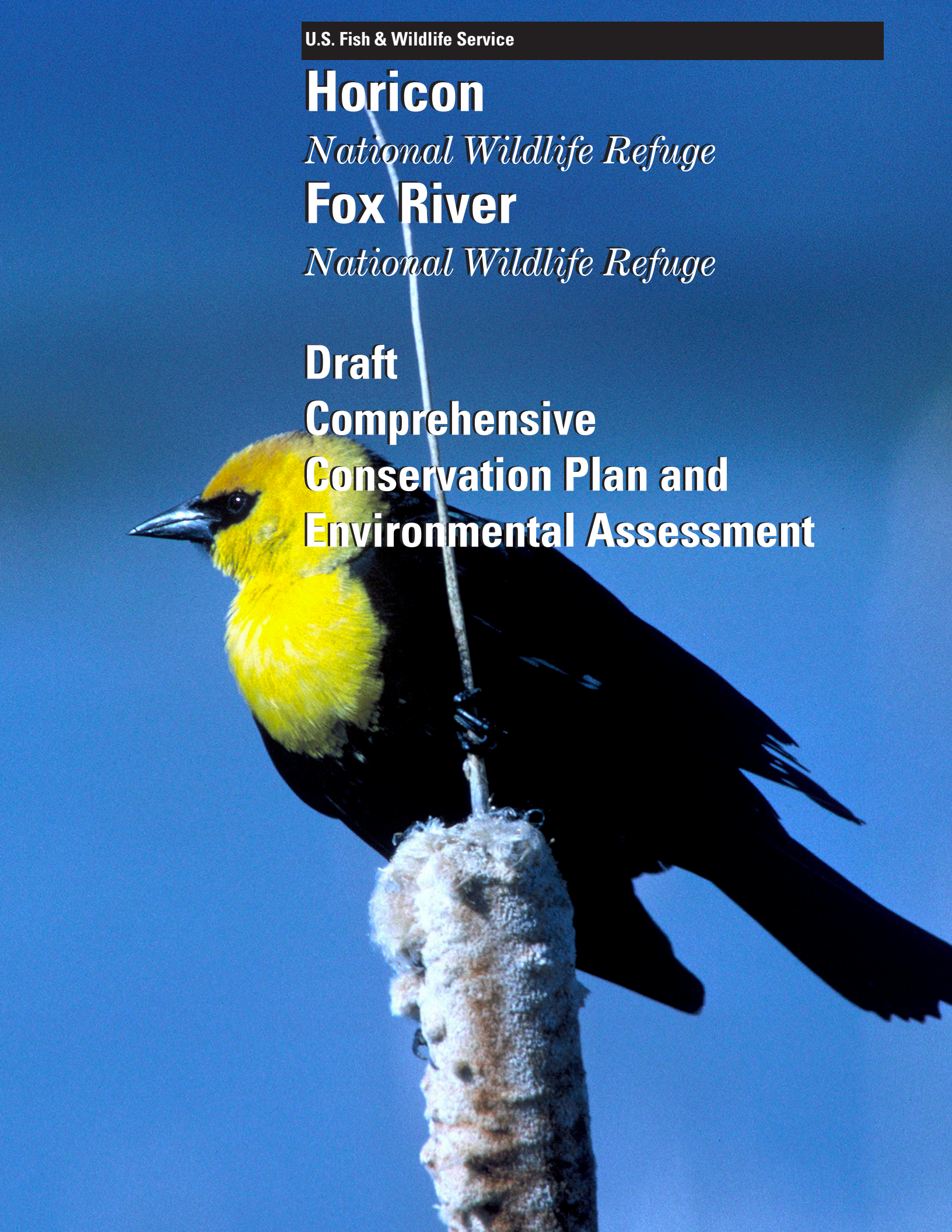
U.S. Fish & Wildlife Service

Horicon
National Wildlife Refuge
Fox River
National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment



Cover Photograph: U.S. Fish and Wildlife Service

The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives and strategies needed to accomplish refuge purposes; and, identify the Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, MN 55111-4056

IN REPLY REFER TO:

FWS/NWRS-CP

JUL 10 2006

Dear Reviewer:

The attached Draft Comprehensive Conservation Plan is a vital part of the future of Horicon and Fox River National Wildlife Refuges (NWR).

The purpose of the Comprehensive Conservation Plan is to guide Refuge management decisions over the next 15 years. We intend that the Plan provide a clear statement of the desired future condition of the Refuges. The Plan should provide for an understanding of Refuge management actions to all who are interested in Horicon and Fox River NWRs, and it should provide a sound basis for long-term operations, maintenance and capital improvement budget requests.

We invite you to review the Plan and tell us what you think. Your comments on the draft plan will help us write the final plan that is both visionary and practical. The Horicon Refuge will host an open house-style meeting sometime in early August. The time and location of this event will be announced in the local media and in the summary of the Plan.

Please address written comments to: U.S. Fish and Wildlife Service, Division of Conservation Planning, Attn: Gary Muehlenhardt, BHW Federal Building, 1 Federal Drive, Fort Snelling, MN 55111. Comments can also be sent through the Service's Planning Website at http://www.fws.gov/midwest/planning/horicon/index.html.

In order for the Planning Team to consider your input when writing the final plan, we need to receive your written comments by **August 28, 2006**. However, comments received after that date are welcome for consideration in future management decisions.

Again, thank you for your time, thoughts, and interest in planning for Horicon and Fox River NWRs.

Sincerely,

Gary Muehlenhardt

Gary Muehlenhardt
Planning Team Leader

Horicon and Fox River

National Wildlife Refuges

Draft Comprehensive Conservation Plan and Environmental Assessment

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Chapter 1: Introduction and Background

Introduction

Twelve thousand years ago, glaciers created the shallow peat-filled marshland basin known as the "Little Everglades of the North," or Horicon Marsh. In the beginning, the Horicon Marsh supported a vast array of wildlife and generations of native peoples. When early European settlers came to this land the Marsh began to undergo dynamic changes lasting to the present day. The waters and wet soils of the Marsh were alternately dammed, ditched, drained, and farmed. Competing human demands led to the Marsh being one of the most contested pieces of real estate in the history of Wisconsin. The battle was ultimately decided in favor of wildlife conservation. Today, the Horicon Marsh is a national treasure and a destination for hundreds of thousands of visitors.

The U.S. Fish and Wildlife Service

Horicon and Fox River National Wildlife Refuges are administered by the U.S. Fish and Wildlife Service (USFWS or Service). The USFWS is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. It oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat such as wetlands. The Service also manages the National Wildlife Refuge System.

Fox squirrel. USFWS

The National Wildlife Refuge System

Refuge lands are part of the National Wildlife Refuge System, which was founded in 1903 when President Theodore Roosevelt designated Pelican Island in Florida as a sanctuary for Brown Pelicans. Today, the system is a network of about 545 refuges and wetland management districts covering about 95 million acres of public lands and waters. Most of these lands (82 percent) are in Alaska, with approximately 16 million acres located in the lower 48 states and several island territories.

The National Wildlife Refuge System is the world's largest collection of lands specifically managed for fish and wildlife. Overall, it provides habitat for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects. As a result of international treaties for migratory bird conservation and other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have

been established to protect migratory waterfowl and their migratory flyways. Horicon Refuge serves a dual purpose both as a critical nesting ground and as an important link in the Mississippi Flyway network of refuges that serve as rest stops and feeding stations for migrating ducks and geese.

Refuges also play a crucial role in preserving endangered and threatened species. Among the most notable is Aransas National Wildlife Refuge in Texas, which provides winter habitat for the highly endangered whooping crane. Likewise, the Florida Panther Refuge protects one of the nation's most endangered predators. Refuges also provide unique recreational and educational opportunities for people. When human activities are compatible with wildlife and habitat conservation, they are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation, photography, environmental education, and environmental interpretation. Many refuges have visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 2004.

The National Wildlife Refuge System Improvement Act of 1997 established several important mandates aimed at making the management of national wildlife refuges more cohesive. The preparation of Comprehensive Conservation Plans (CCPs) is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the National Wildlife Refuge System and purposes of the individual refuges are carried out. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the National Wildlife Refuge System and identify the archeological and cultural values of Refuge System lands.

The goals of the National Wildlife Refuge System are to:

- Fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, inter-jurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including ecological processes characteristic of those ecosystems.
- Foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

The Great Lakes Basin Ecosystem

Horicon National Wildlife Refuge lies within the Great Lakes Basin Ecosystem, a system shared between eight states and Canada. This ecosystem is made up of the world's largest freshwater body, which holds 18 percent of the world's supply of freshwater, covers 95,000 square miles, has 9,000 miles of shoreline, includes more than 5,000 tributaries, and has a drainage basin of 288,000 square miles.

The Basin contains critical breeding, feeding, and resting areas as well as migration corridors for waterfowl, colonial nesting birds, and many other species of migratory birds. At the same time, the Great Lakes Basin Ecosystem faces a variety of biological concerns, including the impact of exotic species, the precarious nature of the aquatic community structure, and high levels of contaminants. Certain species within the Great Lakes basin have drawn special concern. Fish species of special interest include lake trout, lake sturgeon, lake whitefish, walleye, Pacific salmon, and landlocked Atlantic salmon and their forage. Native mussels are a management concern because they are being seriously

Lesser Yellowlegs. USFWS

affected by zebra mussels and are in danger of extirpation from the Great Lakes Basin. Thirty-one species of migratory birds that the Service considers of management concern are found in the Great Lakes ecosystem.

A recent survey of biological diversity in the Basin identified 130 globally rare or endangered plant and animal species. The Bald Eagle, Peregrine Falcon, Kirtland's Warbler, Piping Plover, Mitchell's satyr and Karner blue butterflies, Indiana bat, gray wolf, lake sturgeon, deepwater sculpin, and pugnose shiner are some of the threatened, endangered, and candidate species that inhabit the Great Lakes ecosystem.

Horicon Marsh

Horicon Marsh is the largest freshwater cattail marsh in the United States, consisting of some 32,000 acres. The marsh is 14 miles long and 3 to 5 miles wide and has been classified as a palustrine system dominated by persistent emergent vegetation and floating vascular aquatic beds. The southern one-third of the marsh is managed by the Wisconsin Department of Natural Resources (Wisconsin DNR) while the northern two-thirds of the marsh is managed by the U.S. Fish and Wildlife Service.

In 1991 the marsh was designated a "Wetland of International Importance" by the Ramsar Convention, an intergovernmental treaty that obligates 45 signatory nations to consider wetland conservation in land-use planning, wise use of wetlands, establish wetland reserves, and encourage wetland research and data exchange. Designated sites in the United States include Okefenokee National Wildlife Refuge, Georgia/Florida; Everglades National Park, Florida; and Chesapeake Bay Estuarine Complex, Maryland/Virginia, to name a few.

In 1997, Horicon Marsh was accepted as a Globally Important Bird Area in American Bird Conservancy's United States Important Bird Areas program. The marsh received this recognition especially because more than 50 percent of the Mississippi Flyway Canada Geese migrate through the marsh during the fall and 2 percent of the flyway population of Mallards migrates through during the fall, with impressive numbers of other waterfowl. In the fall of 2004, the Horicon Marsh was recognized by the State as an Important Bird Area.

Horicon National Wildlife Refuge

Horicon NWR is located 6 miles east of Waupan in southeastern Wisconsin (Figure 1). Current Refuge ownership consists of over 15,500 acres of marsh and 5,600 acres of associated upland habitat. Marsh habitat is seasonally to permanently flooded and dominated by cattail, river bulrush, common reed grass, sedges, and reed canary grass. Uplands include nearly 2,000 acres of woodlands and 3,600 acres of grasslands.

Resource management at the Refuge involves using a variety of techniques to preserve and enhance habitats for wildlife, with programs both in marsh and upland management. Marsh management involves the manipulation of water levels to achieve a desired succession of wetland plant communities to meet the seasonal needs of wildlife populations. Upland management includes establishing and maintaining grasslands to provide nesting habitat for ducks, Sandhill Cranes, and various song birds. Management objectives include waterfowl production and migratory bird use, with Redhead ducks being emphasized.

Fox River National Wildlife Refuge

The Fox River NWR, established in 1979, consists of 1,004 acres of land located 10 miles north of Portage, Wisconsin along State Highway F (Figure 2). The Refuge is administered by staff at Horicon National Wildlife Refuge, approximately 40 miles to the east.

The majority of the Refuge is shallow marsh, sedge meadow, fen, or wet prairie wetlands. Upland prairie and forest is also present on the Refuge. The matrix of wetland and upland habitat provides excellent habitat for both wetland and upland associated wildlife, such as ducks, Sandhill Cranes, herons, rails, songbirds, deer, turkey, and Bobwhite Quail. Approximately 50 cranes use the Refuge during the summer and more than 300 use it as a staging area during fall migration .

Current management on the Refuge is focused on restoring historic upland habitats including oak savanna and open grasslands. The natural hydrology of the area is also being restored primarily through the filling of agricultural drainage ditches.

Figure 1: Location of Horicon NWR, Dodge and Fond Du Lac Counties, Wisconsin

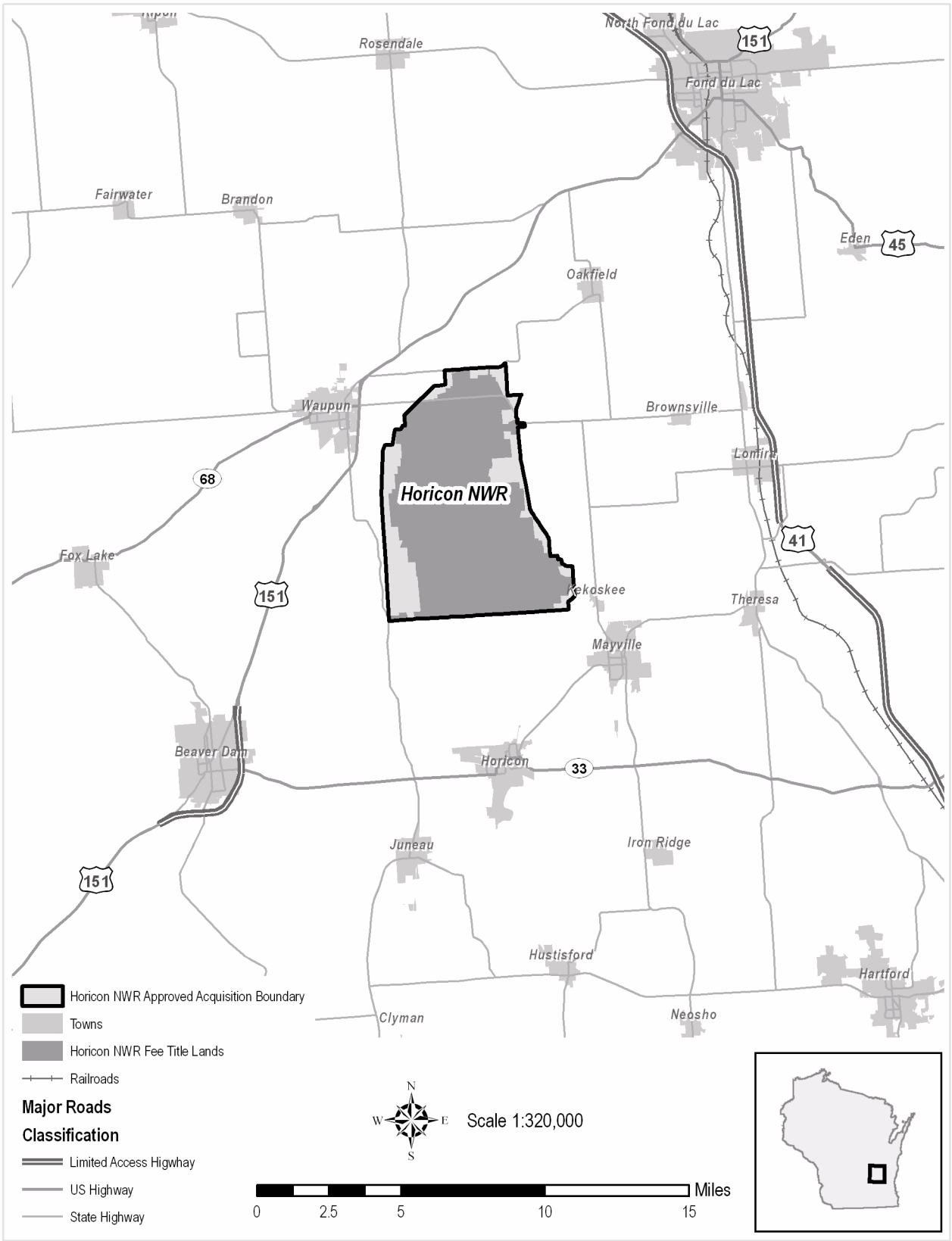
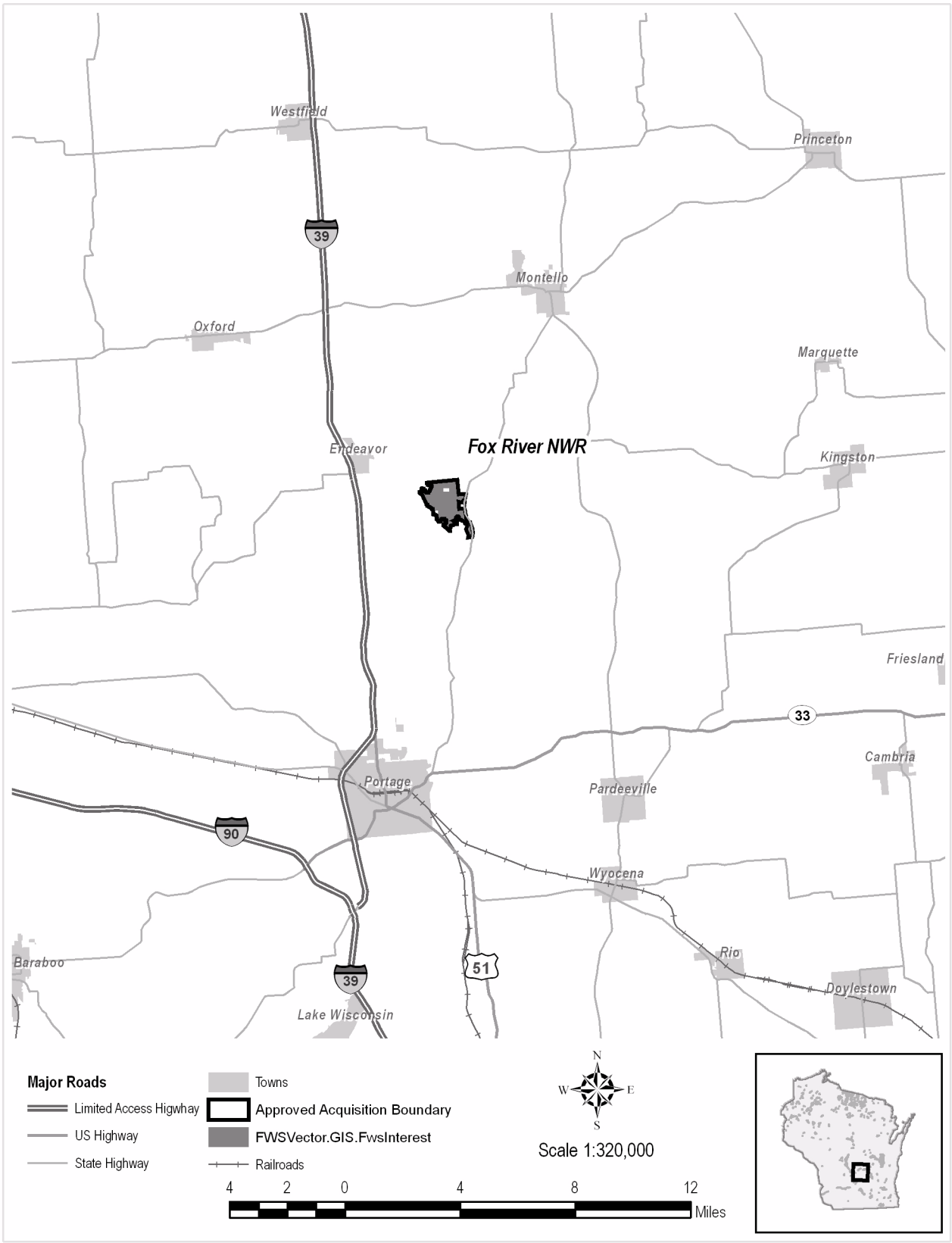


Figure 2: Location of Fox River NWR, Marquette County, Wisconsin



Visitor facilities and opportunities are minimal but include two parking areas, signs, and an annual deer hunt.

Fox River National Wildlife Refuge is located across the highway from a County Park named after John Muir, a famous conservationist in the 19th and early 20th centuries, who lived near the County Park and the Refuge during part of his boyhood years.

Refuge Purposes

Horicon National Wildlife Refuge was established in 1941 under the authority of the Federal Migratory Bird Conservation Act of 1929. The purpose of the Refuge is: "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..."

Fox River was established in 1977 under two legislative authorities:

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" Fish and Wildlife Act of 1956

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." Migratory Bird Conservation Act, February 18, 1929, 16 U.S.C. 715d

Refuge Visions

The planning team considered the past vision statements and emerging issues and drafted the following vision statements as the desired future state of each Refuge:

Horicon National Wildlife Refuge

> Horicon NWR will be beautiful, healthy, and support abundant and diverse native fish, wildlife, and plants for the enjoyment and thoughtful use of current and future generations. The Refuge's hydrologic regime will include a functional Rock River riparian system, with clean water flowing into and out of the Refuge. The Refuge will be a place where people treasure an incredible resource that upholds the distinction of a Wetland of International Importance.

Fox River National Wildlife Refuge

> Fox River NWR will consist of diverse, productive habitats and wildlife that provides conditions found historically (pre-European settlement) in the Upper Fox River watershed. Specifically, the Refuge consists of a mosaic of oak savanna, dry and wet prairie, fens, sedge meadow, and shallow marsh habitats managed to perpetuate a variety of native plant and wildlife species, namely those of priority to the Service.
>
> Refuge staff, located at Horicon NWR, are a multi-disciplined team dedicated to providing quality habitat and wildlife management, as well as quality wildlife-dependent public use opportunities compatible with Refuge purposes. Local communities and visitors value the Refuge for the personal, financial, and societal benefits it provides. A strong conservation ethic is promoted in the surrounding communities where both John Muir and Aldo Leopold were inspired by nature's beauty, complexity, and value.

Purpose and Need for Plan

This CCP articulates the management direction for Horicon and Fox River National Wildlife Refuges for the next 15 years. Through the development of goals, objectives, and strategies, this CCP describes how the refuges also contribute to the overall mission of the National Wildlife Refuge System. Several legislative mandates within the National Wildlife Refuge System Improvement Act of 1997 have guided the development of this plan. These mandates include:

- Wildlife has first priority in the management of refuges.
- Wildlife-dependent recreation activities, namely hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation are priority public uses of refuges. We will facilitate these activities when they do not interfere with our ability to fulfill the refuges' purpose or the mission of the Refuge System.
- Other uses of the Refuge will only be allowed when determined appropriate and compatible with Refuge purposes and mission of the Refuge System.

School visit to Horicon NWR.

The plan will guide the management of Horicon NWR and Fox River NWR by:

- Providing a clear statement of direction for the future management of each Refuge.
- Making a strong connection between Refuge activities and conservation activities that occur in the surrounding area.
- Providing Refuge neighbors, users, and the general public with an understanding of the Service's land acquisition and management actions on and around the Refuge.
- Ensuring the Refuge actions and programs are consistent with the mandates of the National Wildlife Refuge System.
- Ensuring that Refuge management considers federal, state, and county plans.
- Ensuring that Refuge management considers the preservation of historic properties.
- Establishing long-term continuity in Refuge management.
- Providing a basis for the development of budget requests on the Refuge's operational, maintenance, and capital improvement needs.

History and Establishment

Horicon National Wildlife Refuge

Nearly twelve thousand years ago, glaciers created the shallow peat-filled marshland basin known today as the Horicon Marsh (Figure 3). Since that time, nomadic hunters and gatherers succeeded by numerous Indian cultures, including the Paleo hunters, the Hopewellian People, and the Woodland Indians have lived near this marsh. In fact, archaeological records confirm nearly every prehistoric Indian culture known to the Upper Midwest lived near Horicon Marsh at one time or another.

When early European settlers came to this land they settled among the Indian villages and established their first modern settlement – the town of Horicon. In 1846, a dam was built on the Rock River to power a sawmill and to develop steamboat navigation. The dam created Lake Horicon, which at the time was considered to be the largest human-engineered lake in the world. At this time water levels in the marsh were raised by 9 feet, but after 23 years of disputes, the dam was removed and the marsh was returned to a haven for wildlife.

The era that followed was one of hunting clubs and market hunting days, which lasted to the early 1900s. At this time, other interests appeared to influence and dominate the marsh, most notably, moist-soil agriculture. Root crop cultivation soon became the incentive to drain the lands around the marsh, and within a short time, the entire marsh. Despite these efforts, attempts to farm the peat soil failed and left behind natural resource devastation that could have hardly been foreseen.

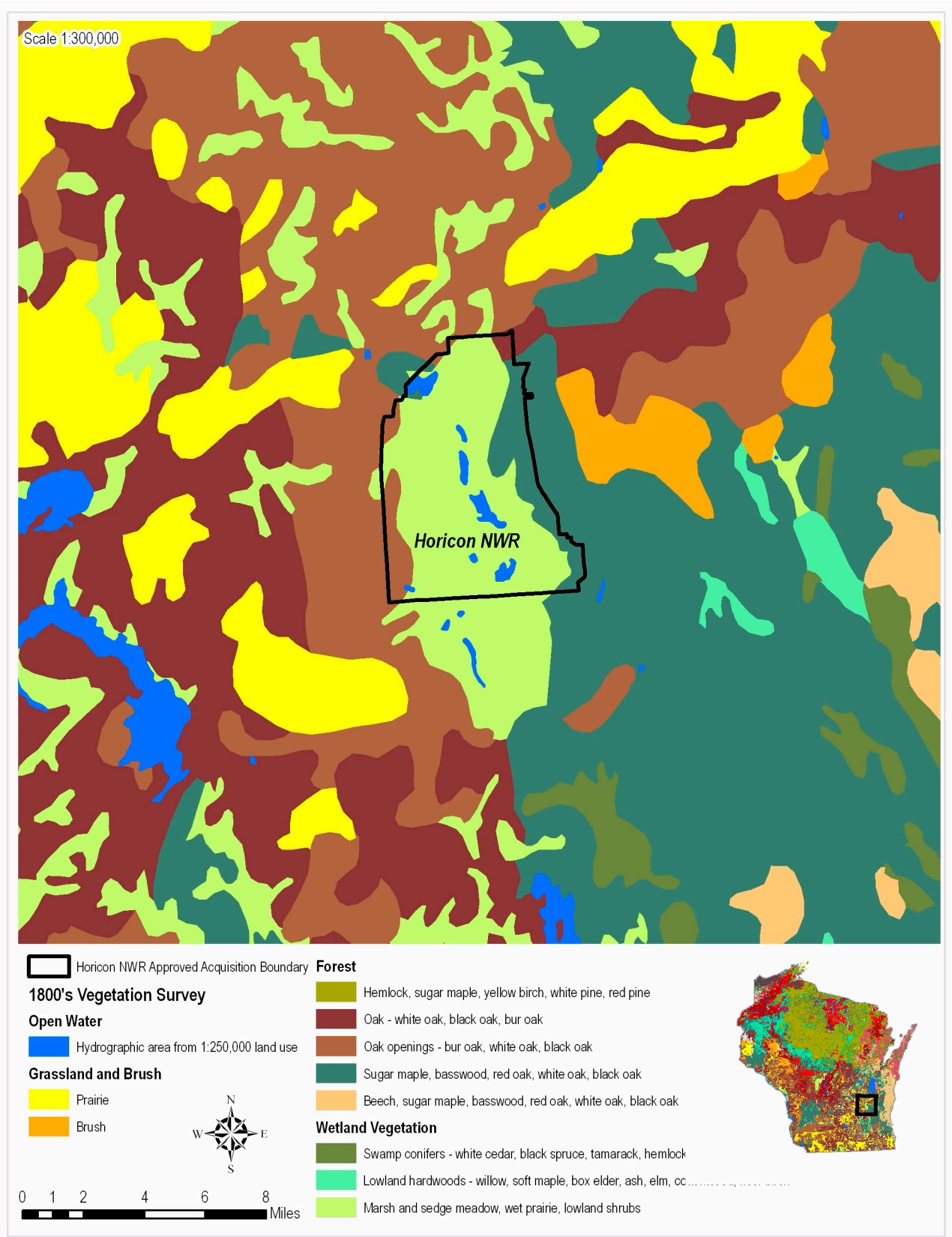
In 1921, several conservation-minded individuals began a fight to restore the marsh, and 6 years later the state legislature passed the Horicon Marsh Wildlife Refuge Bill. This action provided for the construction of a dam to restore marshland water levels and permit the acquisition of lands in and around the marsh which led to the establishment of Horicon National Wildlife Refuge in 1941.

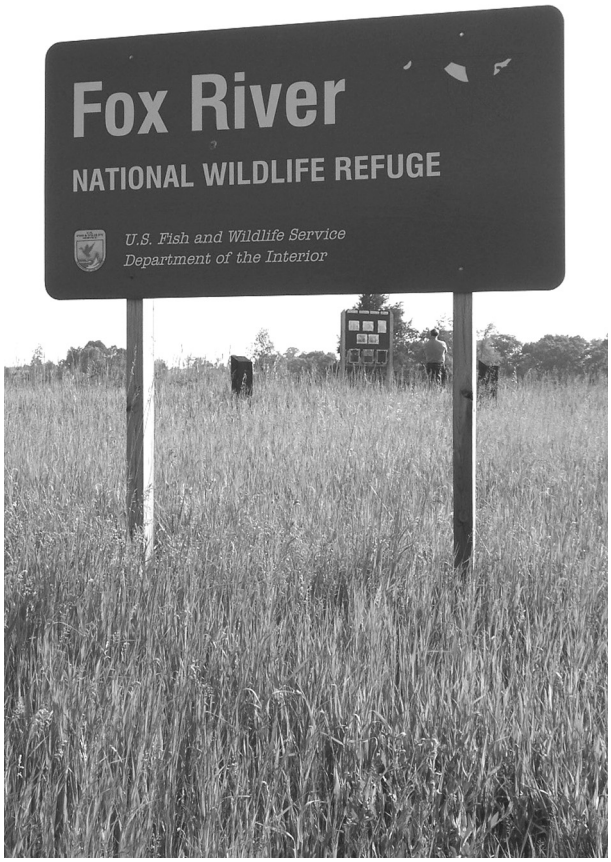
Fox River National Wildlife Refuge

Fox River National Wildlife Refuge was authorized by the USFWS Director in 1978 under the Service's Unique Wildlife Ecosystem Program for the purposes of protecting an area known as the Fox River Sandhill Crane Marsh from further drainage for agricultural purposes. The marsh was known as an important breeding and staging area for the Sandhill Crane. The following paragraphs recount the events leading up to establishment of the Refuge.

During the summer of 1978, Federal authorities documented activities on a marsh adjacent to County Road F that appeared to be in violation of Section 404 of the Federal Water Pollution Control Act. A court case (Civil No. 78-c-367) subsequently followed and determined that a substantial portion

Figure 3: Historic Vegetation of the Horicon Marsh (1850s)





Entrance sign at Fox River NWR. USFWS

of the ditching and filling activities within the marsh boundaries were within the limits of Section 404 jurisdiction. The U.S. Attorney agreed to prosecute the case. A preliminary injunction was filed on July 28, 1978, in U.S. District Court, Eastern District of Wisconsin, that restrained the landowner from further ditching and filling activities.

Subsequently, the court issued a Consent Decree whereby the Service agreed to purchase the subject 631-acre property after a specified amount of restoration. The Fox River National Wildlife Refuge was formally established during the spring of 1979 when the Service acquired the property to fulfill the Consent Decree.

Planning documents completed at the time of Refuge establishment recommended a Refuge boundary encompassing 1,043 acres, the minimum size needed to meet Service goals and objectives.

Legal Context

In addition to the executive order establishing the Refuge, and the National Wildlife Refuge System Improvement Act of 1997, several federal laws, executive orders, and regulations govern administration of Horicon NWR and Fox River NWR. Appendix E contains a partial list of the legal mandates that guided the preparation of this plan and those that pertain to Refuge management.

Chapter 2: The Planning Process

The Draft CCP for Horicon NWR and Fox River NWR has been written with input and assistance from citizens, non-governmental organizations (NGOs), and staff from state and local agencies. The participation of these stakeholders is vital and all of their ideas have been valuable in determining the future direction of the refuges. Refuge and Service planning staff are grateful to all of those who have contributed time, expertise and ideas throughout the comprehensive conservation planning process. We appreciated the enthusiasm and commitment expressed by many for the lands and living resources administered by the Horicon NWR.

Prairie habitat, Horicon NWR. USFWS

Internal Agency Scoping

The CCP planning process began in January 2005 with a kickoff meeting between Refuge staff and regional planners from the Service's office in the Twin Cities. The participants in this "internal scoping" exercise reviewed vision statements and goals, existing baseline resource data, planning documents and other refuge information for Horicon NWR and Fox River NWR. In addition, the group identified a preliminary list of issues, concerns and opportunities facing the refuges that would need to be addressed in the CCP.

A list of required CCP elements such as maps, photos, and GIS data layers was also developed at this meeting and during subsequent e-mail and telephone communications. Concurrently, the group studied federal and state mandates plus applicable local ordinances, regulations, and plans for their relevance to this planning effort. Finally, the group agreed to a process and sequence for obtaining public input and a tentative schedule for completion of the CCP. A Public Involvement Plan was drafted and distributed to participants immediately after the meeting.

Internal scoping continued with a meeting at the Regional Office in Fort Snelling, Minnesota in March 2005. Staffers from Region 3, including supervisors, planners, and biologists covering wildlife/habitat and migratory birds joined the Horicon NWR Refuge Manager for a discussion on the issues, public response and a number of considerations related to the CCP.

Open Houses

Public input was encouraged and obtained using several methods, including open houses, written comments during a public scoping period, issue-based focus groups, and personal contacts.

Initial public scoping for the CCP for Horicon NWR and Fox River NWR began in March 2005 with a series of open house events held in Montello (Fox River), Waupun and Mayville, Wisconsin. Turnout was light with approximately 25 people in total attending.

Those interested in making written comments had until April 15, 2005 to submit them. Comments could be sent by U.S. mail, e-mail, or via the Horicon planning website on the Internet. Approximately 20 comment forms and other written comments were submitted to the Refuge during the scoping process.

Focus Group Meeting

On June 1-2 (Horicon) and June 7 (Fox River), 2005, all-day public focus group workshops were held to obtain more detailed input on the issues and opportunities identified in preliminary scoping and to begin development of alternatives. Twenty-eight people, representing Wisconsin DNR, Refuge staff, conservation organizations, neighboring communities, Refuge users, and other stakeholders attended these discussions.

Summary of Issues, Concerns and Opportunities

A large list of issues, concerns, and opportunities was generated during internal Refuge scoping, public open house sessions and workshops. The goals, objectives, and strategies in Chapter 4 are intended to address this list. The major issues addressed in the CCP are described as follows:

Horicon National Wildlife Refuge

Habitat Management

Upland habitat restoration and management

The Refuge could restore areas to historic vegetation or create habitats that are lacking in the area. Possibilities include managing the Refuge's east side as hardwoods mixed forest and the west side as grassland (historic vegetation). Or we could convert all uplands to native grassland on the entire Refuge since grasslands are lacking in area.

Invasive plant species

Habitat structure on the Refuge is threatened by invasive, non-native plant species such as reed canary grass and leafy spurge. Invasive plant species are often those introduced from Europe or Asia and they have no native biological controls in the United States. They are often early successional species adapted to disturbance, they move in quickly, and are difficult to control with traditional methods such as prescribed fire.

Land Acquisition (authorized boundary and adjustments)

Several participants suggested that the Refuge and partners actively pursue land protection within the 1995 expansion boundary. Conservation measures within the expansion area will help to protect the Horicon Marsh.

Off-Refuge involvement and external threats (i.e. watershed protection)

A large portion of the Interagency Workshop was spent discussing sedimentation and environmental contaminant issues related to the Marsh. All participants agreed that soil conservation measures in the upper watershed would go far in reducing these problems. However, increasing wetland conservation and encouraging new agricultural practices will be a huge task that will require innovative approaches to public and private partnerships.

A proposal for a wind energy facility adjacent to the Refuge, which could include up to 133 wind turbines to generate electricity, was also discussed during internal scoping. The primary concern was the potential impact to migratory birds and resident bats from striking the towers and turbines that would reach up to 389 feet above ground level.

Water Management:

The management of water levels is the key to maintaining a viable Marsh. However, the State portion of the marsh, Lake Sinnissippi, and other downstream waterbodies control how much water the Refuge can hold and release. The CCP should decide how the pools of Horicon NWR should be managed and could include filling ditches, improving dikes, and adding or removing water control structures.

Refuge road, Horicon NWR

Wildlife Management

Migratory Birds

Data suggests that predation loss is high for waterfowl and other ground-nesting birds. The small ratio of uplands to wetland area may be a factor. The CCP should decide if the Refuge should be managed for birds in migration and accept a high nesting loss or if predator control is a viable option.

Carp Control

Carp are causing a lot of damage to the wetland habitat of the Horicon Marsh. Carp control measures include trapping/removal and periodic application of the pesticide Rotenone. However, despite control measures, carp populations remain too high.

Threatened and endangered species

People enjoy seeing Bald Eagles, which are the most conspicuous and spectacular listed species that occurs at Horicon NWR. It is highly probable that Whooping Cranes, recently re-introduced to Wisconsin, will expand their use of the Refuge. Indeed, one Whooping Crane has already been using the Refuge for four years in a row, while a second crane used the Refuge in 2004 for at least a few days.

Visitor Services

Deer hunting

Horicon NWR supports a number of hunts for white-tailed deer including archery, firearm, and special opportunities for hunters with disabilities. If the deer herd is above desirable population levels, it may cause increased habitat damage, deer/auto collisions and neighboring crop damage. In addition, chronic wasting disease is a new concern within the State. Increased hunting may be a necessary control measure for all of the above reasons.

Waterfowl hunting

Horicon NWR has been entirely closed to waterfowl hunting since 1966. In 1953, the perimeter of the Refuge was opened for goose hunting, with goose blinds set up on a 7-mile narrow strip. This was originally supposed to be an experiment, but it lasted until 1966. It was basically the precursor to the intensive hunting zone that occurs today on private land around the whole Refuge. Some hunters who use the State portion of the marsh have expressed an interest in hunting on the federal Refuge. However, many hunters also value the fact that the sanctuary status of the federal Refuge also holds migrating birds in the area for longer periods of time.

Upland game hunting

Additional upland game hunting opportunities were identified including longer seasons on squirrels, rabbits, and pheasants and a possible spring Wild Turkey hunt.

Fishing

Opportunity and demand for angling on Horicon NWR is limited due to shallow water, turbidity, and higher-quality fishing opportunities in the local area. The Refuge is closed to motorboat access during the open water season. However, some ice fishing may be feasible, especially if limited to specific sites, with no permanent shanties and no motorized access.

Wildlife observation

Horicon NWR receives 450,000 visitors a year with heavy visitation in the fall during waterfowl migration. Most of these visits are concentrated on the auto tour route, walking trails, and the floating boardwalk. The CCP would be the proper place to discuss new facilities or accommodation for visitors.

State Highway 49 Issues

State Highway 49, a high-volume traffic roadway, bisects the northern edge of the Horicon Marsh. Many participants pointed out that wildlife road kill on Hwy 49 is excessive. In addition, contaminants from Hwy 49 include the potential for a toxic spill, road salts, grain spills and trash deposited along road.

Cultural Resources

As a federal conservation agency, the Service has a responsibility for the protection of the many known and undiscovered cultural resources located on Refuge lands.

Visibility of Horicon NWR as a National Resource

Horicon Marsh is recognized locally, nationally and internationally as a valuable natural resource, especially in light of its long, colorful history and designation as a wetland of international importance. However, some participants believed that more could be done to raise the stature of the Refuge, and perhaps funding levels, internally within the National Wildlife Refuge System.

Fox River National Wildlife Refuge

Wildlife Management

The Refuge was established for nesting Sandhill Cranes during a time when the species was declining throughout the Midwest. Crane numbers have increased significantly during the last 20 years. The reintroduction of Whooping Cranes to Wisconsin has created the likelihood that a nesting pair may establish on the Refuge. In fact, an individual Whooping Crane used the area in 2004.

Habitat Management

Historic habitat restoration

General Land Office surveys from 1832 suggest much of the landscape around the Refuge was historically dry prairie and oak savanna. The Refuge has been working to restore the uplands to these habitats.

Refuge inholdings and cooperative work with neighbors

The Refuge contains some small parcels of private lands within the authorized boundaries. A general desire was expressed to encourage cooperative work with landowners since we share habitats and wildlife.

Additional land conservation

Scoping participants wondered if there was a need for land protection outside existing approved boundaries. It was suggested that adjacent habitat could be restored or managed to complement Refuge goals.

Visitor Services

Deer Hunting

Currently the only public use allowed on the Refuge is deer hunting. Options discussed include more intensive antlerless harvests and total or periodic closures knowing that the chronic wasting disease concern may prevent the Refuge from decreasing the hunting pressure.

Additional hunting for small game and Wild Turkey

A few participants wanted to see more hunting opportunities on the Refuge. Law enforcement concerns and the relatively small size of uplands on the Refuge may preclude some hunts. The Refuge may be able to support a limited spring hunt for Wild Turkeys on the 250-300 acres of uplands available. Squirrel hunting on these acres is also a possibility.

Visitors to Horicon NWR. USFWS

Fishing access

Boat access for fishing is available along the Fox River. Many people have expressed interest in fishing on Long Lake. The 1-mile hike from the parking lot to the potential fishing spot is expected to limit the number of anglers. Boating access may need to be seasonally restricted to reduce disturbance of migratory birds, especially nesting Sandhill Cranes.

Potential Ice Age Trail crossing

The National Park Service has suggested that the Service establish a segment of the Wisconsin Ice Age State and National Trail through the Refuge. Trail location, maintenance, and restrictions on off-road vehicles are addressed in the CCP.

On-site environmental education and interpretation

Participants suggested that the Refuge could do more with the local community and schools. Developing a cadre of teachers and volunteers who could lead field trips was mentioned as one strategy.

Cultural Resources

As a federal conservation agency, the Service has a responsibility for the protection of the many known and undiscovered cultural resources located on Refuge lands.

Administration and Logistics

Refuge staffing and law enforcement

The Refuge has been administered by the Horicon NWR, located a 1-hour drive east of the Fox River NWR. This arrangement will probably continue due to funding constraints and the fact that the Refuge will be relatively low-maintenance after ongoing habitat restoration.

Preparation, Publishing, Finalization and Implementation of the CCP

The Draft CCP and Environmental Assessment (EA) for Horicon NWR and Fox River NWR were prepared by a team that includes staff from the Horicon NWR and USFWS Regional Office, and with the assistance of a private contractor. The CCP/EA will be published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Draft EA (Appendix A) presents a range of alternatives for future management and identifies the preferred alternative, which is also the Draft CCP. A public review period of at least 30 days, which will include a public meeting, will follow release of the draft plan.

Verbal and written comments received by the Service will be incorporated where appropriate and perhaps result in modifications to the preferred alternative or in the selection of one of the other alternatives. The alternative that is ultimately selected will become the basis of the ensuing Final CCP. This document then, becomes the basis for guiding management over the coming 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas will also underpin the annual budgeting process for refuge operations and maintenance. Most importantly, it lays out the general approach to managing habitat, wildlife, and people at the Horicon NWR and Fox River NWR that will direct day-to-day decision-making and actions.

Chapter 3: Refuge Environment

Horicon National Wildlife Refuge

Introduction

Twelve thousand years ago, a colossal Ice Age glacier scraped and gouged out a trough that over the millennia has become a shallow, peat-filled marshland basin. It is known as Horicon Marsh, or the "Little Everglades of the North." Since the Pleistocene Epoch – a frozen era that ended just a moment ago in the vast reaches of our planet's geologic past – momentous changes have swept over the land. The climate warmed considerably, extinction claimed scores of North American megafauna such as mammoths and mastodons, and a newly arrived, potent force of nature and agent of ecological change – Homo sapiens – strode confidently across the continent.

Horicon NWR was established for the protection and conservation of migratory waterfowl. It is located on the west branch of the Rock River in southeastern Wisconsin, 43 miles west of Lake Michigan and 65 miles northwest of Milwaukee (Figure 4).

The Refuge comprises the northern two-thirds (21,400 acres) of the 32,000-acre Horicon Marsh; the Horicon Marsh State Wildlife Area, managed by the Wisconsin Department of Natural Resources for hunting, fishing, and other public use activities, occupies the southern third of the marsh (approximately 11,000 acres). See Figure 5.

