups.
- Work with state partners to convert the old railroad bed that runs through the Papakating Creek Focus Area to a non-motorized, multi-use trail with interpretive opportunities at its many access points.
- Create visitor-based wildlife studies to increase interest and understanding of refuge management techniques.
- Collaborate with a local source that could provide the refuge with real-time weather data and create refuge programs linking weather and climate with migratory birds and other wildlife.

**Objective 3.5
(Environmental Education)**

Within 15 years of CCP approval, refuge staff will increase environmental education opportunities by offering at least four programs, on- or off-refuge, annually. We will stress our role as a facilitator of environmental education programs, rather than a primary provider.

Rationale

Because of its location in a populated area, the refuge has the opportunity to reach out to thousands of children and young adults. The student enrollment in Sussex and Orange Counties is approximately 64,000. Furthermore, the refuge is located within an hour's drive of the greater New York metropolitan area. The closest environmental education facility to the refuge is more than an hour away. By offering additional environmental education opportunities at the refuge, the community will become more knowledgeable about their own unique natural resources and environmental issues.

The current environmental education program focuses on the facilities available at the headquarters complex. Those include office space in the headquarters building, a large, paved parking area, public restroom facilities, two nature trails, river access and a bridge over the river, an outdoor classroom/pavilion and a pond. Through partnerships, the refuge is offering a limited environmental

education program. We will use this planning document to increase that program's scope.

In 2004, regional office staff helped the refuge develop an education facility concept for the Owens Station complex, a group of buildings uniquely located near the Wallkill River. We had planned to develop an education pavilion and a trail at Owens Station that would provide students an opportunity to visit a variety of native habitats, including woodland, shrub/scrub, field and wetland habitats. The concept also included an outdoor classroom area located near the river's edge.

Unfortunately, financial circumstances have prevented that concept from becoming a reality. If complete funding becomes available during the life of the plan, the refuge will pursue that concept for the Owens Station complex. Until then, the refuge will focus mainly on improving its existing environmental education programs.

Strategies

- Staff and volunteers will continue to conduct occasional on- and off-site presentations.
- Work with partners to develop a more comprehensive environmental education program.

Within 5 years of CCP approval:

- Work with partners such as New Jersey Audubon Society to help develop an integrated classroom curriculum in local schools.
- Through an expanded refuge internship program, work with local middle and high school students to increase awareness and career appreciation for wildlife and conservation biology.
- Expand the refuge's partnership with New Jersey Audubon Society (NJAS). Through that cooperation, have their staff and resources sponsor environmental education classes and public events on the refuge that incorporate the refuge or Service mission. Have NJAS sponsor or lead two or more public programs on the refuge each year.
- Provide at least one "Teach the Teacher" workshop each year.

Within 15 years of CCP approval:

- Work with state partners to offer joint environmental education programs focusing on the relationship of state land to federal land.
- If we secure complete funding for Owens Station, look for opportunities to offer environmental education programs, mainly through partners.

Objective 3.6 (Cultural Resources)

In compliance with the overall management objectives of the Service, refuge staff will encourage and enhance educational, interpretive and research opportunities for cultural resources identified by archaeologists.

Rationale

In addition to protecting cultural resources on Service-owned land, Service policy also encourages us to use information about cultural resources in educational materials for the public. As we state in chapter 2, the Service funded an historical and archeological reconnaissance of the Wallkill River Valley in 1999 (Maymon 2002). That reconnaissance compiles materials on the region's history,

and offers valuable information we could include in educational materials and programming for the public.

Although the reconnaissance thoroughly investigated historical sites on and around the refuge, it did not evaluate refuge structures for their historic potential, which this CCP proposes to do. Information about historic structures on the refuge also could be used in education materials for the public.

Strategies

- Continue to comply with section 106 of the National Historic Preservation Act of 1966, as amended.
- Continue to promote and encourage academic research on, or relating to, refuge land.
- Add Archaeological Resource Protection Act (ARPA) language to appropriate public use materials to warn visitors about disturbing/looting historic and archeological resources.
- Encourage law enforcement personnel to train in ARPA enforcement.

Within 10 years of CCP approval:

- Include cultural resources information in refuge environmental education and interpretation programs. Use results from local excavations, published articles on Wallkill Valley prehistory and the reconnaissance survey to interpret Native American history and prehistory.
- Monitor known prehistoric sites on the refuge to protect them from looting and other ARPA violations.
- Complete evaluations of historic refuge structures for National Register eligibility in compliance with section 110 of the National Historic Preservation Act of 1966.
- Survey potential prehistoric sites (quarries, living/working areas) and share archaeological information through interpretive programs.

Objective 3.7 (Quality Visitor Experience)

Within 5 years of CCP approval, hire a visitor services professional who will begin to establish protocols for calculating annual visitation and determining maximum visitor carrying capacities associated with maintaining a quality experience for all six priority public uses.



The refuge works with Service professionals at Wallkill, Great Swamp and the Regional Office to improve the visitor experience.