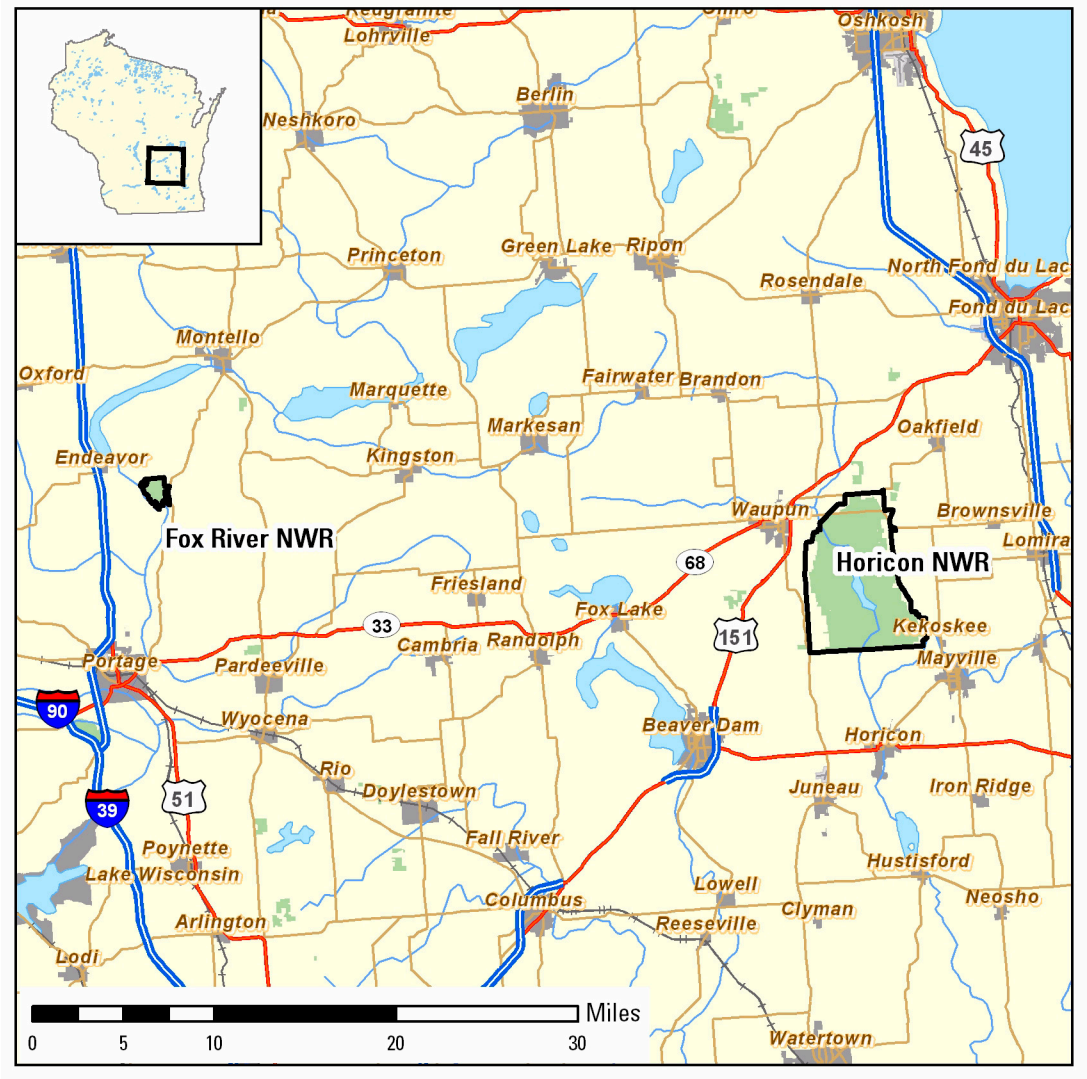
Horicon Marsh rests in the shallow peat-filled lake bed carved out by the Green Bay Lobe of the Wisconsin Glacier those thousands of years ago. The basin is 14 miles long and from 3 to 5 miles wide. The marsh is bounded on the east by the Niagara escarpment, a ridge climbing rather abruptly to an elevation of 1,100 feet, approximately 250 feet above the marsh. The landscape west of the Refuge rises very gently and is dotted with many small prairie potholes and several shallow lakes.

Areial photograph shows Horicon NWR. USFWS

Features of the area's Ice Age heritage abound in the surrounding landscape. Ice Age glaciation – in particular what is known as the Wisconsin Glaciation, from 80,000 to about 12,000 years ago – which reached as far south as Rock County south of the Refuge, left behind tell-tale evidence such as eskers, drumlins, moraines, and kettles (NPS, no date).

Horicon Marsh is the largest freshwater cattail marsh in the United States, and up to one million Canada Geese visit the Refuge each fall, with a peak of 300,000 birds. The Refuge and marsh also provide habitat for many species of wetland birds including ducks, cranes, pelicans, herons and shorebirds.

Figure 4: Southeast Wisconsin and Location of Horicon NWR

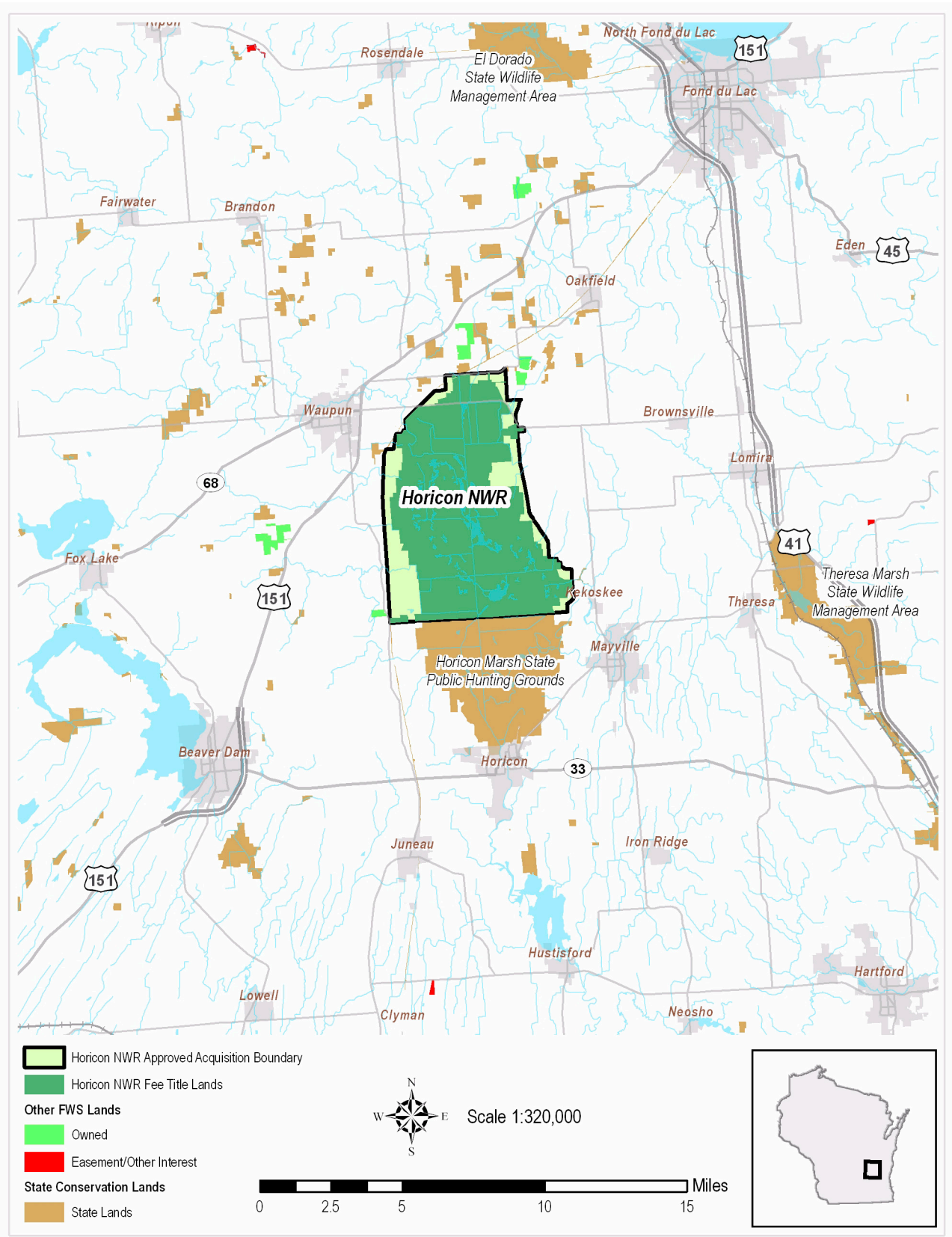


The ecological importance of Horicon Marsh is recognized not just nationally but internationally. In 1990, Horicon Marsh was designated a "Wetland of International Importance" by the Ramsar Convention, an intergovernmental treaty that obligates 45 signatory nations to consider wetland conservation through land use planning, wise use of wetlands, establishment of wetland reserves, and wetland research and data exchange. In 1997, the Horicon Marsh was named a Globally Important Bird Area in American Bird Conservancy's United States Important Bird Areas program. The marsh received this recognition for several reasons, but especially because: 1) more than half of the Mississippi Flyway Canada Geese migrate through the marsh during the fall, and 2) two percent of the biogeographic population of mallards migrates through during the fall, with impressive numbers of other waterfowl.

Climate

As would be expected from its location in the northern Midwest, deep in the heart of the continent and far from the moderating sea coasts, Horicon NWR's climate is typically continental, with cold winters and warm summers. The Refuge has an average annual temperature of 46 degrees Fahrenheit. July is the warmest month with an average temperature of 73 degrees Fahrenheit. The coldest month is January with an average temperature of 21 degrees Fahrenheit.

Figure 5: Conservation Lands in Southeastern Wisconsin, Horicon NWR



Annual precipitation is about 28 inches, with approximately 20 inches of this occurring between April and September, and falling as rain. Snowfall averages 34 inches annually. Freezing usually begins around October 1 and lasts until May 12, making the length of the growing season an average of 142 days. Wind speeds average about 10.6 miles per hour throughout the year. March, April, and November have the highest wind speeds with an average of 12 miles per hour. Winds are normally from the south in the summer and the west in the winter (USFWS, 1995).

Geology and Glaciation

The Niagara Escarpment is a layer of bedrock that consists of limestone cliffs and talus slopes. It abuts the eastern edge of Horicon Marsh and extends further south; north of Horicon Marsh, it reaches into the town of Oakfield and continues all along the eastern shore of Lake Winnebago to Green Bay and Door County. Overall, the Niagara Escarpment extends for a distance of 230 miles in Wisconsin.

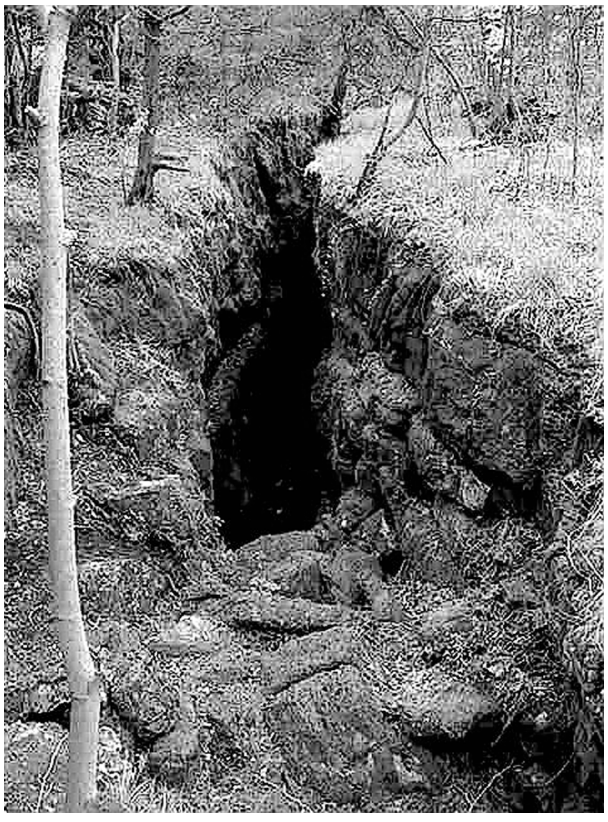
The escarpment continues beneath Lake Michigan, Lake Huron, Lake Erie, and the State of Michigan, and reappears as a surface feature at Niagara Falls in New York. In other words, the same layer of rock that forms the gentle hills to the east of the marsh extends 500 miles to the east and is the same rock layer over which the Niagara River plunges at Niagara Falls. It has been said that residents of eastern Wisconsin live, work, and play on the backside of Niagara Falls.

The escarpment or "Ledge" is up to 250 feet high, but the maximum thickness of this rock layer varies from 450 to 800 feet. The Ledge's rock – dolomitic limestone – is more than 400 million years old. In comparison, the Appalachian Mountains are about 480 million years old and the Rockies about 70 million. However, the Ledge can be considered even younger because it was reformed at its current location by the last glacier, which receded from this area about 12,000 years ago.

The durability of the Ledge is due to the erosion-resistant sedimentary rocks that form it: limestones and dolomites laid down in the Silurian Period from 443 to 417 million years ago. Dolomite, the main ingredient, was formed by calcium and magnesium carbonate [CaMg(CO3)2] deposited from decomposing shells and skeletons of primitive sea life that lived in a subtropical coral reef. At the time, this ancient inland sea's basin covered all of what is now lower Michigan, Lake Michigan and eastern Wisconsin.

A soft, impermeable layer called Maquoketa shale lies beneath the Ledge. It was formed during the Ordovician Period (about 480 million years ago) when thick deposits of mud were laid down from erosion in the Appalachian Mountains rising to the east as North America collided with Africa to form the supercontinent of Pangea. Today, this shale erodes quickly where it is exposed, allowing the dolomite to continually break off and form a new cliff face, the same process can be measured at Niagara Falls in miles per century. It is in part because of this relatively soft shale layer that Horicon Marsh was later formed by glacial action.

It is also partly because of this impermeable shale bed that many crystal-clear springs form at the base of the Ledge. Fed by precipitation, water flows down slope at and beneath the surface of the Ledge through the dolomite, which is highly fractured into perpendicular horizontal and vertical joints. Springs form at the base of the Ledge where



Breakneck Ledge, Horicon NWR

glaciers deposited drift consisting in part of impermeable clays. Water eventually drains into Horicon Marsh or Lake Winnebago.

Besides ancient marine life and the resulting upwarping, glacial ice also molded the Ledge. In some places successive glaciers obliterated it, making it a difficult landscape feature to trace in southern Wisconsin. In other places, glaciers created huge fissures and crevasses. The Ledge would certainly be higher and sharper without the impacts of glacial scouring and bulldozing (USFWS, no date-a).

Vast continental glaciers altered Wisconsin's landscape many times during a series of glacial periods over at least the last one million years through four different Ice Ages. Named for the location of their most southerly advance, those Ice Ages are called the Nebraskan, Kansan, Illinoisan, and Wisconsin. The Horicon Marsh that we see today was most affected by the Wisconsin Glaciation, the most recent of the Ice Age advances.

The Wisconsin Glaciation lasted from 80,000 years ago to about 12,000 years ago, leaving behind a terminal moraine 900 miles in length throughout the state. The enormous glaciers, more than a mile thick in places, did not simply come and go, leaving no trace of their existence. Rather, they advanced and retreated gradually and on majestic scale, and in so doing shaped the landscape of today's Wisconsin and the other Great Lakes states. The five Great Lakes themselves, also a product of the extensive glaciation, are visible from the moon. While not visible from the moon, other glacial features such as bogs, fens, lakes, marshes, erratics, moraines, kames, eskers, drumlins, potholes, and kettles, are quite evident to earth-bound observers and serve as constant reminders of Horicon Marsh's icy past.

The Green Bay lobe of the Wisconsin Glaciation gripped eastern Wisconsin and scoured out Green Bay, the Fox River, Lake Winnebago, Horicon Marsh, and the Rock River basin reaching as far south as Janesville and Madison. As the glacier lobes receded, flowing meltwater pooled, forming large lakes where silt and clay collected. In the Fox River valley, Green Bay, and Lake Winnebago are small remnant depressions of one such huge lake, Glacial Lake Oshkosh (Attig et al., 2005).

The glacier receded in stages, creating recessional moraines that mark a temporary, icy delay in their retreat. The City of Horicon on the south end of the Marsh is built on such a recessional moraine. For awhile, it acted as an earthen dam, holding back melting ice waters into Glacial Lake Horicon, 51 square miles in size, and five times larger than Lake Mendota. The headwaters of the Rock River formed near this lake. Rising glacial melt waters eventually wore a path over and down through the moraine. Over time, water flow broke through the dam, and water levels on the lake lowered, draining the lake. The lowering of the glacial lake level stopped abruptly, when the Rock River reached the hard Galena-Dolomite rock strata (layer) in its bed at Hustisford Rapids, 7 miles downstream from Horicon Marsh. This solid rock strata has acted as a natural dam, maintaining a fairly constant level of water, north to the Fond du Lac County line. As crushed gravel, sand, fine silts and clays were deposited in the Glacial Lake Horicon basin, it evolved into the marsh it is at present.

Today, Horicon Marsh is considered an extinct glacial lake. The manmade dam on the Rock River in the City of Horicon is located conveniently within the recessional moraine that once held back the meltwaters for Glacial Lake Horicon. The headquarters for the Horicon Marsh State Wildlife Area is built on a large drumlin (an elongated hill or ridge of glacial drift or till), with many more drumlins in a fan-shaped pattern to the south of the City of Horicon in Dodge and Jefferson counties. Other moraines occur on the northeast and northwest corners of Horicon NWR. Glacial erratics – boulders carried away from their place of origin and deposited elsewhere as the glacier melted – dot the landscape and are especially noticeable after prescribed fires (USFWS, no date-b).

Soils

The major factors in soil formation are parent material, climate, relief, topography, vegetation, and time. Soils in the Horicon NWR area are the result of atmospheric, chemical, and organic forces modifying the surface of the glacial deposits. The glacial deposits consist of unsorted sand, gravel, boulders, clay, fragments of local limestone and sandstone bedrock, and igneous and metamorphic rock from outside the region. Soils include those of a glacial deposit origin and vary between poorly drained peat and muck types, transition silty loam soils interspersed with sandy loam and clay, to excellent agricultural soils being intensively farmed. Topsoil depths range from 10 to 14 inches.

Soil types around the Refuge include Houghton muck and peat soils, which cover about 90 percent of the Refuge and other soils that cover upland areas and margins surrounding the marsh. Soil groups associated with the margins of the marsh include the following:

- Stoney land wet and maumee sandy loams – found around drainage ways and on foot slopes of moraines on the east side of the Refuge. They are very poorly drained sandy soils with rounded glacial stones one to two feet in diameter. Depth of groundwater is zero to three feet.
- Pella – Virgil silt loams – transition soils located between the marsh and the uplands. They are gently sloping somewhat poorly drained silty loam soils underlain by sandy loam glacial till at depths of 3 to 4 feet. These soils have seasonally high groundwater table and may be inundated for short periods of time.
- LeRoy – Theresa silt loams – consisting of deep, gently sloping to steep, well-drained soils located in the upland areas. These soils are typical of the farmlands surrounding the Refuge. Groundwater on these soils is at a depth of 6 feet or greater.
- Beecher – Morley silt loams – prominent on the uplands along the central eastern border and the northern tip of the Refuge. These soils are poorly to well-drained, level to steep silt loams underlain by calcareous silty clay loam till. Depth to groundwater is 1 to 3 feet.

Surface Hydrology

Horicon Marsh is located in the headwater region of the Upper Rock River Watershed (Figure 6). The marsh occupies a long north-south trending valley excavated by glacial action, with steeply rising terrain of the Niagara escarpment to the east and gently rolling glacial deposits to the north and west. The Rock River rises less than 30 miles north of the marsh and discharges into the Mississippi River at Rock Island, Illinois. The Upper Rock River Watershed drains a total of 266.5 square miles (Wisconsin Wetlands Inventory, 1978-1979).

The principle source of runoff to the Refuge is the west branch of the Rock River, which drains a total of 110 square miles above the Refuge before it enters the Refuge 2 miles east of the City of Waupun. The portion of the river within the Refuge was historically channelized by a main ditch running along a north-south line that discharges to a main outlet near the City of Horicon. However, it has reverted back to a meandering river in all reaches on the Refuge except the last half-mile. Other sources of runoff to the Refuge include Plum Creek and Mill Creek, which enter the marsh from the west. These two streams and others entering from the west and northwest drain through gently rolling agricultural lands and have relatively gentle gradients ranging from 5 to 10 feet per mile. Uplands to the east of the Refuge are relatively steep agricultural lands. The above-mentioned sources of runoff combine to yield a total drainage area of approximately 208 square miles above the main dike outlet (Table 1).

All watersheds in the Upper Rock River Basin are considered candidates for nonpoint source pollution control. The Wisconsin Water Quality Management Program – Areawide Water Quality Management Plan for the Upper Rock River Basin, 1989 (Plan) outlines 11 management activities that should be undertaken to reduce water quality impacts from nonpoint sources. They are:

- Nonpoint source water resource monitoring needs;
- Reduce cropland erosion in areas likely to be affecting water quality;
- Reduce bank erosion on adversely impacted lakes and streams;
- Reduce the water quality impacts of livestock concentration areas including barnyards, feedlots, rest areas, and grazed woodlots, pastures, and streambanks;
- Minimize the water quality impacts of construction site erosion and runoff;
- Develop and carry out a program to control erosion along roadsides;
- Minimize the impact of urban stormwater discharges on lake and stream water quality;
- Reduce the impact of hydrologic modifications such as stream straightening and dams;
- Give priority for nonpoint source monitoring and evaluation to priority watersheds and watersheds being considered for priority watershed selection;
- Seek additional means of financing nonpoint source pollution abatement work; and
- Counties in the basin should identify failing septic systems and require their replacement.

Figure 6: Location of Rock River Watershed, Horicon NWR

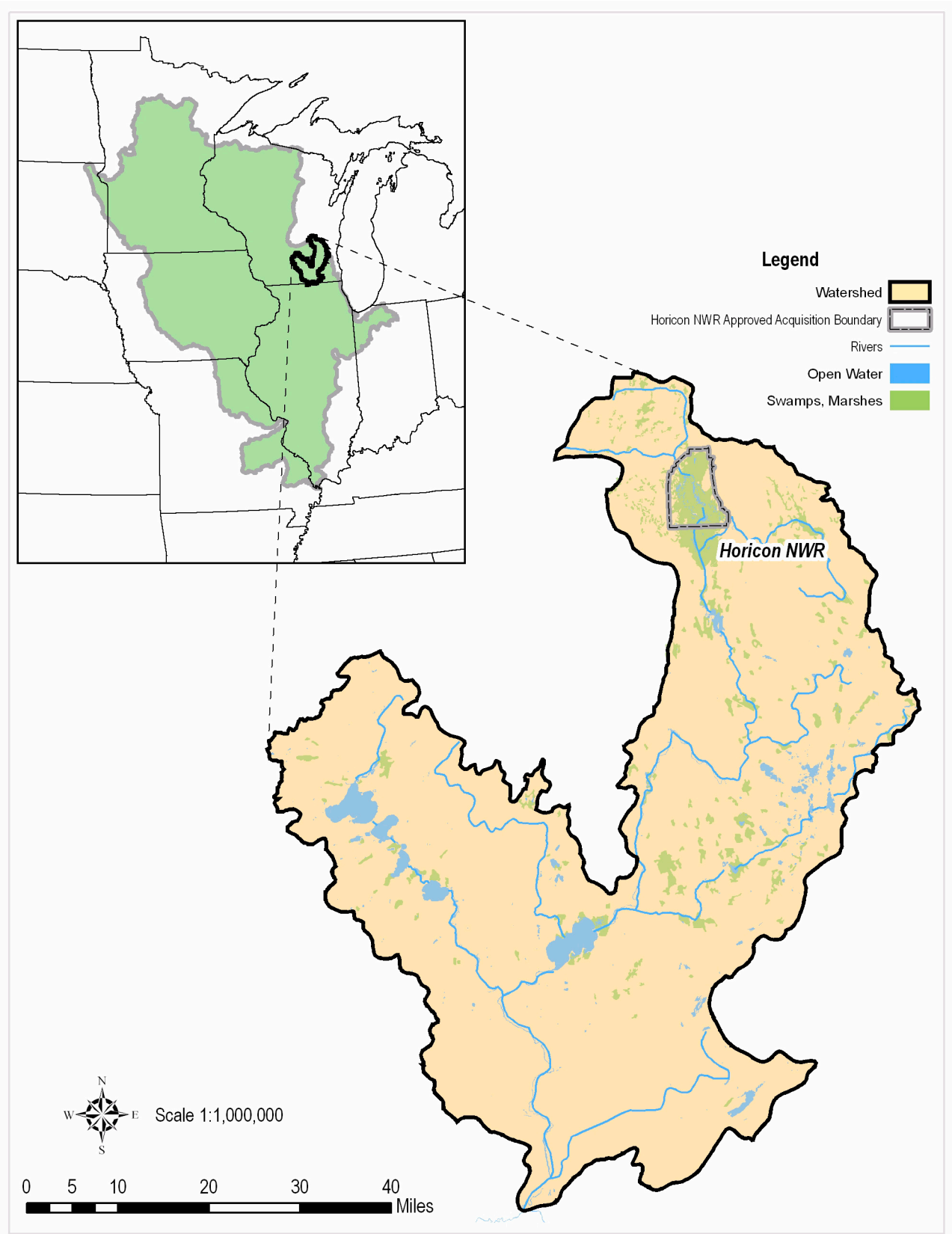


Table 1: Watershed Characteristics, Horicon Marsh, Horicon NWR

Tributary Name	Gage Number	Drainage Area (Square Miles)	Slope (Miles)	100-Year Discharge (CFS)
Plum Creek	-	15.2	10.1	1000
Mill Creek	-	21.7	7.4	1400
South Branch Rock River	5-4235	62.8	5.7	3950
West Branch Rock River T14NR15E	5-4230	41.4	7.5	2630
West Branch Rock River T12NR15E (Main Dike Outlet)[1]	-	208	5.0	860.7

1. Discharge is difficult to estimate at the main dike due to the amount of storage at Horicon Marsh. The approximate 100-year stage is 1929 and is a statistical inference based on 25 years of Refuge stage records.

In the watershed upstream of Horicon Marsh, erosion and sedimentation associated with agricultural land uses are an issue for the Refuge because these sediments are transported downstream by the Rock River and deposited in the low-gradient, low-kinetic energy marsh.

Wilderness Review

As part of the CCP process, lands within the legislative boundaries of both Refuges were reviewed for wilderness suitability. No lands were found suitable for designation as Wilderness as defined by the Wilderness Act of 1964. With the possible exception of the Main Pool impoundment on Horicon NWR, the Refuges do not contain 5,000 contiguous roadless acres, nor do they have any units of sufficient size to make their preservation practicable as Wilderness. Lands acquired for both refuges have been substantially affected by humans, particularly through agriculture and transportation infrastructure.

Archeological and Cultural Values

Land in the area of Horicon NWR and Fox River NWR was important to prehistoric peoples and to Euro-American settlers. Horicon Marsh has been an exceptionally rich resource for subsistence cultures since the glaciers left, and this long and heavy use by prehistoric people is recorded in the numerous archeological sites on and around the marsh. For Euro-Americans, the marsh and its outlet were important resources for commercial and light industrial development, and later for commercial and recreational hunting.

The cultures of the prehistoric and early historic periods at Horicon and Fox River refuges are basically the same although the Horicon Marsh area appears to have supported a larger amount of human use.

An archeological site near the Refuge in Fond du Lac County shows evidence of people during the late PaleoIndian period. The PaleoIndian period extends from 10000 B.C. to about 8000 B.C. and represents the culture of the earliest known peoples in Wisconsin. The evidence for these people is usually associated with mega-fauna (i.e., bison) kill and butchering sites. Any sites containing evidence of people from this period would be considered very important.

Several archeological sites on and near the Refuges contain evidence of people from the next cultural period, known as the Archaic, covering the period 8000 to 1000 B.C. These people appear to have been hunters and gatherers, making a seasonal round of subsistence resource locations. Late in the period (or early in the next cultural period) these people began burying their dead in natural mounds and commenced using pottery. Very little is known about this long and early culture, so intact sites containing Archaic period material could be very important. During the altithermal, a hot and dry period extending from 4700 to 3000 B.C., people appear to have clustered around the few remaining (and shrunken) bodies of water such as Horicon Marsh. But overall, populations grew substantially as the people exploited increasingly varried habitats.

The Woodland period extended from 1000 B.C. to A.D. 1600. Most archeological sites on and around the Refuges contain Woodland period components.

The people of this culture are mostly identified by their burial mounds and by their use of pottery. Late in the period they began using the bow and arrow; prior to that time "arrowheads" were spearpoints. Although hunting and gathering continued with its seasonal round of resource areas, they also had larger permanent seasonal villages and grew corn, beans, and squash in gardens.

The Mississippian culture centered in the St. Louis, Missouri, vicinity, covered the period A.D. 1000 to 1600. Wisconsin was in the northern periphery and just two sites near Horicon Refuge are reported to contain evidence of this late prehistoric culture.

European arrival in the Carribean and on the Atlantic coast introduced Western culture and resulted in severe disruption of the prehistoric cultures in Wisconsin long before the first European entered Wisconsin. European-introduced diseases spread ahead of Caucasian population advances and decimated the native populations with reports of up to 90% mortality. Horses and guns made some tribes powerful and led to westward movements of eastern tribes. The fur trade with Europeans further disrupted native cultures. These and many other events led to consolidation and disintegration and relocation of Indian tribes so that identifying historical tribal antecedents in the archeological record is almost impossible.

The historic period tribes encountered by Europeans in Wisconsin generally and in the Horicon Refuge area specifically included the Winnebago (some of which are known as the Ho-Chunk) as well as the Potowatomi and Menominee. Other tribes within Wisconsin that may have visited the Refuge area include the Ottawa, Huron, Fox, Sauk, Miami, Mascouten, and Ojibwa. Historic tribal archeological sites are located on and near Horicon Refuge.

For the historic period, human activities in each Refuge area were different.

The first Western culture settlement appears to have been in the town of Horicon vicinity. Joel Doolittle built the first cabin in 1845. The first dam at Horicon Marsh was probably built in 1845, replaced a year later by a higher dam that raised the marsh water level by nine feet, and led to further settlement and a sawmill, grist mill, blacksmith shop, stores, and the Horicon Hotel; the owners removed the dam in 1869. Other towns originating during this period included Burnett, Waupun, and Mayville. From the time of the first dam Euro-Americans manipulated Horicon Marsh water levels for floating logs downstream to St. Louis and other places in the 1850s; and farmers drained, ditched, and plowed the marsh commencing in the 1870s. Recreational hunting became important in the late 19th and early 20th century as hunting clubs acquired land and built low head dams and hunting lodges. In 1930 another dam was built and water levels elevated for waterfowl habitat, then lowered for farming. Thus for the past 150 years the Horicon Marsh has been subjected to a variety manipulations to support commercial, recreational, and agricultural activities.

Otter tracks, Horicon NWR

The Fox River was part of one of the most important transportation routes, from the Great Lakes to the Mississippi River and to the Gulf of Mexico, during the 17th and 18th centuries. The first steam boat came up the Fox River in 1851. Nevertheless the Refuge area was agricultural until acquired by the FWS. Immediately east of the Refuge is Fountain Lake Farm, the John Muir Farmstead, that is listed on the National Register of Historic Places.

The two Refuges have 16 completed cultural resources (archeological) studies. Based on these studies and information from the Wisconsin Historic Preservation Database and other sources, known and reported cultural resources on the two Refuges can be summarized.

Social and Economic Context

Most of Horicon NWR is located in Dodge County, Wisconsin, with a small portion in the north located in Fond du Lac County, Wisconsin. Table 2 presents social and economic indicators of these two counties in comparison with the State of Wisconsin as a whole.

Table 2: Socioeconomic Characteristics Dodge and Fond du Lac Counties, Wisconsin

Characteristic	Dodge County	Fond du Lac County	Wisconsin
Population, 2004 estimate	88,057	98,663	5,509,026
Population, % change, 2000-2004	2.5%	1.4%	2.7%
Population, 2000	85,897	97,296	5,363,675
Population, % change, 1990-2000	12.2%	8.0%	9.6%
Land Area, 2000 (square miles)	882	723	54,310
Persons per square mile (population density), 2000	97.4	134.6	98.8
White persons, %, 2000	95.3%	96.2	88.9%
Non-Hispanic white persons, %, 2000	93.8%	95.1%	87.3%
Black or African American persons, %, 2000	2.5%	0.9%	5.7%
American Indian persons, %, 2000	0.4%	0.4%	0.9%
Asian persons, %, 2000	0.3%	0.9%	1.7%
Persons of Latino or Hispanic origin, %, 2000	2.5%	2.0%	3.6%
Language other than English spoken at home, %, 2000	4.6%	4.8%	7.3%
Foreign born persons, %, 2000	1.6%	2.0%	3.6%
High school graduates, % of persons age 25+, 2000	82.3%	84.2%	85.1%
Bachelor's degree or higher, % of persons 25+, 2000	13.2%	16.9%	22.4%
Persons with a disability, age 5+, 2000	11,344	12,799	790,917
Median household income, 1999	$45,190	$45,578	$43,791
Per capita money income, 1999	$19,574	$20,022	$21,271
Persons below poverty, %, 1999	5.3%	5.8%	8.7%
Sources: USCB, 2005a; USCB, 2005b; USCB, 2005c			

Both Dodge and Fond du Lac counties are characterized by a mixture of rural and urban areas, that is, small towns and villages surrounded by predominantly agricultural countryside. The population densities of both counties roughly mirror that of Wisconsin as a whole (98 and 135 vs. 99 persons per square mile, respectively), while the State of Wisconsin has slightly less population density than the USA as a whole (99 vs. 80). However, the USA's figure is somewhat distorted by large, thinly populated Alaska.

In 1990, 39 percent of Dodge County was classified by the Census Bureau as rural, and 61 percent urban (USFWS, 1995). In the same year, Fond du Lac County was 35 percent rural and 65 percent urban.

The populations of both counties are growing relatively slowly at the present time, that is, growing more slowly than the state as well as the nation. Dodge County's population grew by 2.5 percent from 2000 to 2004, and by 12.2 percent in the 1990s, while Fond du Lac County's population grew by 1.4 percent from 2000-2004 and 8 percent from 1990-2000.

Both counties have lower percentages of minorities than the state as a whole and the country at large, which is very typical of the more rural, northern states. Likewise, there are lower percentages of foreign born and persons who speak languages other than English at home.

Educational attainment is lower in both Dodge and Fond du Lac counties than in Wisconsin overall, with much lower percentages of college graduates in the two counties than in the state. However, this is very representative of rural areas around the country and is a reflection of the labor market and kinds of jobs available in rural vs. urban areas. In spite of having fewer college graduates in

Woodsedge, Horicon NWR

their midst, the median household incomes of both counties exceed the state's median household income, which is unusual for areas without large towns or cities.

It is of note that both counties have more than 10,000 residents with at least one disability, which underscores the importance of Horicon NWR having accessible facilities.

Several geographic features are important to the local economy. Mineral resources are extracted and sold, the high quality soil contributes to the success of agriculture, and the climate affords opportunities for many economic activities and causes limitations for others. The surrounding landscape consists of gently rolling hills, flat agricultural land, drained and cropped wetlands, and patches of deciduous forest. Upland sites are dominated by agriculture, especially dairy farming, and contain nine communities with populations from approximately 200 to more than 8,000 people. Little of the native forest cover remains in the two-county area. The main forest species are oak, elm, maple, and other hardwoods. There is limited economic potential from the remaining woodlots since they tend to be small and widely scattered. Many contain residential development and some are located on public lands (USFWS, 1995).

Table 3 shows the area of land by land-use class for Dodge and Fond du Lac Counties.

Table 4 on page 26 and Table 5 on page 27 provide employment and industry data for Dodge and Fond du Lac counties.

The relatively small portion of the overall workforce in the two counties directly involved in farming and agriculture belies the importance of farming in the landscape economy of the two counties. In Dodge County for example, agriculture includes hundreds of family-owned farms, related businesses and industries that provide equipment, services and other products farmers need to process, market and deliver food and fiber to consumers. The production, sales and processing of farm products generates employment, economic activity, income and tax revenue in the county (UWE, 2004a).

The University of Wisconsin estimates that agriculture provides 9,508 jobs in Dodge County – almost 20 percent of Dodge County's workforce of 48,463 people. These jobs are quite diverse, including farm owners, on-farm employees, veterinarians, crop and livestock consultants, feed and fuel suppliers, food processors, farm machinery manufacturers and dealers, barn builders and agricultural lenders. Every job in agriculture generates an additional 0.9 job in Dodge County due to the multiplier effect. In addition, agriculture generates over $1.4 billion in economic activity, accounting for about 28 percent of Dodge County's total economic activity. Moreover, every dollar of sales of agricultural products generates an additional $0.39 of economic activity in other parts of the Dodge County economy (UWE, 2004a).

Several mining operations are located in the general vicinity of Horicon NWR. Products include limestone, stone, sand, and gravel. Markets for these products tend to be limited by the distance to which it is economically feasible to transport the desired materials. The majority of the materials mined are used for local road construction and maintenance projects, other construction activities, and concrete manufacturing. Employment in this industry has remained small, but has grown in recent years (USFWS, 1995).

As the tables indicate, manufacturing is the largest source of employment in the Horicon NWR area. Products include machinery, metal products, commercial printing, canned vegetables, automobile products, dairy products, and chemicals, to name a few. More than 75 percent of the manufacturing jobs in Dodge County are in three industries. Employment in these three industries has increased faster than the county average, indicating employment has become more concentrated and less diverse.

Table 3: Area of Land by Land-Use Class For Dodge and Fond du Lac Counties (thousands of acres)[1]

County	Forest	Cropland	Pasture	Wetland[2]	Total
Dodge	27.8	438.6	25.2	111.2	581.3
Fond du Lac	35.1	342.9	37.9	69.6	489.5

1. USFWS, 1995; Timber Resources of Wisconsin's Southeast Survey Unit, USDA, 1983
2. USFWS, 1995; Wisconsin Wetland Inventory

Table 4: Dodge County Employment and Industry Data

Occupation	Number	Percentage
Employed civilian population 16 years and over	43,197	100.0
Occupation		
Management, professional, and related occupations	10,911	25.3
Service occupations	5,979	13.8
Sales and office occupations	9,298	21.5
Farming, fishing, and forestry occupations	660	1.5
Construction, extraction, and maintenance occupations	4,158	9.6
Production, transportation, and material moving occupations	12,191	28.2
Industry		
Agriculture, forestry, fishing and hunting, and mining	2,148	5.0
Construction	2,840	6.6
Manufacturing	14,359	33.2
Wholesale trade	1,142	2.6
Retail trade	4,668	10.8
Transportation and warehousing, and utilities	1,584	3.7
Information	792	1.8
Finance, insurance, real estate, and rental and leasing	1,523	3.5
Professional, scientific, management, administrative, and waste management services	1,691	3.9
Educational, health and social services	6,929	16.0
Arts, entertainment, recreation, accommodation and food services	2,235	5.2
Other services (except public administration)	1,555	3.6
Public administration	1,731	4.0
Class of Worker		
Private wage and salary workers	35,568	82.3
Government workers	4,339	10.0
Self-employed workers in own not incorporated business	3,099	7.2
Unpaid family workers	191	0.4
Source: USCB, 2000a		

Horicon NWR was one of the sample refuges investigated in a national study of the economic benefits to local communities of national wildlife refuge visitation (Laughland and Caudill, 1997). This study found that that in 1995, resident and non-resident visitors to Horicon NWR spent about $1.9 million in the Refuge (Table 6). When this spending had cycled through the economy, the Refuge had generated $1.53 million in final demand, $616,000 in employee compensation, and 44 jobs.

Table 5: Fond du Lac County Employment and Industry Data

Employed civilian population 16 years and over	51,374	100.0
Occupation		
Management, professional, and related occupations	13,526	26.3
Service occupations	7,750	15.1
Sales and office occupations	11,625	22.6
Farming, fishing, and forestry occupations	638	1.2
Construction, extraction, and maintenance occupations	4,837	9.4
Production, transportation, and material moving occupations	12,998	25.3
Industry		
Agriculture, forestry, fishing and hunting, and mining	2,148	4.2
Construction	3,325	6.5
Manufacturing	13,935	27.1
Wholesale trade	1,365	2.7
Retail trade	5,863	11.4
Transportation and warehousing, and utilities	2,539	4.9
Information	773	1.5
Finance, insurance, real estate, and rental and leasing	2,120	4.1
Professional, scientific, management, administrative, and waste management services	2,495	4.9
Educational, health and social services	8,930	17.4
Arts, entertainment, recreation, accommodation and food services	3,250	6.3
Other services (except public administration)	2,307	4.5
Public administration	2,324	4.5
Class of Worker		
Private wage and salary workers	42,762	83.2
Government workers	5,483	10.7
Self-employed workers in own not incorporated business	2,949	5.7
Unpaid family workers	180	0.4
Source: USCB, 2000b		

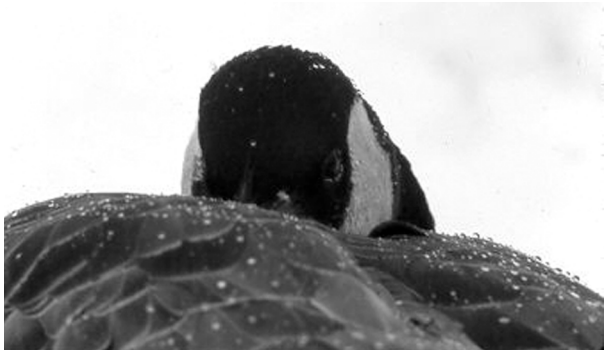
Table 6: 1995 Recreation-related Expenditures (1995 $ in thousands) of Visitors to Horicon NWR

Activity	Resident	Non-resident	Total
Non-consumptive	$70.8	$1,772.9	$1,843.7
Hunting	$11.9	$37.3	$49.2
Fishing	$1.5	---	$1.5
Total	$84.2	$1,810.2	$1,894.4
Source: Laughland and Caudill, 1997			

The study concluded that Horicon NWR had a net economic value of $1,840,200. Every dollar of budget expenditure at the Refuge generated economic effects of $10.12. While the Refuge is a small part of the regional economy, Horicon NWR and the marsh it protects help define the region's character and maintain its quality of life, and thus are important for the promotion of a diverse regional economy (Laughland and Caudill, 1997).

Table 7: Mississippi Valley Canada Goose Population Estimates (1948-1990)

Year	Horicon Marsh	Mississippi Valley Population
1948	2,000	170,000
1958	51,000	214,000
1974	214,000	304,000
1984	121,000	477,000
1987	236,000	725,000
1990	199,000	1,300,000



Canada Goose, Horicon NWR

Natural Resources

Habitats

Horicon NWR includes over 15,500 acres of marsh and 5,600 acres of associated upland habitat (Figure 7). Marsh habitat is seasonally to permanently flooded and dominated by cattail, river bulrush, common reed grass, sedges, and reed canary grass. Uplands include near 3,600 acres of grasslands and 2,000 acres of woodlands (USFWS, 1995).

Of the nearly 16,000 acres of wetlands on the Refuge, approximately 3,000 acres are seasonally flooded (Type I) basins, 12,000 acres are deep (Type IV) freshwater marshes, and 1,000 acres are sub-impoundments. Roughly half of the Refuge consists of dense stands of cattails, either in solid stand or mixed with other species. Other species include soft-stemmed bulrush, hard-stemmed bulrush, slender bulrush, river bulrush, burreed, various sedges, smartweeds, chufas, pigweeds, millets, and sagittaria. There are approximately 2,000 acres of moist soil plants found in and around the edges of the water areas during drawdown condition. These include chufas, smartweeds, pigweeds, etc. About half of the aquatic areas consist of fairly deep lakes, ditches, and other water areas in which stands of submersed aquatics are found. These include various pondweeds, coontail, elodea, duckweeds, and milfoil (USFWS, 1995).

Grasslands consist of approximately 57 percent introduced grasslands, 24 percent forbs, 17 percent are native grasslands, and 3 percent are wet meadows. Woodlands are willow-dominated (55 percent), mixed hardwoods (22 percent), aspen-dominated (12 percent), willow-cattail (8 percent), and oak savanna (3 percent). From these figures, it is evident that almost two-thirds (63 percent) of the Refuge's woodlands are lowland or bottomland and a little more than one-third (37 percent) are upland woodlands.

Resource management at the Refuge involves using a variety of techniques to preserve and enhance habitats for wildlife, with programs both in marsh and upland management. Marsh management involves the manipulation of water levels to achieve a desired succession of wetland plant communities to meet the seasonal needs of wildlife populations. Upland management includes establishing and maintaining grasslands to provide nesting habitat for ducks, Sandhill Cranes, and various song birds. Management objectives include waterfowl production and migratory bird use, with Redhead ducks being emphasized.

Wildlife

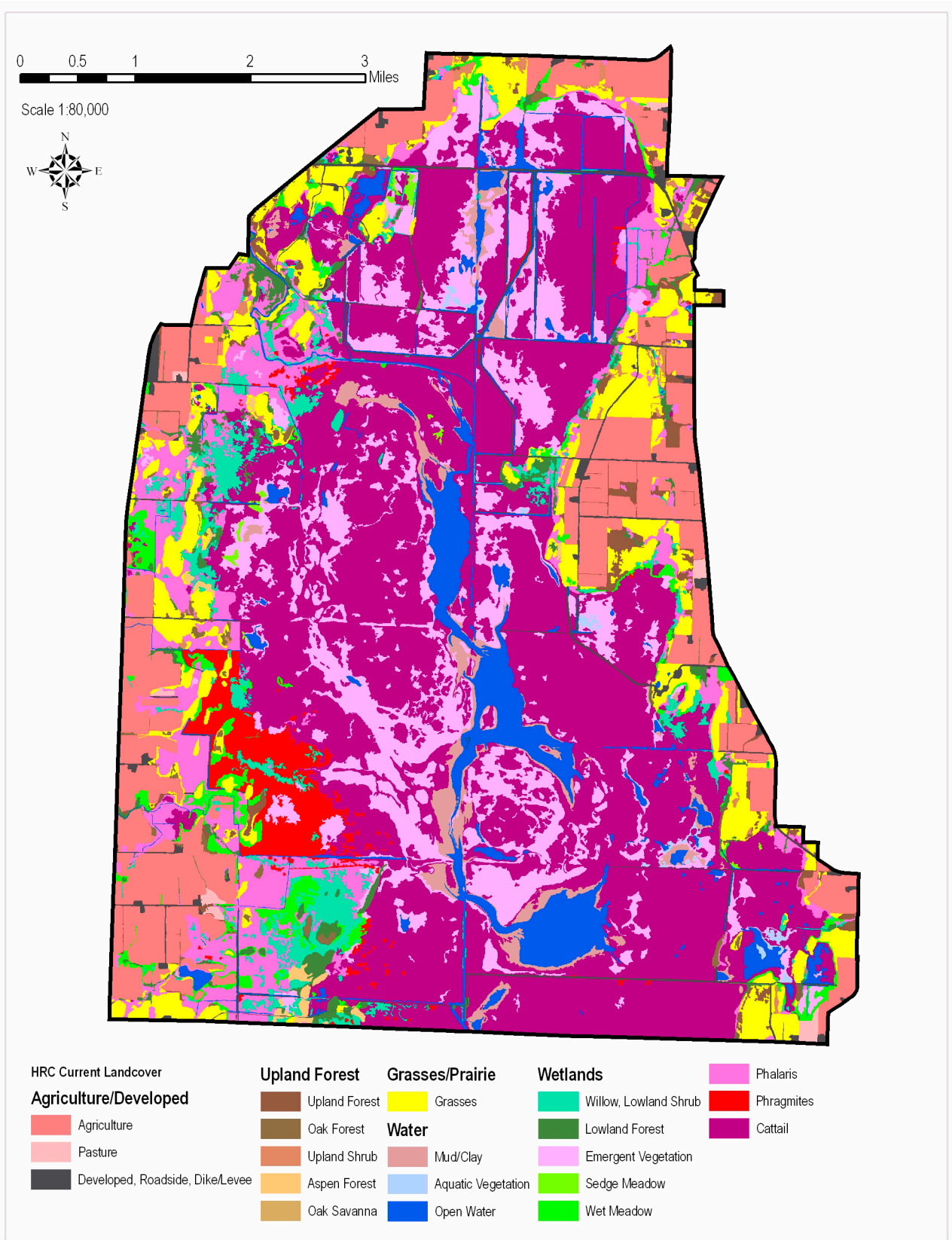
Waterfowl

Horicon Marsh is a major migratory stop-over point for waterfowl (ducks, geese, and swans) of the Mississippi Flyway, with use-days reaching six to 12 million annually. Waterfowl production averages about 3,000 ducklings per year.

The marsh annually attracts Mississippi Valley Population (MVP) Canada Geese during their travels between Hudson Bay and southern Illinois/ western Kentucky (Table 7). The geese are on the marsh from late February to mid-April and from mid-September until freeze-up, with peak numbers in mid-October. The marsh is an important staging area which fuels their journey north and furnishes energy for reproduction.

Up to 1 million Canada Geese migrate through the Refuge each fall. On a peak fall day, there could be as many as 300,000 geese in the area. Most of the Canada Geese that stop at Horicon Marsh fly to their winter range in the area where the Ohio River

Figure 7: Current Landcover of Horicon NWR (2006 Classification)



joins the Mississippi River, about 450 miles away. The rest of the Mississippi Valley population of Canada Geese that migrate through Michigan, Ohio, and Indiana join these birds on the wintering grounds located in southern Illinois, western Kentucky, Tennessee, and Missouri. From about the middle of March until the end of April the birds pass through Horicon Marsh once more to rest and fatten up for the flight to the nesting grounds near Hudson Bay in Canada (USFWS, no date-d).

The geese eat about a half-pound of food per day per bird when they are at Horicon NWR. They are grazers – they like soft shoots, leaves, and buds from meadow plants, grasses, wild rice, and cultivated crops. Goslings eat many insects as a supply of protein for rapid body growth. They also eat grain and other seed crops where they can find them. When geese are present for long periods of time in extremely large numbers they can cause a severe problem for some land owners. Geese will feed on the very same crops farmers in east-central Wisconsin grow – corn, alfalfa, and winter wheat. Assistance to farmers is provided by the U.S. Department of Agriculture and the State of Wisconsin through a program that charges a surtax on hunting licenses. The surtax is used to partially pay land owners for damage caused by geese. This program is administered by county governments.

Mallards are the principle species of ducks using the area, but Green-winged and Blue-winged Teal, American Wigeon, Redheads, Northern Pintails, Gadwalls, Wood Ducks, scaup, and Ruddy Ducks are also abundant, with peak duck numbers traditionally reaching 60,000. The marsh is especially important to Redhead Ducks, which have experienced a population decline nationwide. The marsh is the largest nesting area for Redhead Ducks east of the Mississippi River, with estimated 2,000-3,000 birds using the marsh for this purpose. Historically, a majority of the continent's Canvasback population used the region during nesting or migration (Kahl, 1985).

Marsh Birds

For centuries, marsh birds in particular have descended upon food-rich wetland stopover sites during their annual migration between Central and South America and their northern U.S., Canadian and Arctic breeding grounds. Horicon Marsh has provided an important link in their journey.

Common marsh and water birds on the Refuge include the Pied-billed Grebe, American Bittern, Great Blue Herons, Black-crowned Night Herons, Great Egrets, Common Gallinule, Sora and Virginia Rails, and Sandhill Cranes. Tremendous numbers of shorebirds use low water pools with counts of a single species typically numbering over 5,000 (USFWS, 1995).

Other Birds

Horicon NWR has documented 267 species of birds on the Refuge (see Appendix C for a complete list), including resident, migratory, and accidental species (USFWS, no date-e). Of the 267 species recorded on the Refuge, 223 are expected to be present while 44 birds are listed as "accidental," meaning they are not normally expected to be present. Many birds are present for less than all four seasons, and they may be abundant, common, uncommon, or rare.

Although most famous as a fall stopover for hundreds of thousands of interior Canada Geese, the vitality and versatility of the marsh is much better represented by the diversity of birds that use the Refuge and the marsh. An equal number of birds use the marsh in the spring as in fall, and some species are partial to grassland or upland habitats.

Mammals

The marsh supports an array of resident mammals including white-tailed deer, woodchucks, red fox, squirrels, raccoons, muskrat, skunk, mink, otter, opossum, and coyote. Mammals tend to be most abundant in and around the wetland habitat due to the abundant food and cover available. Muskrats play an important role in striking a balance between the stands of cattail and the open water zones.

Upland mammals of Horicon NWR, and their abundance (abundant, common, or uncommon), include the following:

- Opossum – common
- Eastern Cottontail Rabbit – common
- Meadow Vole – abundant
- Field mice – abundant
- 13-Lined Ground Squirrel – common
- Eastern Chipmunk – common
- Eastern Gray Squirrel – common
- Fox Squirrel – uncommon

- Woodchuck – common
- Little Brown Bat – common
- Big Brown Bat – common
- Striped Skunk – common
- Red Fox – common
- Coyote – common
- White-tailed Deer – common
- Raccoon – abundant

Lowland mammals at Horicon NWR include the following:

- Muskrat – abundant
- Beaver – uncommon
- River Otter – uncommon
- Mink – common

Fish

At one time Horicon Marsh supported a population of game fish that included northern pike, crappie, bluegill, and bass. However, due to habitat degradation associated with turbidity and filling in of the marsh, game fish populations have dramatically declined.

Carp populations have become a serious problem in the marsh due to their high number, aquatic plant diet, and habit of markedly increasing water turbidity during feeding. Carp are extremely prolific, spawning semi-annually, with females producing as many as 60,000 eggs per pound of fish. They retard the growth of aquatic vegetation by consuming it and by roiling the water so that increased turbidity reduces photosynthetic efficiency which is essential for wetland food chains. Current management strategies at controlling carp include physical removal, water level manipulation, chemical eradication, and stocking of predators, especially northern pike (USFWS, 1995).

Amphibians and Reptiles

Amphibians and reptiles are two natural and distinct classes of vertebrates common to the area. Several species of turtles and snakes are found in the area. Salamanders, newts, toads, and frogs depend on quality wetland habitat for their survival.

Amphibians recorded at Horicon NWR include the following:

- Western Chorus Frog – uncommon
- Leopard Frog – common
- American Toad – abundant

Snapping turtle, Horicon NWR

- Spring Peeper
- Eastern Gray Treefrog
- Bullfrog
- Green Frog
- Wood Frog
- Tiger Salamander

Reptiles recorded at Horicon NWR include the following:

- Painted Turtle – common
- Snapping Turtle – common
- Red-Bellied Snake – common
- Garter Snake – common
- Milk Snake – rare

Threatened and Endangered Species

At present, the only Federally-listed threatened or endangered wildlife species that uses the marsh is the Bald Eagle. Bald Eagles were placed on the Federal Endangered Species list in 1973, and are protected by both state and federal laws. Since Wisconsin's eagle population was higher and more stable than that of most other states, the federal government listed the state's eagles as "threatened" in 1978. In 1991, 414 active Bald Eagle territories were located, exceeding the recovery goal of 360.

The formerly listed Peregrine Falcon has also been observed at Horicon NWR (listed as "rare" in spring, fall, and winter), but in a conservation success story, it was de-listed in 1999 due to continent-wide improvements in the status of peregrine populations, from 324 breeding pairs in 1975 to 2,000-3,000 breeding pairs by the late 1990s (USFWS, no date-f).

State-listed endangered species at Horicon NWR include the Osprey, Forster's Tern, and Barn Owl.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions for the refuges. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective. Several trans-national migratory bird conservation initiatives have emerged to help guide the planning and implementation process. The regional plans relevant to Horicon NWR and Fox River NWR are:

- The Upper Mississippi River/Great Lakes Joint Venture Implementation Plan of the North American Waterfowl Management Plan;
- The Partners in Flight Boreal Hardwood Transition [land] Bird Conservation Plan;
- The Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan; and
- The Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan.

All four conservation plans will be integrated under the umbrella of the North American Bird Conservation Initiative (NABCI) in the Prairie Potholes, Eastern Tallgrass and Prairie Hardwood Transition Bird Conservation Regions (BCR 11, 22 and 23). Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trend. These scores are often used by agencies in developing lists of priority bird species. The Service based its 2001 list of Non-game Birds of Conservation Concern primarily on the Partners in Flight, shorebird, and waterbird status assessment scores.

Wildlife Species of Management Concern

Appendix G summarizes information on the status and current habitat use of important wildlife species found on lands administered by Horicon NWR. Individual species, or species groups, were chosen because they are listed as Regional Resource Conservation Priorities or State-listed threatened or endangered species. Other species are listed due to their importance for economic or recreational reasons, because the Refuge or its partners monitor or survey them, or for their status as a nuisance or invasive species.

Great Egret, Horicon NWR

Horicon NWR Current Refuge Programs: Where We Are Today

Consistent with its authorizing legislation, Horicon NWR conducts a broad array of wildlife management activities on the Refuge. Horicon NWR's Master Plan, completed in 1978, developed a list of planned activities consistent with the purpose of the Refuge:

- Waterfowl Production – Diver and dabbler ducks
- Waterfowl Maintenance – Diver and dabbler ducks, geese
- Environmental Preservation
- Special Recognition Species – marsh birds, shorebirds, and raptors
- Threatened Species Maintenance – Bald Eagle, Osprey, Cormorant
- Wildlife/Wildlands Observation
- Wildlife Trails (non-motorized)
- Tour Routes (motorized)
- Interpretive Center
- Interpretive Exhibits/Demonstrations
- Environmental Education

- Hunting – Migratory waterfowl, coot, big game, upland game
- Fishing

In the quarter-century since publication of the Master Plan, Refuge management has made significant progress in implementing these planned activities and products. Refuge planning and management, however, are a continual work in process that evolves over time depending on feedback and monitoring as well as changing values, needs, and priorities in wildlife management at the Refuge, regional, and national scale. Hence the value of a new plan – this CCP – which updates and modifies Horicon NWR's management emphasis.

This section summarizes current management programs, operations, and facilities at Horicon NWR. It also describes the participation and cooperation of Refuge staff and management activities with our partnering agencies and stakeholders in the wider community on efforts to balance competing demands for natural resources, wildlife, and protection from environmental hazards like flooding.

Habitat Restoration

Many of the current management efforts on the Refuge focus on restoring valuable wildlife habitats that have declined regionally since the advent of intensive habitat modification and destruction wrought by Euro-American settlement, agricultural development and drainage projects. Horicon NWR staff carries out wetland and upland habitat restoration projects on the Refuge.

Habitat Restoration on the Refuge

Habitat restoration efforts at Horicon NWR focus on both upland and wetland habitats. Within the last year, upland habitat restoration has focused on improving the quality and quantity of oak savanna habitats. Brush and other tree species have choked out oak savanna habitat. Several methods are used to remove the brush and other trees to allow for the resurgence of oaks. Refuge staff issue firewood-cutting permits to remove larger trees that have encroached on the historic oak savannah openings. Staff and contractors will also remove larger trees. Staff will use specialized equipment to mow brushy areas to reclaim the grass component of the oak savannah habitat. Staff will also be experimenting with particularly hot prescribed burns as a means of restoring and maintaining oak savanna.

Black-eyed Susan, Horicon NWR

Efforts are also under way to restore native prairie grasslands on the Refuge. Restoration typically involves treatment of degraded grasslands, those that have become dominated by non-native, invasive, or woody species like willows. Fields with non-native or invasive species are sprayed with the herbicides Round-Up and 2-4D. The area is then burned to provide good seed-to-ground contact. The seed mix includes 21 forb species and five grass species, all Wisconsin Genotype. The seedings are usually initiated in late fall or early winter, dependant on a light snow cover. A seed blower attached to the hitch of a vehicle is used to plant the seed. Fields invaded by small woody vegetation are mowed using a Fecon mower. Most upland fields on the Refuge have been invaded and dominated with reed canary grass, sweet clover or wild parsnip.

Although native to North America, reed canary grass has hybridized with introduced European strains to create a highly aggressive and invasive strain that is spreading at the expense of other native species. Reed canary grass is flood-tolerant, resistant to burning, a prolific seed producer, spreads rapidly through rhizomes, and quickly forms virtual monocultures in wet meadows by shading out native grasses and forbs. Control requires aggressive measures. Horicon NWR is experimenting with using grazing as a tool to reduce

the amount of reed canary grass. This is a form of adaptive management, and in the spirit of adaptive management, we are always experimenting with different methods to enhance native grasslands.

Managed impoundments give opportunities to restore wetland habitat to more desirable conditions. Currently, a project is under way removing the functionality of ditches in the Main Pool of the Refuge. By creating long ditch plugs in several areas of the ditch, staff are trying to reestablish sheet flow of water and prevent ground and surface water flow from being transported down the ditches.

Habitat Management

As our knowledge and understanding of wildlife ecology evolves over time, and as circumstances and values "on the ground" change, the direction of wildlife management tends to change as well. Two examples of changing philosophies and approaches are evident at Horicon NWR and many other national wildlife refuges, with regard to the "edge effect" and the value of diverse warm season seed mix for wildlife. The conventional wisdom among wildlife managers in the late 1970s and early 1980s was that it was valuable to maximize edges between different vegetation communities. The justification was that since wildlife species that depend on one or the other, or both, of two adjoining habitats could occur near the edge between the two habitats, these edges tend to have higher species diversity than locations set deep within any one habitat type. Thus, increasing the length of edges was deemed desirable.

Twenty-five years later, however, as more information became available from long-term studies, biologists now believe that the advance of civilization has whittled away large contiguous blocks of habitat, and the species that depend on them are in jeopardy. Biological diversity is best served by reducing fragmentation and increasing the areas of habitat blocks, as well as by increasing the connectivity between blocks of similar habitat, so that organisms may move along these corridors and maintain genetic fitness and variability, and thus population viability.

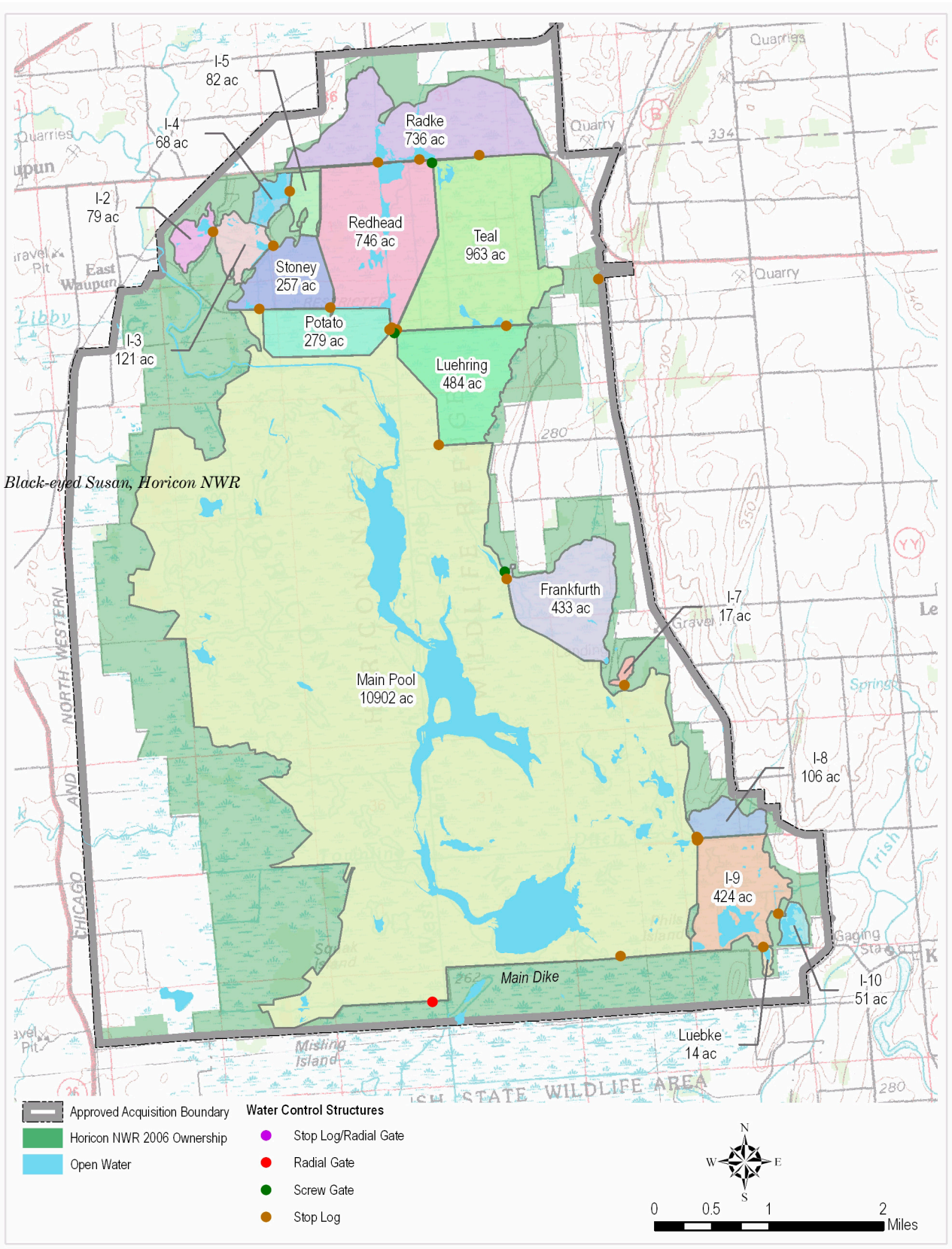
Similarly, for decades wildlife biologists (particularly waterfowl managers) encouraged the planting of dense nesting cover for waterfowl nesting. This method of seeding planted a very thick stand of warm season grass, usually only one or two species with little forb diversity. However, by the late 1990s, wildlife biologists generally and the U.S. Fish and Wildlife Service specifically were adopting more holistic approaches to wildlife management. They realized that these planting were too thick for nesting and that waterfowl preferred a diverse structure of forbs and grasses for nesting.

In recent years, the management philosophy at Horicon NWR, paralleling that of other refuges around the country, has become more oriented toward fostering or simulating natural processes (like wildland fire) to achieve desired landscapes and to restore scarce habitats that were prevalent prior to Euro-American settlement in the region. Given the highly manipulated environments in which Horicon NWR and most other refuges occur, this often means actively intervening in natural plant community succession and hydrologic processes rather than passively allowing nature to "run its course." In order for the Refuge to effectively pursue its purpose and meet the expectations of the American public, Refuge staff actively manage the various habitats through a variety of techniques and procedures discussed in the following paragraphs.

Managing Water Impoundments and Moist Soil Units

Horicon NWR's water management program is very complex and involves 17 impoundments (Figure 8). Pools are frozen for about 4 months of the year, from December to April. During periods of "ice-out," May to November, water management not only must balance competing considerations of wildlife and habitats on the Refuge itself, but it must deal with the requests of off-Refuge neighbors downstream as well as other township, county, state, watershed, and flood control agencies. Regulating water levels – whether at maximum pool levels or in drawdown (emptying pools almost entirely of water) – is a vital management tool for waterfowl, shorebirds, and wading birds. Over the years, water management has been further complicated by increased land clearing and development on private lands upstream of the Refuge, which increase nutrient and sediment transport onto the Refuge. Within the last 2 years, the Refuge has experienced severe flooding, which results in rapid pool level increase, or "bounce," of 2 to 3 feet. Bounces during the breeding season negatively affect nesting efforts of many species. For instance, the flood that began in May of 2004 essentially wiped out a production year for many species. Managers must be cognizant of conditions throughout the watershed, exercise good judgment, and at times be willing to deviate tempo-

Figure 8: Impoundments, Horicon NWR



Black-eyed Susan, Horicon NWR

rarily from Refuge objectives when downstream cities and towns are experiencing extreme flooding events.

Horicon NWR's Marsh and Water Management Plan (1993) guides management of the Refuge's marshes, open water, water levels and discharges. The plan states that production and maintenance of waterfowl are the primary objectives at Horicon NWR, and that to fully achieve these objectives, a diversity of habitats must be provided to meet the life history requirements of waterfowl for nesting, brood rearing, and migration. The presence or absence of water, its depth, and the seasonal timing of water depth fluctuations are all manipulated to produce various stages of marsh habitats on which different water-dependent birds rely.

An annual marsh and water management plan is written every winter. This plan summarizes operations during the previous year, describes major water management problems, and documents construction and rehabilitation projects. It also identifies proposed pool elevations for the upcoming years along with stated objectives for each management unit. Main Pool, by far the largest on the Refuge, serves as an example. Its spillway elevation is 858 feet above mean sea level (MSL), its drawdown elevation is 851 feet. MSL, it was last drawn down in 1999, and the next planned drawdown is currently taking place. Objectives for the following year in 2000 were to maintain and reestablish hardstem bulrush and limit the increase of cattails by flooding out new plants.

Refuge management is continually adjusting scheduled water manipulation in response to the vagaries of the weather or maintenance of water control structures. For instance, in 2004 a leak in the culvert leading to the pump house in the Potato impoundment was discovered. Potato then had to be drained to fix the problem, resulting in an unexpected drawdown. Continual maintenance and repair of aging water control facilities such as gates, pilings, gauges, dikes, bridges, riprap, and channels are necessary to keep facilities and controls operable, and thus to meet water and marsh habitat management objectives.

Annual outflows have a wide range of fluctuation at Horicon NWR, depending on precipitation. Outflow can range from 10 cubic feet per second (cfs) discharge from the Refuge into the Rock River during dry years to over 1,000 cfs in wet years with one or more large storms.

Marsh, Horicon NWR

There have been persistent flooding problems within the watershed, downstream of the Refuge, and on the Refuge itself. Possible solutions have been investigated and explored for a number of years. One possibility is that the current water control structure for Main Pool would be enlarged or several new ones installed along Main Dike Road in conjunction with a new emergency spillway. During flood events, water from Refuge pools and the Rock River could theoretically be discharged faster after the flood peak, to the benefit of the Refuge and its marsh habitats and agricultural areas immediately downstream of the Refuge. It would also allow more flexibility in managing water on the Main Pool impoundment. At present, this proposal has advanced beyond the concept stage, and is currently in the developmental stage.

Moist Soil management on the Refuge is conducted annually. The I-5 impoundment has been drawn down for the past 7 years during spring and summer to promote emergent vegetation. During the fall and winter of 1997 to 1999 all the emergent vegetation was wiped out due to reflooding of the unit. In 2000, the unit was drawn down for the fall and winter as well, in hopes of sustaining an emergent vegetation cover and compacting the very deep mud layer that may have been the cause of the vegetation decline after reflooding.

Mowing on Grasslands and Wet Meadows

Mowing is used in grasslands and certain wetlands like sedge meadow to cut willows and prevent their encroachment. If left alone, hardy, aggressive willows would invade and dominate nearly all wetland areas on the Refuge except for the cattail marsh areas. Mowing maintains a mosaic of willow age classes, ensuring winter browse for deer. It also reduces the willow canopy layer and improves the understory of sedges and grasses that foster deeper

penetration of fire into willow stands. Increased willow control and better cover for nesting marsh and upland birds that use these areas are the ultimate result of this mowing. Typically, about 100 acres a year are mowed on the Refuge.

Haying on Grasslands

The Refuge has a small haying program with three benefits:

- Reduces seed source of reed canary grass.
- Reduces thick litter layer that inhibits nesting.
- It attracts visually impressive birds like Sandhill Cranes, and concentrations of waterfowl to areas where they can be observed by the public.

In a typical year, 30 to 40 acres of reed canary grass is hayed and removed from the Refuge, providing grazing areas for waterfowl and other animals.

Prescribed Fire on Uplands and Wetlands

Fires were once a natural disturbance that helped maintain upland prairies and lowland marshes by decreasing the presence of harmful invading plants. Today prescribed fires are used to setback woody and herbaceous plants that invade prairies and wetlands. The suppression of fire that naturally occurred prior to European settlement allows undesirable fire intolerant species to exist where they otherwise would not have. Many native species of plants and trees are fire resistant, while others require fire to exist. By using prescribed fire as a management tool we can mimic a natural ecosystem function helping to maintain the habitat characteristics which our local plants and animals have evolved from.

Today prescribed fire is one of Horicon NWR's most useful tools for maintaining prairie and marsh vegetative characteristics. Since many upland birds and waterfowl require open areas for nesting, prescribed fire helps maintain habitat necessary for migratory species. By choosing burn units based on needs of the wildlife habitat we can maintain a combination of prairie, savanna, marsh, sedge meadow and woodland habitats required by native wildlife species.

Prescribed fires can help reduce the danger of uncontrolled wildfires by reducing the buildup of hazardous fuel loads in and around the Refuge.

Horicon NWR has a fire management plan that facilitates prescribed burns in the spring and fall seasons. In fiscal year 2005, prescribed fire was used on 21 units totaling 3,230 acres. The spring season was exceptionally successful in terms of acreage and most importantly ecological objectives. The annual average over the last 10 years has been 826 acres. Burns are scheduled on a 3- to 5-year rotation and timed to meet specific vegetative goals. Post-fire monitoring is conducted to measure the success of each burn, in ecological terms. The National Fire Plan has provided increased emphasis on fire planning, management, and suppression at the national level. Horicon NWR has added one permanent seasonal Range Technician to meet the demands of the new fire program.

Wildfire Preparedness

Wildfires occur on the Refuge annually. In 2005, there were four fires on the Refuge. Additionally, Refuge staff assisted the state on four fires locally. The Refuge is prepared with staff and equipment for wildfire activity and is available to assist both local and national firefighting efforts.

Most summers Horicon NWR firefighters go on western wildfire details to assist other refuges and agencies when wildfire danger is high.

Controlling Invasive Plants

Every year, Horicon NWR submits a Refuge Annual Planning Report to the Regional Office documenting the status of invasives on the Refuge and efforts to control their spread. The exotic and invasive species of most concern and the extent of their infestation on the Refuge are wild parsnip (600 acres), reed canary grass (1,900 acres), purple loosestrife (100 acres) and leafy spurge (3 acres).

Wild Parsnip

Wild parsnip (*Pastinaca sativa*) is an aggressive, Eurasian weed that frequently invades and modifies a variety of open habitats. Wild parsnip slowly invades an area in waves following initial infestation. Once the population builds, it spreads rapidly. Wild parsnip can cause phytophotodermatitis to the skin. If the plant juices come in contact with skin in the presence of sunlight, a rash and/or blistering can occur, as well as skin discoloration that may last several months. Staff has had a difficult time controlling the spread of this invasive. Fire has no effect on wild parsnip since plants simply resprout. Due to the large acreage that is affected, hand pulling is not an option. In 2005, mowing fields just as the seed

heads turned color, had mixed results. Some fields had effective control while others were mowed too early and the wild parsnip resprouted and flowered. Staff is continuing to make adjustments and monitor the spread.

Reed Canary Grass

Reed canary grass (*Phalaris arundinace*), as mentioned earlier, is native to North America, but has hybridized with introduced European strains to create a highly aggressive and invasive strain that is expanding at the expense of other native species. It is flood-tolerant, resistant to burning, produces seeds prolifically, spreads rapidly via rhizomes, and quickly forms virtual monocultures in wet meadows by shading out native grasses and forbs. Aggressive measures are needed to control it.

Purple Loosestrife

Purple loosestrife (*Lythrum salicaria*) is a wetland herb that was introduced as a garden perennial from Europe during the 1800s. It is still promoted by some horticulturists for its beauty as a landscape plant, and by beekeepers for its nectar-producing capability. By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars. Purple loosestrife can spread rapidly, eventually taking over an entire wetland and almost entirely eliminating the open water habitat. Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. The Refuge continues to monitor the purple loosestrife infestation. Refuge staff stopped raising Galerucella spp beetles several years ago. Several beetle surveys in early spring showed poor survival of beetles in the areas of original release. It was hoped that the beetles would be self-sustaining and that some of the beetles could be translocated to new areas of infestation. Refuge staff will continue to monitor the changes around the Refuge where beetles were released to see if additional beetles will need to be raised and released to combat the purple loosestrife. The original release sites have shown encouraging results over the last 6 years.

Leafy Spurge

Leafy spurge (*Euphorbia esula*) is an aggressive, exotic, perennial weed that is especially pernicious in western grasslands. It out-competes desirable native vegetation, growing in dense clumps with one or more shoots emerging from a woody root crown. This weed contains irritating chemicals that many animals avoid eating. Previous measures to control the leafy spurge included spraying it with the herbicide Plateau; however, the weed can be resistant to chemical control. It has a pervasive root system and appears able to block the downward movement of herbicides. Still another problem with chemicals is that herbicides sprayed to kill spurge also kill desirable broadleaved plants. It should be noted that prescribed fire does not control leafy spurge. In 2005, biological control of the leafy spurge was initiated. Several species of beetles totaling 100,000 specimens were collected from the Trempealeau NWR. This included three varieties of Aphthona flea beetles: Aphthona nigriscutis, Apthona cyparissiae, Apthona czwalinae and a long-horned stem miner called *Oberea erythrocephala*. Monitoring of leafy spurge and beetle survival continues.

Purple loosetrife, Horicon NWR

Other species: There are several other plant species, both on and off the Refuge, that threaten the vegetative integrity of the Refuge. On the Refuge, the spread of common reed or phragmites (*Phragmites australis*) is of concern. The use of fire and chemical treatment using HABITAT are methods of control being explored. European buckthorn (*Rhamnus cathartica*) has a very rapid growth rate and resprouts vigorously after being cut. Typical of several non-native understory shrub species, buckthorns leaf out very early and retain their leaves late in the growing season, thereby shading out native wildflowers. Currently, management of this

species includes pulling young seedlings and/or cutting and spraying stumps with 2-4D. Garlic mustard (*Alliaria petiolata*) is a rapidly spreading woodland weed that is displacing native woodland wildflowers in Wisconsin. A combination of pulling and spraying is a management tool for controlling this invasive. Also, spotted knapweed (*Centaurea maculosa*), an aggressive, non-native invader of grasslands, grows on roadsides near the Refuge.

Habitat Monitoring

Aerial Infrared – GIS Technology

Horicon NWR has had aerial infrared photography taken in 1996, 1999, 2000, 2001 and annually since 2003. The 2005 photos were digitized into a vegetation classification. The primary purpose of the photos is monitoring habitat changes that occur either naturally or due to management. In the past, visual comparisons of photos between years were done to make these evaluations. In 1999, Horicon NWR used a Geographic Information System (GIS) to make quantitative evaluations of open water to cattail growth and germination. GIS technology is used to compare infrared photos taken in different years to determine the changes in habitat that are taking place due to management activities such as water level manipulation and prescribed burning.

Grassland Surveys

The annual grassland surveys, initiated in 2001 using plant community associations at point count sites, continue. These surveys were developed and tested in 1999 on several points at Horicon NWR based on a similar grassland survey conducted at J. Clark Salyer NWR. In addition to several association changes based on local habitat, visual obstruction readings (VOR) using a Robel pole and litter depths were taken at each site. It is hoped that eventually the grassland survey will be correlated to grassland bird surveys and guide the Refuge grassland management program including prescribed burning. Many staff days and hours are required to monitor each site every year. In 2004, only three of the plots were completed. All three sites were on the Hishmeh tract near Luehring Lake. This area is planned for burning in 2005. Survey methods are being reviewed to see if they can be simplified to reduce the time involved on each plot by reducing the individual points down from 800 per plot.

Prescribed Burning

Six photo stations were established on units that were planned for burning in 2004 to provide a photographic record of changes in habitat. Photos were taken annually in 2004 and 2005 and comparisons in the changes in vegetative cover will be made with the photos. In addition, future plans include additional monitoring, including vegetation and organic substrate surveys.

Wildlife Monitoring and Research

Two basics types of inventories and investigations are conducted at Horicon NWR:

- surveys and censuses of selected species or species groups, which are typically made on an annual basis.
- basic research into wildlife biology and ecology, which have no specific schedule.

The surveys and censuses are generally made by staff and volunteers, and consist of organized surveys and/or censuses, or a compilation of observations and recorded sightings made over the course of the year.

Research studies are usually undertaken in cooperation with university professors and their students or other agencies, often with the direct participation and cooperation of Refuge staff and assisted by volunteers.

Surveys and Censuses

Surveys and censuses at Horicon NWR are guided by a 1990 Wildlife Inventory Plan.

Snowy Plover, Horicon NWR

Endangered and/or Threatened Species – Two federally listed threatened species are found on the Refuge, the Bald Eagle and Whooping Crane. Visual observations of eagles and Whooping Cranes are recorded. Bald Eagle nests are monitored annually to determine nest success. In 2005, one nest was active; it was located in a tall cottonwood tree.

Amphibians – Horicon NWR has been part of the Nationwide Malformed Amphibian Survey Project conducted by the Bloomington Ecological Services Field Office. The Refuge was part of this study from 2001-2003.

In 2000, a volunteer initiated a frog survey as part of the Marsh Monitoring Program sponsored by Bird Studies Canada and Environment Canada to study wetland amphibians and birds in the Great Lakes basin. Eight stations were set up and sampled three times a year. Volunteers continue to conduct these surveys. Seven species of frogs and toads have been identified by their calls on the Refuge: green frog, wood frog, chorus frog, northern leopard frog, American toad, gray treefrog, and bullfrog.

Raptors – Staff compile observations of rare and uncommon raptors at the Refuge, including the Snowy Owl and the formerly listed Peregrine Falcon.

Waterfowl – Breeding waterfowl, including Canada Geese and ducks, are inventoried every spring and summer. By using waterfowl surveys and brood surveys Refuge staff are able to estimate the number of ducks and geese present as well as an estimate of production. Numbers of several species of waterfowl are also estimated during the fall migration, including Mallard, Blue-winged Teal, Green-winged Teal, Ruddy and Ring-necked Ducks and Canada and Snow Geese.

Bird banding has been a tool of wildlife managers for decades. Banding enables biologists to identify and track movement and timing patterns of migratory bird populations. Metal bands or rings with identification information are affixed to the leg of the bird. The bird must be recaptured or killed and held in hand to record the information on the band. Horicon NWR has an annual banding quota of 400 Mallard Ducks. In past years, it has been difficult to reach the established quota. In 2005, 50 Mallards and 82 Wood Ducks were also banded.

Marsh Birds, Shorebirds, Gulls and other Migratory Birds – Horicon NWR conducts censuses and observations of many water-dependent avian species. Estimates of nest numbers are obtained for the three predominant colonial nesting birds (i.e., birds that nest in colonies) on the Refuge: White Pelican, Black-crowned Night-heron, and Double Crested Cormorant. Over the years, averages of 350 pairs of White Pelicans, 100 pairs of Black-crowned Night-herons, and 150 pairs of Double Crested Cormorants have nested at Horicon NWR.

Six species of marsh birds – American Bittern, Least Bittern, Sora, Virginia Rail, Yellow Rail and King Rail – are typically surveyed several times a year using passive call and call playback techniques.

Point counts are also made of migratory songbirds during the breeding season. Seven of 32 sites were surveyed in 2005 with 44 species found. Henslow's Sparrows continue to be found on the surveys, as well as an increased numbers of Bobolinks. No Meadowlarks were found on the 2005 survey, which is of great concern.

During years when management activities create extensive mudflats and moist soil units, Horicon NWR is a popular stopover area for shorebirds. These birds are often observed in the spring and/or summer by volunteer birding enthusiasts. Fifteen to 20 species of shorebirds and thousands of individual birds have been observed by staff and visitors.

The 29th Annual Crane count, sponsored by the International Crane Foundation (ICF) in Baraboo, Wisconsin, continues as an annual survey, both on and off the Refuge. For the first time in 2004, Refuge staff did not coordinate the count. ICF could not find anybody to replace the county coordinator, so they did it themselves. In 2005 a new coordinator was selected and will coordinate and receive the information. Ten of 13 sites were counted on the Refuge. Dodge County had a total of 65 people participate with 21 of those observers on refuge sites. Refuge sites will continue to be available for the crane count.

Roadkill – A roadkill survey has been conducted along Highway 49 since 2001. The roadkill survey is conducted daily most of the year, less frequently in winter. The survey is conducted at the same time of day, between 7:00 a.m. and 8:00 a.m. Results from 2004 included a total of 379 individuals killed, representing 43 different species. The changes in habitat on both sides of the highway influence what species

Pike, Horicon NWR

are using the area. The Friends of Horicon NWR and Refuge staff have been working toward a solution with the Wisconsin Department of Transportation.

Fish – Electro-shocking fish surveys are conducted every 3 to 5 years. Previous fish surveys showed that carp numbers were increasing, composing more than 95 percent of the fish in the marsh. Electro-shocking efforts in 2005 proved, once again, that the carp population is very high. The survey showed that carp made up 98 percent of the catch, with bullheads a distant second at 1 percent. The remaining 1 percent contained a variety of other fish including: fathead minnows, green sunfish, pumpkinseeds, two white suckers, golden shiners, one bluegill, and one large mouth bass. In July, Radke Pool became a popular feeding sight for the Great Egrets and pelicans. Two fyke nets were set overnight to find out what the birds were eating and produced interesting results. Upon retrieval the next morning, the mini fyke net could barely be moved because of the number and weight of fish in it. More than 97,000 young-of-the-year carp were collected. The large mesh fyke net, set near the monument in Radke Pool, had a variety of fish including carp, black and brown bullheads, bluegill, green sunfish, golden shiners, brook stickleback, southern redbelly dace, and one northern pike.

Other surveys – Other surveys conducted on and off the Refuge include Mourning Dove, breeding bird survey routes, midwinter waterfowl and the Christmas bird count.

Resident Wildlife – An aerial deer census is conducted every winter by the Wisconsin DNR. The February 2006 deer population was estimated at 35 deer per square mile for Unit 68B and 51 deer per square mile for Unit 68A. A deer management density goal of 30 deer per square mile is recommended by the Wisconsin DNR.

Refuge staff record visual observations of infrequently observed furbearers like beaver and river otters. A muskrat hut survey is also conducted during the winter to gain population estimates.

Studies and Investigations

The Refuge is the site of a variety of wildlife research studies, ranging from life history studies to disease effects. Horicon NWR initiates, encourages and cooperates with these studies in a number of ways, including the use of housing, equipment and other facilities by guest researchers, by subsidizing volunteers, and by direct collaboration in the field. Recent and ongoing studies include the following:

Factors Influencing Reproductive Success of Forster's Terns at Horicon Marsh – Initiated in 2004 by Dr. David Shealer, Loras College, Dubuque, Iowa, this study aims to determine population sizes and the effects of habitat, food availability and predation on reproductive success at Horicon Marsh and Grand Lake Marsh. At Horicon Marsh, two areas (Main Pool, Teal Pool) clearly are important nesting areas for Forster's Terns, probably because these areas contain extensive stands of bulrushes.

Interactions of prescribed burning, soils, and water on nutrient dynamics, vegetation, aquatic invertebrates, and wetland birds in managed emergent marshes – This study is being conducted by the Biological Monitoring Team (Soch Lor and Kari Ranallo), LaCrosse, Wisconsin and the USGS Northern Prairie Wildlife Research Center (Murray Laubhan, Ned (Chip) Euliss and Jane Austin), Jamestown, North Dakota. This research project is a joint USGS-FWS inter-regional (Regions 3 & 5) fire and wetland study that will focus on examining the relationship fire has with cattail-dominated wetlands. This study aims to provide wetland managers with scientifically sound information to improve their understanding and decision-making of how

burning affects nutrient dynamics, which in turn influence emergent plant, aquatic invertebrate, and waterbird communities.

Vegetation Classification Using GIS & Aerial Infra-red Photos for Horicon NWR – Jennifer Dieck, USGS Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, is cooperating with Horicon NWR in the application of GIS and photo interpretation to map and classify vegetative cover on the Refuge.

Rotational Grazing Affects on Reed Canary Grass – This study is being conducted in cooperation with Laura Paine, UWEX-Columbia County, Portage, Wisconsin; Randall Jackson, University of Wisconsin-Madison, Madison, Wisconsin; and Brian Pillsbury, NRCS, Baraboo, Wisconsin. This study will focus on how rotational grazing of sheep can affect the vegetative cover of a field dominated by reed canary grass. Vegetation surveys were conducted fall of 2005 prior to any grazing. In spring of 2006, sheep will be allowed to graze on the divided field with limited time frames. Annual vegetation surveys conducted by UW – Madison students will determine the affects of the grazing on the reed canary grass. It is hoped that the grazing will decrease the reed canary grass and allow other grasses and forbs to germinate.

Effects of Avian Vacuolar Myelinopathy on Coot – This study was conducted by Andy Berch, USGS National Wildlife Health Center, Madison, Wisconsin. Avian Vacuolar Myelinopathy is a neurological disease prominent in the wintering grounds of the coot. Suspect cause may be an anotoxin–A, which is a naturally produced toxin from a cyanobacteria called Anabenea. Coot ingest the toxin from the food they eat. Bald Eagles are also dying from eating the Coot. Healthy Coot were collected from the Refuge and then injected with the toxin at the Health Lab. This study will help researchers understand the disease better and potentially help mitigate the cause. Results are being analyzed.

Population Demographics of Nesting Black Terns – Dr. David Shealer, Loras College, Dubuque, Iowa, finalized this four-year study in 2003 to determine population demographics of nesting Black Terns. Field work concentrated on locating as many Black Tern nests as possible, monitoring of nests to determine productivity and reasons for nest failure, banding of adults and young, and collecting blood samples from chicks and adults to determine sex using DNA microsatellite markers and conduct studies of parentage using DNA fingerprinting. Most of the work was conducted at Horicon NWR but banding and blood work was also conducted at nearby smaller colonies. Results are being analyzed.

Elevation Survey of Main Pool and Main Dike Road – This survey was conducted by Brian Tangen, USGS Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Results of this survey would be used to create baseline data of the Main Pool elevation and sedimentation and also help determine where a new water control structure should be placed. Results are being analyzed.

Wildlife Management

Wildlife management activities at Horicon NWR are directed by the Refuge's establishing purposes and general mandate to conserve trust resources. Wildlife management is accomplished primarily through habitat manipulation rather than by direct manipulation of wildlife species and populations. See the sections on habitat restoration and management above. However, the following activities do pertain directly to increasing or decreasing wildlife numbers through management, conservation, and where necessary, control of wildlife populations.

Disease Monitoring and Control

Staff is continually monitoring the health and condition of wildlife populations on the Refuge and staying abreast of the regional status of diseases that affect the health of wildlife, humans, or both. Through monitoring and preventive measures, it is possible to prevent isolated cases from triggering major outbreaks of disastrous epidemics.

Historically the Refuge had a type C Avian botulism outbreak every year with a couple of hundred birds picked up in the various impoundments. Staff would routinely conduct surveillance in mid-July and continue until December. Since 1992, the number of dead birds has dropped dramatically to less than a dozen per year and the surveillance has been limited to observations during daily refuge functions. If mortality of birds is suspected, then further searches in the impoundments are conducted by airboat. In 2005, the Refuge experienced the first major outbreak in many years. Certain environmental factors can contribute to the botulism spores germinating, producing the toxin, and resulting in an outbreak. These environmental factors, such as high temperatures, low water levels with exposed mudflats, and the presence of decaying organic matter (fish), which support the toxin production, were all

present in 2005. About 1,200 ducks, mostly Mallards, were retrieved and buried by Refuge staff. This number does not reflect the total loss of birds, since only a percentage of the birds are picked up.

In 2002, the Wisconsin DNR found the first confirmed case of Chronic Wasting Disease (CWD) within the State's deer herd in the southwestern part of Wisconsin. Horicon NWR is not located within the area of Wisconsin where CWD has been detected. However, in preparation for an outbreak, in 2005 Refuge staff wrote a Chronic Wasting Disease Surveillance and Management Plan, along with an Environmental Assessment (EA). The Plan identifies the strategies for CWD management on the Refuge, which mirror the strategies identified in the State Plan. These strategies include Disease and Population Management measures, Surveillance and Coordination measures, Testing and Handling of CWD Suspect Animals, and Baiting and Feeding measures. In summary, Refuge staff will rely on hunter harvest during established seasons to approach the Wisconsin DNR population goals and will conduct active, opportunistic observations of deer on Refuge lands. Baiting and feeding will not be allowed on Refuge lands and any deer suspected of CWD will be euthanized. The complete Plan and EA is available at the Refuge office.

West Nile Virus was found in Wisconsin for the first time in 2001 in infected wild birds. Spread by mosquitoes, this exotic virus infects mammals, including humans, and birds. Members of the Corvidae family (crows and jays) seem to be especially vulnerable. In 2005, three pelicans on the Refuge tested positive for West Nile Virus. Staff continues to monitor for West Nile.

Nest Structures

The Refuge has 57 Wood Duck houses that are checked and maintained annually by staff and volunteers. Two volunteers checked and maintained 97 Bluebird nest boxes at various sites around the Refuge. In addition, the Girl Scouts from Camp Silverbrook in West Bend helped check the nest boxes at the Environmental Education Barn. This year, many new nest boxes were constructed, donated, and installed by the volunteers. Fifteen Prothonotary Warbler boxes were also installed along wet forest dikes. Two Osprey platforms, installed in 2000, are also present on the Refuge and in 2005 a pair of Osprey were observed bringing sticks to the Frankfurth platform. Unfortunately, with only a few dozen sticks on the platform they abandoned the site.

Wild Turkey, Horicon NWR

Predator and Exotic Wildlife Control

A variety of furbearer species are traditionally trapped on the Refuge: muskrat, mink, raccoon, opossum, red fox, skunk, coyote, and weasel. These species cause problems for the Refuge because the upland predators prey on the ground-nesting birds and the muskrat cause damage to the dikes. The number of interested trappers has steadily declined over the years, primarily due to low fur prices and low number of muskrats available. Therefore, interest in the trapping program is now primarily recreational.

The Refuge is divided into 21 marsh units, six dike units, and two upland units. The units are sold through an open auction held each September. However, since the 2000/2001 trapping season, no marsh units have been offered due to low muskrat numbers, which plummeted after a planned drawdown of the main pool.

In 2003/04, three of the trappers, including both upland trappers, never even came out to trap. Similarly, in 2004/2005, two of the dike units never sold and of the remaining six units that did sell, only three of those trappers actively trapped. Therefore, Refuge staff decided to not offer trapping for the 2005/2006 season. Trapping results for the last several years are shown in Table 8.