Rationale

The Service is constantly trying to strike a balance between protecting wildlife resources and offering a quality visitor experience. Refuge managers have a responsibility to be good stewards of publicly protected lands and waters. At the same time, the American public is entitled to quality outdoor recreation experiences on refuges when they do not interfere with the mission of the Service or refuge purposes. Some protected public lands are under-used by the American public, while others are over-used, causing concern about public safety, impacts on resources, or loss of quality recreational opportunities. A visitor capacity study is a management tool useful in sustaining quality outdoor recreation opportunities and matching public interests (demand) with available recreation opportunities (supply).

Strategies

Within 5 years of CCP approval:

- Obtain better estimates of visitation.
- Identify target audiences.
- Address the possibility of a fee program and/or installing a donation box at the Wood Duck Nature Trail to help fund maintenance work.

Within 15 years of CCP approval:

- Monitor the quality of wildlife-viewing opportunities by soliciting oral and written comments from visitors. Work with our regional office staff to develop and implement additional strategies for measuring quality of experience.
- Work with our regional office staff to develop and implement strategies for determining visitor carrying capacity.

GOAL 4:

Cultivate an informed and conservation-educated public that works to support the refuge purposes and the National Wildlife Refuge System mission.

Objective 4.1 (Outreach)

Increase participation in local events and remain active with conservation commissions and state and local conservation partnerships whose message advocates resource conservation and stewardship and promoting the mission of the National Wildlife Refuge System.

Rationale

Public outreach would improve recognition of the refuge, the Refuge System and the Service among neighbors, local leaders, conservation organizations and elected officials, thus generating support for conservation in the region.

Strategies

- Maintain open communication with local and county officials and organizations. Implement public use program in accordance with draft Visitor Services Plan prepared in 1997.
- Increase public awareness and attract visitors through use of media and local businesses, including local television, Internet, and local chambers of commerce.
- Participate in annual special events such as Vernon Earthfest, Orange County Conservation Field Days, Earth days and special events sponsored by local organizations.
- Continue to collaborate with Bergen County Audubon Society through the “Audubon Refuge Keeper” program.
- When invited, participate in local and regional committees, such as the Wallkill River Watershed Management Plan Public Advisory Committee and the Vernon Chamber of Commerce Eco-tourism Committee.

Within 5 years of CCP approval:

- Increase the visibility of refuge land through boundary posting and increased participation in community events.

- Undertake efforts to strengthen the refuge friends group and, where appropriate, make them a major partner in refuge efforts.
- Strengthen relationships with local businesses, particularly those that can benefit from ecotourism.

Within 15 years of CCP approval:

- Increase speaking opportunities about the refuge and its mission at local civic organizations throughout the Wallkill River watershed.
- Encourage local organizations to “adopt” the refuge by serving as advocates and undertaking special projects.

**Objective 4.2
(Communication)**

Increase public awareness and attract visitors through the media and local businesses, including local television, web page, and local chambers of commerce.

Rationale

It is Service policy that refuge personnel will actively involve themselves in effective communication between the Service and the public. Good public relations depend on many factors. Important among these is open and continuing communication between the refuge and the public. Various means are available to refuge managers by which to communicate information effectively, such as contact with the public through refuge programs, news media interviews, news releases, and participating in community events.

Strategies

- Continue to maintain the refuge website.
- Continue to distribute media releases, media alerts and television advertisements.
- Continue to hold media events at the refuge.
- Continue to offer and provide tours to members of the local media.
- Continue to participate in local chamber of commerce events.

Within 5 years of CCP approval:

- Increase the visibility of the refuge within the community through increased participation in community events, such as fairs, festivals and celebrations.
- Strengthen relationships with local businesses, particularly those that can benefit from ecotourism.
- Encourage refuge staff to be involved with one or more community-based groups, based on their interests.
- Encourage local organizations to link appropriate goals with those of the Service and the refuge. Participate in joint publications, media releases and events.

Objective 4.3 (Support Programs)

Maintain programs for volunteers, interns, youths and community service participants to help support all aspects of refuge management including maintenance, biological surveys and public use.

Rationale

Volunteers, interns and other youth and community service participants contribute significantly to the refuge's biological, public use, and maintenance programs. Their work includes wildlife surveys, invasive species identification, bluebird box monitoring and maintenance, trail maintenance, carpentry, computer support, visitor services support, and cleanup or grounds maintenance. In fiscal year 2006, 35 refuge volunteers contributed more than 2,000 hours.

Strategies

- Continue to work with independent, local volunteers as opportunities arise. Make an effort to recruit volunteers who have a specific set of skills and knowledge of the refuge so they can work with minimal supervision.
- Continue to foster the new refuge Friends Group (founded in 2006).
- Continue scouting programs.
- Continue to provide training opportunities for college students through refuge (and partner) internship program.
- Work with Sussex County Probation Office's community service program to maintain trails, grounds, and structures.

Within 5 years of CCP approval:

- Develop an orientation guide and provide liaison between staff, volunteers, and community service participants to work on specific projects.