The carp trap installed along the Rock River at the north side of the Refuge is emptied several times each spring. Carp start filling the trap in early April. In 2005, over 100 tons of carp were removed. Other game fish and desirable species caught in the trap and released included northern pike, walleye, crappie, yellow perch, bluegill, and white suckers.

Table 8: Furbearer Trapping Totals, 2000-2005, Horicon NWR

Species	2000-01	2001-02	2002-03	2003-04	2004-05
Muskrat	397	2,430	1,224	415	60
Mink	0	2	10	6	0
Raccoon	162	75	20	7	44
Opossum	75	28	57	12	28
Fox	0	0	0	0	10
Skunk	41	7	0	7	0
Coyote	0	0	0	0	5
Weasel	2	0	0	1	0

Several painted turtles were also released. In addition, another 200 tons of carp were treated with Rotenone.

Coordination Activities

Horicon NWR staff invests a significant amount of energy and time representing the Refuge in its role as a partner with other government and resource agencies and as a neighbor and large landowner in the community. Staff participate as team members of various committees and groups.

Interagency Coordination

Refuge staff has been involved with the Rock River Headwaters, Inc. (RRHI) since 1994, when the organization was called the Horicon Marsh Area Coalition. The mission of RRHI, a nonprofit organization, is to serve as a catalyst for cooperation between citizens, businesses, agriculture, and government to protect, restore, and sustain the ecological, economic, cultural, historic, and recreational resources in the Upper Rock River Basin through a watershed-based approach. In recent years, RRHI has received three $10,000 grants to be used to educate the residents of the Rock River watershed on the importance of water quality and better land management practices.

The Refuge's involvement with the Marsh Management Committee, formed in 1998, has continued. The committee is made up of representatives from non-profit organizations, government organizations, and the private sector for the purpose of guiding the management of Horicon Marsh for the benefit of a healthy ecosystem and the people who enjoy it. Refuge staff has attended monthly meetings.

Each year Refuge staff coordinate with the local Wisconsin DNR staff on a variety of issues, including: public use events and publications, water management, carp control, law enforcement, hunting programs, fire; maintenance, and trapping programs.

Since 2000, the Refuge has participated in the Rural Fire Assistance Program, which provides financial assistance to rural fire departments in the community around the Refuge. Since the program's inception, five out of six fire departments have received over $79,000 dollars. Only Burnett Fire Department on the west side of the marsh has chosen to not participate in the grant program.

Public Recreation, Environmental Education and Outreach

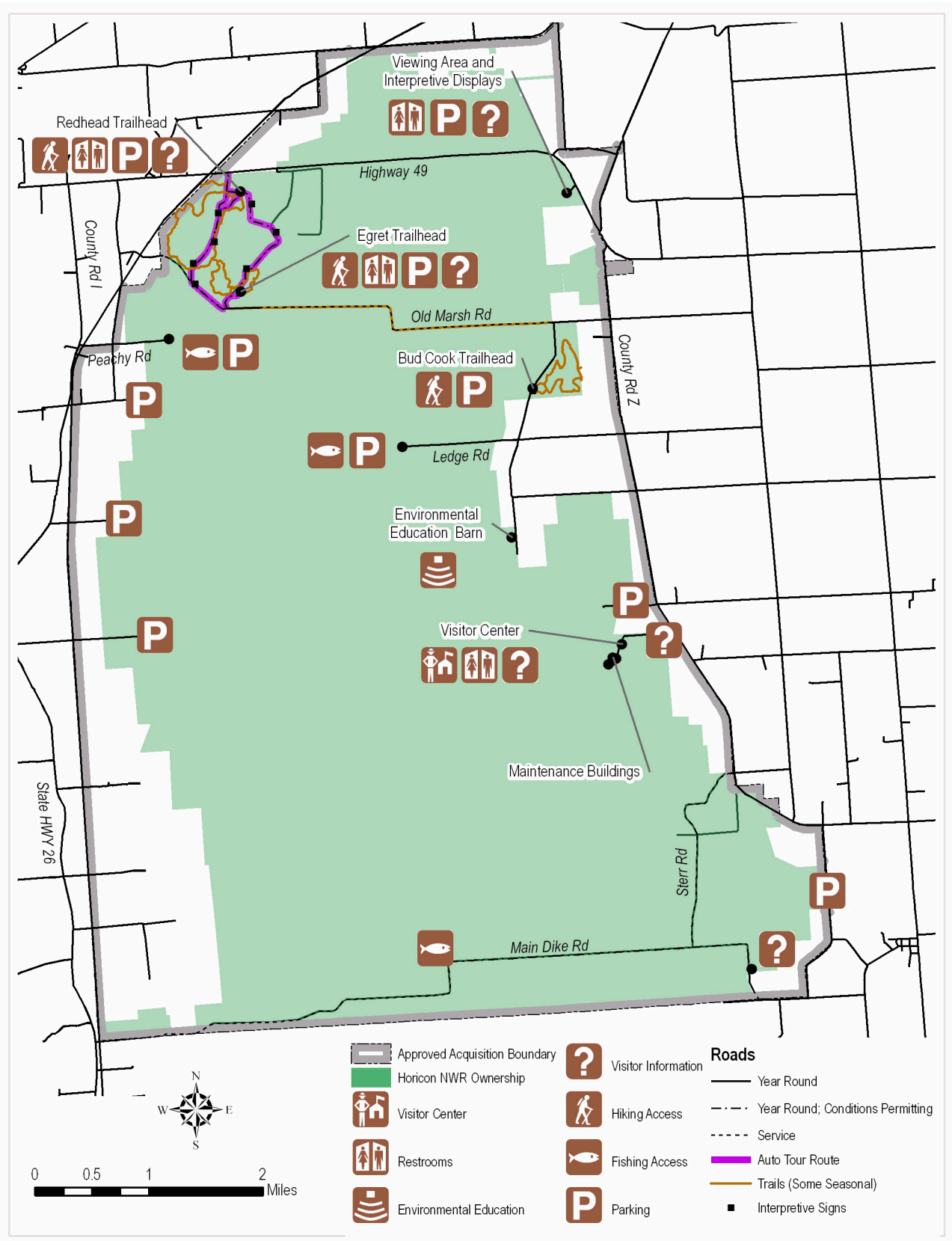
The 1997 National Wildlife Refuge System Improvement Act emphasizes wildlife management and that all prospective public uses on any given refuge must be found to be compatible with the wildlife-related refuge purposes before they can be allowed. The Refuge System Improvement Act also identifies six priority uses of national wildlife refuges that in most cases will be considered compatible uses: wildlife observation, wildlife photography, hunting, fishing, environmental education, and (nature) interpretation. Opportunities to participate in all of these wildlife-dependent activities exist at Horicon NWR. (See Figure 9)

Activities that are prohibited on the Refuge due to conflicts with wildlife include: camping, boating, canoeing, ATV's, snowmobiles, and fires.

Bicycling, hiking, leashed dogs on trails, and trapping on an as-needed basis, are the only other activities that have been determined compatible with the priorities of the Refuge.

Facilities include a 6,000-square-foot visitor center with exhibit space, employee offices, and a large multi-purpose room. There is also an observation

Figure 9: Existing Visitor Facilities, Horicon NWR



deck with scopes, a rustic environmental education barn, a viewing area on Highway 49 with interpretive exhibits and restrooms with running water, a paved auto tour route with interpretive kiosks and wayside signs, three hiking trails, a floating boardwalk and a paved link to the Wild Goose State Trail, two grassland hiking trails at the Bud Cook area with kiosk and observation deck with spotting scopes, and accessible fishing platforms at three different locations on the Refuge. Aside from these visitor use areas, the remaining part of the Refuge is closed to public access with the exception of statewide hunting seasons.

Currently, the most updated plan on file for any of the compatible activities is a Five-Year Environmental Education plan, prepared in December 2003, which provides the background and direction for environmental education at the Refuge. This plan will be re-evaluated as part of the CCP process.

A Visitor Services Review Report was prepared by Region 3 staff of the U.S. Fish and Wildlife Service in October of 2005. The report lists 10 minimum visitor services requirements and includes a number of recommendations on how to improve visitor services on the Refuge. Some of these include: developing a visitor services plan and revising or writing step-down plans for each of the six wildlife-dependent activities, updating interpretive signs and kiosks and adding new directional signs, and generally enhancing several of the existing visitor use areas.

Annual visitation is approximately 450,000 each year for priority public uses on the Refuge.

Hunting

Hunting opportunities on the Refuge include Ring-necked Pheasant, Gray Partridge, cottontail rabbit, squirrel, and deer. Closed areas include the viewing area and interpretive displays on Highway 49, the Bud Cook Hiking Area, and a small area around the office/visitor center. The auto tour route/hiking trail complex is closed to all hunting except during the deer gun season; a 600-acre area around the office/visitor center is closed to all hunting except for special hunts for hunters with disabilities; and the former Stensaas unit is closed to all hunting except for youth and novice Ring-necked Pheasant hunters. The Refuge is closed to migratory bird hunting, other than a controlled Youth Waterfowl Hunt. State regulations apply to all Refuge hunters, except that currently all seasons close at the end of the deer gun season on the Refuge. However, changes were recently submitted to the Federal Register for the 2006 hunting season. All hunting seasons on the Refuge will coincide with the State seasons for all species that are currently open for hunting on the Refuge.

Since 1994, a 600-acre area around the office/visitor center was set aside for hunters with disabilities during the regular nine-day deer gun season at the end of November. This area had previously been closed to all hunting. The area was also opened at that time to archery hunters, through a permit system. This same area has also been open since 2000 for an early, 9-day gun hunt that the State offers to hunters with disabilities every October. In 2003, in order to improve success for the hunters with disabilities, the area was expanded to 880 acres and the archery hunting was eliminated. This area has remained closed to all other hunting except during special T-Zone deer gun hunts, when it is open to all deer hunters.

Since 1984, a supervised youth waterfowl hunt has been held every year on a designated impoundment on the Refuge. Refuge staff select three weekend days during the season for the hunt. Youth are selected through a random drawing, with preference given to those who have never been in the hunt. In order to apply, youth must have completed hunter safety and one of the local Ducks Unlimited Greenwings Days or Wisconsin Waterfowl Association Waterfowl Skills Clinic. Each youth who is selected may have one youth partner who also has to meet the above requirements and one adult sponsor who is not allowed to hunt. Approximately two dozen youth participate each year and usually each party is successful in harvesting at least one duck. In 2005, the drought was so severe that the youth hunt was cancelled for the first time due to lack of water.

Fishing

Fishing opportunities are limited to the public due to shallow water conditions and the absence of a variety of game fish. Boats are not allowed on the Refuge. Bank fishing in accordance with Wisconsin State fishing regulations is permissible on the Refuge at three locations: Main Dike Road, Ledge Road and Peachy Road. Main Dike Road and Ledge Road have accessible fishing piers on location but lack welcome kiosks. The Peachy Road access is currently in the planning process for reconstruction. Game fish are stocked each year at various locations throughout the Refuge. One youth fishing event is held on the Refuge during the summer in celebra-

Students working on nature journals, Horicon NWR

tion of National Fishing Week. This event involves a morning of interactive stations that cover safety, bait and lure selection, casting, and fish biology and management with free merchandise such as hats, sunglasses, lures and tackle, followed by an afternoon of staff-led fishing at various sites on the Refuge.

Wildlife Observation

Wildlife observation is a popular activity at the Refuge. At least 267 different species of birds have been documented on the Refuge over the years. The Refuge is recognized as both a state and globally important bird area. Between mid-September and mid-November, visitation is at its peak due to the fall migration of over one million geese that use the Refuge as a stopping point in their nearly 850-mile migration to southern wintering areas. The three-mile paved Horicon Ternpike Auto Tour Route is an excellent place for wildlife observation and receives the highest annual visitation of any sites throughout the Refuge. Many public events and interpretive programs occur on the Refuge that focus on wildlife observation, mainly bird-watching, such as the Horicon Marsh Bird Festival, guided birding tours, and Marsh Melodies.

Wildlife Photography

Consistent with the opportunities to view wildlife, many Refuge visitors also photograph the many birds, mammals, and other creatures that they observe on the Refuge. No photo blinds have been constructed at this time but future locations are being considered.

Wildlife Interpretation

The Refuge lacks a Visitor Services Plan and a primary interpretive theme to provide guidance for Refuge management and staff on matters related to visitor services. Developing a plan and interpretive themes was one of the recommendations outlined in the 2005 visitor services review report. The plan, when developed, will provide interpretive methods and concepts, specify compatible forms of wildlife-dependent recreation, and identify existing and proposed public use areas and facilities for the Refuge. Currently, numerous interpretive programs are conducted on and off the Refuge for ages ranging from pre-school children to adults. Primary topics include the history of Horicon Marsh, habitat management and resource issues.

Environmental Education

Environmental education is the most developed component of the visitor services program to date. The Refuge piloted the Rhythms of the Refuge curriculum for Region 3 and has used activities found in the curriculum in numerous programs for local public, private and home-schooled groups, Scouts groups and community-based service organizations. Program participants range from preschool to adult, with the majority being elementary and middle school students. Activities are conducted at the visitor center, the Environmental Education barn, the Egret Trail and boardwalk, off-site in the classroom and through distance learning sessions. All programs are free and are led by trained volunteers and Refuge staff.

In addition to the standard curriculum, Refuge volunteers participate in the Rolling Readers literacy program and lead classroom activities relating to the Refuge. The Refuge also offers a variety of educational trunks and materials available for check-out such as the wildlife discovery trunk, prairie trunk, aquatic exotics, songbird trunk and wetland trunk.

Volunteer and Friends Contributions

The Refuge friends group, Friends of Horicon National Wildlife Refuge, is heavily involved in the operation of the Refuge's visitor services program. The group runs a gift shop, Coot's Corner, in the visitor center, provides funding for educational supplies and services and provides volunteers for many environmental education and interpretive programs, events, and outreach activities for the Refuge. In addition to the Friends group there are also

approximately 100 other volunteers, both individual and groups, that donate time to the Refuge to assist with providing information to the public at the visitor center and other sites during peak visitation, habitat restoration, environmental education, interpretive and outreach programs, and administrative and maintenance tasks.

Outreach

Outreach is an important component of Refuge operations. In addition to off-site interpretive and environmental education programs, the Refuge sends out monthly news releases pertaining to recreational opportunities and resource issues and maintains a website with links to: the Rhythms of the Refuge environmental education curriculum and teacher resources, news releases, current habitat conditions, historical information about the marsh, maps, regulations, and a calendar of events listing interpretive programs. The Refuge also maintains a Traveler Information System (TIS) with monthly updates and also a weekly waterfowl numbers phone recording.

Refuge staff and volunteers reach a wider audience by partnering with other natural resource agencies and local community service groups to offer regional educational and recreational events such as the Horicon Marsh Bird Festival, Marsh Melodies, Ducks Unlimited Outdoor Show, and many other events.

Archaeological and Cultural Resources

Cultural resources management in the Service is the responsibility of the Regional Director and is not delegated for the Section 106 process when historic properties could be affected by Service undertakings, for issuing archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO about Service undertakings, by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Muskrat, Horicon NWR

Law Enforcement

Horicon NWR is dedicated to safeguarding the resources under its jurisdiction, including natural resources, cultural resources, and facilities. Resource management on the Refuge includes both protective and preventive functions. Protection is safeguarding the visiting public, staff, facilities and natural and cultural resources from criminal action, accidents, negligence and acts of nature such as wildfires. Preventing incidents from occurring is the best form of protection and requires a known and visible law enforcement presence as well as other proactive steps to address potential threats and natural hazards.

Over the years, the most common violations on the Refuge have been vandalism and trespass. Vandalism incidents have included damage to signs and other structures and dumping on the west side roads, which are all township roads that dead-end at the Refuge boundary. Trespass violations have usually involved visitors who wander into closed areas. Other incidents have included hunting violations, shining on the Refuge, drug problems, arson, and taking protected plants and animals from the Refuge.

Fox River National Wildlife Refuge

Introduction

Fox River NWR encompasses 1,004 acres of wetland and upland habitat along the Fox River in Marquette County, approximately 35 miles west of Horicon National Wildlife Refuge. Fox River NWR was established in 1979 under the U. S. Fish and Wildlife Service's Unique Wildlife Ecosystem Program to protect an area known as the Fox River Sandhill Crane Marsh from further drainage and to preserve associated upland habitat. The Refuge

protects an important breeding and staging area for the Sandhill Crane. The majority of the Refuge contains sedge meadow, wet prairie, and shallow marsh wetlands (Figure 10 and Figure 11). Fox River NWR is managed by staff from Horicon NWR.

The Refuge is unique not only because of its importance to nesting Sandhill Cranes, but because of the diversity of wildlife within this wetland/ upland complex. The Refuge has 10 distinct plant communities ranging from upland coniferous and deciduous woodlands to five wetland communities. This diversity of vegetation communities is responsible for the presence of about 150 different species of wildlife. Wildlife diversity to this extent within such a relatively small, confined area is not encountered elsewhere in Wisconsin (USFWS, 1987).

Fox River NWR is located directly across the road (County Highway F) from John Muir Memorial Park, a county park named after the famous conservationist and founder of the Sierra Club. During part of his boyhood years, Muir lived near the county park and Fox River NWR. Although he settled in California, explored the High Sierra and wilderness Alaska, and traveled all over the world, John Muir never forgot this humbler land, and tried several times to purchase and preserve parts of it. He remarked:

> …even if I should never see it again, the beauty of its lilies and orchids is so pressed into my mind I shall always enjoy looking back at them in imagination even across seas and continents and perhaps after I am dead.

Climate

As would be expected, given its proximity to Horicon NWR, Fox River NWR's continental climate, characterized by cold winters and warm summers, is very similar to that of Horicon NWR. In the nearby county seat of Montello, July is the warmest month with average highs of 78 degrees Fahrenheit and January the coldest month with average lows of 4 degrees Fahrenheit. Annual precipitation is about 32 inches, with April through September the wettest months. Average snowfall is approximately 40 inches. The median growing season is 144 days (Wisconline, 2005).

Topography and Soils

Local relief is quite gentle, sloping to the Fox River and adjacent marshes. Elevations range from the river at 770 feet above mean sea level (msl) to an upland hill that rises to 816 feet msl. Soils are predominantly muck and peat underlain by sandy alluvium deposited by the Fox River. The island and upland edges have sandy soils, ranging from loamy sand to sandy loam (USFWS, 1979; USFWS, 2003).

Surface Hydrology

The surface hydrology of the Refuge is dominated by the Fox River, which bisects it. The majority of habitats on the Refuge consist of sedge meadow, wet prairie, and shallow marsh wetlands, dominated by many species of sedges, grasses, and cattail. These are all considered wetland habitats and many would qualify as "jurisdictional wetlands" or "waters of the United States." That is, these areas are under the jurisdiction of Section 404 of the Clean Water Act and the Army Corps of Engineers for the purpose of actions that might deposit fill in these waters/wetlands or otherwise alter their values and functions.

Archeological and Cultural Values

Much of the general discussion of Horicon NWR's pre-history and history would also be applicable to Fox River NWR. See "Archeological and Cultural Values" on page 22 for a combined history of the two refuges.

Social and Economic Context

Marquette County, where Fox River NWR is located, is a more rural county than either Dodge or Fond du Lac counties, where Horicon NWR is situated. Table 9 presents data on socioeconomic features of the county in comparison with Wisconsin as a whole.

Marquette County has a substantially smaller population as well as a lower population density than either Dodge or Fond du Lac counties. Its population has declined slightly since 2000, although it grew very rapidly in the 1990s, three times as quickly as the state did. Still, the county population density is only one-third of Wisconsin's average density.

Figure 10: Current Land Cover, Fox River NWR

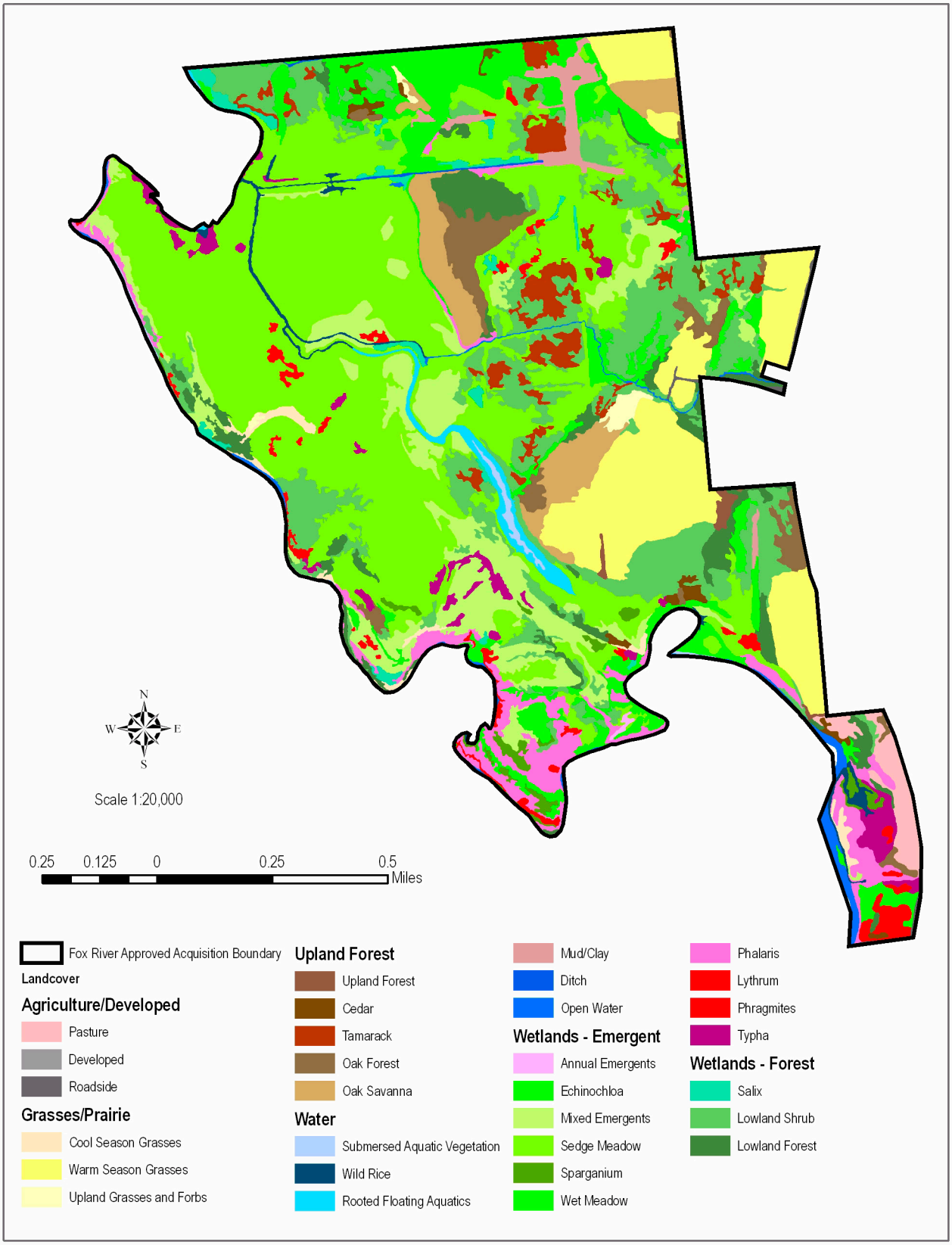


Figure 11: Historic Vegetation of the Fox River NWR

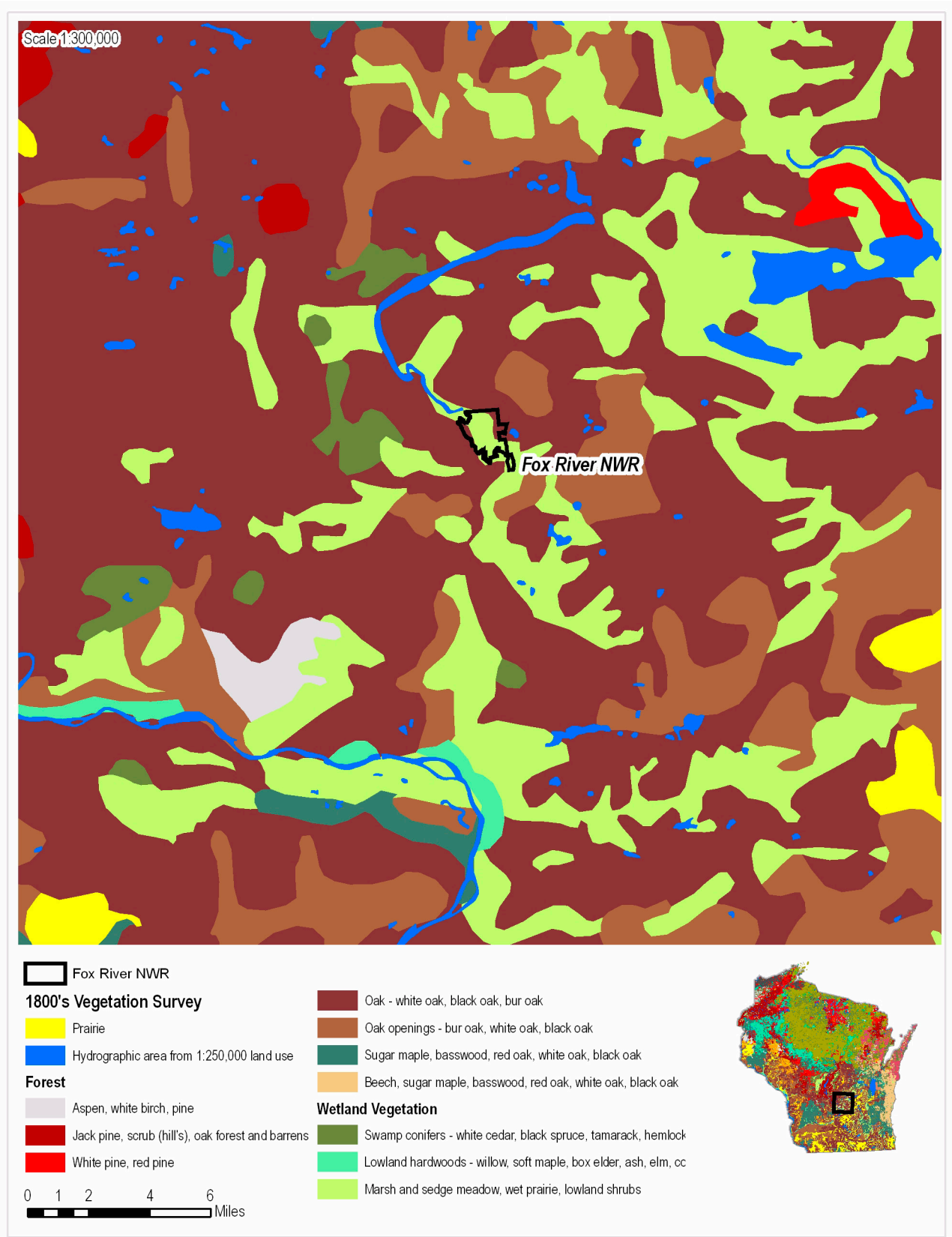


Table 9: Socioeconomic Characteristics, Marquette County, Wisconsin

Characteristic	Marquette County	Wisconsin
Population, 2004 estimate	14,973	5,509,026
Population, % change, 2000-2004	- 5.4%	2.7%
Population, 2000	15,832	5,363,675
Population, % change, 1990-2000	28.5%	9.6%
Land Area, 2000 (square miles)	455	54,310
Persons per square mile (population density), 2000	35	98.8
White persons, %, 2000	93.7%	88.9%
Non-Hispanic white persons, %, 2000	92.0%	87.3%
Black or African American persons, %, 2000	3.4%	5.7%
American Indian persons, %, 2000	1.0%	0.9%
Asian persons, %, 2000	0.3%	1.7%
Persons of Latino or Hispanic origin, %, 2000	2.7%	3.6%
Language other than English spoken at home, %, 2000	6.2%	7.3%
Foreign born persons, %, 2000	1.5%	3.6%
High school graduates, % of persons age 25+, 2000	78.8%	85.1%
Bachelor's degree or higher, % of persons 25+, 2000	10.1%	22.4%
Persons with a disability, age 5+, 2000	2,863	790,917
Median household income, 1999	$35,746	$43,791
Per capita money income, 1999	$16,924	$21,271
Persons below poverty, %, 1999	7.7%	8.7%
Sources: USCB, 2005c; USCB, 2005d		

Except for American Indians, Marquette County has a lower percentage of minorities than the state as a whole and the country at large, which is very typical of the more rural, northern states. Likewise, there are lower percentages of foreign born and persons who speak languages other than English at home than in Wisconsin generally.

Educational attainment is substantially lower than in Wisconsin overall, with the percentage of college graduates in the county less than half the percentage of college graduates in the state (10 percent vs. 22 percent). However, as stated earlier in the case of Dodge and Fond du Lac counties, this is very typical of rural areas around the country. Both median household income and per capita money income in Marquette County are substantially below the state figures (18 percent and 20 percent, respectively).

The almost 3,000 county residents with a disability underscores the importance of Fox River trying to serve this population.

Table 10 provides industry and employment data for Marquette County.

The low employment and industry figures for agriculture belie its prominent place in the landscape of Marquette County. Farmers own and manage 145,552 acres in the county – including pastures, cropland and tree farms – fully half of all the land in Marquette County. Individuals or families own 90 percent of these farms, with family partnerships, family-owned corporations, and non-family corporations accounting for the remainder (UWE, 2004b).

Marquette County ranks consistently among Wisconsin's top five producers of mint oil and Christmas trees and also has significant potato and sweet corn production. The county has a rich history of dairy as well as cash grain crops. It also has several large nursery producers and sod farms. Production of landscape trees and plants as well as landscape and grounds maintenance is rapidly growing segments of Marquette County's agricultural industry. Greenhouses, tree farms, nurseries, sod farms and other horticultural businesses contribute to the diversity of agriculture in the county.

Table 10: Marquette County Employment and Industry Data

Workforce	Number	Percentage
Employed civilian population 16 years and over	6,621	100.0
Occupation		
Management, professional, and related occupations	1,460	22.1
Service occupations	1,213	18.3
Sales and office occupations	1,245	18.8
Farming, fishing, and forestry occupations	155	2.3
Construction, extraction, and maintenance occupations	827	12.5
Production, transportation, and material moving occupations	1,721	26.0
Industry		
Agriculture, forestry, fishing and hunting, and mining	402	6.1
Construction	538	8.1
Manufacturing	1,749	26.4
Wholesale trade	143	2.2
Retail trade	629	9.5
Transportation and warehousing, and utilities	320	4.8
Information	108	1.6
Finance, insurance, real estate, and rental and leasing	243	3.7
Professional, scientific, management, administrative, and waste management services	236	3.6
Educational, health and social services	941	14.2
Arts, entertainment, recreation, accommodation and food services	633	9.6
Other services (except public administration)	282	4.3
Public administration	397	6.0
Class of Worker		
Private wage and salary workers	5,021	75.8
Government workers	847	12.8
Self-employed workers in own not incorporated business	689	10.4
Unpaid family workers	64	1.0
Source: USCB, 2000c		

Overall, agriculture accounts for 1,779 jobs in Marquette County and $167 million in economic activity. It contributes $55 million to the county's total income and $5 million in taxes (UWE, 2004b).

Natural Resources

Habitats

Nine plant communities are recognized on the Refuge: upland deciduous forest, upland old field, lowland forest, low prairie, fen, sedge meadow-shrub carr, shallow and deep marsh, and submerged aquatic plants in open water. Only two of these nine (upland deciduous forest, and upland old field) are upland habitats; the others are lowland, wetland, or bottomland habitats with high moisture or saturated soils. Two features of the wetlands are acid sands and alkaline seeps; in combination, they give the wetlands an unusual floristic diversity. The diversity and structure of the vegetation communities offer an outstanding variety of habitats for wildlife.

Another habitat feature that contributes to habitat diversity is a 40-acre upland island in the center of the marsh. This island is generally

inaccessible to humans or cattle during the summer and represents an excellent example of an undisturbed climax oak-hickory woodlot.

The majority of the Refuge consists of sedge meadow, wet prairie, and shallow marsh wetlands dominated by many species of sedges, grasses, and cattail. However, other wetland types such as fens, lowland forest, shrub-carr thickets, deep marsh, and open water occur on the Refuge as well.

In Wisconsin generally, sedge meadows are dominated by sedges, most of which belong to the genus Carex, growing on saturated soils. Other sedges found in sedge meadows include spike rushes (Eleocharis sp,), bulrushes (Scirpus sp.) and nutgrasses (Cyperus sp.). Grasses (Poaceae) and true rushes (Juncus spp.) are also found in sedge meadows. The forb species are diverse but scattered and may flower poorly under intense competition with the sedges. Sedge meadows often grade into shallow marshes, calcareous fens, low prairies and bogs (WWA, 2002).

Fens are a very rare wetland type in Wisconsin and harbor many state-listed threatened and endangered plants. Shrub-carr thickets are a wetland community dominated by tall shrubs such as red-osier dogwood, meadow-sweet, and various willows. Canada bluejoint grass is often very common (WDNR, 2004b).

Upland habitats consist of closed canopy upland deciduous forest dominated by white, black, and bur oak, upland dry prairie, and oak savanna. Three spring-fed creeks flow through the Refuge, adding to the diversity of the area (USFWS, no date-g).

In 2003, the Service conducted surveys of six broad habitat types on the Refuge in order to monitor vegetation and wildlife communities, as well as abiotic conditions, namely the hydrologic regime (USFWS, 2003).

Wet Prairie – Emergent Marsh

This habitat type is very broad on the Refuge and includes most treeless wetland habitats, such as wet prairie, sedge meadow, and shallow emergent marsh. Wet prairie and sedge meadow are difficult to differentiate, since these two habitats tend to mix together. Wet prairie is drier than the sedge meadows and is dominated by tussek sedge (Carex stricta), flat-top aster, joe-pie weed, goldenrod spp., wild iris, smartweed spp., and sensitive fern. Wet prairie also tends to be overgrown in many places with shrubs such as red-osier dogwood, willow spp.,

Falsenettle, Horicon NWR

poison sumac, and alder. Many of the wet prairie sites are also fens, where rare plants characteristic of fens were documented in the 2003 survey, such as hedge nettle, swamp thistle, lousewort, obedient plants, sneezeweed, culvers root, water hemlock, downy willoweed, and St. John's wort, among others. There is rarely any surface water in the wet prairie, only moist soil.

Sedge meadow is dominated by plant species with more flooding tolerance, such as lake sedge (Carex lacustra), Carex laciosa, blue joint grass, marsh fern, some patches of tussock sedge, Impatiens spp., wild iris, and moss spp. The sedge meadows are much more monotypic and have fewer forbs than the wet prairies. Other species documented in the 2003 survey that were not too common included mint spp., bedstraw, and Rumex spp. Water depths in sedge meadows varied from 0 – 10 inches, with a mean close to 5 inches.

Shallow emergent marsh has generally deeper water depths, ranging from 0 – 30 inches, with a mean close to 15 inches. Again, while it is difficult to discern distinct differences in shallow marsh and sedge meadow, shallow marsh tends to be dominated by cattail spp., lake sedge, some blue

joint grass, Epilobium spp., Sagitarria spp., Biden spp., Rumex spp., Scirpus spp. (wool grass, river bulrush, and softstem bulrush), smartweed spp., bur reed, and sweet flag.

A variety of wildlife species, from ducks to rails to songbirds, use this habitat type. Common breeding bird species in this habitat type include Sandhill Crane, Mallard, Blue-Winged Teal, Wood Duck, Canada Goose, Sedge Wren, Swamp Sparrow, Common Yellowthroat, Red-Winged Blackbird, Northern Harrier, American Goldfinch, Tree Swallow, Sora, American Bittern, Green Heron, Great Blue Heron, Great Egret, Bobolink, Eastern Kingbird, and American Crow. Only a few Yellow and Virginia Rails were seen during the summer 2003 survey; the Yellow Rail is a species of concern and is very rare. Species present in larger numbers during fall included Sandhill Crane, Mallard, Blue-Winged Teal, Canada Goose, Bald Eagle, American Crow, and Red-Winged Blackbird. Species not present during the summer 2003 survey, but present during the fall included Black Ducks, Green-Winged Teal, Common Snipe, American Tree Sparrow, Snow Bunting, and Lapland Longspur (USFWS, 2003).

Wetland Shrub-Scrub

These shrub-carr habitats are dominated by red osier dogwood, other dogwood spp., willow spp., alder spp., bog birch, tamarack, green ash, poison sumac, and some aspen. The herbaceous community and hydrology is similar to that of wet prairie, and as a result fens occur in this shrub scrub habitat (USFWS, 2003).

Common breeding birds include Sandhill Crane (in the more open shrub-scrub areas), Song Sparrow, Yellow Warbler, Common Yellowthroat, Swamp Sparrow, Blue-Winged Warbler, Northern Cardinal, Alder and Willow Flycatcher, American Crow, American Goldfinch, Woodcock, Gray Catbird, Mourning Dove, Brown-Headed Cowbird, Red-Winged Blackbird, Cedar Waxwing, Veery, Rufous-Sided Towhee, Eastern Kingbird, Green Heron, Blue-Gray Gnatcatcher, Blue Jay, and Indigo Bunting. A few Bell's Vireos were documented during the summer 2003 survey, a rare bird for this part of the United States. Birds common during fall migration include Sandhill Crane, Woodcock, Yellow-Rumped Warbler, American Goldfinch, Gray Catbird, Golden-Crowned Kinglet, Blue Jay, Downy Woodpecker, Cedar Waxwing, Sharp-Shinned Hawk, Cooper's Hawk, Eastern Bluebird, Palm Warbler, Song Sparrow, American Robin, and Northern Flicker (USFWS, 2003).

Wetland Forest

Dominant trees in this habitat type include tamarack, green ash, swamp white oak, red maple, elm spp., and to a lesser extent, bur oak. Mid-canopy trees and shrubs include those mentioned previously, dogwood spp., bog birch, poison sumac, alder spp., and willow spp. The herbaceous layer was dominated by moss spp., carex spp., grass spp., wild raspberry, fern spp., Impatiens spp., and nettle spp. Little, if any, surface water is present in wetland forest, but soil is very moist (USFWS, 2003).

In terms of bird use, this is possibly the most diverse habitat type on the Refuge. Common breeding species in this habitat type include Veery, House Wren, American Robin, Cedar Waxwing, Yellow Warbler, Common Yellowthroat, Blue-Winged Warbler, Red-Bellied Woodpecker, Pileated Woodpecker, Rose-Breasted Grosbeak, Downy Woodpecker, Indigo Bunting, Willow and Alder Flycatcher, Gray Catbird, Baltimore Oriole, Northern Flicker, Blue Jay, Eastern Wood-Pewee, Red-Eyed Vireo, Ovenbird, Northern Cardinal, Mourning Dove, Yellow-Throated Vireo, Black-Capped Chickadee, and Blue-Gray Gnatcatcher. Species present in larger numbers during fall include American Robin, Cedar Waxwing, American Goldfinch, Black-Capped Chickadee,

Northern Cardinal, Horicon NWR

Yellow-Rumped Warbler, White-Throated Sparrow, White-Breasted Nuthatch, Fox Sparrow, and American Crow. In the 2003 survey, a long-eared owl was documented in a tamarack forest in October (USFWS, 2003).

Upland Prairie

In the 2003 survey, only four points were located in upland prairie (old agriculture fields). These points were dominated by monotypic cool season grass stands consisting of mainly smooth brome, quack grass, and Kentucky bluegrass. Goldenrod spp. and common mullein were the only common forbs found.

In contrast to wetland forest, upland prairie likely had the lowest number of bird species surveyed in 2003. The habitat was very monotypic, likely causing low bird species richness. Bird species documented in upland prairie included Bobolink, Northern Bobwhite, Wild Turkey, Common Yellowthroat, Tree Swallow, Eastern Bluebird, Field Sparrow, Song Sparrow, Eastern Kingbird, Sandhill Crane, and European Starling (USFWS, 2003).

Upland Savanna

Upland savanna is similar to upland prairie on the Refuge, the only difference being that these sites have been invaded by small red cedar and white pine, thus creating an old field savanna. This savanna is not the goal of management and restoration efforts – the goal is true oak savanna. In the 2003 survey, these old field savannas did contain some good native plant species (in a limited amount) not found on upland prairie sites, such as big bluestem, little bluestem, whorled, common, and sand milkweed, Carex spp., wild raspberry, aster spp., multiflora rose, western ragweed, bush clover, needle grass, Cyperus spp., horsemint, blazing star, and butterfly milkweed.

Upland savanna has more species than upland prairie, likely because of the presence of small cedar and white pine in the prairie. In the 2003 survey, these species included Sandhill Crane (feeding), Chipping Sparrow, Clay-Colored Sparrow, Henslow's Sparrow, Common Yellowthroat, American Robin, Field Sparrow, Rufous-Sided Towhee, Mourning Dove, American Goldfinch, Song Sparrow, Eastern Bluebird, Tree Swallow, Savanna Sparrow, Barn Swallow, Eastern Kingbird, Bobolink, Turkey Vulture, Red-Tailed Hawk, and Brown-Headed Cowbird (USFWS, 2003).

Upland Forest

All of the upland forest on the Refuge was historically oak savanna, dominated by white, black, and bur oak. Now, it is a closed canopy forest with many tree species that are not fire tolerant. Many remnant savanna trees exist in these forests, obviously open grown, with broad, spreading, drooping crowns. Dominant tree species were white oak, black oak, bur oak, black cherry, red cedar, elm spp., northern red oak, shagbark hickory, sugar maple, and some green ash. Mid-canopy trees and shrubs consisted of those dominant trees mentioned previously, plus mulberry, grape spp, winterberry, and dogwood spp. The herbaceous layer was dominated by huckleberry spp., wild raspberry, garlic mustard (not good), avans, nettle spp., grass spp., and burdock.

This habitat type is also very diverse in terms of bird use. Just a few of the most common breeding birds seen in the 2003 survey were Pileated, Red-Bellied, and Downy Woodpecker, White-Breasted Nuthatch, Scarlet Tanager, Rose-Breasted Grosbeak, Ovenbird, Eastern-Wood Pewee, Black-Capped Chickadee, Northern Cardinal, Gray Catbird, Hairy Woodpecker, Red-Eyed Vireo, Northern Flicker, Great Crested Flycatcher, Indigo Bunting, Blue Jay, American Crow, American Goldfinch, Cedar Waxwing, Blue-Gray Gnatcatcher, and Mourning Dove. Less common birds include Ruffed Grouse, Chestnut-Sided Warbler, Lincoln's Sparrow, Yellow-Throated Vireo, Black-Billed Cuckoo, and Blue-Headed Vireo. Golden-Crowned Kinglet, Wild Turkey, American Robin, Yellow-Rumped Warbler, Black- and White Warbler, White-Throated Sparrow, Slate-Colored Junco, Cedar Waxwing, Northern Shrike, Bohemian Waxwing, and Fox Sparrow are commonly observed on the Refuge during fall (USFWS, 2003).

Open Water – Deep Marsh

In the 2003 survey, this habitat type was not officially sampled with the methods used in the habitat types above. However, casual observations from open water/deep marsh wetlands on the Refuge are recorded here. Wild rice and a variety of submersed aquatic vegetation (SAV) was present on Refuge open water wetlands. SAV consisted of water lilies, Potomogetan spp., coontail, wild celery, and a variety of others not identified.

Species using open water on the Refuge during summer include Mallard, Blue-Winged Teal, Wood Duck, Canada Geese, Great Blue Heron, Great Egret, Green Heron, Sandhill Crane, American Bittern, Belted Kingfisher, Bald Eagle, Killdeer, Black Tern, and Caspian Tern. In addition to the birds listed above, fall migrants at Fox River include Ring-Billed Gull, Tundra Swan, Osprey, Western, Pectoral, and Least Sandpiper, Lesser and Greater Yellowlegs, Long-Billed Dowitcher, Green-Winged Teal, Black Duck, Gadwall, and Northern Shoveler (USFWS, 2003).

Wildlife

The matrix of many wetland and upland habitat types present on the Refuge furnishes excellent habitat for both wetland and upland associated wildlife, such as ducks, Sandhill Cranes, herons, rails, songbirds, deer, turkey, and Bobwhite Quail. The Refuge also harbors furbearers, marsh birds, raptors, and a variety of woodland mammals, in addition to amphibians, reptiles and fish. Approximately 50 Sandhill Cranes use the Refuge during the summer, but more than 300 cranes use the Refuge as a staging area during fall migration.

Birds

The Fox River NWR is important to nesting Sandhill Cranes and has some of the most productive crane habitat in southern Wisconsin. The marsh supports at least five breeding pairs each year; in addition, it supports a resident flock of 50-60 non-breeding cranes throughout the summer. It is also one of four major staging areas for Sandhill Cranes in southern Wisconsin and is utilized by 300-400 migrating cranes each autumn (USFWS, 1979).

Due to its relatively undisturbed condition, the wooded island in the center of the marsh supports a rookery of herons, including Great Blue Herons, Great Egrets, and Black-crowned Night Herons. In addition to these colonial nesting herons, American Bitterns have been observed nesting in the marsh and Least Bitterns occur during the summer.

Waterfowl numbers in the area are relatively high, with fall censuses having counted approximately 3,000-5,000 ducks and 10,000 Coots on nearby Buffalo Lake. Ducks in the Refuge are mostly Blue-Winged Teal and Mallards. Estimates of breeding pairs per square mile have averaged five pairs of Mallard and 27 pairs of Blue-Winged Teal at the French Creek Wildlife Management area, which has waterfowl habitat similar to that found on Fox River NWR.

White-tail deer buck, Horicon NWR

Altogether, approximately 100 species of birds representing 21 families have been observed at the Refuge. Breeding on the Refuge has been documented for 51 of these species.

Mammals

About 26 species of mammals have been recorded at the Refuge. One of them is Richardson's squirrel, typically a western prairie species. Furbearers include mink, muskrats, beaver, and raccoon. Marquette County has had high densities of white-tailed deer, up to 60 deer per square mile (USFWS, 1979).

Amphibians and Reptiles

At least 15 species of amphibians and reptiles have been identified at the Refuge. This tally includes six species of frogs, five species of turtles, and four species of snakes (USFWS, 1979).

Aquatic Life

Fox River and nearby Buffalo Lake contain an abundance and diversity of fresh water aquatic plant and animal life. Portions of the river and the lake have been chemically treated at times to remove undesirable non-game fish and excessive aquatic vegetation. Game fish included perch, bass

and northern pike. Six species of freshwater clams have been reported at the Refuge, providing food for many wildlife species (USFWS, 1979).

Threatened and Endangered Species

No species on the federal threatened and endangered species list are known to exist at Fox River NWR. However, several state-listed species are present, including the Double-Crested Cormorant, Great Egret, Red-Shouldered Hawk, and wood turtle and Blanding's turtle.

Fox River NWR Current Refuge Programs: Where We Are Today

This section summarizes current management programs, operations, and facilities at Fox River NWR. It also describes the participation and cooperation of Refuge staff and management activities with our partnering agencies and stakeholders in the wider community on efforts to balance competing demands for natural resources, wildlife, and protection from environmental hazards like flooding.

Habitat Management

Many of the current management efforts on the Refuge focus on restoring valuable wildlife habitats that have declined regionally since the advent of intensive habitat modification and destruction wrought by Euro-American settlement, agricultural development and drainage projects. The staff located at Horicon NWR staff carries out wetland and upland habitat restoration projects on the Refuge.

Habitat Restoration

Virtually all the work that has been completed on Fox River NWR to date has been some kind of habitat restoration. After completion of wetland and upland restoration activities, Fox River Refuge will provide wonderful examples of habitats present before European settlement of the area in 1850. The area will then be managed primarily by periodic prescribed burning, mowing, and monitoring/evaluation.

General Land Office (GLO) records for the area and old aerial photos have provided a glimpse into what the area used to look like. For example, a GLO surveyor in December 1832 described seeing what we call today oak savanna along a section line that runs through the Refuge: "land rolling, second rate, thinly timbered with oak." In the wetlands, the surveyor did not give much detail, only statements such as "land level and marshy, no trees." However, the fact that the surveyors did not see any trees in the marsh is very notable as today, large blocks of tamarack, aspen, green ash, willow, and a variety of shrubs such as red osier dogwood exist in the former treeless marsh. This observation tells us that fire was likely present to keep the woody vegetation out of the marsh (most woody vegetation that can tolerate wet conditions is not fire tolerant).

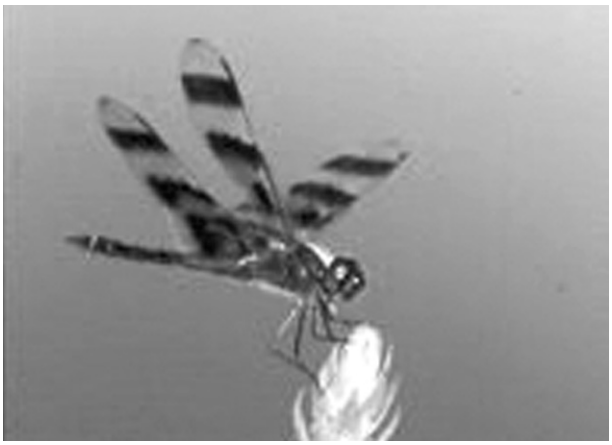
Other sources of information include old aerial photos from the 1930s to the 1950s. These photos depict the current day Fox River NWR with oak savanna still present on the uplands (very little closed canopy forest as is seen today) and a nearly treeless marsh.

Wetland Restoration

In 2004, funding was received for a wetland restoration project on the Refuge from (a) the NAWCA Small Grants Program ($17,500), (b) Ducks Unlimited ($12,500 as a match for the NAWCA grant), (c) Wisconsin Waterfowl Association ($10,000), and the Service's Cooperative Conservation Initiative (CCI; two grants of $20,000 and $2,500). Elevation surveys were conducted throughout the project area in order to determine water flow patterns and post-construction water depths. The wetland restoration involved filling and plugging ditches (via earthen and sheet piling plugs) that drain approximately 350 acres of Refuge wetlands and mowing shrubs that have invaded the fen communities in these wetlands. Several scrapes, ranging in size from 6 to 24 inches in depth, were also dug. Work was done by a construction company from Portage, Wisconsin, using two D-6 dozers with wide tracks, a track hoe, and two tracked dump trucks.

Dry Prairie Restoration

According to 1832 General Land Office surveys, uplands on the Refuge were oak savanna and dry prairie. In 2004, a $20,000 Cooperative Conservation Initiative grant was received to begin restoration of dry prairie habitats on the Refuge. About 45 acres of old agricultural fields (Overlook unit, minus northern 6 acres) dominated by quack grass and smooth brome were prepared and planted to native prairie in 2004. The remaining 45 acres in the East Muir, Rataczak, and North Overlook units were prepared and planted in May of 2005. In addition, needle grass, leadplant, thimbleweed, Canada



Dragonfly, Horicon NWR

milkvetch, white wild indigo, yellow coneflower, rosinweed, compass plant, cup plant, and prairie dock were planted by hand on the top of the hill north and east of the section corner in the Overlook unit. By the end of 2005, the 12-acre Spring Unit and the 8-acre Homestead unit were being sprayed in preparation for seeding.

In 2004, Refuge staff led a red cedar and white pine cutting day to cut and pile invasive red cedar and white pine from the Overlook prairie restoration unit. More than 65 volunteers helped with the project. These volunteers donated more than 260 hours of labor worth more than $3,900 to Fox River NWR on the work day. The day was very successful as all the red cedar and white pine on the Overlook unit were cut and piled.

Between June and October, native prairie grass and forb seed was collected and cleaned from Shoenberg and New Chester Waterfowl Production Areas and private land near the Refuge, as well as Goose Pond Sanctuary, with the aid of many volunteers from Beaver Dam and River Crossing charter schools. Goose Pond Sanctuary, Leopold Wetland Management District, and the Madison Private Lands Office aided with the seed collection and cleaning efforts. Five species of grass and 32 species of forbs were collected, worth more than $12,000 if bought from local vendors. Combining seed collected and purchased, nine species of grass and 42 species of forbs comprised the seed mix of 2.6 lbs./acre of grass and 1.75 lbs./acre of forbs.

Oak Savanna Restoration

Nearly all the historic oak savanna on the Refuge has changed from oak savanna to closed canopy forest due to lack of fire. Large, open grown oaks are present in these forests, but are being starved for sunlight due to encroachment by fire intolerant trees and thick stands of young black oaks. Fire intolerant trees such as red cedar, black cherry, green ash, and elm have colonized these oak savanna habitats and contributed to the closed canopy.

Oak savanna restoration on the Refuge has involved thinning of these closed canopy forests in the Cedar and Bur Oak units. A Montello forest products company was hired to cut the fire intolerant trees mentioned above and thin the smaller oaks and hickories. All of the oaks and hickories above 16 inches DBH (Diameter at Breast Height) were not cut. The thinning opened up the forest and created an oak savanna, at least the tree portion of the savanna. Much slash remained on the ground as a result of the logging. Refuge staff rented a chipper in the Bur Oak unit in an effort to reduce slash. The chips were thrown into the dump truck and hauled to the Montello mulch site in order to reduce chances of invasion by invasive plant species and to enhance chances for a successful prescribed burn next year (piles of chips don't burn very well). The chipper is a great way to remove the slash, but requires extensive labor and funds. The need for prairie grass and forb seeding will be evaluated after several successful prescribed fires have removed much of the slash.

It will likely take several years to restore all aspects of the historic oak savannas on the Refuge. In addition to removing slash, stumps need to be cut lower to the ground and treated with herbicide to prevent re-sprouting. Lack of personnel with the needed training to apply the herbicides during logging severely restricted the number of stumps that could be treated shortly after cutting. Aspen has resprouted in the Bur Oak unit and will need to be controlled in the future via burning, mowing, or chemicals.

Water Level Management

As mentioned in the wetland restoration section, hydrological restoration in Refuge wetlands will be accomplished via ditch filling, plugging and stream course reestablishment. No water control structures that would require intensive management are needed on the Refuge in order to manage Refuge sedge meadow/shallow marsh habitats similar to historic conditions. The majority of the Refuge has significant groundwater inputs and surface water inputs from spring fed streams, precipitation, and a natural flood regime from the Fox River. As a result,

Cattails, Horicon NWR

the majority of the Refuge is very wet. Surface water depths ranged from 0-30 inches above the spongy peat layer and some areas even have floating vegetation (water depths greater than 30 inches).

Vegetation composition and structure vary along this water level gradient. Any wetland restoration that takes place will be designed so that only passive water level management will be needed and hydrological conditions will be restored as closely as possible to pre-European settlement conditions. For instance, after ditches are plugged or filled, periodic visits should be done to make sure that plugs are holding and ditches remain filled. Stream courses that were restored should be checked to make sure they are still coursing down the restored paths.

Moist Soil Management

No intensive moist-soil management occurs on the Refuge because there is no need for infrastructure in the naturally functioning parts of this wetland. The 400 acres of wetland impacted by past ditching efforts will be restored by filling and plugging of ditches (no water control structures). Productive moist-soil areas naturally occur in various locations on the Refuge. The largest moist-soil wetland is Crane Pool, a 10-acre wetland on the southwest side of the Refuge. This wetland is directly connected to the Fox River and as a result, water levels fluctuate with river height. Other pockets of moist-soil exist throughout Refuge wetlands, but in all they total less than another 10 acres.

Nearly all the other Refuge wetlands function as wet prairie, sedge meadow, or shallow emergent marsh where more stable water levels across the seasons and years creates ideal conditions for perennial plant species such as Carex spp. The moist-soil areas seem to lack this stable water, likely as a result of little groundwater inputs on these sites (unlike the majority of the Refuge). These sedge meadow/shallow marsh areas with native perennial vegetation and more stable water regimes are also heavily used by waterbirds, namely Sandhill Cranes, Canada Geese, Blue-winged Teal, and Mallards. In many cases, the birds "roto-till" the marsh, eating tubers, newly sprouted shoots, and seeds. Waterbird use of these areas tends to be higher in the spring when more habitat and food sources are made available due to higher river flows, snowmelt, and precipitation.

Although wild rice production is not considered "moist-soil," it should be noted for its significance on the Refuge. Wild rice occurs on the Refuge in shallow, open water areas, such as the outlet to Long Lake, in most Refuge streams and ditches with water flow, in the old Fox River channel slough on the northwest side of the Refuge, and along the shoreline of oxbow lake and the active Fox River channel. It is estimated that approximately 20 acres of wild rice exist either on or adjacent to the Refuge. Wild rice sites are extremely attractive to fall migrating waterfowl. Mallards, Blue-winged Teal, Wood Ducks, and Black Ducks are seen in sizeable numbers in the fall utilizing these wild rice stands. Dabbling ducks also use stands of wild rice during the breeding season for brood rearing areas.

Prescribed Fire

Fire was an integral part of the oak savanna and sedge meadow wetland habitats historically present on the Refuge. Fire greatly reduced the abundance of fire intolerant woody and herbaceous vegetation, thus effectively maintaining the savannas and marshes. General Land Office notes describe Refuge wetlands in 1832 as "wet marsh, no trees." Due to fire suppression efforts after human settlement, frequency of fire greatly diminished. Open forests became closed forests, treeless marshes became dominated by lowland forests or shrubs on the

higher elevations, and dry prairies were invaded by woody vegetation. In order to reduce this woody component and aid in the process of restoring native habitats, prescribed burns are needed for the entire Refuge. Burn units were identified for the entire Refuge and a burn schedule discussed so each unit is burned on a recurring 3-4 year schedule.

Prescribed fire is one of Fox River NWR's most useful tools for maintaining prairie and marsh vegetative characteristics. Since many upland birds and waterfowl require open areas for nesting, prescribed fire helps maintain habitat necessary for migratory species. By choosing burn units based on needs of the wildlife habitat we can maintain a combination of prairie, savanna, marsh, sedge meadow and woodland habitats required by native wildlife species.

Haying

Historically permits were issued for haying the units that border County Road F. In recent years, no haying has been done on the Refuge. Refuge staff has mowed fields in preparation for native grass plantings.

Controlling Invasive Plants

The Refuge is very unique in that the abundance of exotic and invasive plants is extremely low as compared to other sites. Only small, scattered patches of exotic plants occur within a sea of native plants. Most of the quack grass and brome dominated fields were sprayed in 2004 and 2005 as part of the prairie restoration project. Monitoring is needed for reed canary grass, phragmites, purple loosestrife, and garlic mustard and aspen. The most important invasive plant species is loosestrife. Areas of reed canary grass are spreading and taking over native sedge meadow; Refuge staff is attempting to identify the best control techniques for this exotic species to control it in the worst areas before the problem intensifies. It is important to closely monitor the areas recently disturbed by logging and wetland restoration. Equipment brought into these areas has increased the potential for invasive species introduction.

In 2005, Refuge staff collected purple loosestrife beetles from an area west of Winona, Minnesota. A total of approximately 750 beetles were released on and around the Fox River Refuge where purple loosestrife was present.

Vegetation Surveys

Vegetation and Habitat Surveys

The majority of the Refuge is sedge meadow, wet prairie, and shallow marsh wetlands dominated by many species of sedges, grasses, and cattail. However, other wetland types such as fens, lowland forest, shrub-carr thickets, deep marsh, and open water occur on the Refuge as well.

As discussed previously, in 2003, 100 survey points were randomly placed in six broad habitat types on the Refuge in order to monitor vegetation and wildlife communities, as well as abiotic conditions, namely the hydrologic regime. At this point, the data have not been entered or analyzed. These surveys will provide good insight into the effects of management and restoration efforts on habitat and wildlife.

Wildlife Management

Wildlife management activities at Fox River NWR are directed by the Refuge's establishing purposes and general mandate to conserve trust resources. This is accomplished primarily through habitat manipulation rather than by direct manipulation of wildlife species and populations. See the previous sections on habitat restoration and management above. However, activities described below do pertain directly to investigating wildlife population trends through surveys and censuses, increasing or decreasing wildlife numbers through management, conservation, and where necessary, control of wildlife populations.

Wildlife Surveys and Censuses

The matrix of the many wetland and upland habitat types present provides excellent habitat for both wetland and upland associated wildlife, such as ducks, Sandhill Cranes, herons, rails, songbirds, deer, turkey, and Bobwhite Quail. Approximately 60-plus Sandhill Cranes used the Refuge during the summer, but more than 300 cranes used the Refuge as a staging area during most days of fall migration. Comprehensive plant, bird, fish, amphibian, reptile, or mammal lists need to be developed. These baseline surveys will provide good insight into the effects of habitat management and restoration efforts on wildlife.

Waterbird Surveys

In 2004, waterbird surveys were performed on nine transects established either on or within 1.5 miles of the Refuge boundary during the spring.

Table 11: Summary of Spring 2004 Waterbird Surveys, Fox River NWR

Date	Cranes	Geese	Dabblers	Divers	Coot	Great Blue Heron	RB Gull	Forsters Tern	Black Tern	Other	Total
3/25/2004	163	4,584	1,033	50	0	0	14	0	0	0	5,844
4/2/2004	292	621	643	76	50	0	13	0	0	1	1,696
4/7/2004	299	2,272	85	4	0	0	0	0	0	3	2,663
4/15/2004	222	1,665	89	0	0	0	0	0	0	0	1,976
4/27/2004	119	5	80	0	0	1	0	0	0	4	209
5/11/2004	121	14	220	0	0	14	10	4	0	3	386
5/26/2004	39	4	121	7	0	2	2	10	10	0	195
6/18/2004	20	0	28	0	0	7	0	0	7	0	62
Totals:	1,275	9,165	2,299	137	50	24	39	14	17	11	13,031

Table 12: Marsh Birds Detected Per Point, Fox River NWR

Species	Individuals Per Point (n=23)
Sora	0.57
American Bittern	0.17
Virginia Rail	0.13
Yellow Rail	0.04

Survey data from all nine transects were summed to get the data shown in Table 11. No corrections for disturbance or surveyor error were performed. Some surveys were performed via boat and walking, while others were performed only by walking.

A total of 29 waterbird species were documented on the Refuge during the 2004 surveys. Canada Geese, Sandhill Crane, Mallard, Blue-winged Teal, Green-winged Teal, Northern Shoveler, Wood Duck, and Common Merganser make up the majority of individuals documented on the Refuge. Table 11 shows a summary of species and groups documented on the Refuge. The "Geese" category includes 100 White-fronted Geese and two Snow Geese.

Before the two spring flooding events in 2004, the Refuge biologist documented seven active Sandhill Crane nests (two eggs each) and five active Mallard nests.

Whooping Crane 14-02 (female) from the eastern migratory flock re-introduction project was either on the Refuge or within 1.5 miles of the Refuge border in 2004.

Rail and Bittern Surveys

In 2004, 13 of the 56 wet prairie-emergent marsh points were surveyed for rails and bitterns between 5/5 and 6/4 using standardized marsh bird monitoring protocol, namely tape playbacks of vocalizations. Table 12 shows the species documented and number of individuals detected per point. In addition to the species documented below, vocalizations of Least Bitterns and King Rails were also played but with no responses. In all, very few rails and bitterns were documented on the Refuge, likely a result of the deep flooding of many areas during the second visit. Areas with shallow surface water tended to hold more rails and bitterns than areas with deep water or no surface water. Most of the points that are currently drained by the ditch system did not have any rails or bitterns.

Yellow Rails are state-listed as threatened and they are on Region 3's species of conservation concern list; thus, documenting this species on the Refuge is wonderful news. Further management and restoration efforts should take into account the life history needs of this species. Only one Yellow Rail was documented on the rail survey, but two others have been heard on the Refuge; all were found in Carex laciosa with 1 to 3 inches of surface water.

Bird Point Count Surveys

Six habitat types were surveyed at the 102 survey points described above during summer and fall 2003 and spring 2004. Only data from the summer of 2003 were entered and analyzed in 2004 due to time constraints. A summary of the overall species richness on the Refuge and among habitat types, as well as community and species relative abundance among habitat types, follows. Each survey point was placed at least 100 meters apart and 50 meters from

Table 13: Ten Most Common Bird Species Documented on Fox River NWR, Summer 2003

Species	Number	Percent of Total
Sandhill Crane	472	10.94
Swamp Sparrow	395	9.15
Common Yellowthroat	323	7.49
Red-winged Blackbird	318	7.37
Sedge Wren	219	5.07
Song Sparrow	204	4.72
American Goldfinch	192	4.45
Tree Swallow	141	3.26
Canada Goose	140	3.25
Mourning Dove	131	3.04

Table 14: Bird Counts by Habitat Type, Fox River NWR

Habitat Type	Species Richness
Wetland Forest	46
Wetland Prairie Emergent Marsh	44
Wetland Shrub-scrub	44
Upland Savanna	41
Upland Forest	38
Upland Prairie	12

Table 15: Frog and Toad Point Count Surveys, Fox River NWR

Species	Number of Points Where Documented
Chorus frog	15
Spring peeper	15
Leopard frog	11
Wood frog	1
American toad	1

the edge of the respective habitat type. Unless stated otherwise, all results given below pertaining to bird use by habitat type only used data from the less than 50 meters distance band to insure habitat type accuracy and results pertaining to the whole Refuge used all data.

Refuge Species Richness

In 2003, 92 bird species were documented on the Refuge during summer bird point count surveys. The most common species documented on the Refuge are presented in Table 13. However, these data are directly related to the amount of these species' preferred habitat on the Refuge. For example, nearly 75 percent of the Refuge is wet prairie-emergent marsh, thus the most common species on the Refuge are expected to be those that prefer that habitat type. Twenty-two species are on the Regional conservation priority list. Of those, notable rare species documented included American Bittern, Bald Eagle, Henslow's Sparrow, Bobolink, Sedge Wren, Bell's Vireo, Yellow-headed Blackbird, and Yellow Rail.

Species Richness Among Habitat Types

Table 14 shows the number of bird species documented on point counts in each habitat type.

All habitat types except upland prairie had high species richness. The monotypic herbaceous layer with no vertical structure likely contributed to the low number of species found here. In addition, only four points were surveyed in this habitat type.

Amphibian Surveys

In April 2004, 25 wet prairie-emergent marsh points were surveyed for frogs and toads. Protocol involved visiting each point for 10 minutes and recording species present by listening to calls. The numbers of each species were documented if individuals could be distinguished, otherwise a "partial or full chorus" designation was documented if calls were overlapping or constant, respectively. Because surveys were only conducted in early April, species that typically vocalize later in the spring and summer were not detected. For example, the biologist documented gray tree frogs, cricket frogs, and green frogs on the Refuge later in the spring (not part of an official amphibian survey though). Table 15 shows the species documented and number of points where each species was documented.

Red-headed Woodpecker Nesting Survey

In 2004, the biologist from Necedah NWR assisted the Refuge biologist in a survey for breeding Red-headed Woodpeckers. They are a species of conservation concern in Region 3 and the State of Wisconsin, thus monitoring their status on the Ref-

Table 16: Sandhill Crane Survey Results, 1994-2005, Fox River NWR

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Pairs	5	2	3	9	6	5	8	2	9	3	1	3
Total	12	31	7	21	22	27	31	40	22	12	14	17

Table 17: Long Lake Fish Population Survey, 2004, Fox River NWR

Species	Total Number	Average Weight (g)	Average Length (mm)	Range Len (mm)
Bluegill	66	63	146	62-205
Black Crappie	8	245	249	190-305
Pumpkinseed Sunfish	6	54	130	69-176
Largemouth Bass	6	380	259	48-430
Black Bullhead	5	165	208	183-230
Northern Pike	2	1,585	654	654
Johnny Darter	2	1	35	34-35
Carp	1	3,100		608
Yellow Bullhead	1	360	265	
Golden Shiner	1	4	96	
Total	98			

uge is imperative. Moreover, with oak savanna restoration ongoing on the Refuge, it is important to document the response of this species to the restoration actions, i.e., selective thinning.

Two active nest cavities were located on the Refuge, both in an oak savanna restoration unit where trees had just been thinned three months earlier. Six adult birds were documented in oak savanna habitat around nest cavities located in large (>15 inch DBH) snags. In 2003, no nest cavities or Red-headed Woodpeckers were documented on the Refuge, thus the birds seem to be responding to the restoration actions.

Crane Surveys

The Annual Sandhill Crane Count, sponsored by the International Crane Foundation, took place on April 17, 2004, all across Wisconsin and adjoining states. In Wisconsin alone, 12,779 Sandhill Cranes were documented (2,197 pairs) by 2,647 observers (4.83 cranes per observer). Marquette County, where 1,091 Sandhill Cranes (203 pairs) were recorded with 169 observers (6.46 cranes and 1.20 pairs per observer), contained the second highest county population and the highest number of breeding pairs reported in Wisconsin. However, the county ranked eleventh out of 72 counties in the state for the number of cranes documented per observer and thirteenth in the number of pairs documented per observer. Thus, it is safe to say Fox River NWR and Marquette County play an important role in the life history needs of Wisconsin Sandhill Cranes. Survey results for the past 11 years are shown in Table 16.

Fish Surveys

In 2004, a formal baseline fish inventory was conducted on July 12 and 13 with the assistance of the Lacrosse fisheries office. Long Lake, the Fox River, Muir Creek, and the Oxbow Lake were sampled with one-half-inch trap, mini-fyke, and gill nets, as well as electro-fishing techniques. In all, 26 species of fish were documented on the Refuge or in the Fox River adjacent to the Refuge. Very few carp were documented and the Refuge seems to support a very diverse and healthy population of fish in all habitat types sampled. A report detailing lengths and weights of fish caught and catch per unit effort is being prepared by the Lacrosse Fisheries Office. A summary of the species composition in each water body follows (Table 17 and Table 18).

Bluegill is the dominant species in Long Lake, and the majority were collected in the large mesh fyke net, which had the highest catch per unit effort (CPUE) at 3.07 fish/hr. The bluegill fishery would provide angling opportunities at Long Lake, and

Table 18: Fox River and Backwaters Fish Population Survey, 2004, Fox River NWR

Species	Total Number	Average Weight (g)	Average Length (mm)	Range Length (mm)
Bluegill	44	73	144	115-257
Yellow Perch	15	46	150	120-181
Largemouth Bass	11	456	236	43-535
Pumpkinseed Sunfish	7	46	125	80-165
Black Crappie	5	132	188	115-257
Carp	5	2,470	577	510-640
Golden Shiner	5			
Spotfin Shiner	4			
Channel Catfish	3	1,900	575	515-690
Yellow Bullhead	3	395	280	240-315
Bluntnose Minnow	3			
Smallmouth Bass	2	822	306	123-490
Bowfin	2	660	397	387-406
Rock Bass	1	60	130	
Freshwater Drum	1	390	325	
White Sucker	1	750	405	
Tadpole Madtom	1	15	75	
Total	113			

Table 19: Muir Creek Fish Population Survey, 2004, Fox River NWR

Species	Total Number	CPUE (fish/ hour)
Bluntnose Minnow	73	372.45
Fathead Minnow	20	102.04
Largemouth Bass	9	45.92
Central Mudminnow	6	30.61
Blackside Darter	6	30.61
Iowa Darter	4	20.41
Bluegill	4	20.41
Green Sunfish	2	10.20
Brook Stickleback	2	10.20
Bowfin	1	5.10
Pumpkinseed Sunfish	1	5.10
Johnny Darter	1	5.10
Golden Shiner	1	5.10
S. Redbelly Dace	1	5.10
Total	131	668.37

with the occasional largemouth bass and northern pike, this would make a great site for a recreational fishing pier. A recommended lowered bag limit would help sustain this limited fishery.

A total of 17 species representing seven families were collected from the Fox River. Centrachids dominated the catch; bluegill, largemouth bass, pumpkinseed sunfish and black crappie totalled 59 percent of the catch. Channel catfish, yellow bullhead and tadpole madtom represented the catfish family.

Muir Creek was electrofished for 707 seconds at two sites resulting in a catch of 131 individuals. A total of 14 species representing six families were collected (Table 19). Muir Creek is a low volume creek (5-10 cubic feet per second) that flows out of Ennis (Muir) Lake. Several minnow species were present, as were darter, stickleback, mudminnow, bowfin and small centrachids. Only three fish collected measured over 100 mm (4 inches), and all three were largemouth bass. This survey gives us a good baseline to evaluate future work.

Nest Structures

In April 2004, the Friends of Horicon NWR donated five homemade Wood Duck boxes constructed of old Freon tanks. Two of these boxes were placed along Muir Creek on the east side of the Refuge, one on the north side of Oxbow Lake, and two others on the south bank of a slough on the northwest side of the Refuge. When checked in February 2005, one had evidence of a successful hatch of seven Wood Ducks. The other four boxes all had Wood Duck feathers, but no egg membranes.

Pest, Predator, and Exotic Animal Control

Carp were seen in large numbers in Long Lake and the Fox River during the summer and have made areas of the lake very muddy, thus reducing production by submersed aquatic vegetation. Although large numbers were noticed casually, a formal fish survey conducted in July captured only six carp total during netting and electro-fishing samples.

Coordination Activities

Fox River Refuge staff invests a significant amount of energy and time representing the Refuge in its role as a partner with other government and resource agencies and as a neighbor and landowner in the community.

Interagency Coordination

The Refuge biologist has continued efforts to coordinate, plan, and implement wetland, dry prairie, and oak savanna habitat restoration efforts with the assistance and expertise of staff from Horicon and Necedah NWR's, Leopold WMD, Madison PLO, Green Bay Ecological Services office, numerous Wisconsin DNR offices, and the Natural Resources Conservation Service (NRCS). Horicon NWR staff is involved in all aspects of Refuge management and restoration, since Fox River NWR is a satellite of Horicon NWR. The Necedah NWR biologist visited the Refuge on two occasions – once to provide advice on the oak savanna restoration project and the other time to aid in performing a Red-headed Woodpecker survey in newly thinned oak savanna restoration units. Leopold WMD and the Madison PLO were more than helpful in the preparation of a fall prairie seeding on the Refuge. Many of their staff devoted time, expertise, and equipment to aid the biologist in seed collection and cleaning efforts, as well as site preparation and planting.

Wisconsin DNR staff members have visited the Refuge to determine applicable water regulations and provide advice for prairie, oak savanna, and wetland restoration and management. All of the above agencies and offices contributed much staff time to a red cedar cutting day at the Refuge in March 2004, to jumpstart prairie restoration efforts. Specifically, 24 wildlife professionals from three NRCS offices, four FWS offices, and four DNR offices contributed a day's worth of labor to the Refuge during the cedar cutting day.

Since 2000, the Refuge has participated in the Rural Fire Assistance Program, which provides financial assistance to rural fire departments in the community around the Refuge. Since the program's inception, Montello Fire Department has applied for funding in 2003 and 2005 and received $5,850 and $3,000.

Partners, Volunteers and Cooperating Organizations

The Refuge biologist has also expanded cooperation with non-governmental organizations (NGO's) and volunteer groups, to include Ducks Unlimited (DU), Wisconsin Waterfowl Association (WWA), The Nature Conservancy (TNC), Friends of Horicon NWR, River Crossing and Beaver Dam charter schools, and numerous individual volunteers. In 2004 alone, these NGOs and volunteers contributed 1,270 hours of labor to the Refuge, worth more than $20,000. These non-federal dollars were used as a match to three challenge grants received from the FWS for restoration projects. Ducks Unlimited and WWA strongly support the Refuge in wetland restoration efforts via planning and financial support. Staff from WWA visited the Refuge on five occasions to provide wetland restoration recommendations and aid in needed elevation surveys.

In addition, WWA funded a flight over the Refuge to take needed aerial photos of the wetland restoration project area. River Crossing and Beaver Dam charter schools provided indispensable help with cedar cutting and piling, elevation surveys, prairie forb seed collection, and prairie planting efforts. All of the above NGOs and volunteers (except DU) contributed a day's worth of time to the red cedar cutting day held at the Refuge on March 3, 2004.

Public Recreation, Environmental Education and Outreach

The 1997 National Wildlife Refuge System Improvement Act emphasizes wildlife management and that all prospective public uses on any given refuge must be found compatible with the wildlife-related refuge purposes before they can be allowed. The Refuge System Improvement Act also identifies six priority uses of national wildlife refuges that in most cases will be considered compatible uses: wildlife observation, wildlife photography, hunting, fishing, environmental education, environmental interpretation. Currently, no uses are allowed on the Refuge except deer hunting.

Facilities include two parking lots that border County Road F. A two-panel kiosk is in place at each parking lot. These kiosks will provide information on the Refuge system, Refuge regulations and maps, and interpretive information regarding the habitats and wildlife of Fox River NWR.

The Refuge biologist has been involved in outreach efforts over the last 2 years, namely environmental education, with two local charter schools. Tours of Refuge fens, shallow marshes, oak savannas, and prairies were given to the school groups. Flora and fauna were identified and natural processes such as fire and flooding discussed. Not only did these school groups learn a lot about the Refuge and the environment, they had the chance to get their hands dirty and provide wonderful help on the Refuge's 85-acre prairie restoration project (cedar cutting/piling, prairie seed collection, and prairie planting). River Crossing Environmental Charter School from Portage donated 658 hours of labor to the Refuge and Beaver Dam Charter School donated 408 hours.

Eastern cotton-tail, Horicon NWR

Deer Hunting

The Refuge is open to deer hunting during all state deer seasons in Unit 67A. No Refuge permits are required.

Law Enforcement

Fox River NWR is dedicated to safeguarding the resources under its jurisdiction, including its facilities and cultural resources. Resource management on the Refuge includes both protective and preventive functions. Protection is safeguarding the visiting public, staff, facilities and natural and cultural resources from criminal action, accidents, negligence and acts of nature such as wildfires. Preventing incidents from occurring is the best form of protection and requires a known and visible law enforcement presence as well as other proactive steps to address potential threats and natural hazards.

Over the years, the most common violations on the Refuge have been trespass and hunting violations.

Chapter 4: Refuge Management

Horicon National Wildlife Refuge

Future Management Direction: Tomorrow's Vision

Refuge Vision

> Horicon National Wildlife Refuge will be beautiful, healthy, and support abundant and diverse native fish, wildlife, and plants for the enjoyment and thoughtful use of current and future generations. The Refuge's hydrologic regime will include a functional Rock River riparian system, with clean water flowing into and out of the Refuge. The Refuge will be a place where people treasure an incredible resource that upholds the distinction of being a Wetland of International Importance.

Goals, Objectives and Strategies

The planning team developed goals and objectives for three management alternatives at Horicon NWR. Cooperating agencies, conservation organizations, and Refuge staff all participated in this endeavor. Alternative A is the Current Management Direction or No Action Alternative, Alternative B is named Restoring Natural Watercourses, and Alternative C outlines a "Big Pool" concept. The Environmental Assessment (Appendix A) describes and evaluates each alternative. The preferred alternative is B (Restoring Natural Watercourses), and this forms the basis for the Horicon NWR CCP and the goals, objectives and strategies presented on the following pages. The planning team established three goals for major management areas (wildlife, habitat, and people), objectives for achieving those goals, and the specific strategies that will be employed by Refuge staff. The goals are organized into the broad categories of wildlife, habitat, and people.

Horicon NWR

Goal 1: Wildlife

Protect, restore, and maintain a diversity of wildlife species native to habitats historically found on the Refuge, with special emphasis on Service Regional Conservation Priority Species.

Discussion: This goal exemplifies the Refuge staffs commitment to "thinking globally and acting locally." On the local and regional scales, it implements the broad mission of the National Wildlife Refuge System to conserve America's wildlife and enhance biodiversity. Horicon NWR can most effectively do its share as part of the national conservation strategy by focusing on those migratory and resident species indigenous to the particular habitat types found in southeastern Wisconsin. In emphasizing Conservation Priority Species in Region 3 of the Refuge System, Horicon NWR is contributing to wildlife conservation at an appropriate regional scale by trying to assist those species in greatest need of attention. The following objectives primarily deal with

reducing overabundant or nuisance wildlife species and addressing wildlife safety issues. We recognize that most direct wildlife outcomes result through habitat management and these are considered under the Habitat Goal.

Objective 1.1: Deer Population

Annually, maintain Refuge deer population consistent with State Management Unit 68A and 68B at a density of 15-20 deer per square mile based on annual winter surveys.

Discussion: Based on studies and long-term experience with deer herd management by Wisconsin DNR, this is the optimal population density or carrying capacity of white-tailed deer in habitat characteristic of this region. At present, the Refuge's deer herd is healthy and increasing, at a density of approximately 35 (Unit 68B) to 51 (Unit 68A) per square mile.

The deer population on the Refuge, as well as many areas in Wisconsin, is currently above a level that the available habitat can support. Control of the herd through hunting will help reduce the rate of deer-car collisions, the spread of Chronic Wasting Disease, and damage to nearby apple orchards and croplands. A moderate deer density will also contribute to the success of establishing historic upland habitats, especially oak savanna.

Strategies:

1. Change deer hunting opportunities by expanding the current Refuge deer season to include a later archery and muzzleloader hunt to commensurate with the state seasons, with a delayed opening of December 1 on designated dikes north of Ledge Road.
2. Conduct informal survey/interact with hunters and listen to feedback on ways to improve hunt.
3. Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed.
4. Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR.

Objective 1.2: Wildlife-Vehicle Collisions

By 2012, reduce wildlife losses as the result of auto collisions by 50 percent on Highway 49.

Discussion: Wildlife mortality from collisions with automobiles can be substantial, especially in areas of high wildlife concentration. State Highway 49 east of Waupun is a high speed roadway that bisects the northern section of the Horicon Marsh for 2.5 miles. From 2002-2005, Refuge staff and volunteers systematically searched the road throughout the year for road kill. They found a total of 4,244 dead animals, including waterfowl, bitterns, river otters, muskrats, frogs and toads, representing 91 species or species groups. This number should be considered an absolute minimum, as many carcasses are scavenged or hidden in roadside vegetation. The number of roadkill each year is directly related to the water management within the impoundments north and south of Highway 49. When water levels are low in a given year, the roadkill is less. Keeping the water permanently low is not an option since the wetland cycle, drawdown to lake stage, results in the best habitat for wildlife.

Strategies:

1. Support a reroute of State Highway 49, leaving the existing road for bird watching and recreation.
2. Promote lowering of the speed limit along State Highway 49 or at a minimum, promote compliance of the existing speed limit through increased law enforcement patrol.
3. Provide mitigation measures along State Highway 49 to reduce the number of roadkill. These measures may include providing simple barriers or fences along the road where appropriate, constructing coffer dams at strategic locations that allow animals to cross under the road through existing culverts, placing poles or other similar tall barriers along the highway to discourage birds from flying into the path of vehicles.
4. Pursue funding sources to implement the above mitigation measures and/or to participate in research to determine the best measures.
5. Seek to engage local, state, and federal elected officials in finding a solution to this problem.

Objective 1.3: Nuisance Fish and Wildlife Species

Annually reduce the number of carp and predators on the Refuge to improve wetland habitat conditions and protect nesting migratory birds.

Annually evaluate the muskrat population to determine the need for trapping on dike and/or marsh units.

Discussion: Carp are an extremely destructive, non-native species of fish that thrives in low-oxygen conditions, unlike game fish. Carp roll in the marsh sediments and create a cloudy environment and uproot aquatic plants. Little sunlight can penetrate the water and fuel the marsh food web, few organisms thrive in such conditions, and the biological diversity of the Marsh is reduced.

Predators, such as mink and raccoon, are a nuisance species that predate the eggs of ground-nesting birds. Traditionally, trapping has been used to reduce the predator population, but trapper interest and effort over the years has been low. Likewise, trapping has been used to maintain a healthy balance of muskrats. Too many muskrats can destroy the dikes, yet the muskrats are beneficial in areas with dense stands of cattail. Muskrats will open up a dense area by eating the cattail and using the cattail for their houses. Therefore, each area of the Refuge is evaluated annually to determine the need for muskrat trapping.

Strategies:

1. Explore new research techniques such as using pheromones for carp control.
2. Use chemical pesticides periodically (i.e. rotenone) to control carp.
3. Continue use of carp trap and look for improved ways of disposing of the carp such as commercial fisherman, mink farms, etc.
4. Continue stocking marsh with game fish to serve as predators for carp.
5. Conduct Refuge trapping program as necessary and as water and habitat conditions allow.
6. Explore other options, along with trapping, to reduce the number of predators (such as hunting of predators, providing incentives for taking a predator, expanding the trapping season, making upland Refuge trapping regulations less restrictive).
7. Remove woody vegetation, old fencerows, and other structures in order to decrease predator habitat.

Objective 1.4: Regional Conservation Priority (RCP) Species

Within 15 years of CCP approval, 50 percent of the Region 3 RCP species associated with historically occurring habitats will be present on the Refuge.

Discussion: Region 3's Regional Conservation Priority (RCP) list includes rare and declining species, federally listed, and recreationally important species that are of high concern in the upper Midwest. The RCP list was developed to help prioritize management techniques on Service lands and partnership efforts. Appendix G lists the RCP species that have been observed on the Horicon NWR.

Strategies:

1. Monitor population trends according to the wildlife inventory plan.
2. Support research activities that are directed toward these species.
3. Continue water level management to provide a mosaic of water level depths for migrating waterfowl to utilize during spring and fall.
4. Provide mudflats for migrating shorebirds in Early May.
5. Once nesting has been initiated, keep stable water levels to prevent flooding nests.
6. Remove trees and brush that are encroaching on grassland fields.
7. Conduct rotational burning as outlined in the Fire Management Plan to provide a mosaic of burned and unburned habitat.
8. Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches.
9. Restore Oak Savanna areas.

Goal 2: Habitat

Provide a diverse mosaic of wetland, upland, and riverine habitats that meet the needs of Service priority species dependent upon them through habitat preservation, restoration, and management.

Discussion: The Refuge has both inherited and contributed to an altered landscape with vegetation communities different from those that existed during the pre-settlement era (Figure 8). The habitat goal seeks to restore natural landscapes and processes, to the extent feasible, within the constraints imposed by the Refuge's

Wetland tour, Horicon NWR

establishing purposes, the altered landscape outside the Refuge, responsibility to the surrounding community, and wildlife objectives.

Objective 2.1: Restoration of Natural Watercourses

By 2015, re-establish a more natural water flow throughout the Federal portion of the Horicon Marsh, flushing sediments and chemical contaminants through the marsh system, and reducing cattail growth by 20 percent from 2005 levels.

Discussion: This objective will promote a higher flow of water across the marsh to reduce cattail growth and flush excess nutrients and sediments. This objective would encourage the hydrological system to return to a more natural state by re-establishing a meandering river system flowing into and through the north end of the Horicon Marsh. A successful drawdown of the 11,500-acre Main Pool in 2005 revealed the scoured out Rock River channel in many locations and that the main ditch has been predominantly filled. As a result, the Rock River channel was identified and mapped for the first time since the pool was created. The map reveals that the Rock River now meanders back and forth and only exists in a channelized form for the last half mile prior to flowing into the State end of the marsh.

A larger radial gate, a water control structure, and several spillways along Dike Road will be installed. Refuge staff will remove or breech the spoil piles and plug lateral ditches. As a result of these management actions, water from springs and surface flow will move evenly across the marsh. This sheet flow should reduce cattail growth and flush excess nutrients, such as phosphorus, from the marsh. Daily inflow from the Rock River will also be passed through the new radial gate instead of holding water as in the past. The result will be a more open, healthy Horicon Marsh with better-quality wildlife habitat. However, the area may not change for many years since the monotypic stand of cattail could continue to act similarly to how the lateral ditches are presently acting. Benefits will be evident in the long term, although fire control will be more difficult with the loss of the lateral ditches.

The key to success is Refuge management's ability to maintain high water levels when necessary to stress and kill cattails and simulate the high water of the wetland cycle. This will ensure at least some open water annually in the Main Pool.

Strategies:

1. Replace the damaged radial gate on the Main Dike just east of the present location. The water control structure would be kept open most of the time to allow the removal of the daily influx of phosphorus and sediments and allow a meandering river channel throughout the Main Pool.
2. Add a spillway, with a water control structure, at the historic river channel site. The purpose of the spillway would be to release water during heavy rain events. The highest water level achievable in the Main Pool would be dictated by the level of the spillway.
3. Remove or breech spoil banks and plug the lateral drainage ditches to increase water level, reduce side drainage, and increase sheet flow.
4. Evaluate the Wildland Urban Interface (WUI) levee on the west side of the Refuge for possible reconstruction or rehabilitation to improve hydrology, but without negatively effecting fire control. The WUI dike was constructed in 2001 so that prescribed burning could be conducted safely on the Refuge without impacting neighboring property. The dike serves as a firebreak, as well as providing access.

Objective 2.2: Managing Water Impoundments

Annually, manage water impoundments as a complex of basins to provide wetland diversity and improve water quality for maximum benefits to migrating and breeding birds. Management will

be within the capabilities of the wetland system as a whole and individual impoundments will be drawn down on a 3 to 10-year rotation.

Discussion: Water level manipulation allows managers to simulate different stages of the natural flood/drought cycle at the same time in different impoundments. This increases the diversity of habitat types and food resources in the wetland complex that is available to migrating and nesting birds. The emphasis is on semi-permanent wetlands, as these wetlands can be the most productive type. Management can increase this diversity by varying the water regime in each impoundment. The outcome will be interspersion of cover and openings which provide habitat.

Details of specific pool water level manipulations will be described in annual water management plans. The following strategies are generalizations for the next 15 years of water management on Horicon Marsh.

Strategies:

1. Draw down Main Pool (10,845 surface acres) when the opportunity exists (i.e., cooperation with Wisconsin Department of Natural Resources and/or Lake Sinissippi) and when weather conditions permit. The emphasis is on maintaining a diverse aquatic plant community while reducing sedimentation and pollutants.
2. Draw down selective sub-impoundments in a cycle of 4 to 6 years, based on the annual water management plan. Burning may be prescribed if feasible during the drawdown phase.
3. Provide stable water levels from May 1 to July 15 in a variety of cover types for overwater nesting birds.
4. Lower water levels 6 to 12 inches in some impoundments during the fall to provide shallow foraging sites for migrating waterfowl.
5. Draw down selective sub-impoundments each year to expose mudflats for migrating shorebirds.

Objective 2.3: Exotic and Invasive Species Control

By 2020, reduce invasive plant species locations by 50 percent from 2006 levels and make every attempt to eliminate new infestations as they occur.

Discussion: Invasive plant species are often introduced from other areas, usually Europe or Asia, and they have no native biological controls in the United States. The plants are often early successional species adapted to disturbance, moving in quickly. They are difficult to control and interfere with natural ecological processes. If the plants are not controlled, they can completely take over an area, out-competing and displacing native flora and thus reducing its biological potential and benefit to native wildlife.

Strategies:

1. Document the location and size of invasive populations on the Refuge with GIS mapping.
2. Use biological control when available as a preferred strategy.
3. Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed.
4. Use fire and grazing in controlling some invasive plant species.
5. Monitor the infestations and effectiveness of control measures.
6. Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge.

Objective 2.4: Oak Savanna

By 2012, restore and maintain 100 acres of oak savanna in the uplands on the west side of the Refuge to benefit regional habitat diversity and grassland-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50 percent tree canopy closure, 5-35 percent relative cover of shrubs, and at least 50 percent relative cover of diverse native grasses and native forbs.

Discussion: General Land Office surveys from 1832 suggest much of the landscape around the Refuge was historically prairie and oak savanna, with pockets of mixed hardwood forest. Today, less than 1 percent of Wisconsin's prairie and oak savanna remain, largely due to the conversion to agricultural crops, fire suppression, and eradication of large grazing animals such as bison and elk. The North Central bur oak openings are found only in parts of Wisconsin, Minnesota, Iowa, and Illinois. These oak openings are imperiled globally because they are very rare through-

out their range and are one of the most threatened major plant communities in the Midwest. As a result of the thousands of acres of short-rotation agricultural crops in the Upper Rock River watershed which has replaced the prairie and oak savanna, habitat quantity and quality available to upland and wetland wildlife species has been drastically compromised. In addition, water quality has been impacted with excessive amounts of sediments, nutrients, and chemicals entering the Upper Rock River and its tributaries.

Strategies:

1. Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps.
2. Plant native grasses and forbs (flowers) if needed.
3. Plant and protect oak seedlings in native grasslands in the designated oak savanna areas.
4. Control invasive and exotic plants.
5. Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.

Objective 2.5: Grasslands

By 2020, restore and manage 500 to 1,000 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than five percent shrub cover, and a diverse native grass and forb species mix.

Aquatic buttercup, Horicon NWR

Discussion: A portion of Refuge uplands were considered grassland at the time of Euro-American settlement in the mid-19th century. The State of Wisconsin has lost 99 percent of its original, pre-settlement prairies and oak savannas. To varying degrees, grassland bird species have adapted and co-existed with agriculture for most of the past century. However, grassland bird populations are steadily declining in Wisconsin, and throughout the Midwest, due to changes in agricultural practices, land fragmentation, development, and other factors.

Strategies:

1. Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.
2. Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower, or in combination with other techniques.
3. Use chemical treatments exclusively or in combination with other techniques.
4. Use grazing, when appropriate, exclusively or in combination with other techniques.
5. Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions.

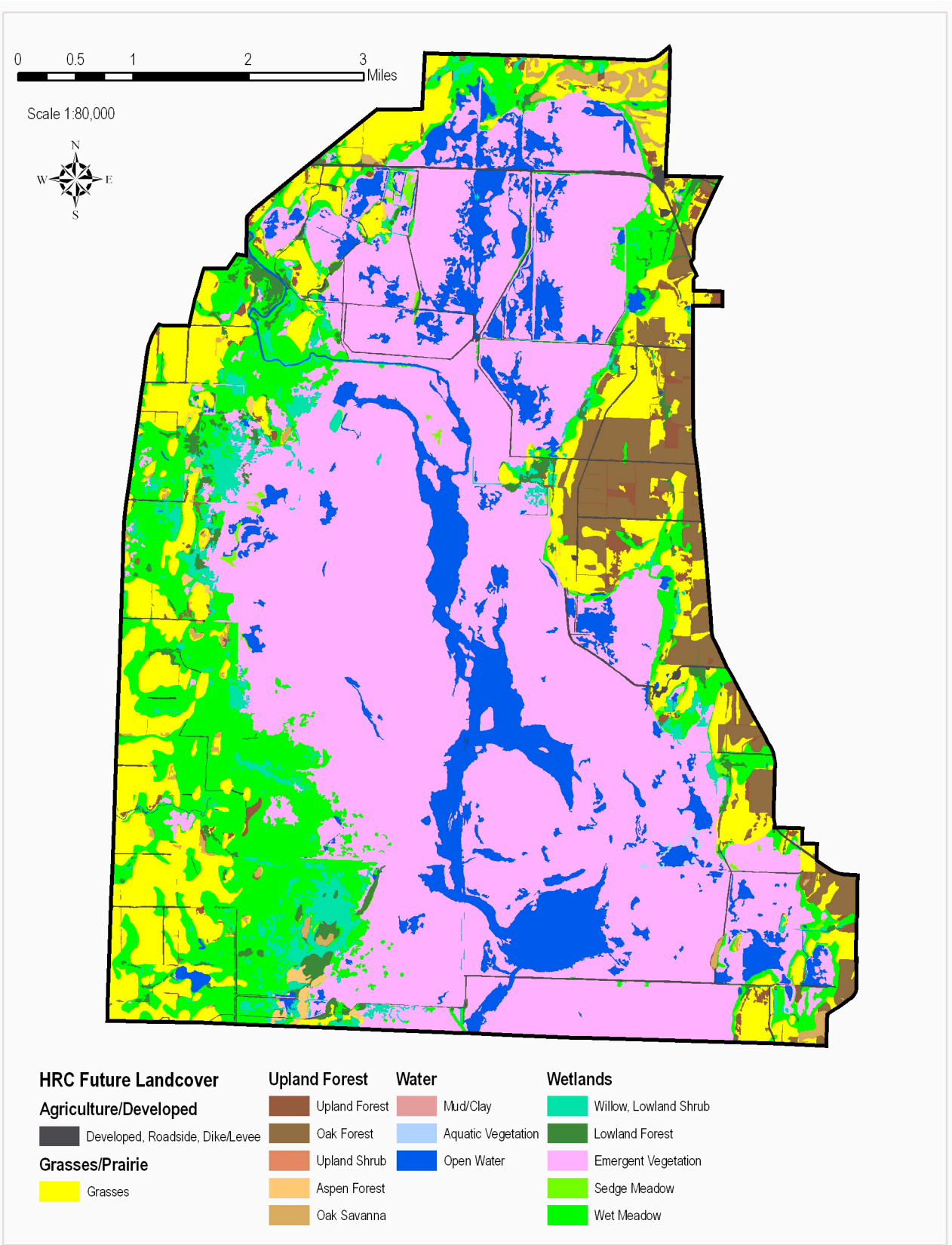
Objective 2.6: Sedimentation of Horicon Marsh

By 2020, reduce sediments and non-point source pollutants entering the Horicon Marsh from drainages of the Rock River watershed by 50 percent from 2000 levels.

Discussion: The quality of water on the Horicon Marsh is one of the most important factors influencing fish, wildlife, and aquatic plant populations and health, which in turn influence the opportunity for public use and enjoyment. Water quality is also beyond the Refuge's ability to influence alone, given the immense size of the Refuge's watershed and multiple-agency responsibilities. This objective recognizes these limitations, but charts a more aggressive role for the Refuge through the strategies below. The objective also highlights the advocacy role the Refuge can play in educating the public and supporting the myriad of agencies which together can influence water quality.

Excessive sedimentation and the accumulation of pollutant chemicals, primarily the nutrient phosphorous, is a major challenge to the management

Figure 12: Future Habitat Conditions of Horicon NWR



of Refuge wetlands and moist soil units. The Horicon Marsh is literally filling up with soil and dense vegetation stimulated by excessive nutrient levels.

The inflow of sediments is highly linked to spring rainfall events. A 3-year study conducted by the U.S. Geological Survey in the late 1990s found that sediment volumes for the month of April range from 1 to 400 tons per day. Phosphorous loads averaged from 124 to 4,000 pounds per day. To deal with these issues in the watershed, existing programs will be used to encourage private landowners to improve soil and water conservation management. Service staff will continue to work with the Natural Resources Conservation Service (NRCS), soil and water conservation districts, the U.S. Geological Survey and local upstream private landowners to reduce soil erosion and to improve water quality, particularly as it affects the Refuge.

Strategies:

1. Increase the enrollment in cost-sharing wetland restorations and agricultural practices that improve water quality and to reduce peak flows entering Horicon Marsh by working with the Service's Partners for Fish and Wildlife program and partnerships with the Dodge County Land Conservation Department, Fond du Lac County Land and Water Conservation Department, Green Lake and Washington Counties, and NRCS.
2. Continue to provide financial and non-financial incentives to private landowners through the above partners to implement conservation measures within the south and west branches of the Rock River watershed. Non-financial incentives can include landowner recognition at public functions, news articles, and voluntary land heritage registries.
3. Conduct door-to-door landowner education using non-government employees and involving local industry and businesses.
4. Monitor water quality and quantity entering the Marsh in cooperation with the U.S. Geological Survey.
5. Purchase land or obtain easements from willing sellers as it becomes available within the authorized Refuge boundaries.
6. Work with water experts, such as hydrologists, groundwater specialists, and other water specialists, on the problems and solutions for the Rock River basin.
7. Cooperate with local government land use planning efforts to ensure that water quality impacts to the Refuge are considered.
8. Continue to stress the importance of water quality in public information and interpretation, and environmental education programs.

Deer hunter on Horicon NWR.

Goal 3: People

Provide quality wildlife-dependent recreational and environmental education opportunities to a diverse audience. These activities will promote understanding, appreciation, and support for Horicon National Wildlife Refuge, the National Wildlife Refuge System, and wildlife conservation.

Objective 3.1: Hunting

Annually, provide no less than 2,000 quality upland hunting visits per year. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.

Discussion: Providing opportunities for hunting is consistent with the Refuge and the National Wildlife Refuge System Improvement Act of 1997. Refuge uplands will be open to hunting, subject to state regulations and public safety concerns, where conflicts with other users will not occur, and where biologically feasible. When necessary, Refuge staff will seek ways to ensure that hunters have the opportunity for quality experiences.

Strategies:

1. Small game: Upon revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit and squirrel hunting will be expanded to include the entire state season and state bag

limits. The season will have a delayed opening of December 1 on designated dikes north of Ledge Road.

2. White-tailed deer: Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal.
3. Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs and wording within brochures and on the Refuge web page.
4. Evaluate the restricted use hunting areas (areas D, E, and F on the Refuge hunting brochure map) for possible amendments. Changes will be reflected in the Refuge Hunt Plan.
5. Increase the visibility of Refuge law enforcement and hunter adherence to Federal and state regulations to ensure quality, ethical hunting.
6. Establish hunter and vehicle counts, through staff and volunteers, at all hunting access points to gain an index on hunting pressure and collect additional hunting data.

Objective 3.2: Fishing

By 2008, provide for 250 quality fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will know that they were fishing on a national wildlife refuge.

Discussion: Currently, there are few fishing opportunities on the Refuge because of low demand, shallow water conditions, and difficulty of access, as well as limited species of game fish. Boats have not been allowed and bank fishing is permitted at three locations, two of which have accessible fishing piers. Game fish including northern pike, bluegill and largemouth bass are stocked each year at various locations throughout the Refuge. One youth fishing event is held on the Refuge during the summer in celebration of National Fishing Week. Angler numbers should increase by promoting ice fishing at a select location.

Strategies:

1. Open all three fishing sites to ice fishing.
2. Continue to provide the annual fishing expedition for area schools, coordinated with volunteers.
3. Maintain accessible bank fishing platforms at all fishing sites.
4. Improve the parking lot at Peachy Road. Develop a site plan for placement of a kiosk; wayfinding, interpretive and regulatory signage; accessible routes; possible rest rooms; and accessible bank fishing facilities.
5. Improve access for fishing at Ledge Road and add signs at Ledge Road and Dike Road.

Objective 3.3: Wildlife Observation and Photography

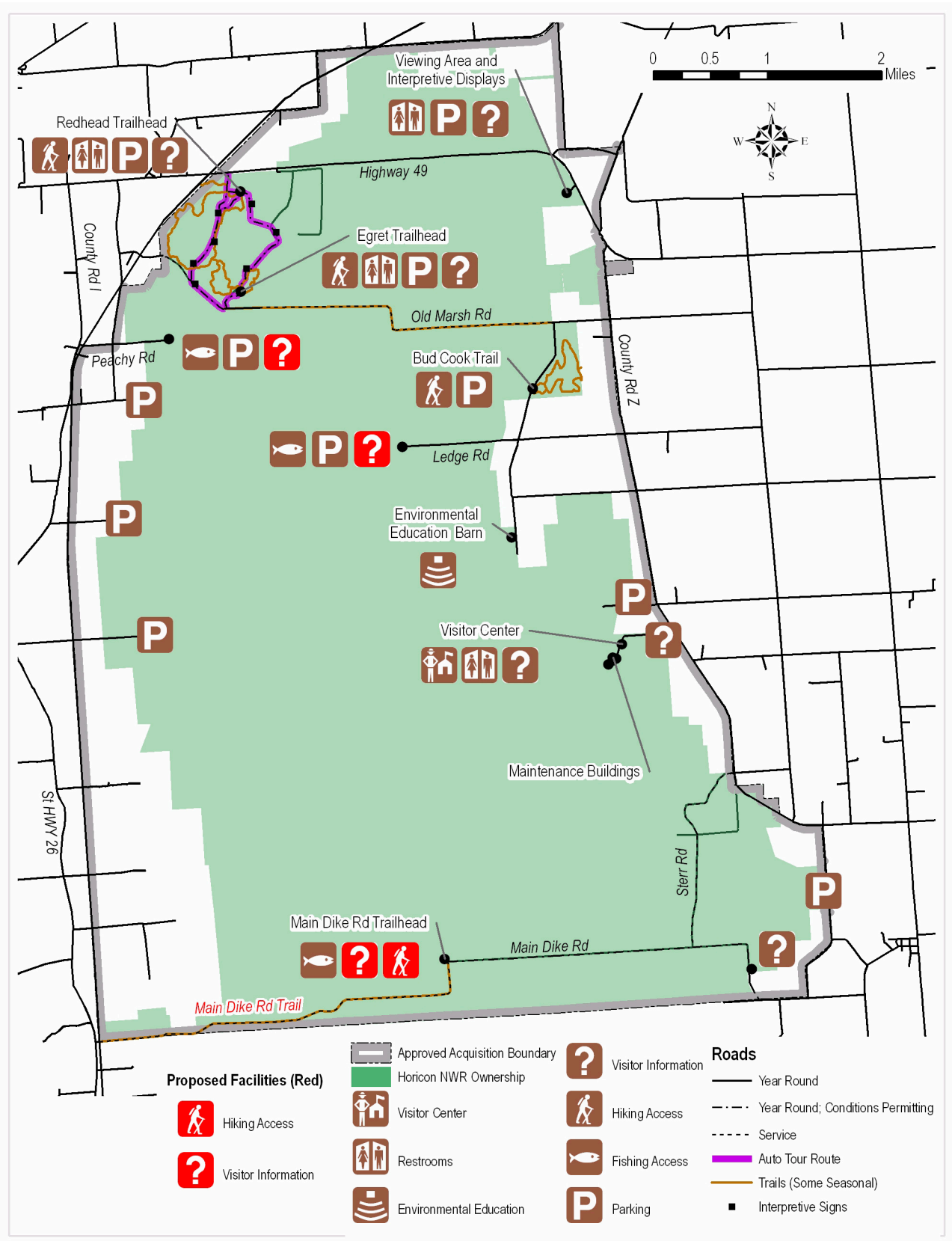
Provide year-round opportunities for up to 400,000 visitors annually to observe and photograph wildlife and habitat.

Discussion: Wildlife observation and nature photography are important and valuable activities for Refuge visitors and are priority, wildlife-dependent uses approved by the National Wildlife Refuge Improvement Act of 1997. Specific activities must be compatible with the purposes of the Horicon NWR.

Strategies:

1. Develop the Highway 49 overlook/comfort station for better wildlife observation and promote the use of the site.
2. Open most of the Refuge roads and trails to wildlife observation and photography via cross country skiing, hiking, and bicycling from December 1 through March 15.
3. Extend the auto tour route season to be open year round, conditions permitting.
4. Open Main Dike Road east of the water control structure year-round, conditions permitting, to automobiles, foot, and bike traffic.
5. Open Main Dike Road west of the fishing site year-round to foot and bike traffic for wildlife observation and photography.
6. Continue Old Marsh Road being open on weekends in June, July, and August to foot and bike traffic for wildlife observation and photography.
7. Open a specific area on the west side and east side of the Refuge to foot traffic for year-round wildlife observation and photography.
8. Install two permanent or temporary photo blinds on the Refuge.
9. Consider developing an interpretive loop trail from the visitor center.

Figure 13: Proposed Visitor Facilities, Horicon NWR



10. As part of the Visitor Services Plan, the trail system will be evaluated to ensure that trails meet resource goals and are accessible to all visitors.

Objective 3.4: Environmental Education and Interpretation

Maintain annual onsite visitation of 2,205 students and 100 group visits (2005 level) to promote understanding and advocacy for the Horicon Marsh and the global environment.

Discussion: Horicon NWR has a long history of providing environmental education and interpretation opportunities for thousands of visitors each year. In 2005, 100 on-site environmental education programs by school groups occurred on the Horicon NWR. However, school budgetary problems have made maintaining even the existing level a serious challenge. The Refuge currently has only one person to handle all responsibilities of the visitor service program, including promoting and conducting environmental education and interpretation.

The Refuge staff will strive to provide educational opportunities focused on the objectives in this plan, so that the public will understand future management activities and provide support. For example, a person who understands how their actions in the watershed can impact the Refuge will be more likely to make changes on their land and support Refuge decisions. Education will lead to understanding and eventually to action.

Strategies:

1. Hire an additional park ranger to serve as environmental education specialist and volunteer coordinator.
2. Train volunteers to provide tours such as goose watches and birding trips.
3. Construct a portable building at the Auto Tour/Hiking Trail Complex for volunteers to use during the busy season as an outpost for providing visitors information.
4. Develop a partnership with local schools to develop a curriculum-based, interdisciplinary environmental education program.
5. Hold teacher workshops to train educators to conduct their own programs.
6. Consider building an amphitheater to be used for environmental education and interpretive presentations.
7. Purchase state-of-the-art audio visual equipment for the new visitor center auditorium where thousands of people are provided programs each year.
8. Update the exhibits and signs in the visitor center and on all kiosks to meet Service regional standards.
9. Update and print new brochures and post them on the Refuge website.
10. Rehabilitate the Highway 49 Overlook into a wildlife observation site used to conduct educational and interpretive programs. Facilities would include: new interpretive panels, a shelter, and an observation deck. The site should be staffed with volunteers during peak migrations.
11. Develop resource issues for interpretive themes, update all interpretive panels to reflect these issues.

Objective 3.5: Community Outreach

Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 1,250 people to participate in off-site programs and exhibits; 25 teachers to participate in training programs, 250 people to volunteer at the Refuge, and 100 people to be members of a supporting Friends group.

Discussion: It is critical to the mission of the Refuge that the neighbors and citizens in the surrounding landscape know about the Refuge and support it as a valuable and contributing part of the community.

Strategies:

1. Offer training programs for teachers centered on the Refuge's place in the ecological landscape, the importance of habitat management, and the objectives in this plan.
2. Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs.
3. Participate in off-site community events.
4. Issue regular news releases and improve the Information Dissemination System for distributing news releases.
5. Maintain and update a Refuge website with current information about Refuge management and events.
6. Increase community partnerships.

7. Work closely with the Friends of Horicon NWR to foster understanding and mutual priorities.
8. Develop outreach plans for important resource issues.

Objective 3.6: Protection of Cultural Resources

Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. (The intent of this objective is to cover Section 106 of the National Historic Preservation Act and Section 7(e)(2) of the FWS Improvement Act.)

Discussion: The historic and pre-historic artifacts on the Refuge are limited and irreplaceable national treasures. Many of the sites have been identified but not researched.

Strategies:

1. Initiate a Cultural Resources Management Plan within 5 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.)
2. Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.)
3. Develop an oral cultural history to preserve the "community memory" about the area.

Objective 3.7: Cultural Resources Appreciation

Seventy percent of visitors will understand and appreciate the cultural history of the Refuge.

Discussion: The interest and depth of a natural landscape is enhanced by an understanding of its human history as well as its natural history. An effective program that increases the understanding of this history by visitors to the Refuge will increase their sense of the Refuge's value. This effort should be evaluated to make sure it is successful in achieving the goals of increased appreciation.

Strategies:

1. Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time.

Columbine, Horicon NWR

Fox River National Wildlife Refuge

Future Management Direction: Tomorrow's Vision

A Vision for Fox River National Wildlife Refuge

Fox River NWR will consist of diverse, productive habitats and wildlife that provides conditions found historically (pre-European settlement) in the Upper Fox River watershed. Specifically, the Refuge consists of a mosaic of oak savanna, dry and wet prairie, fens, sedge meadow, and shallow marsh habitats managed to perpetuate a variety of native plant and wildlife species, namely those of priority to the Service.

Refuge staff, located at Horicon NWR, are a multi-disciplined team dedicated to providing quality habitat and wildlife management, as well as quality wildlife-dependent public use opportunities compatible with Refuge purposes. Local communities and visitors value the Refuge for the personal, financial, and societal benefits it provides. A strong conservation ethic is promoted in the surrounding communities where both John Muir and Aldo Leopold were inspired by nature's beauty, complexity, and value.

Goals, Objectives and Strategies

Goal 1: Wildlife

Protect, restore, and maintain a diversity of wildlife species native to habitats historically found in the Upper Fox River Watershed, with special emphasis on Service priority species, through habitat preservation, restoration, and management.

Objective 1.1: Deer Population

Annually, maintain a deer population at a density of 15-20 deer per square mile to reduce damage to Refuge habitats and maintain a healthy herd.

Discussion: The following notes support a continued high level of deer hunting opportunities on the Refuge. During the summer months of 2003 and 2004, the Refuge biologist regularly saw herds of deer (three to 12) all across the Refuge; deer trails were plentiful, well-developed (wide), and regularly used. Deer damage native plant populations (such as remnant patches of prairie forbs, e.g., spiderwort) and there is the high possibility of high deer populations on the Refuge impacting local farmers and motorists. In addition, the Refuge has been part of a T-Zone unit, which allows additional antlerless deer hunting opportunities, and is just north of the Chronic Wasting Disease zone (increased harvest zones).

Strategies:

1. Continue to use regulated hunting every fall during all state seasons, including archery, gun, muzzleloader, and special hunts.
2. Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed.
3. Conduct informal survey/interact with hunters and listen to feedback on ways to improve the hunt.
4. Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR.

Objective 1.2: Sandhill Cranes

Annually, maintain habitat to support eight pairs of nesting Sandhill Cranes and more than 400 migratory cranes daily during spring and fall.

Discussion: The Refuge was established for nesting Sandhill Cranes during a time when the species was declining throughout the Midwest. Crane numbers have increased significantly during the last twenty years. The reintroduction of Whooping Cranes to Wisconsin has created the likelihood that a nesting pair may utilize Refuge habitats in the future. In fact, an individual Whooping Crane used the area in 2004 and six Whooping Cranes were present within 3 miles of the Refuge boundary in 2005.

Strategies:

1. Monitor Sandhill Crane use of the Refuge.
2. Maintain the open structural component in prairies and oak savannas on the Refuge as Sandhill Cranes forage in these habitats.

Objective 1.3: Regional Conservation Priority (RCP) Species

Within 15 years of CCP approval, 50 percent of the Region 3 RCP species associated with historically occurring habitats will be present on the Refuge.

Discussion: Region 3's Regional Conservation Priority (RCP) list includes rare and declining species, federally listed, and recreationally important species that are of high concern in the upper Midwest. The RCP list was developed to help prioritize management. High priority species already present on the Refuge that need to be perpetuated include Red-headed Woodpecker, Henslow's Sparrow, Yellow Rail, American Bittern, Mallard, Canada Goose, Sandhill Crane, Sedge Wren, Bobolink, and Eastern Meadowlark.

Strategies:

1. Monitor population trends according to the Wildlife Inventory Plan.
2. Support research activities that are directed toward these species.

Mallard drake, USFWS

3. Continue restoring natural hydrology to benefit waterfowl and other birds by filling/plugging remaining ditches.
4. Monitor effects of ditch plugging on vegetation and bird use.
5. Remove trees and brush that are encroaching on grassland fields.
6. Continue burn program rotation of every 4-8 years to provide a mosaic of burned and unburned habitat.
7. Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches.
8. Restore oak-savanna areas.

Goal 2: Habitat

Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands.

Objective 2.1: Oak Savanna

By 2010, restore and maintain 90 acres of oak savanna in the uplands to benefit regional habitat diversity and savanna-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50 percent tree canopy closure, 5-35 percent relative cover of shrubs, and at least 25 percent relative cover of diverse native grasses and native forbs (Figure 14).

Discussion: General Land Office surveys from 1832 suggest much of the landscape around the Refuge was historically dry prairie and oak savanna. Today, less than 1 percent of Wisconsin's prairie and oak savanna remain, largely due to the conversion to agricultural crops, fire suppression, and eradication of large grazing animals such as bison and elk. As a result of the thousands of acres of short-rotation agricultural crops in the Upper Fox River watershed, habitat quantity and quality available to upland and wetland wildlife species has been drastically compromised. In addition, water quality has been impacted with excessive amounts of sediments, nutrients, and chemicals entering the Upper Fox River and its tributaries.

Strategies:

1. Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps.
2. Plant native grasses and forbs (flowers) if needed.
3. Plant oak seedlings in native grasslands in the designated oak savanna areas.
4. Control invasive and exotic plants.
5. Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.

Objective 2.2: Grasslands

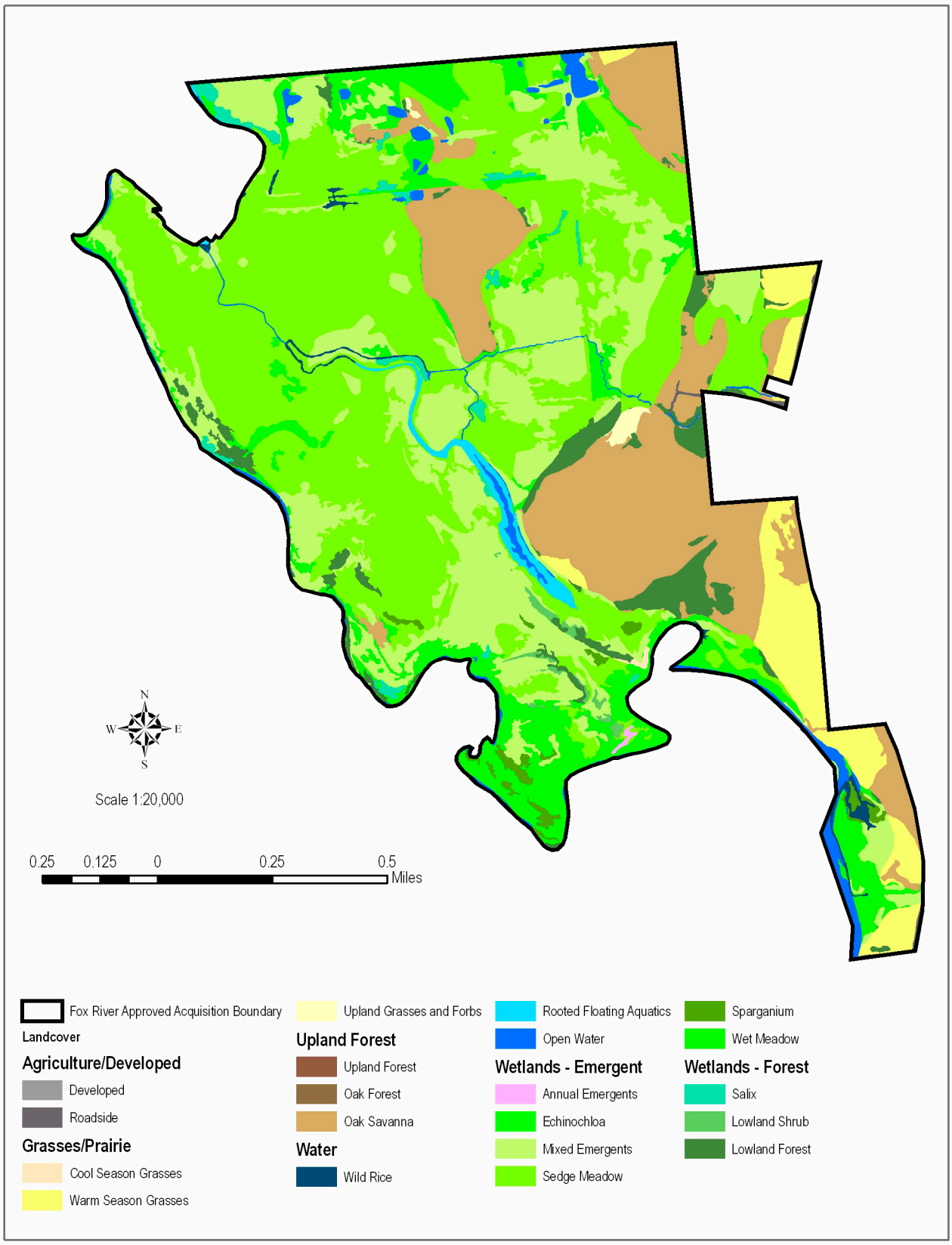
By 2008, restore and manage 115 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit wildlife species that depend on this habitat type, including Henslow's Sparrow, Bobolink, Grasshopper Sparrow, and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than 5 percent shrub cover, and a diverse native grass and forb species mix.

Discussion: A portion of Refuge uplands were considered grassland at the time of Euro-American settlement in the mid-19th century. The state of Wisconsin has lost 99 percent of its original, pre-settlement prairies and oak savannas. To varying degrees, grassland bird species have adapted and co-existed with agriculture for most of the past century. However, grassland bird populations are steadily declining in Wisconsin, and throughout the Midwest, due to changes in agricultural practices, land fragmentation, development, and other factors.

Strategies:

1. Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.
2. Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower, or in combination with other techniques.
3. Use chemical treatments exclusively or in combination with other techniques.
4. Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions.

Figure 14: Future Vegetation Cover, Fox River NWR



Objective 2.3: Fen and Wet Prairie

By 2010, restore and maintain annually 100 acres of fen and wet prairie habitats with a shrub coverage of 5-25 percent to benefit Regional Conservation Priority species dependent on this habitat type such as Sedge Wren, Bell's Vireo, and Alder Flycatcher, as well as a variety of state endangered and threatened plants.

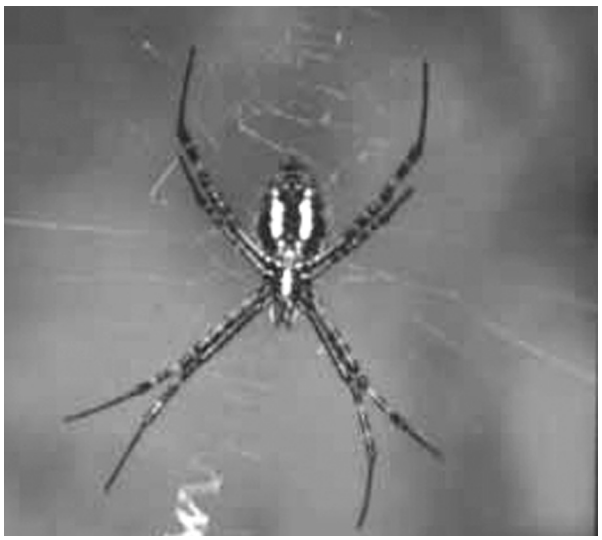
Discussion: Remnant tracts of wet prairie and fens are extremely rare in Wisconsin. Many of the historic tracts were either drained and tilled or allowed to be overgrown by shrubs as a result of the lack of fire and altered hydrology. The fen and wet prairie areas on the Refuge have never been tilled and still hold a diverse, native plant community characteristic of this habitat type. For example, tussock sedge, big bluestem, flat-top aster, joe-pie weed, and goldenrod spp. are the dominant species, with hedge nettle, swamp thistle, lousewort, obedient plants, sneezeweed, culvers root, water hemlock, downy willoweed, and St. John's wort as less common species. The hydrology in these sites is still relatively intact (many calcareous seeps and high groundwater table are still very evident) although more than half of this habitat type has been taken over to some degree by shrubs such as red osier dogwood, poison sumac, and willow. The high quality remnant fen and wet prairie tracts on the Refuge should be protected and restored via the strategies that follow.

Strategies:

1. Attempt to burn each unit in early fall as outlined in the Fire Management Plan to control brush.
2. Use mechanical treatments such as hand cutting or mowing over the ice when burning is not effective for controlling brush.
3. Use localized chemical treatments on the stumps in conjunction with the mechanical treatments.
4. Control other invasive and exotic plants.
5. Inventory and monitor plant species composition and structure and compare to other native fens and wet prairies; try to achieve historical conditions.

Objective 2.4: Sedge Meadow and Shallow Emergent Marsh

Annually, maintain 600 to 650 acres of sedge meadow and shallow emergent marsh to benefit Regional Conservation Priority species dependent on this habitat type such as the Yellow Rail, American Bittern, Sedge Wren, Mallard, Canada Goose, and Sandhill Crane, among others.



Spider, Horicon NWR

Discussion: Sedge meadow is a rare wetland habitat in the region due to habitat destruction and degradation from ditching, drain tile, tillage, nutrient and sediment inputs, as well as invasion by exotic species such as reed canary grass. The Refuge retains a small, high quality portion of the remaining sedge meadow present in the Midwest. The Refuge's sedge meadow is still dominated by native species such as lake sedge, C. laciosa, blue joint grass, marsh fern, tussock sedge, Impatiens spp., wild iris, and moss spp. The sedge meadow was never tilled but the hydrology in 400 acres was compromised in the late 1970s via ditching. A wetland restoration project began in 2004 to restore historical hydrologic conditions back to these sedge meadows via ditch filling and plugging.

Strategies:

1. Monitor the hydrological and plant species composition and structure changes associated with restoration activities.
2. Practice adaptive management in restored areas via maintaining restored conditions if habitat goals are achieved or modifying techniques if goals are not achieved. The ultimate goal would be to achieve historical site conditions.
3. Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.

Objective 2.5: Exotic and Invasive Species Control

Inventory and actively reduce invasive plant species throughout the Refuge. By 2015, reduce invasive species locations by 50 percent from 2005 levels and make every attempt to eliminate new infestations as they occur.

Discussion: Invasive species are often introduced from other areas (usually Europe) and have no native biological controls. The plants are often early successional species adapted to disturbance and move in quickly. They are difficult to control and they interfere with natural ecological processes. If the plants are not controlled, they can completely take over an area, out-competing native flora and reduce its biological potential and benefit to native wildlife. Exotic and invasive species on the Refuge in order of abundance include:

- reed canary grass
- cool season grasses such as quack grass, Kentucky bluegrass, and smooth brome
- purple loosestrife
- garlic mustard
- spotted knapweed
- leafy spurge
- black locust
- glossy buckthorn

Many areas of the Refuge need to be monitored. For example, sedge meadow can be vulnerable to invasion by reed canary grass. Fortunately, less than 10 percent of the historical sedge meadow is dominated by reed canary grass, primarily near the banks of the Fox River, but this area and recently disturbed sites will need to be watched. Purple loosestrife has also begun to invade the sedge meadow within the last year.

Strategies:

1. Document the location and size of invasive populations on the Refuge with GIS mapping.
2. Use biological control when available as a preferred strategy.
3. Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed.
4. Use fire in controlling some invasive plant species.
5. Monitor the infestations and effectiveness of control measures.
6. Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge.

Objective 2.6: Land Conservation

By 2020, conserve sufficient lands adjacent to the Refuge to ensure the restoration and protection of Refuge wetlands.

Discussion: As the Refuge is relatively small and is surrounded by many agricultural lands, habitat and wildlife are vulnerable to human induced disturbance such as increased nutrient and sediment loads, abundant invasive species seed sources off the Refuge, and human presence and hunting along the borders. These problems can be offset via the following strategies.

Strategies:

1. Protect 200 acres of land surrounding the Refuge by acquiring fee title or conservation easements from willing sellers. The Refuge will need to obtain the concurrence of the Service Director prior to acquiring land.
2. Improve cooperative conservation work with adjacent landowners by sharing technical advice and referring them to the Service's Partners for Fish and Wildlife program, USDA's programs, or other NGO's for assistance in performing conservation practices on their lands.

Goal 3: People

Provide quality visitor services compatible with the purposes for which the Refuge was established and/or the mission of the Refuge System. These wildlife-dependent activities will promote an understanding and appreciation of the naturally functioning landscape and the Service's management efforts on the Refuge.

Objective 3.1: Hunting

Provide no less than 100 quality upland hunting visits for area residents per year. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.

Discussion: Providing opportunities for hunting is consistent with the Refuge purposes and the National Wildlife Refuge System Improvement Act of 1997. Refuge uplands will be open to hunting, subject to state regulations and public safety concerns, where conflicts with other users will not occur, and where biologically feasible. When

necessary, Refuge staff will seek ways to ensure that hunters have the opportunity for high quality experiences.

Strategies:

1. Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs, and wording within brochures and on the Refuge web page.
2. Increase the visibility of Refuge law enforcement and hunter adherence to federal and state regulations to ensure quality, ethical hunting.
3. *White-tailed deer:* Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal.

Objective 3.2: Fishing

By 2008, provide for 75 fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will recollect awareness that they were fishing on a national wildlife refuge.

Discussion: Boat access for fishing is available along the Fox River. Many people have expressed interest in fishing on Long Lake. The one-mile hike from the parking lot to the potential fishing spot is expected to limit the number of anglers (Figure 15). Boating will continue to be restricted on Refuge-interior waterways other than the Fox River to reduce disturbance of migratory birds, especially nesting Sandhill Cranes.

Strategies:

1. Provide fishing on designated areas of the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan.
2. Monitor litter and provide signs to educate anglers to always carry out trash.

Objective 3.3: Wildlife Observation and Photography

Provide limited opportunities for 200 visitors annually to observe and photograph wildlife and habitat.

Discussion: No trails should be built solely on the Refuge as the likely low number of visits from the public would likely not warrant the impact to habitat and disturbance to wildlife associated with trail maintenance. A segment of the Wisconsin Ice Age State and National Trail may traverse the Refuge from Muir Park to the north if needed to connect properties.

Birding, Horicon NWR

Strategies:

1. Provide wildlife observation and photography on designated areas of the Refuge during given times of the year where it does not interfere with wildlife.
2. Consider establishment of a segment of the Wisconsin Ice Age State and National Trail through the Refuge.

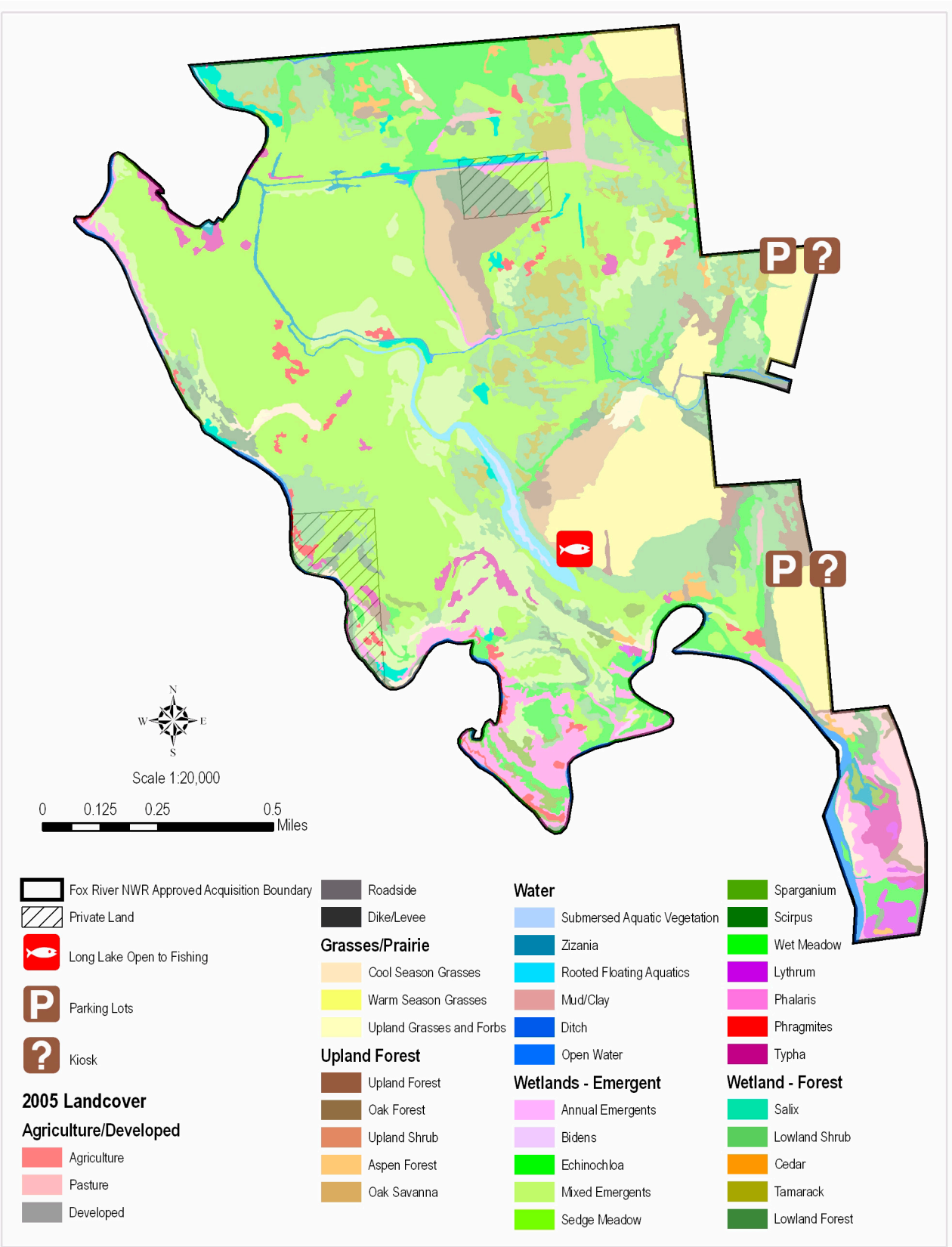
Objective 3.4: Environmental Education and Interpretation

Provide for annual onsite visitation of 100 students and 2-4 group visits.

Discussion: A limited amount of onsite environmental education occurs at the present time. The Refuge biologist has provided environmental education and Refuge tours for two local charter schools. However, school budgetary problems have made maintaining even this modest level of environmental education a serious challenge. The Refuge does not have a staff person to promote and conduct environmental education and interpretation. Nonetheless, Fox River NWR is in a position to provide more environmental education than it does at present to grade-level and college students and the general public in south-central Wisconsin.

The Refuge staff will strive to provide educational opportunities that highlight the objectives in this plan, so that the public will understand future management activities and provide sup-

Figure 15: Current and Proposed Visitor Facilities, Fox River National Wildlife Refuge



port. For example, a person who understands the benefits of controlling invasive species will be more likely to support Refuge decisions.

Strategies:

1. Work with local teachers to develop grade-specific curricula that meet local, state and national education standards and that keep focus on the Refuge.
2. If feasible, train volunteers to provide tours or lessons for classrooms.
3. Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted.
4. Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes.
5. Train educators to conduct their own programs (via teacher workshops).
6. If necessary, redesign or enlarge both Refuge parking lots to accommodate school buses.

Objective 3.5: Community Outreach

Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 200 students to participate in programs, four teachers to participate in training programs, and 10 people to volunteer at the Refuge.

Discussion: It is critical to the mission of the Refuge that the neighbors and citizens in the surrounding landscape know about the Refuge and support it as a valuable and contributing part of the community.

Strategies:

1. Offer training programs for teachers centered on the Refuge's place in the ecological landscape, the importance of habitat management, and the objectives in this plan.
2. Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs.
3. Participate in off-site community events.
4. Issue regular news releases and improve the Information Dissemination System for distributing news releases.
5. Maintain and update a Refuge website with current information about Refuge management and events.
6. Increase community partnerships.
7. Develop outreach plans for important resource issues and improve the outreach to the Refuge neighbors about habitat management (i.e., tree cutting, invasive species control, prescribed fire).

Objective 3.6: Protection of Cultural Resources

Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. (The intent of this objective is to cover Section 106 of the National Historic Preservation Act and Section 7(e)(2) of the FWS Improvement Act.)

Discussion: The historic and pre-historic artifacts on the Refuge are limited and irreplaceable national treasures. Many of the sites have been identified but not researched.

Strategies:

1. Initiate a Cultural Resources Management Plan within 3 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.)
2. Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.)
3. Develop an oral cultural history to preserve the "community memory" about the area.

Chapter 5: Plan Implementation

New and Existing Projects

This CCP outlines an ambitious course of action for the future management of Horicon and Fox River National Wildlife Refuges. The ability to enhance wildlife habitats on the Refuges and to maintain existing and develop additional quality public use facilities will require a significant commitment of staff and funding from the Service. Both Refuges will continually need appropriate operational and maintenance funding to implement the objectives in this plan.

The following section provides a brief description of the highest priority Refuge projects, as chosen by the Refuge staff and listed in the Refuge Operating Needs System (RONS). A full listing of unfunded Refuge projects and operational needs can be found in Appendix F.

Horicon Refuge Operating Needs Projects

- Improve Water Level Management (Maintenance Worker). Provide a maintenance worker to improve wetland management through prescribed burning, mowing, diking, water level management, and the operation and maintenance of an existing dike, ditch and pumping system. To provide the best possible wetland habitat, the refuge actively manages over 15,000 acres of high quality wetlands. Horicon National Wildlife Refuge is a Wetland of International Importance and a Globally Important Bird Area. The 32,000-acre marsh, jointly managed with the Wisconsin Department of Natural Resources, is also an important migration stop for millions of waterfowl and other migratory birds. Strategies 2.1-3 and 2.2.1-5; Estimated cost: $150,000.

River otter, Horicon NWR

- Enhance Refuge Management and Administration (Resource Specialist). Provide a resource specialist to conduct wildlife and habitat surveys, waterfowl banding, water level management, carp control, public use programs, and other needs such as updating and writing Refuge plans. The 32,000-acre marsh, jointly managed with the Wisconsin Department of Natural Resources, is an important migration stop for Canada geese, waterfowl and other migratory birds. Horicon National Wildlife Refuge is a Wetland of International Importance and a Globally Important Bird Area. The marsh is also the largest freshwater cattail marsh in the United States and supports a wide variety of plants and

animals. Strategies 1.1.3-5, 1.4.1-2, 2.1-3, 2.2.1-5, all strategies within Objectives 3.1-3.5; Estimated cost: $150,000.

- Increase Conservation Projects with Landowners in the Upper Rock River Watershed. Provide an outreach specialist under contract to act as a liaison between landowners and existing government and NGO conservation programs. The contractor will work closely with the refuge staff, federal Partners for Fish and Wildlife staff, Wisconsin DNR, Counties, and non-profit groups to encourage understanding, and action, of private landowners in the upper watershed of the critical issue of soil erosion and contaminants impacting the Horicon Marsh. Strategies 2.6.1-8; Estimated cost: $70,000 - $150,000.
- Improved Upland Habitat Restoration and Maintenance. Manage 5,000 acres of uplands on Horicon National Wildlife Refuge through the planting of native grasses and forbs. Selected upland sites would be prepared for planting and supplies purchased to be used in this long-term effort to restore native prairie grasses and forbs. A seed cache would also be built. This project would help control noxious weeds and invasive woody species in uplands by purchase of herbicides, boom sprayer, other application equipment, and 15-foot bat wing mower. Control of these invasive weeds is important since they cause degradation of nesting habitat and a decrease in overall plant and animal diversity. Strategies 2.3.1-6, 2.4.1-3, 2.5.1-3 Estimated Cost: $150,000.
- Reduce Woody Vegetation on Upland Grasslands. This project will involve hiring a contractor to thin or cut woody vegetation on uplands. The stumps would be treated with chemicals. One of the biggest factors that prevent some of the uplands from being managed is the encroachment of woody vegetation. Strategies 2.3.1-6, 2.4.1-3, 2.5.1-3; Estimated cost: $250,000.
- Reduce Wildlife-Vehicle Collisions on State Highway 49. This project will provide for physical and educational strategies to reduce the loss of wildlife along a major highway bisecting the Horicon Marsh. State Highway 49 is a high speed roadway that bisects the northern section of the Horicon Marsh for 2.5 miles. During the 2002-2005 alone, well over 4,200 dead animals, including waterfowl, bitterns, river otters, muskrats, frogs and toads were found along this roadway. Partial solutions to this problem include raised culverts, or simple barriers and fences and poles along key segments of the highway. Increased law enforcement patrol is also a key issue.

  Funding may also be used for research and monitoring. Matching or supplemental funds may also be available through the U.S. Department of Transportation (SAFETEA LU) or other sources. Strategies 1.2.1-4; Estimated cost: $1,500,000.
- Volunteer Coordination. This project will provide for a volunteer coordinator position. Horicon National Wildlife Refuge has over 280 volunteers, who provide much assistance to the refuge on many different projects in all program areas. However, volunteers need attention and consistent direction; a volunteer coordinator is needed to provided provide overall management to the program, expand opportunities for volunteers to get involved with the refuge and ensure volunteers' needs are being met. Strategies 3.5.2 and 3.5.8; Estimated cost: $150,000.
- Assess Impacts of Visitor Use and Disturbance of Wildlife. Conduct an in-depth evaluation of the Refuge's visitor services programs and the effects of visitor use on wildlife. This work would be completed through a contract with a local university. Currently, about 450,000 people visit Horicon NWR every year. Public use is limited to certain areas. This study would provide staff information on the impacts of future proposed activities on closed areas of the Refuge and if deemed compatible, would increase visitor use. Currently staff has few data available to support the opening of areas to public use. Strategies 3.1.1, 3.1.7, 3.1.8, 3.1.10, 3.2.2, 3.3.1-4; Estimated cost: $50,000.
- Improve Visitor Services by Providing New Refuge Brochures. Develop new brochures for the Horicon NWR, a Wetland of International Importance, a Globally Important Bird Area, and the largest freshwater cattail marsh in the United States. About 450,000 people from all over the world visit this important resource. Many people request information on specific items such as certain kinds of wildlife that use the Refuge and the archaeological history of the area.

  This project would provide funding for printing and reprinting of new and old Refuge bro-

chures, bird lists, hunting brochures, and maps. Thousands of publications are distributed to visitors by mail. Tourism groups and local businesses facilitate further distribution. Currently, in partnership with the Wisconsin Department of Natural Resources, a combined hunter map and a combined visitor map is developed and printed each year. Each year, the Department of Natural Resources covers the cost of this publication. Strategies 1.1.1, 3.1.4, 3.4; Estimated cost: $100,000.

- Enhance Visitor Center Experience for Individuals and Groups. Replace exhibits in visitor center where thousands of people visit each year. Current exhibits are outdated and in need of repair. Strategy 3.4.7. Estimated cost: $200,000.
- Improve Water Quality of Horicon Marsh Ecosystem. Various studies over the years have determined that the marsh is being polluted with high amounts of nutrients and pesticides at an alarming rate. This project will determine areas within the watershed that need the most attention, locate high discharge areas, provide for incentives for landowners to implement conservation measures, provide for education, and fund conservation easements. Strategies 2.6.1-8 Estimated cost: $1,000,000.
- Analyze Existing Water Quality Data. Three years of U.S. Geological Survey data on the Horicon Marsh was conducted to monitor flow velocity and collect water samples. The data now sits in boxes and needs to be analyzed and described in a final report. The marsh is continually being polluted with contaminants at an alarming rate. The analysis of this study will determine management direction in working towards a solution. Strategies 2.6.4 and 2.6.7; Estimated cost: $130,000.
- Improve Water Management on the Marsh (Heavy Equipment). Purchase a dozer, tracked truck, mat track, and Marshmaster to facilitate the repair of Refuge dikes, which are badly deteriorating to the point of becoming unsafe. The equipment will also be used to fill old, submerged ditches as described in the CCP. Purchase is more economical and efficient than continual equipment rental. The Refuge also requires an aerial lift to facilitate ongoing maintenance needs more efficiently and safely. A pump and generator for drawing the water off of the units and personnel to operate pumps is necessary to successfully manage moist soil areas for waterfowl. Many wetland areas are managed as moist soil units, which involves drawing the water off of an area in late spring and flooding the area in the fall. This management stimulates the growth of wetland plants that are attractive to waterfowl. Strategies 2.1.1-4, 2.2.1-5; Estimated costs: $190,000 (tracked truck), $30,000 (mat tracks), $27,000 (aerial lift), $118,000 (dozer), $50,000 (pump & generator), Marshmaster ($100,000).
- Improve Visitor Services by Providing Staff for Visitor Center. Currently the Refuge has two intermittent employees who staff the visitor center, especially on the busy weekends in the fall. They are assisted by volunteers, but Service policy prevents volunteers from working alone. During lean years, the employees do not work and the visitor center does not stay open on weekends. The Refuge has over 450,000 visitors per year, especially in the fall. This project would provide funding for these intermittent employees so that the visitor center can remain open on weekends. Strategies 3.1, 3.2, 3.3, 3.4, 3.5 Estimated cost $20,000
- Enhance Visitor Center Experience and Decrease Wildlife Vehicle Collisions. This project would provide funding for supplies and equipment for current law enforcement personnel. For example, a computer in the vehicle and a radar gun (with training) would allow the officer to be more efficient and would also alleviate the speeding problem on Highway 49. Fewer animals would become roadkill if people were forced to follow the speed limit. Enforcement on Highway 49 would also provide for a safer environment for people. About 450,000 people visit the Refuge every year. Highway 49 offers one of the best viewing areas and many of those people drive extra slow on the highway or pull off onto the shoulder, walking along the side of the highway or even across it as semis and other vehicles speed past. Strategies 1.2.2, 3.1.5, 3.1.6, 3.3. Estimated cost $20,000.
- Improve Habitat for Nesting Migratory Bird Species by Controlling Predators. Predators, such as mink and raccoon, are a nuisance species that predate the eggs of ground-nesting birds. Managing this problem through trapping has not worked over the years due to low trapper interest and effort, namely due to the low price of pelts. This project would allow for

incentives for trappers, as well as a contractor to remove woody vegetation, old fencerows and other structures to decrease the predator habitat. Strategies 1.3.6 and 1.3.7. Estimated Cost $100,000.

- Improve Habitat for Migratory Bird Species by Controlling Invasive Carp. Carp are an extremely destructive, non-native species of fish that thrives in low-oxygen conditions such as the shallow wetlands of Horicon Marsh. Carp roll in the marsh sediments and create a cloudy environment and uproot aquatic plants. Little sunlight can penetrate the water and fuel the marsh food web. Few organisms thrive in such conditions and the biological diversity of the Marsh is reduced. This project would provide for the purchase of chemical pesticides (rotenone), maintenance needs for the carp trap, and funds for implementing new research techniques such as pheromone. Strategies 1.3.1, 1.3.2, 1.3.3 Estimated Cost $100,000.
- Enhance Visitor Services by Improving Fishing Sites. Fishing is one of the priority public uses of the Refuge system. The Refuge currently offers fishing at three designated fishing site. All of the sites will have accessible fishing platforms that require annual maintenance due to normal wear and tear and, unfortunately, vandalism. This project would provide funds for maintaining the sites, including the platforms, and improvement of the Peachy Road fishing site to include a kiosk, an accessible trail, accessible fishing platforms. Improvement for access at the Ledge Road fishing site is also needed as the Rock River has shifted and anglers no longer have access to water unless Refuge staff provide a bridge or platform. Strategies 3.2 Estimated Cost $125,000.

Fox River Refuge Operating Needs Projects

- Improve Visitor Services by Providing New Refuge Brochures. Develop new brochures for the Fox River NWR. With the expanded hunting and other uses proposed, brochures will be needed to assist visitors. A brief hunting brochure is the only pamphlet currently available for visitors to the Refuge. This project would provide funding for printing of new Refuge brochures, bird lists, hunting brochures, and maps. Hundreds of publications are distributed to visitors by mail. Strategies 1.1, 3.1, 3.2, 3.3, 3.4, 3.5; Estimated cost: $50,000.
- Develop a Complete Inventory and List of Species to Improve Habitat Management. Complete a thorough bird, amphibian, reptile, and mammal inventory (by contract) to assist refuge staff in developing the best management for the area. The Fox River National Wildlife Refuge contains a diversity of wildlife within this wetland/upland complex. The Refuge has ten distinct plant communities ranging from upland coniferous and deciduous woodlands to five wetland communities. This diversity is responsible for the presence of about 150 different species of wildlife. Species diversity of this extent, within a relatively small confined area of 1,000 acres, is not found in many parts of Wisconsin. Strategy 3.3.7; Estimated cost: $75,000.
- Improved Upland Habitat Restoration and Maintenance. Manage uplands on Fox River National Wildlife Refuge through the planting of native grasses and forbs. Selected upland sites would be prepared for planting and supplies purchased to be used in this long term effort to restore native prairie grasses and forbs. This project would help control noxious weeds such as reed canary grass, phragmites, purple loosestrife, spotted knapweed, leafy spurge, garlic mustard, and invasive woody species in uplands by purchase of herbicides. Control of these invasive weeds is important since they cause degradation of nesting habitat and a decrease in overall plant and animal diversity. Strategies 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, and 2.5. Estimated Cost $75,000.
- Improved Upland Management through Removal of Woody Vegetation. This project will involve hiring a contractor to thin or cut woody vegetation on uplands. The stumps would be treated with chemical. One of the biggest factors that prevents some of the uplands from being managed is the encroachment of woody vegetation. Strategies 1.2, 1.3, 2.1, 2.2, 2.3, and 2.5; Estimated cost: $100,000.
- Enhance Refuge Management and Administration (Resource Specialist). Provide a resource specialist to conduct wildlife and habitat surveys, public use programs, and other needs such as updating and writing Refuge plans. Currently, the Refuge is managed by the staff at Horicon National Wildlife Refuge. For the past several years, money has been

provided through the Natural Resource Damage Assessment (NRDA) fund for a temporary employee who has worked on habitat restoration projects and wildlife surveys full-time at the Refuge. This money and person will end in 2007 and much work remains. Strategies 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4., 3.5 Estimated cost: $150,000.

Future Staffing Requirements

Implementing the visions set forth in this CCP will require additions to the organizational structure of Horicon Refuge. Existing staff will direct their time and energy in somewhat new directions and new staff members will be added to assist in these efforts. The first organizational chart shows the existing Refuge staff as of Fiscal Year 2006. Table 20 identifies additional staff needed to fully implement this plan by Fiscal Year 2021.

Table 20: Additional Staffing Required to Fully Implement the CCP by 2021, Horicon NWR

Position	FTEs
Refuge Operations Specialist (Resource Specialist)	1.0
Maintenance Worker	1.0
Park Ranger (volunteer coordinator)	1.0
Refuge Operations Specialist (Fox River NWR)	1.0
Total	4.0

Partnership Opportunities

Partnerships have become an essential element for the successful accomplishment of Horicon and Fox River NWR goals, objectives, and strategies. The objectives outlined in this draft CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations and individual citizens. This broad-based approach to managing fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many. Horicon and Fox River National Wildlife Refuges will continue to seek creative partnership opportunities to achieve its vision for the future.

Particularly notable partners of the Refuges include the Friends of Horicon National Wildlife Refuge, Refuge volunteers, Wisconsin Department of Natural Resources, Wisconsin Wetlands Association and Ducks Unlimited.

Step-down Management Plans

Step-down management plans describe specific actions that support the accomplishment of Refuge objectives. The management plans identified in Table 21 and Table 22 will be reviewed, revised, or developed as necessary to achieve the results anticipated in this draft CCP.

Archeological and Cultural Values

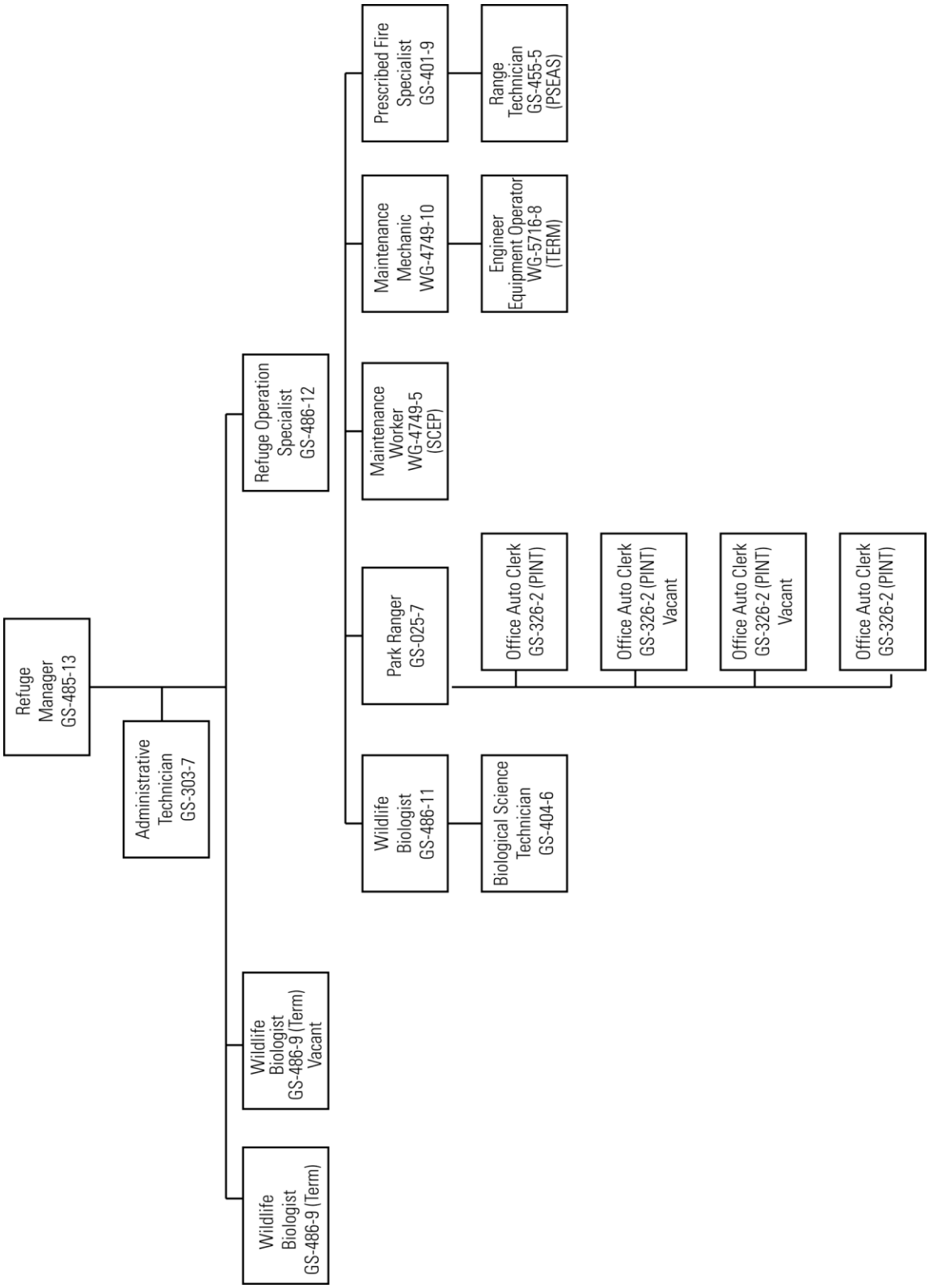
As part of its larger conservation mandate and ethic, the Service through the Refuge Manager applies the several historic preservation laws and regulations to ensure historic properties are identified and are protected to the extent possible within its established purposes and Refuge System mission.

Early in project planning for all undertakings, the Refuge Manager informs the RHPO (Regional Historic Preservation Officer) to initiate the Section 106 process. Concurrent with public notification and involvement for environmental compliance and compatibility determinations if applicable, or cultural resources only if no other issues are involved, the Refuge Manager informs and requests comments from the public and local officials through presentations, meetings, and media notices; results are provided to the RHPO.

Archeological investigations and collecting are performed only in the public interest by qualified archeologists or by persons recommended by the Governor working under an Archaeological Resources Protection Act permit issued by the Regional Director. The Refuge Manager has found this third-party use of Refuge land to be compatible. (The requirements of ARPA apply to FWS cultural resources contracts as well: the contract is the equivalent of a permit.) Too, the Refuge Manager issues a special use permit. Refuge personnel take steps to prevent unauthorized collecting by the public, contractors, and Refuge personnel; violators are cited or other appropriate action taken. Violations are reported to the Regional Historic Preservation Officer.

The Refuge Manager will, with the assistance of the RHPO, develop a step-down plan for surveying

Figure 16: Current Staffing Chart, Horicon NWR



lands to identify archeological resources and for developing a preservation program to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.

The Refuge Manager should have and implement a plan for inspecting the condition of known cultural resources on the Refuge and report to the RHPO changes in the conditions.

The Refuge Manager will initiate budget requests or otherwise obtain funding from the 1% O&M program base provided for the Section 106 process compliance:

1. Inventory, evaluate, and protect all significant cultural resources located on lands controlled by the FWS, including historic properties of religious and cultural significance to Indian tribes.
2. Identify and nominate to the National Register of Historic Places all historic properties including those of religious and cultural significance to Indian tribes.
3. Cooperate with Federal, state, and local agencies, Native American tribes, and the public in managing cultural resources on the Refuge.
4. Integrate historic preservation with planning and management of other resources and activities.
5. Recognize the rights of Native Americans to have access to certain religious sites and objects on Refuge lands within the limitations of the FWS mission.

Monitoring and Evaluation

The direction set forth in this CCP and specifically identified strategies and projects will be monitored throughout the life of this plan. On a periodic basis, the Regional Office will assemble a station review team whose purpose will be to visit Horicon NWR and evaluate current Refuge activities in light of this plan. The team will review all aspects of Refuge management, including direction, accomplishments and funding. The goals and objectives presented in this CCP will provide the baseline from which this field station will be evaluated.

Table 21: Step-down Management Plan Schedule, Horicon NWR

Step-down Management Plan	Completed/ Updated	Anticipated Revision
Visitor Services Plan	n/a	2008
Hunting Plan	1987	2007
Law Enforcement Plan	1992	2007
Furbearer Management And Trapping Plans	1979*	2008
Marsh & Water Management Plan[1]	1993*	n/a
Habitat Management Plan	n/a	2009
Wildlife Inventory Plan	1990	2008
Resource Inventory Plan	n/a	2008
Fire Management Plan	2001	2011
Cultural Resources Management Plan	n/a	2012
Accessibility Plan	n/a	2012
Fishing (Fisheries Management) Plan	1986	2008
Grassland Management Plan	1994	n/a
Safety Plan	1987	2008

1.Annual Management Plans are written for the Water Management and Trapping Plans

Table 22: Step-down Management Plan Schedule, Fox River NWR

Step-down Management Plan	Completed /Updated	Anticipated Revision
Visitor Services Plan	n/a	2010
Hunting Plan	1987	2007
Law Enforcement Plan	n/a	2007
Habitat Management Plan [1]	n/a	2009
Wildlife Inventory Plan	n/a	2008
Resource Inventory Plan	n/a	2008
Fire Management Plan	2001	2007
Cultural Resources Management Plan	n/a	2012
Accessibility Plan	n/a	2012
Fishing (Fisheries Management) Plan	n/a	2007
Safety Plan	1987	2008

1.Annual Management Plans are written for the Water Management and Trapping Plans

Appendix A: Draft Environmental Assessment

Horicon and Fox River

National Wildlife Refuges

Draft Environmental Assessment

DRAFT ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR HORICON AND FOX RIVER NATIONAL WILDLIFE REFUGES

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for Horicon National Wildlife Refuge (NWR), as well as for nearby Fox River National Wildlife Refuge, which is managed by Horicon NWR staff from that refuge. Both refuges are located in southeastern Wisconsin. This Draft Environmental Assessment (EA) considers the biological, environmental and socioeconomic effects that implementing the CCP (which is the preferred alternative in this EA), two other management alternatives for Horicon NWR, and one other management alternative for Fox River NWR, would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the three refuges for the next 15 years. The management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in the CCP.

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Chapter 1: Purpose and Need

1.1 Background

This EA accompanies the CCP for two national wildlife refuges located in Wisconsin: Horicon and Fox River. These two refuges have one CCP because both are managed by Horicon NWR staff based at Horicon Marsh. There are no management facilities (e.g. offices, headquarters, visitor center, maintenance area, equipment) permanently located at Fox River NWR.

1.1.1 Horicon National Wildlife Refuge

Horicon NWR was set aside in 1941 for the protection and preservation of migratory waterfowl. It is located on the west branch of the Rock River in southeastern Wisconsin, 43 miles west of Lake Michigan and 65 miles northwest of Milwaukee. The Refuge comprises the northern two-thirds (21,492 acres) of the 32,000-acre Horicon Marsh, the largest freshwater cattail marsh in the United States. The Marsh is a shallow peat-filled lake bed – 14 miles long and 3-5 miles wide – gouged out by the Wisconsin Glacier thousands of years ago.

Horicon Marsh is bounded on the east by a sharply rising ridge of the Niagara escarpment which rises approximately 250 feet above the marsh to an elevation of 1,100 feet. The land to the west of the Refuge rises slowly and is dotted with many small potholes and several shallow lakes. Horicon Marsh is located in the upper reaches of the Rock River watershed. Major land types identified on the Refuge include 16,961 acres of wetlands, of which the majority are classified as deep, freshwater marsh; and 4,336 acres of uplands, including 410 acres of forest land and brush land habitat.

The southern third (11,000 acres) of Horicon Marsh is managed by the Wisconsin Department of Natural Resources as a wildlife area and fur farm for hunting, fishing and other public use activities. In 1990, Horicon Marsh was designated a "Wetland of International Importance" by the Ramsar Convention, an intergovernmental treaty that obligates 45 signatory nations to consider wetland conservation through land use planning, wise use of wetlands, establishment of wetland reserves, and wetland research and data exchange. In 1997, the Horicon Marsh was accepted as a Globally Important Bird Area in American Bird Conservancy's United States Important Bird Areas program. The marsh was accepted for this recognition for several reasons, especially because more than 50 percent of the Mississippi Flyway Canada geese migrate through the marsh during the fall, and two percent of the biogeographic population of mallards migrates through during the fall, with impressive number of other waterfowl. In the fall of 2004, the Horicon Marsh was recognized by the State as an Important Bird Area.

1.1.2 Fox River National Wildlife Refuge

Fox River National Wildlife Refuge encompasses 1,004 acres of wetland and upland habitat along the Fox River in Marquette County, approximately 35 miles west of Horicon National Wildlife Refuge. Fox River NWR was established in 1979 under the U. S. Fish and Wildlife Service's Unique Wildlife Ecosystem Program to protect an area known as the Fox River Sandhill Crane Marsh from further drainage and to preserve associated upland habitat. The Refuge protects an important breeding and staging area for the Sandhill Crane. Approximately 50 cranes use the Refuge during the summer and more than 300 use it as a staging area during fall migration.

The uniqueness of the Refuge is not only because of its importance to nesting Sandhill Cranes, but for the diversity of wildlife within this wetland/upland

Figure 1: Horicon NWR Location

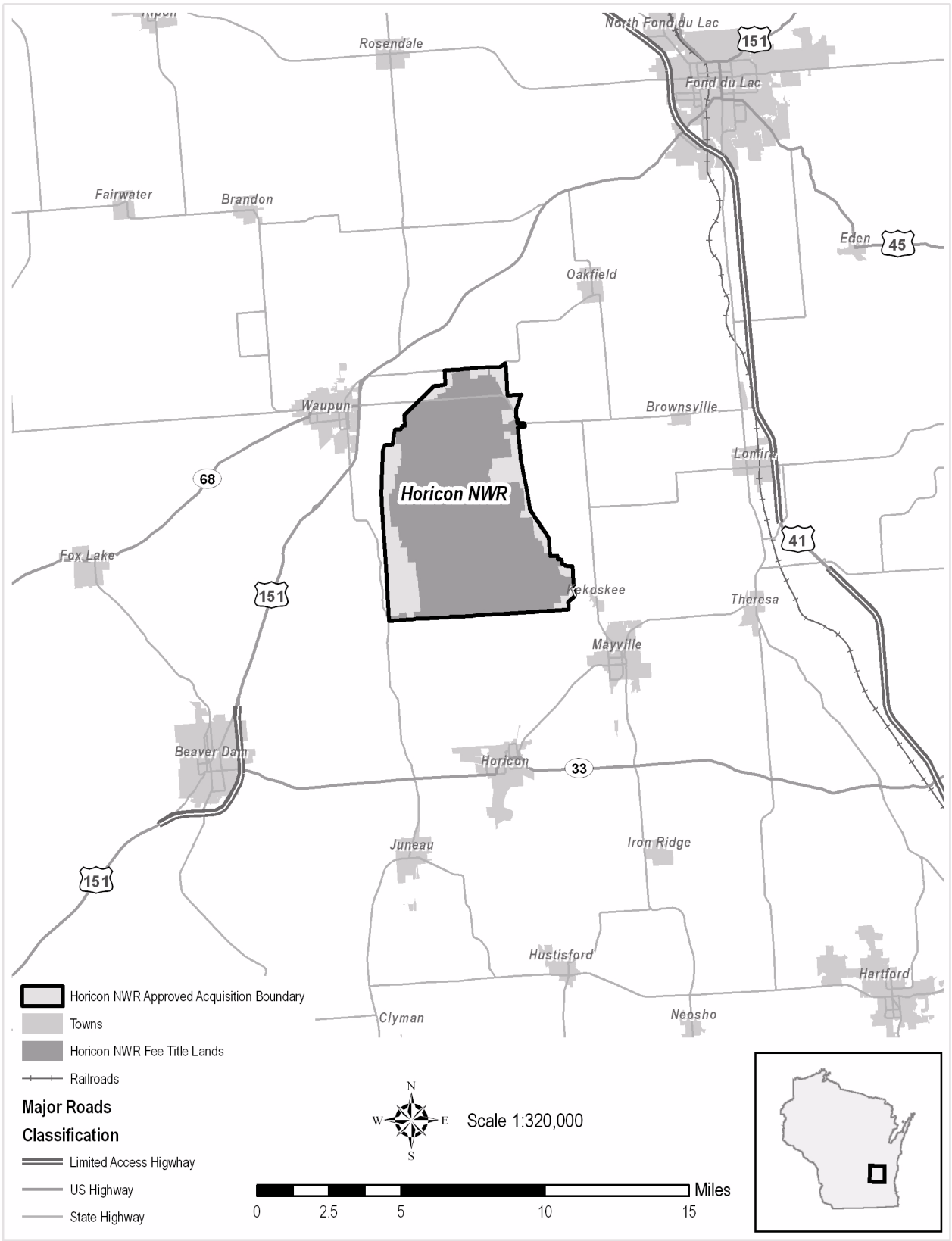
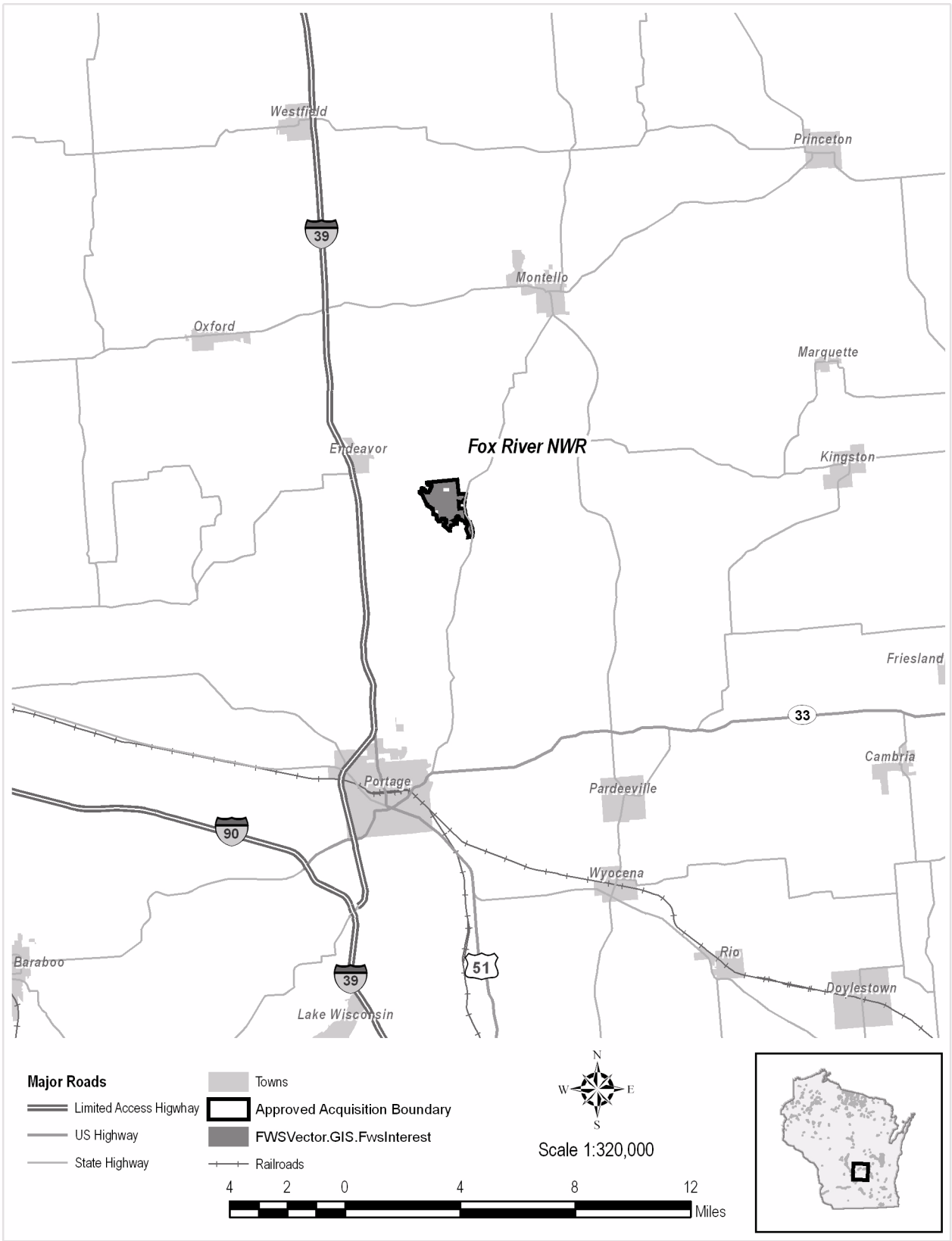


Figure 2: Fox River NWR Location



complex. The Refuge has 10 distinct plant communities ranging from upland coniferous and deciduous woodlands to five wetland communities. The majority of the Refuge contains sedge meadow, wet prairie, and shallow marsh wetlands. Upland prairie and forest is also present on the Refuge. The diversity of vegetation communities is responsible for the presence of about 150 different species of wildlife. Wildlife diversity to this extent within such a relatively small, confined area is not encountered elsewhere in Wisconsin.

The matrix of wetland and upland habitat provides excellent habitat for both wetland and upland associated wildlife, such as ducks, Sandhill Cranes, herons, rails, songbirds, deer, turkey, and Bobwhite Quail.

1.2 Purpose

The purpose of the proposed action is to specify management directions for Horicon National Wildlife Refuge and Fox River National Wildlife Refuge over the coming 15 years. These management directions will be described in detail through two distinct sets of goals, objectives, and strategies (one for each refuge) in a Comprehensive Conservation Plan (CCP).

The action is needed because adequate, long-term management direction does not currently exist for the refuges. Management is now guided by various general policies and short-term plans. The action is also needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

1.3 Need for Action

The CCP ultimately derived from this EA will establish the overall management directions for Horicon and Fox River national wildlife refuges over the next 15 years. Both refuges currently lack long-term management plans. Instead, management is broadly guided at present by general Service policies, by interpreting the official purposes for which each refuge was created, and by short-term, step-down management plans.

This EA will present three management alternatives for the future of Horicon NWR and two alternatives for Fox River NWR. For each refuge, the preferred alternative will be selected based on its ability to meet identified goals. These goals may also be considered as the primary need for action. Goals for the refuges were developed by the planning team and encompass all aspects of refuge management, including wildlife management, habitat management, and public use. Each of the management alternatives for the refuges described in this EA will be able to at least minimally achieve these goals.

1.3.1 Horicon National Wildlife Refuge Goals

Wildlife – Protect, restore, and maintain a diversity of wildlife species native to habitats historically found on the Refuge, with special emphasis on Service Regional Conservation Priority Species.

Habitat – Provide a diverse mosaic of wetland, upland, and riverine habitats that meet the needs of Service priority species dependent upon them through habitat preservation, restoration, and management.

People – Provide quality wildlife-dependent recreational and environmental education opportunities to a diverse audience. These activities will promote understanding, appreciation, and support for Horicon National Wildlife Refuge, the National Wildlife Refuge System, and wildlife conservation.

1.3.2 Fox River National Wildlife Refuge Goals

Wildlife – Protect, restore, and maintain a diversity of wildlife species native to habitats historically found in the Upper Fox River Watershed, with special emphasis on Service priority species, through habitat preservation, restoration, and management.

Habitat – Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands.

People – Provide quality visitor services compatible with the purposes for which the Refuge was established and/or the mission of the Refuge System. These wildlife-dependent activities will promote an understanding and appreciation of the naturally functioning landscape and the Service's management efforts on the Refuge.

1.4 Decision Framework

The Regional Director for the Great Lakes-Big Rivers Region (Region 3 of the U.S Fish and Wildlife Service) will need to make two decisions based on this EA: (1) select an alternative for each refuge, and (2) determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS). For Horicon NWR, the planning team has recommended Alternative 2 ("Restoring Natural Watercourses") to the Regional Director. Coincidentally, for Fox River NWR, the team also recommends Alternative 2 ("Historic Habitat Conditions and Enhanced Visitor Services") to the Regional Director. The Draft CCP was developed for implementation based on these recommendations.

1.5 Authority, Legal Compliance, and Compatibility

The National Wildlife Refuge System includes federal lands managed primarily to provide habitat for a diversity of fish, wildlife and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes for Horicon NWR were derived from the Migratory Bird Conservation Act of 1929. Fox River NWR was established in 1977 under two different legal authorities: the Migratory Bird Conservation Act and the Fish and Wildlife Act of 1956. The appendices of the Draft CCP contain a list of the key laws, orders and regulations that provide a framework for the proposed action.

1.6 Scoping of the Issues

The CCP planning process began in January 2005 with a kickoff meeting between Refuge staff and regional planners from the Service's office in the Twin Cities. The participants in this "internal scoping" exercise reviewed the Horicon and Fox River NWR vision statements and goals, existing baseline resource data, planning documents and other refuge information. In addition, the group identified a preliminary list of issues, concerns and opportunities facing the refuges that would need to be addressed in the CCP.

A list of required CCP elements such as maps, photos, and GIS data layers was also developed at this meeting and during subsequent e-mail and telephone communications. Concurrently, the group studied federal and state mandates plus applicable local ordinances, regulations, and plans for their relevance to this planning effort. Finally, the group agreed to a process and sequence for obtaining public input and a tentative schedule for completion of the CCP. A Public Involvement Plan was drafted and distributed to participants immediately after the meeting.

Internal scoping continued with a meeting at the Regional Office in Fort Snelling, Minnesota in March 2005. Staffers from Region 3, including supervisors, planners, and biologists covering wildlife/habitat and migratory birds joined Horicon's Refuge Manager for a discussion on the issues, public response and a number of considerations related to the CCP.

Public input was encouraged and obtained using several methods, including open houses, written comments during a public scoping period, issue-based focus groups, and personal contacts. Initial public scoping for the Horicon and Fox River National Wildlife Refuge CCP began in March 2005 with a series of open house events held in Montello (Fox River), Waupun and Mayville, Wisconsin. Turn-out was light with approximately 25 people in total attending.

Those interested in making written comments had until April 15, 2005 to submit them. Comments could be sent by U.S. mail, e-mail, or via the Horicon planning website on the Internet. Approximately 20 comment forms and other written comments were submitted to the Refuge during the scoping process.

On June 1-2 (Horicon) and June 7 (Fox River), 2005, all-day public focus group workshops were held to obtain more detailed input on the issues and opportunities identified in preliminary scoping and to begin development of alternatives. Twenty-eight people, representing Wisconsin DNR, Refuge staff, conservation organizations, neighboring communities, Refuge users, and other stakeholders attended these discussions.

1.6.1 Horicon NWR Issues, Concerns and Opportunities

The following list of issues was generated by internal Refuge scoping, public open house sessions and focus group workshops:

1.6.1.1 Habitat Management

- Upland habitat restoration and management
- Invasive plant species
- Prescribed burning

- Land acquisition (authorized boundary and adjustments)
- Off-refuge involvement and external threats (i.e. watershed protection)

1.6.1.2 Water Management

- Water control structures are inadequate to manage water
- Water quality is compromised by sedimentation and contaminants
- Watershed vs. Marsh vs. Refuge management emphasis

1.6.1.3 Wildlife Management

- Nuisance fish and wildlife control
- Non-game species
- Threatened and endangered species

1.6.1.4 Public Use

- Deer hunting
- Waterfowl hunting
- Upland game hunting
- Fishing
- Wildlife observation
- State Highway 49 issues
- Visibility of Horicon NWR as a National Resource
- Miscellaneous forms of motorized and non-motorized recreation (e.g. hiking, bicycling, cross-country skiing, canoeing)
- Road network, auto tour route, parking
- Visitor Center
- Visitor access (increase, current level adequate, no access)
- Other facilities
- Outreach message (i.e. biological benefits and ecotourism benefits of refuge)
- Environmental education with schools and local communities

1.6.1.5 Cultural Resources

- Protection of cultural resources

1.6.2 Fox River NWR Issues, Concerns and Opportunities

The following list of issues was generated by internal Fox River NWR scoping, public open house sessions and the focus group workshop:

1.6.2.1 Wildlife Management

- Management for nesting and staging Sandhill Cranes

1.6.2.2 Habitat Management

- Historic habitat restoration
- Monitoring habitat restoration success
- Refuge inholdings and cooperative work with neighbors
- Additional land conservation

1.6.2.3 People

- Deer Hunting
- Additional hunting for small game and Wild Turkey
- Fishing access
- Potential Ice Age Trail crossing
- Law enforcement limitations
- On-site environmental education and interpretation

1.6.2.4 Administration and Logistics

- Refuge staffing and location
- Volunteers

1.6.2.5 Cultural Resources

- Protection of cultural resources

Chapter 2: Description of the Alternatives

2.1 Formulation of Alternatives

The CCP planning team developed management alternatives for both of the refuges based on the issues, concerns and opportunities raised during the CCP scoping process. The issues that are discussed came from individuals, local citizens and officials, cooperating agencies, conservation organizations and Refuge staff. Summaries of the three alternatives are provided in Table 1 on page 114 and Table 2 on page 128. The following management alternatives were developed to generally fit within the current Refuges' budget. In other words, the alternatives were formulated under the assumption that a large budget increase for Refuge operations is unlikely during the life of the plan. If an alternative calls for one program to increase in size or scope other Refuge programs may need to be reduced. However, the alternatives do consider the possibility of new private resources (volunteers, grant funds, etc.) and a modest refuge program and/or staff funding increase.

2.2 Horicon National Wildlife Refuge

The three management alternatives were developed to address most of the issues, concerns, and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in five broad issue categories:

Refuge Habitat: What is an appropriate mix of habitats – upland, wetland, open water, mudflats, forest, brush, grassland, etc. – within this ecological zone in the 21st century, and what level of habitat restoration and maintenance is feasible given the constraints of funding and ecological succession?

Water Management: How can the Refuge best manage impoundment water levels and their timing, including drawdowns and full pools, to accommodate multiple and competing objectives and constraints with regard to habitats, nesting, migration, resting, and feeding?

Landscape and Watershed: How can we engage with the agricultural community and land developers to reduce sediment load and contaminants in the marsh? What changes in the surrounding landscape threaten Refuge resources and how can we mitigate the impacts?

Wildlife Management: Should the Refuge conduct nuisance wildlife control, and are appropriate resources allocated to non-game species? What is the effect of desired habitat conditions on wildlife populations?

Visitor Services: Should additional wildlife-dependent recreation opportunities be made available or are the existing opportunities for wildlife observation and photography, hunting, environmental education and interpretation adequate?

2.2.1 Alternative A: Current Management Direction (No Action)

Horicon NWR's Current Direction Alternative manages water impoundments to provide a variety of water conditions for waterbirds including ducks, geese, shorebirds, and wading birds during spring, summer, and fall. Water management is achieved on 17 impoundments or approximately 17,000 acres of wetland habitat. Nearly all of the Refuge uplands, or 5,000 acres, are being restored and maintained as open grasslands and oak savanna to benefit nesting

grassland birds and waterfowl. These habitat types were found in the area during the early 1800's, prior to European settlement. Trees along old fences and lanes are being removed in order to increase the grassland parcel sizes. Invasive plant species are controlled using a variety of chemical, mechanical and biological methods. Woodlands are being managed through thinning and/or removal of invasive species in order to maintain the health of the stands.

Landscape and watershed involvement by Service employees is limited due to staffing constraints but includes managing FmHA easements, Partners for Fish and Wildlife projects, and participation on inter-agency teams, and other partnership efforts.

All six of the wildlife-dependent recreation uses allowed on the National Wildlife Refuge System are encouraged and take place at Horicon NWR. Visitor services under the Current Direction Alternative are provided by a variety of on-Refuge environmental education programs, auto-tour routes, annual open houses, foot trails, visitor center, a floating boadwalk, and observation platforms. The hunting program consists of a firearms and archery deer season and an upland small game season. Fishing opportunities include bank fishing at three designated sites. Off-Refuge outreach by Refuge staff includes school talks, radio programs, informational kits, and displays at events.

2.2.2 Alternative B: A Free-Flowing Rock River (Preferred Alternative)

This alternative would seek to re-establish a braided river system flowing into the north end of the Horicon Marsh. The radial gate would remain open so that the marsh is managed as an open system. Water management would continue on the 16 sub-impoundments.

Existing and newly-acquired Refuge uplands acres would continue to be restored and maintained as open grasslands and oak savanna, which is typical of habitat types prior to European settlement and/or represents a declining and rare habitat type. Trees along old fences and lanes would be removed in order to increase the grassland parcel sizes. Invasive plant species would be controlled using a variety of chemical, mechanical and biological methods. Woodlands would be managed through thinning or removal of invasives in order to maintain the health of the stand.

Landscape and watershed involvement by staff and partners would be increased to reduce sedimentation rate and water quality in the Horicon Marsh. Strategies would include personal contact with the agricultural community and other landowners by non-government personnel, increased Partners for Fish and Wildlife projects in the watershed, and participation on inter-agency teams, and other partnership efforts.

All six of the wildlife-dependent recreation uses allowed on the National Wildlife Refuge System would take place at Horicon NWR. Hunting, fishing, wildlife observation, and photography opportunities would all increase. Visitor services would be provided through a variety of on-Refuge environmental education programs, auto-tour routes, annual open houses, foot trails, visitor center, a floating boardwalk, and observation platforms. Community outreach, including school talks, teacher workshops, informational kits, and displays at events, would increase with new staff and volunteer capabilities.

2.2.3 Alternative C: The Big Pool

Alternative C would seek to manage the majority of Horicon Marsh, approximately 10,845 acres, as one large waterbody. The main dike would be removed and the natural sinuosity of the Rock River would be encouraged. The removal of the southern dam, operated by the WIDNR, would also be explored. Water management control would still exist on 16 sub-impoundments or approximately 5,000 acres of wetland habitat.

The problem of marsh sedimentation would be solved under this alternative by dredging the main channel. The nutrient-rich dredge spoil could be sold to farmers within the watershed to enhance depleted cropland soils. Essentially, the sediments would be put back to their source. In addition, new soil erosion prevention measures would be put into place where spoil is distributed in order to slow the rate of future sedimentation in the Horicon Marsh.

The remainder of management direction is the same as Alternative B.

2.2.4 Alternatives Considered But Not Developed

2.2.4.1 Pre-settlement Conditions

The CCP planning team also considered the alternative of returning the Horicon Marsh to its original, pre-settlement condition. Attempting to restore pre-settlement conditions would mean restoring it to the state it was in prior to large-scale settlement and draining by Euro-American homesteaders beginning in the 1840s and continuing into the early 20th cen-

tury. To implement this alternative and meet its goals, all impoundments and dikes would have to be removed and ditches filled in.

The planning team dismissed this alternative on the grounds that it would be very costly, controversial, and would severely disrupt long-established drainage and water management institutions and infrastructure not under control of the Refuge. This approach may also be contrary to the established purposes of Horicon NWR "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act).

While reverting to pre-settlement conditions would undoubtedly benefit some wildlife, probably those species that favor shrub/scrub and open water, it would not allow the Refuge to meet its primary obligation to serve as a stopover and breeding ground for migratory birds.

2.2.4.2 New Dikes and Water Control Structures

The planning team also considered the concept of creating impoundments throughout the Main Pool by strategic placement of new dikes and water control structures. This alternative was considered but not developed further due to its extreme construction and maintenance costs.

2.2.5 Comparison of Management Alternatives

Table 1 compares each of the three proposed management alternatives by objective and strategy.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Goal 1. Wildlife – Protect, restore, and maintain a diversity of wildlife species native to habitats historically found on the Refuge, with special emphasis on Service Regional Conservation Priority Species.		
Objective 1.1: Deer Population. Same as Alternative B.	*Objective 1.1: Deer Population.* Annually, maintain Refuge deer population consistent with State Management Units 68A and 68B at a density of 15-20 deer per square mile based on annual winter surveys.	*Objective 1.1: Deer Population.*Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B except #2.	Strategies: ■ Change deer hunting opportunities by expanding the current Refuge deer season to include a later archery and muzzleloader hunt to commensurate with the state seasons, with a delayed opening of December 1 on designated dikes north of Ledge Road. ■ Conduct informal survey /interact with hunters and listen to feedback on ways to improve hunt. ■ Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed. ■ Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR.	Strategies: ■ Employ same strategies as Alternative B.
Objective 1.2: Wildlife-Vehicle Collisions. For the 15-year duration of the CCP, do not allow wildlife mortality from wildlife-vehicle collisions to exceed 2006 levels.	*Objective 1.2: Wildlife-Vehicle Collisions.* By 2012, reduce wildlife losses as the result of auto collisions by 50% on Highway 49.	*Objective 1.2: Wildlife-Vehicle Collisions.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B except #1.	Strategies: ■ Support a reroute of State Highway 49 leaving the existing road for bird watching and recreation. ■ Promote lowering the speed limit along State Highway 49 or at a minimum, promote compliance of the existing speed limit through increased law enforcement patrol. *Continued next page*	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
	Strategies (Continued) ■ Provide mitigation measures along State Highway 49 to reduce the number of roadkill. These measures may include providing simple barriers or fences along the road where appropriate, constructing coffer dams at strategic locations that allow animals to cross under the road through existing culverts, placing poles or other similar tall barriers along the highway to discourage birds from flying into the path of vehicles. ■ Pursue funding sources to implement the above mitigation measures and/or to participate in research to determine the best measure.	
Objective 1.3: Nuisance Fish and Wildlife Species Same as Alternative B.	*Objective 1.3: Nuisance Fish and Wildlife Species*. Annually, reduce the number of carp and predators on the Refuge to improve wetland habitat conditions and protect nesting migratory birds. Annually evaluate the muskrat population to determine the need for trapping on dike and/or marsh units.	*Objective 1.3: Nuisance Fish and Wildlife Species* Same as Alternative B.
Strategies: ■ Employ strategies #2, #3, and #4 from Alternative B.	Strategies: ■ Implement new research techniques such as using pheromones for carp control. ■ Use chemical pesticides periodically (i.e. rotenone) to control carp. ■ Continue use of carp trap and look for improved ways of disposing of the carp such as commercial fisherman, mink farms, etc. ■ Conduct Refuge trapping program as necessary and as water conditions allow. ■ Explore other options, along with trapping, to reduce the number of predators (such as hunting of predators, providing incentives for taking a predator, expanding the trapping season, making upland Refuge trapping regulations less restrictive). ■ Remove woody vegetation, old fencerows, and other structures in order to decrease predator habitat.	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Objective 1.4: Regional Conservation Priority (RCP) Species. RCP species will receive no special consideration in Refuge management decisions.	*Objective 1.4: Regional Conservation Priority (RCP) Species.* Within 15 years of CCP approval, 50 percent of the Region 3 RCP species associated with historically occurring habitats will be present on the Refuge.	*Objective 1.4: Regional Conservation Priority (RCP) Species.* Same as Alternative B.
Strategies: ■ Monitor population according to the wildlife inventory plan but with no emphasis on RCP species.	Strategies: ■ Monitor population trends according to the wildlife inventory plan. ■ Support research activities that are directed toward these species. ■ Continue water level management to provide a mosaic of water level depths for migrating waterfowl to utilize during spring and fall. ■ Provide mudflats for migrating shorebirds in Early May. ■ Once nesting has been initiated, keep stable water levels to prevent flooding nests. ■ Remove trees and brush that are encroaching on grassland fields. ■ Conduct rotational burning as outlined in the Fire Management and Habitat Management Plans to provide a mosaic of burned and unburned habitat. ■ Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches. ■ Restore Oak Savanna areas.	Strategies: ■ Employ same strategies as Alternative B.
Goal 2. Habitat – Provide a diverse mosaic of wetland, upland, and riverine habitats that meet the needs of Service priority species dependent upon them through habitat preservation, restoration, and management.		
Objective 2.1: Maintenance of current water and marsh management regime. For duration of CCP, maintain existing water management regime and water control infrastructure, including dikes and water control structures.	*Objective 2.1: Restoration of Natural Watercourses.* By 2015, re-establish a more natural water flow throughout the Federal portion of the Horicon Marsh, flushing sediments and chemical contaminants through the marsh system, and reducing cattail growth by 20 percent from 2005 levels.	*Objective 2.1: Creation of a "Big Pool."* By 2015, manage the majority of Horicon Marsh as one large waterbody by removing the Main Dike to encourage the natural sinuosity of the Rock River.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Strategies: ■ Maintain existing radial gate on Main Dike and continue present operation of the gate. ■ Continue drawdowns of Main Pool every 5-6 years to control cattails and sediment accumulation.	Strategies: ■ Replace the damaged radial gate on the Main Dike just east of the present location. The water control structure would be kept open most of the time to allow the removal of the daily influx of phosphorus and sediments and allow a braided river channel throughout the Main Pool. ■ Add a spillway, with a water control structure, at the historic river channel site. The purpose of the spillway would be to release water during heavy rain events. The highest water level achievable in the Main Pool would be dictated by the level of the spillway. ■ Remove or breech spoil banks and plug the lateral drainage ditches to increase water level, reduce side drainage, and increase sheet flow. ■ Evaluate the Wildlife Urban Interface levee on the west side of the Refuge for possible reconstruction or rehabilitation to improve hydrology, but without negatively effecting fire control.	Strategies: ■ Explore removal of the southern Horicon Marsh dam operated by WIDNR. ■ Continue to practice water management control on 16 sub-impoundments or approximately 5,000 acres of wetland habitat. ■ Solve the problem of marsh sedimentation by dredging the main channel. ■ Nutrient-rich dredge spoil could be sold to farmers within the watershed to enhance depleted cropland soils. ■ Work with farming community to implement new soil erosion prevention measures where spoil is distributed in order to slow the rate of future sedimentation in the Horicon Marsh.
Objective 2.2: Managing Water Impoundments. Same as Alternative B.	*Objective 2.2: Managing Water Impoundments.* Annually, manage water impoundments as a complex of basins to provide wetland diversity and improve water quality for maximum benefits to migrating and breeding birds. Management will be within the capabilities of the wetland system as a whole and individual impoundments will be drawn down on a 3 to 10-year rotation.	*Objective 2.2: Managing Water Impoundments.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B.	Strategies: ■ Draw down Main Pool when the opportunity exists and when weather conditions permit. The emphasis is on maintaining a diverse aquatic plant community while reducing sedimentation and pollutants. ■ Draw down selective sub-impoundments in a cycle of 4 to 6 years, based on the annual water management plan. Burning may be prescribed to occur if feasible during the drawdown phase. ■ Provide stable water levels from May 1 to July 15 in a variety of cover types for over-water nesting birds. *Continued next page*	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
	Objective 2.2: Managing Water Impoundments. Strategies (Continued) ■ Lower water levels 6 to 12 inches in some impoundments during the fall to provide shallow foraging sites for migrating waterfowl. ■ Draw down selective sub-impoundments each year to expose mudflats for migrating shorebirds.	
Objective 2.3: Invasive Species Control. For duration of CCP, prevent infestations of invasive plant species from spreading beyond 2006 levels.	*Objective 2.3: Invasive Species Control.* By 2020, reduce invasive plant species locations by 50 percent from 2006 levels and make every attempt to eliminate new infestations as they occur.	*Objective 2.3: Invasive Species Control.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B except #6.	Strategies: ■ Document the location and size of invasive populations with GIS mapping. ■ Use biological control when available as a preferred strategy. ■ Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed. ■ Use fire and grazing in controlling some invasive plant species. ■ Monitor the infestations and effectiveness of control measures. ■ Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge program.	Strategies: ■ Employ same strategies as Alternative B.
Objective 2.4: Oak Savanna. For duration of CCP, maintain current area of oak savanna in the uplands to benefit regional habitat diversity.	*Objective 2.4: Oak Savanna.* By 2007, restore and maintain 100 acres of oak savanna in the uplands to benefit regional habitat diversity and grassland-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50% tree canopy closure, 5-35% relative cover of shrubs, and at least 50 percent relative cover of diverse native grasses and native forbs.	*Objective 2.4: Oak Savanna.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B.	Strategies: ■ Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps. ■ Plant native grasses and forbs (flowers) if needed.	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
	Objective 2.4: Oak Savanna. Strategies (Continued): ■ Plant oak seedlings in native grasslands in the designated oak savanna areas. ■ Control invasive and exotic plants. ■ Conduct rotational burning (prescribed fire) as outlined in the Fire Management Plan and Habitat Management Plan.	
Objective 2.5: Grasslands. For duration of CCP, maintain and manage existing area of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than five percent shrub cover, and a diverse native grass and forb species mix.	*Objective 2.5: Grasslands.* By 2008, restore and manage 500 to 1000 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than five percent shrub cover, and a diverse native grass and forb species mix.	*Objective 2.5: Grasslands.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B.	Strategies: ■ Conduct rotational burning (prescribed fire) as outlined in the Fire Management Plan and Habitat Management Plan. ■ Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower, or in combination with other techniques. ■ Use chemical treatments exclusively or in combination with other techniques. ■ Use grazing, when appropriate, exclusively or in combination with other techniques. ■ Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions.	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Objective 2.6: Sedimentation of Horicon Marsh. For duration of CCP, ensure that levels of sediments and non-point source pollutants entering the Horicon Marsh from drainages of the Rock River are no greater than 2006 levels.	*Objective 2.6: Sedimentation of Horicon Marsh.* By 2020, reduce sediments and non-point source pollutants entering the Horicon Marsh from drainages of the Rock River watershed by 50% from 2000 levels.	*Objective 2.6: Sedimentation of Horicon Marsh.* Same as Alternative B.
Strategies: ■ Increase the enrollment in cost-sharing wetland restorations and agricultural practices that improve water quality and to reduce peak flows entering Horicon Marsh by working with the Service's Partners for Fish and Wildlife program and partnerships with the Dodge County Land Conservation Department, Fond du Lac County Land and Water Conservation Department, Green Lake and Washington Counties, and NRCS. ■ Continue to provide financial and non-financial incentives to private landowners through the above partners to implement conservation measures within the south and west branches of the Rock River watershed. Non-financial incentives can include landowner recognition at public functions, news articles, and voluntary land heritage registries.	Strategies: ■ Increase the enrollment in cost-sharing wetland restorations and agricultural practices that improve water quality and to reduce peak flows entering Horicon Marsh by working with the Service's Partners for Fish and Wildlife program and partnerships with the Dodge County Land Conservation Department, Fond du Lac County Land and Water Conservation Department, Green Lake and Washington Counties, and NRCS. ■ Continue to provide financial and non-financial incentives to private landowners through the above partners to implement conservation measures within the south and west branches of the Rock River watershed. Non-financial incentives can include landowner recognition at public functions, news articles, and voluntary land heritage registries. ■ Conduct door-to-door landowner education using non-government employees and involving local industry and businesses. ■ Monitor water quality and quantity entering the Marsh in cooperation with the U.S. Geological Survey. ■ Purchase land or obtain easements from willing sellers as it becomes available within the authorized Refuge boundaries. ■ Work with water experts, such as hydrologists, groundwater specialists, and other water specialists, on the problems and solutions for the Rock River basin. ■ Cooperate with local government land use planning efforts to ensure that water quality impacts to the Refuge are considered. ■ Continue to stress the importance of water quality in public information and interpretation, and environmental education programs.	Strategies: Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Goal 3. People – Provide quality wildlife-dependent recreational and environmental education opportunities to a diverse audience. These activities will promote understanding, appreciation, and support for Horicon National Wildlife Refuge, the National Wildlife Refuge System, and wildlife conservation.		
Objective 3.1: Hunting. Annually, provide no less than 75 quality upland hunting experiences per year.	*Objective 3.1: Hunting.* Annually, provide no less than 2,000 quality upland hunting visits per year. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.	*Objective 3.1: Hunting.* Same as Alternative B.
Strategies: ■ Small game: After revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit and squirrel hunting will be maintained as they are at present. ■ White-tailed deer: Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal. ■ Continue to collect hunting data through volunteers. ■ Develop a revised and current Refuge hunting plan based on the CCP.	Strategies: ■ Small game: After revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit and squirrel hunting will be expanded to include the entire state season and following state bag limits. The season will have a delayed opening of December 1st on designated dikes north of Ledge Road. ■ White-tailed deer: Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal. ■ Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs and wording within brochures and on the Refuge web page. ■ Evaluate the restricted use hunting areas (areas D, E, and F on the Refuge hunting brochure map) for possible amendments. Changes will be reflected in the Refuge Hunt Plan. ■ Increase the visibility of Refuge law enforcement and hunter adherence to Federal and state regulations to ensure quality, ethical hunting. ■ Establish hunter and vehicle counts, through staff and volunteers, at all hunting access points to gain an index on hunting pressure and collect additional hunting data.	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Objective 3.2: Fishing. For the duration of the CCP, maintain bank fishing on the Refuge in accordance with Wisconsin State fishing regulations at three locations: Main Dike Road, Ledge Road and Peachy Road.	*Objective 3.2: Fishing.* By 2008, provide for 250 quality fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will know they were fishing on a national wildlife refuge.	*Objective 3.2: Fishing.* Same as Alternative B.
Strategies: ■ Maintain accessible fishing piers at Main Dike Road and Ledge Road. ■ Complete planning process for new access to Peachy Road bank fishing site and implement reconstruction. ■ Continue to stock game fish annually at various locations throughout the Refuge. ■ Hold one youth fishing event on the Refuge every summer in celebration of National Fishing Week.	Strategies: ■ Open all three fishing sites to ice fishing. ■ Continue to provide the annual fishing expedition for area schools, coordinated with volunteers. ■ Maintain accessible bank fishing platforms at all fishing sites. ■ Improve the parking lot at Peachy Road. Develop a site plan for placement of a kiosk; wayfinding, interpretive and regulatory signage; accessible routes; possible rest rooms; and accessible bank fishing facilities. ■ Improve access for fishing at Ledge Road and add signs at Ledge Road and Dike Road.	Strategies: ■ Employ same strategies as Alternative B.
Objective 3.3: Wildlife Observation and Photography. Provide year-round opportunities for up to 350,000 visitors annually to observe and photograph wildlife and habitat.	*Objective 3.3: Wildlife Observation and Photography.* Provide year-round opportunities for up to 400,000 visitors annually to observe and photograph wildlife and habitat.	*Objective 3.3: Wildlife Observation and Photography.* Same as Alternative B.
Strategies: ■ Continue to monitor wildlife mortality problem along Highway 49 and consider means of reducing mortality. ■ Maintain the Ternpike auto tour route season. ■ Conditions permitting, keep the Main Dike Road open year-round to vehicles, foot, and bike traffic. ■ Install two permanent or temporary photo blinds near hiking trails. ■ Provide volunteer-led programs such as the goose watches at the Highway 49 viewing area and volunteer-led bird watching tours. ■ Develop an interpretive loop trail from the visitor center.	Strategies: ■ Determine whether to develop the Highway 49 overlook/comfort station for better wildlife observation or to restore the site to upland habitat, including removal of the buildings and parking lot. This area receives little visitor use in its present state. ■ Open other specific areas of the Refuge during the March 15 to December 1 time period for wildlife observation and photography via hiking and bicycling. ■ Extend the auto tour route season to be open year round, conditions permitting. ■ Open Main Dike Road year-round, conditions permitting, to automobiles, foot, and bike traffic. ■ Open Main Dike Road west of the fishing site year-round to foot and bike traffic for wildlife observation and photography. *Continued next page*	Strategies: Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Objective 3.3: Wildlife Observation and Photography. Strategies (Continued): ■ Continue to participate in and promote public events and interpretive programs on the Refuge that focus on wildlife observation, mainly bird-watching, such as the Horicon Marsh Bird Festival, guided birding tours, and Marsh Melodies.	*Objective 3.3: Wildlife Observation and Photography.* Strategies (Continued): ■ Continue Old Marsh Road being open on weekends in June, July, and August to foot and bike traffic for wildlife observation and photography. ■ Open a specific area on the west side and east side of the Refuge for year-round wildlife observation and photography. ■ Install two permanent or temporary photo blinds on the Refuge. ■ As part of the Visitor Services Plan, the trail system will be evaluated to ensure that trails meet resource goals and are accessible to all visitors. ■ Consider developing an interpretive loop trail from the visitor center.	
Objective 3.4: Environmental Education and Interpretation. Same as Alternative B.	*Objective 3.4: Environmental Education and Interpretation.* Maintain annual onsite visitation of 2,205 students and 100 group visits (2005 level) to promote understanding and advocacy for the Horicon Marsh and the global environment.	*Objective 3.4: Environmental Education and Interpretation.* Same as Alternative B.
Strategies: ■ Continue to conduct numerous interpretive programs on and off the Refuge for ages ranging from pre-school children to adults. Primary topics will include the history of Horicon Marsh, habitat management and resource issues. ■ Continue to implement Rhythms of the Refuge program for school groups, Scouts, and civic groups. ■ Utilize trained volunteers to conduct EE on and off Refuge. ■ Continue participation in the Rolling Readers literacy program, using volunteers. ■ Continue to offer a variety of educational trunks and materials available for check-out, such as the Wildlife Discovery trunk, prairie trunk, aquatic exotics, songbird trunk and wetland trunk.	Strategies: ■ Hire an additional park ranger to serve as environmental education specialist and volunteer coordinator. ■ Train volunteers to provide tours or lessons for classrooms. ■ Construct a portable building at the Auto Tour/Hiking Trail Complex for volunteers to use during the busy season as an outpost for providing visitors information. ■ Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Hold teacher workshops to train educators to conduct their own programs. ■ Consider building an amphitheater to be used for environmental education and interpretive presentations. *Continued next page*	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
	Objective 3.4: Environmental Education and Interpretation. Strategies (Continued): ■ Purchase state-of-the-art audio visual equipment for the new visitor center auditorium where thousands of people are provided programs each year. ■ Update the exhibits and signs in the visitor center and on all kiosks. ■ Update and print new brochures.	
Objective 3.5: Community Outreach. Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 1,000 people to participate in off-site programs and exhibits; 20 teachers to participate in training programs, 250 people to volunteer at the Refuge, and 100 people to be members of a supporting friends group.	*Objective 3.5: Community Outreach.* Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 1,250 people to participate in off-site programs and exhibits; 25 teachers to participate in training programs, 250 people to volunteer at the Refuge, and 100 people to be members of a supporting Friends group.	*Objective 3.5: Community Outreach.* Same as Alternative B.
Strategies: ■ Offer training programs for teachers centered on the Refuge's place in the ecological landscape and the importance of habitat management. ■ Continue to send out monthly new releases pertaining to recreational opportunities and resource issues and maintains a website with links to: the Rhythms of the Refuge environmental education curriculum and teacher resources; news releases; current habitat conditions; historical information about the marsh; maps; regulations; and a calendar of events listing public interpretive programs. ■ Maintain a Traveler Information System (TIS) with monthly updates and also a weekly waterfowl numbers phone recording. ■ Refuge staff and volunteers will reach a wider audience by partnering with other natural resource agencies and local community service groups to offer regional educational and recreational events such as the Horicon Marsh Bird Festival, Marsh Melodies, Ducks Unlimited Outdoor Show, and many other events.	Strategies: ■ Offer training programs for teachers centered on the Refuge's place in the ecological landscape and the importance of habitat management ■ Offer training programs for teachers centered on the Refuge's place in the ecological landscape, the importance of habitat management, and the objectives in this plan. ■ Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs. ■ Participate in off-site community events. ■ Issue regular news releases and improve the Information Dissemination System for distributing news releases. ■ Maintain and update a Refuge website with current information about Refuge management and events. ■ Increase community partnerships. ■ Work closely with the Friends of Horicon NWR to foster understanding and mutual priorities. ■ Develop outreach plans for important resource issues.	Strategies: ■ Employ same strategies as Alternative B.

Table 1: Comparison of Objectives by Management Alternative For Horicon National Wildlife Refuge

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternatiave C: The Big Pool
Objective 3.6: Protection of Cultural Resources. Same as Alternative B.	*Objective 3.6: Protection of Cultural Resources.* Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. (The intent of this objective is to cover Section 106 of the National Historic Preservation Act and Section 7(e)(2) of the FWS Improvement Act.)	*Objective 3.6: Protection of Cultural Resources.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B.	Strategies: ■ Initiate a Cultural Resources Management Plan within 5 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.) ■ Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.) ■ Develop an oral cultural history to preserve the "community memory" about the area.	Strategies: ■ Employ same strategies as Alternative B.
Objective 3.7: Cultural Resources Appreciation. Same as Alternative B.	*Objective 3.7: Cultural Resources Appreciation.* Seventy percent of visitors will understand and appreciate the cultural history of the Refuge.	*Objective 3.7: Cultural Resources Appreciation.* Same as Alternative B.
Strategies: ■ Employ same strategies as Alternative B.	Strategies: ■ Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time.	Strategies: ■ Employ same strategies as Alternative B.

2.3 Fox River National Wildlife Refuge

The Fox River NWR CCP planning team developed two management alternatives based on the issues, concerns and opportunities raised during the CCP scoping process. The issues that are discussed came from individuals, local citizens and officials, cooperating agencies, conservation organizations and Refuge staff. The management alternatives were developed to address most of the issues, concerns, and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in three issue categories:

Refuge Habitat: What is an appropriate mix of habitats within this ecological zone in the 21st century, and what level of habitat restoration and maintenance is feasible given the constraints of funding and ecological succession?

Visitor Services: The Refuge is currently closed to public use except during the deer hunting season. Should additional wildlife-dependent recreation opportunities be made available beyond the existing annual deer hunt?

Facilities and Administration: What types of facilities will be required if the Refuge is opened to more uses in the future? How will the Refuge be administered after current restoration work is complete?

2.3.1 Alternative A: Current Management Direction (No Action)

The Current Direction Alternative continues with ongoing restoration and management activities on Refuge wetlands and uplands. The goal of restoration on the Refuge is to create a mosaic of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands. These habitats would be managed to perpetuate a variety of native plant and wildlife species, especially those of priority to the Service.

The primary Refuge habitat consists of 779 acres of wetlands along the Fox River. The wetlands are composed primarily of sedge meadow, although fens, shallow marsh, and wet prairie are present as well. Approximately 375 acres of the wetland has never been drained; the remainder was drained in 1978 before the Service purchased the land. The 375 acres of undrained wetlands would continue to be protected under the Current Direction Alternative. The hydrologic regime and other historic habitat conditions within the 404 acres of drained wetlands would be restored and maintained through ditch plugging and filling, prescribed fire and subsequent monitoring.

Historically, the uplands at Fox River NWR consisted of oak savanna and dry prairie meadows. The oak savanna history is evidenced by the presence of open-grown mature oaks that are now part of a closed canopy forest. Nearly all of the Refuge uplands, or 225 acres, are being restored and maintained as open grasslands and oak savanna to benefit nesting grassland birds, birds dependent upon oak savanna, and waterfowl. These habitat types were found in the area during the early 1800's, prior to European settlement. Invasive plant species are controlled using a variety of chemical, mechanical and biological methods.

Visitor services under the Current Direction Alternative would be provided solely through an annual deer hunt. Hunting would continue to be used as a management tool to maintain an optimal white-tailed deer population. The Refuge would continue to be closed to visitors the remainder of the year.

2.3.2 Alternative B: Historic Habitat Conditions and Enhanced Visitor Services

Alternative B would include more opportunities for wildlife-dependent recreation on the Refuge than Alternative A, including additional hunting opportunities, the initiation of a fishing program, new wildlife observation and photography opportunities, and the beginning of an environmental education and interpretation program. Habitat restoration and management would continue as in the Current Direction Alternative to perpetuate a variety of native plant and wildlife species, especially those of priority to the Service.

Deer hunting would continue at current levels and a spring season for Wild Turkeys would be initiated. Ice fishing would be allowed on Refuge water bodies. The proposed Wisconsin Ice Age State and National Trail segment may cross Refuge lands and serve as access for wildlife observation and photography, hunting, and environmental education and interpretation. The Refuge would be open seasonally for wildlife observation and photography and environmental education and interpretation. Refuge staffing would remain minimal, although we would seek to add a part-time position dedicated to the Refuge. Environmental education for school groups would be encour-

aged based on staff availability and interpretive displays placed on the Refuge's two kiosks.

2.3.3 Alternatives Considered but not Developed

The planning team discussed two additional concepts for managing the Refuge. One concept would be to create water impoundments within the low-lying area along the Fox River. Impoundments would allow for greater control of water depth to allow for moist soil management to benefit a variety of waterfowl and shorebirds. However, aside from being costly, impoundments would destroy natural sedge meadows; an increasingly rare habitat type.

The second concept would be to suspend current restoration efforts and allow the land to revert to pre-existing conditions on its own through "natural succession" of this perturbed ecosystem. Few or none of the ditches would be filled and the altered hydrology would remain. Forested uplands would succeed back to a dense canopy with a heavy understory of shrubs and small trees. Invasive plant species would continue to spread, unchecked by control measures. This concept was not explored because it does not meet the habitat goal of the Refuge to re-establish historic vegetative conditions.

2.3.4 Comparison of Management Alternatives

Table 2 compares both of the proposed management alternatives by objective and strategy.

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Goal 1: Wildlife – Protect, restore, and maintain a diversity of wildlife species native to habitats historically found in the Upper Fox River Watershed, with special emphasis on Service priority species, through habitat preservation, restoration, and management.	
Objective 1.1: Deer Population. Annually, maintain a deer population at a density of 15-20 deer per square mile to reduce damage to Refuge habitats and maintain a healthy herd.	*Objective 1.1: Deer Population.* Same as Alternative A.
Strategies: ■ Continue to use regulated hunting every fall during all regular state seasons, including archery, gun, muzzleloader, and special hunts. ■ Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed. ■ Conduct informal survey/interact with hunters and listen to feedback on ways to improve the hunt. ■ Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR.	Strategies: ■ Employ same strategies as Alternative A.
Objective 1.2: Sandhill Cranes. Annually, maintain habitat to support 8 pairs of nesting Sandhill Cranes and more than 400 migratory cranes daily during spring and fall.	*Objective 1.2: Sandhill Cranes* Same as Alternative A.
Strategies: ■ Monitor Sandhill Crane use of the Refuge. ■ Maintain the open structural component in prairies and oak savannas on the Refuge as Sandhill Cranes forage in these habitats.	Strategies: ■ Employ same strategies as Alternative A.
Objective 1.3: Regional Conservation Priority (RCP) Species. RCP species will receive no special consideration in Refuge management decisions.	*Objective 1.3: Regional Conservation Priority (RCP) Species.* Within 15 years of CCP approval, 50 percent of the Region 3 RCP species associated with historically occurring habitats will be present on the Refuge.
Strategies: ■ Monitor population trends through point counts, waterfowl surveys, breeding bird surveys, etc. according to the wildlife inventory plan but with no emphasis on RCP species.	Strategies: ■ Monitor population trends according to the Wildlife Inventory Plan. ■ Support research activities that are directed toward these species. Continue restoring natural hydrology to benefit waterfowl and other birds by filling/plugging remaining ditches. ■ Monitor effects of ditch plugging on vegetation and bird use. ■ Remove trees and brush that are encroaching on grassland fields. ■ Continue burn program rotation of every 4-8 years to provide a mosaic of burned and unburned habitat. ■ Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches. ■ Restore oak-savanna areas.

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Goal 2: Habitat – Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands.	
Objective 2.1: Oak Savanna. By 2010, restore and maintain 90 acres of oak savanna in the uplands to benefit regional habitat diversity and savanna-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50 percent tree canopy closure, 5-35 percent relative cover of shrubs, and at least 25 percent relative cover of diverse native grasses and native forbs.	*Objective 2.1: Oak Savanna.* Same as Alternative A.
Strategies: ■ Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps. ■ Plant native grasses and forbs (flowers) if needed. ■ Plant oak seedlings in native grasslands in the designated oak savanna areas. ■ Control invasive and exotic plants. ■ Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan.	Strategies: ■ Employ same strategies as Alternative A.
Objective 2.2: Grasslands. By 2008, restore and manage 115 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit wildlife species that depend on this habitat type, including Henslow's sparrow, Bobolink, Grasshopper sparrow, and Eastern meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than 5 percent shrub cover, and a diverse native grass forb species mix.	*Objective 2.2: Grasslands.* Same as Alternative A.
Strategies: ■ Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan. ■ Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower, or in combination with other techniques. ■ Use chemical treatments exclusively or in combination with other techniques. ■ Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions.	Strategies: ■ Employ same strategies as Alternative A.
Objective 2.3: Fen and Wet Prairie. By 2010, restore and maintain annually 100 acres of fen and wet prairie habitats with a shrub coverage of 5-25 percent to benefit Regional Conservation Priority species dependent on this habitat type such as Sedge Wren, Bell's Vireo, and Alder Flycatcher, as well as a variety of state endangered and threatened plants.	*Objective 2.3: Fen and Wet Prairie.* Same as Alternative A.

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Strategies: ■ Attempt to burn each unit in early fall as outlined in the Fire Management Plan to control brush. ■ Use mechanical treatments such as hand cutting or mowing over the ice when burning is not effective for controlling brush. ■ Use localized chemical treatments on the stumps in conjunction with the mechanical treatments. ■ Control other invasive and exotic plants.	Strategies: ■ Employ same strategies as Alternative A.
■ *Objective 2.4: Sedge Meadow and Shallow Emergent Marsh.* Annually, maintain 600 – 650 acres of sedge meadow and shallow emergent marsh to benefit Regional Conservation Priority species dependent on this habitat type such as the Yellow Rail, American Bittern, Sedge Wren, Mallard, Canada Goose, and Sandhill Crane, among others.	*Objective 2.3: Fen and Wet Prairie.* Same as Alternative A.
Strategies: ■ Monitor the hydrological and plant species composition and structure changes associated with restoration activities. ■ Practice adaptive management in restored areas via maintaining restored conditions if habitat goals are achieved or modifying techniques if goals are not achieved. The ultimate goal would be to achieve historical site conditions. ■ Conduct rotational burning (prescribed fire) as outlined in the *Fire Management Plan* and the *Habitat Management Plan.*	Strategies: ■ Employ same strategies as Alternative A.
Objective 2.5: Exotic and Invasive Species Control. Inventory and actively reduce invasive plant species throughout the Refuge. By 2015, reduce invasive species locations by 50 percent from 2005 levels and make every attempt to eliminate new infestations as they occur.	*Objective 2.5: Exotic and Invasive Species Control.* Same as Alternative A.
Strategies: ■ Document the location and size of invasive populations on the Refuge with GIS mapping. ■ Use biological control when available as a preferred strategy. ■ Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed. ■ Use fire in controlling some invasive species. ■ Monitor the infestations and effectiveness of control measures. ■ Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge.	Strategies: ■ Employ same strategies as Alternative A.

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Objective 2.6: Land Conservation. By 2020, conserve sufficient lands adjacent to the Refuge to ensure the restoration and protection of Refuge wetlands.	*Objective 2.6: Land Conservation.* Same as Alternative A.
Strategies: ■ Acquire in fee title or in easement from willing sellers 200 acres of land surrounding the Refuge. ■ Improve cooperative work with adjacent landowners, who have similar habitats and wildlife via sharing technical advice and referring them to the FWS's Partners for Fish and Wildlife program, USDA's programs, or other NGO's for assistance in performing conservation practices on their lands.	Strategies: ■ Employ same strategies as Alternative A.
Goal 3: People – Provide quality visitor services compatible with the purposes for which the Refuge was established and/or the mission of the Refuge System. These wildlife-dependent activities will promote an understanding and appreciation of the naturally functioning landscape and the Service's management efforts on the Refuge.	
Objective 3.1: Hunting. Maintain current deer hunting opportunities on the Refuge for area residents.	*Objective 3.1: Hunting.* Provide no less than 100 quality upland hunting visits for area residents per year. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.
Strategies: ■ Maintain current public awareness of Refuge hunting opportunities through existing maps, signs, and wording within brochures and on the Refuge web page. ■ Maintain current Refuge law enforcement and hunter adherence to federal and state regulations. ■ Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal.	Strategies: ■ Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs, and wording within brochures and on the Refuge web page. ■ Increase the visibility of Refuge law enforcement and hunter adherence to federal and state regulations to ensure quality, ethical hunting. ■ Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal.
Objective 3.2: Fishing. Maintain current closure of Refuge to fishing.	*Objective 3.2: Fishing.* By 2008, provide for 75 fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will be aware that they were fishing on a national wildlife refuge.
No strategies required; Fox River NWR closed to all fishing.	Strategies: ■ Provide fishing on designated areas of the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan. ■ Monitor litter and provide signage to educate anglers to always carryout trash.
Objective 3.3: Wildlife Observation and Photography. Unsupervised wildlife observation and photography continue to be prohibited at Fox River NWR.	*Objective 3.3: Wildlife Observation and Photography.* Provide limited opportunities for 200 visitors annually to observe and photograph wildlife and habitat.
■ No strategies required; Fox River NWR closed to all wildlife observation and photography.	Strategies: ■ Provide wildlife observation and photography on designated areas of the Refuge during given times of the year where it does not interfere with wildlife. ■ Consider establishment of a segment of the Wisconsin Ice Age State and National Trail through the Refuge.

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Objective 3.4: Environmental Education and Interpretation. Provide for annual onsite visitation of 100 students and 2-4 group visits.	*Objective 3.4: Environmental Education and Interpretation.* Same as Alternative A
Strategies: ■ Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes. ■ Train educators to conduct their own programs (via teacher workshops).	Strategies: ■ Provide educational opportunities based on the objectives in this plan, so that the public will understand future management activities and provide support. For example, a person who understands the benefits of controlling invasive species will be more likely to support Refuge decisions. ■ If feasible, train volunteers to provide tours or lessons for classrooms. ■ Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes. ■ Train educators to conduct their own programs (via teacher workshops). ■ If necessary, redesign or enlarge both Refuge parking lots to accommodate school buses.
Objective 3.5: Community Outreach. Maintain existing awareness of Refuge management within surrounding areas by continuing outreach efforts to two local charter schools.	*Objective 3.5: Community Outreach.* Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 200 students to participate in programs, four teachers to participate in training programs and 10 people to volunteer at the Refuge.
Strategies: ■ Continue to provide environmental education to two nearby charter schools. ■ Continue to provide tours of Refuge habitats to groups from these two schools. ■ Continue to use students from two charter schools in habitat restoration projects on the Refuge.	Strategies: ■ Improve outreach to Refuge neighbors about the benefits of habitat prescriptions such as tree cutting, invasive species control, and prescribed fire. ■ Offer training programs for teachers centered on the Refuge's place in the ecological landscape, the importance of habitat management, and the objectives in this plan. ■ Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs. ■ Participate in off-site community events. ■ Issue regular news releases and improve the Information Dissemination System for distributing news releases. ■ Maintain and update a Refuge website with current information about Refuge management and events. ■ Increase community partnerships. ■ Develop outreach plans for important resource issues and improve the outreach to the Refuge neighbors about habitat management (i.e., tree cutting, invasive species control, prescribed fire).

Table 2: Comparison of Objectives by Management Alternative for Fox River NWR

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Objective 3.6: Protection of Cultural Resources. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. (The intent of this objective is to cover Section 106 of the National Historic Preservation Act and Section 7(e)(2) of the FWS Improvement Act.)	*Objective 3.6: Protection of Cultural Resources.* Same as Alternative A.
Strategies: ■ Initiate a Cultural Resources Management Plan within 3 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.) ■ Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.) ■ Develop an oral cultural history to preserve the "community memory" about the area.	Strategies: ■ Employ same strategies as Alternative A.

Chapter 3: Affected Environment

This chapter includes an overview of the affected environments of Horicon and Fox River national wildlife refuges. More detail is contained in Chapter 3 of the CCP itself.

3.1 Horicon National Wildlife Refuge

3.1.1 Introduction

Horicon National Wildlife Refuge was established in 1941 for the protection and conservation of migratory waterfowl. It is located on the west branch of the Rock River in southeastern Wisconsin, 43 miles west of Lake Michigan and 65 miles northwest of Milwaukee.

Horicon Marsh rests in the shallow peat-filled lake bed carved out by the Green Bay Lobe of the Wisconsin Glacier those thousands of years ago. The basin is 14 miles long and from three to five miles wide. The marsh is bounded on the east by the Niagara escarpment, a ridge climbing rather abruptly to an elevation of 1,100 feet, approximately 250 feet above the marsh. The landscape west of the Refuge rises very gently and is dotted with many small prairie potholes and several shallow lakes.

The Refuge comprises the northern two-thirds (21,492 acres) of the 32,000-acre Horicon Marsh; the Horicon Marsh State Wildlife Area, managed by the Wisconsin Department of Natural Resources for hunting, fishing, and other public use activities, occupies the southern third of the marsh (approximately 11,000 acres). Current Refuge ownership consists of 15,573 acres of marsh and 5,476 acres of associated upland habitat. Marsh habitat is seasonally to permanently flooded and dominated by cattail, river bulrush, common reed grass, sedges, and reed canary grass. Uplands include 1,878 acres of woodlands and 3,598 acres of grasslands.

Resource management at the Refuge involves using a variety of techniques to preserve and enhance habitats for wildlife, with programs both in marsh and upland management. Marsh management involves the manipulation of water levels to achieve a desired succession of wetland plant communities to meet the seasonal needs of wildlife populations. Upland management includes establishing and maintaining grasslands to provide nesting habitat for ducks, Sandhill Cranes, and various song birds. Management objectives include waterfowl production and migratory bird use, with Redhead ducks being emphasized.

The ecological importance of Horicon Marsh is recognized not just nationally but internationally. In 1990, Horicon Marsh was designated a "Wetland of International Importance" by the Ramsar Convention, an intergovernmental treaty that obligates 45 signatory nations to consider wetland conservation through land use planning, wise use of wetlands, establishment of wetland reserves, and wetland research and data exchange. In 1997, the Horicon Marsh was named a Globally Important Bird Area in American Bird Conservancy's United States Important Bird Areas program. The marsh received this recognition for several reasons, but especially because: 1) more than half of the Mississippi Flyway Canada geese migrate through the marsh during the fall, and 2) two percent of the biogeographic population of mallards migrates through during the fall, with impressive numbers of other waterfowl. In the fall of 2004, the Horicon Marsh was recognized by the State as an Important Bird Area.

3.1.2 Geographic/Ecosystem Setting

Horicon National Wildlife Refuge lies within the Great Lakes Basin Ecosystem, a system shared

between eight states and Canada. This ecosystem is made up of the world's largest freshwater body, which holds 18 percent of the world's supply of freshwater, covers 95,000 square miles, has 9,000 miles of shoreline, includes more than 5,000 tributaries, and has a drainage basin of 288,000 square miles.

The Basin contains critical breeding, feeding, and resting areas as well as migration corridors for waterfowl, colonial nesting birds, and many other species of migratory birds. At the same time, the Great Lakes Basin Ecosystem faces a variety of biological concerns, including the impact of exotic species, the precarious nature of the aquatic community structure, and contaminant levels.

Certain species within the Great Lakes basin have drawn special concern. Fish species of special interest include lake trout, lake sturgeon, lake whitefish, walleye, Pacific salmon, and landlocked Atlantic salmon and their forage. Native mussels are a management concern because they are being seriously impacted by zebra mussels and are in danger of *extirpation* from the Great Lakes Basin. Thirty-one species of migratory birds that the Service considers of management concern are found in the Great Lakes ecosystem.

A recent survey of biological diversity in the Basin identified 130 globally rare or endangered plant and animal species. The Bald Eagle, Peregrine Falcon, Kirtland's Warbler, Piping Plover, Mitchell's satyr and Karner blue butterflies, Indiana bat, gray wolf, lake sturgeon, deepwater sculpin, and pugnose shiner are some of the threatened, endangered, and candidate species that inhabit the Great Lakes ecosystem.

3.1.3 Climate

Horicon NWR's climate is typically continental, with cold winters and warm summers. The Refuge has an average annual temperature of 46 degrees Fahrenheit. July is the warmest month with an average temperature of 73 degrees Fahrenheit. The coldest month is January with an average temperature of 21 degrees Fahrenheit.

Annual precipitation is about 28 inches, with approximately 20 inches of this occurring between April and September, and falling as rain. Snowfall averages 34 inches annually. Freezing usually begins around October 1st and lasts until May 12th, making the length of the growing season an average of 142 days. Wind speeds average about 10.6 miles per hour throughout the year. March, April, and November have the highest wind speeds with an average of 12 miles per hour. Winds are normally from the south in the summer and the west in the winter.

3.1.4 Geology

Horicon Marsh and its surroundings have a fascinating geologic history. The Niagara Escarpment is a layer of bedrock that consists of limestone cliffs and talus slopes. It abuts the eastern edge of Horicon Marsh and extends further south; north of Horicon Marsh, it reaches into the town of Oakfield and continues all along the eastern shore of Lake Winnebago to Green Bay and Door County. Overall, the Niagara Escarpment extends for a distance of 230 miles in Wisconsin.

Vast continental glaciers altered Wisconsin's landscape many times during a series of glacial periods over at least the last one million years through four different Ice Ages. Named for the location of their most southerly advance, those Ice Ages are called the Nebraskan, Kansan, Illinoisan, and Wisconsin. Horicon Marsh was most affected by the Wisconsin Glaciation, the most recent of the Ice Age advances.

The Wisconsin Glaciation lasted from 80,000 years ago to about 12,000 years ago, leaving behind a terminal moraine 900 miles in length throughout the state. The enormous glaciers, more than a mile thick in places, did not simply come and go, leaving no trace of their existence. Rather, they advanced and retreated gradually and on majestic scale, and in so doing shaped the landscape of today's Wisconsin and the other Great Lakes States. Glacial features such as bogs, fens, lakes, marshes, erratics, moraines, kames, eskers, drumlins, potholes, and kettles serve as constant reminders of Horicon Marsh's icy past.

The Green Bay lobe of the Wisconsin Glaciation gripped eastern Wisconsin and scoured out Green Bay, the Fox River, Lake Winnebago, Horicon Marsh, and the Rock River basin reaching as far south as Janesville and Madison. As the glacier lobes receded, flowing meltwater pooled, forming large lakes where silt and clay collected. In the Fox River valley, Green Bay, and Lake Winnebago are small remnant depressions of one such huge lake, Glacial Lake Oshkosh.

Today, Horicon Marsh is considered an extinct glacial lake. The manmade dam on the Rock River in the city of Horicon is located conveniently within the recessional moraine that once held back the meltwaters for Glacial Lake Horicon. The headquarters for the Horicon Marsh State Wildlife Area is built on a large drumlin (an elongated hill or ridge of glacial drift or till), with many more drumlins in a fan-shaped pattern to the south of the city of Horicon in Dodge and Jefferson Counties. Other moraines occur on the northeast and northwest corners of the Horicon

National Wildlife Refuge. Glacial erratics – boulders carried away from their place of origin and deposited elsewhere as the glacier melted – dot the landscape, and especially noticeable after prescribed fires.

3.1.5 Soils

Soils everywhere are the product of material deposited or accumulated by geologic forces. The major factors in soil formation are parent material, climate, relief, topography, vegetation, and time. The method of soil formation determines its physical and chemical properties. Soils in the Horicon NWR area are the result of atmospheric, chemical, and organic forces modifying the surface of the glacial deposits. The glacial deposits consist of unsorted sand, gravel, boulders, clay, fragments of local limestone and sandstone bedrock, and igneous and metamorphic rock from outside the region. Soils include those of a glacial deposit origin and vary between poorly drained peat and muck types, transition silty loam soils interspersed with sandy loam and clay, to excellent agricultural soils being intensively farmed. Topsoil depths range from 10 to 14 inches. Soil types around the Refuge include Houghton muck and peat soils, which cover about 90% of the Refuge and other soils that cover upland areas and margins surrounding the marsh. Soil groups associated with the margins of the marsh include the following:

Stoney land wet and maumee sandy loams – found around drainage ways and on foot slopes of moraines on the east side of the Refuge. They are very poorly drained sandy soils with rounded glacial stones one to two feet in diameter. Depth of groundwater is zero to three feet.

Pella – Virgil silt loams - transition soils located between the marsh and the uplands. They are gently sloping somewhat poorly drained silty loam soils underlain by sandy loam glacial till at depths of three to four feet. These soils have seasonally high groundwater table and may be inundated for short periods of time.

LeRoy – Theresa silt loams - consisting of deep, gently sloping to steep, well-drained soils located in the upland areas. These soils are typical of the farmlands surrounding the Refuge. Groundwater on these soils is at a depth of six feet or greater.

Beecher – Morley silt loams - prominent on the uplands along the central eastern border and the northern tip of the Refuge. These soils are poorly to well-drained, level to steep silt loams underlain by calcareous silty clay loam till. Depth to groundwater is 1 to 3 feet.

3.1.6 Surface Hydrology

Horicon Marsh is located in the headwater region of the Upper Rock River Watershed. The marsh occupies a long north-south trending valley excavated by glacial action, with steeply rising terrain of the Niagara escarpment to the east and gently rolling glacial deposits to the north and west. The Rock River rises less than 30 miles north of the marsh and discharges into the Mississippi River at Rock Island, Illinois. The Upper Rock River Watershed drains a total of 266.5 square miles (Wisconsin Wetlands Inventory, 1978-1979).

The principle source of runoff to the Refuge is the west branch of the Rock River, which drains a total of 110 square miles above the Refuge before it enters the Refuge 2 miles east of the City of Waupun. The portion of the river within the Refuge was historically channelized by a main ditch running along a north-south line that discharges to a main outlet near the city of Horicon. However, it has reverted back to a meandering river in all reaches on the Refuge except the last half-mile. Other sources of runoff to the Refuge include Plum Creek and Mill Creek, which enter the marsh from the west. These two streams and others entering from the west and northwest drain through gently rolling agricultural lands and have relatively gentle gradients ranging from five to 10 feet per mile. Uplands to the east of the Refuge are relatively steep agricultural lands. The above-mentioned sources of runoff combine to yield a total drainage area of approximately 208 square miles above the main dike outlet.

In the watershed upstream of Horicon Marsh, erosion and sedimentation associated with agricultural land uses are an issue for the Refuge because these sediments are transported downstream by the Rock River and deposited in the low-gradient, low-kinetic energy marsh.

3.1.7 Archeological and Cultural Resources and Historical Preservation

The cultures of the prehistoric and early historic periods at Horicon and Fox River refuges are basically the same although the Horicon Marsh area appears to have supported a larger amount of human use.

An archeological site near the Refuge in Fond du Lac County shows evidence of people during the late PaleoIndian period. The PaleoIndian period extends from 10000 B.C. to about 8000 B.C. and represents the culture of the earliest known peoples in Wiscon-

sin. The evidence for these people is usually associated with mega-fauna (i.e., bison) kill and butchering sites. Any sites containing evidence of people from this period would be considered very important.

Several archeological sites on and near the Refuges contain evidence of people from the next cultural period, known as the Archaic, covering the period 8000 to 1000 B.C. These people appear to have been hunters and gatherers, making a seasonal round of subsistence resource locations. Late in the period (or early in the next cultural period) these people began burying their dead in natural mounds and commenced using pottery. Very little is known about this long and early culture, so intact sites containing Archaic period material could be very important. During the altithermal, a hot and dry period extending from 4700 to 3000 B.C., people appear to have clustered around the few remaining (and shrunken) bodies of water such as Horicon Marsh. But overall, populations grew substantially as the people exploited increasingly varried habitats.

The Woodland period extended from 1000 B.C. to A.D. 1600. Most archeological sites on and around the Refuges contain Woodland period components. The people of this culture are mostly identified by their burial mounds and by their use of pottery. Late in the period they began using the bow and arrow; prior to that time "arrowheads" were spearpoints. Although hunting and gathering continued with its seasonal round of resource areas, they also had larger permanent seasonal villages and grew corn, beans, and squash in gardens.

The Mississippian culture centered in the St. Louis, Missouri, vicinity, covered the period A.D. 1000 to 1600. Wisconsin was in the northern periphery and just two sites near Horicon Refuge are reported to contain evidence of this late prehistoric culture.

European arrival in the Carribean and on the Atlantic coast introduced Western culture and resulted in severe disruption of the prehistoric cultures in Wisconsin long before the first European entered Wisconsin. European-introduced diseases spread ahead of Caucasian population advances and decimated the native populations with reports of up to 90% mortality. Horses and guns made some tribes powerful and led to westward movements of eastern tribes. The fur trade with Europeans further disrupted native cultures. These and many other events led to consolidation and disintegration and relocation of Indian tribes so that identifying historical tribal antecedents in the archeological record is almost impossible.

The historic period tribes encountered by Europeans in Wisconsin generally and in the Horicon Refuge area specifically included the Winnebago (some of which are known as the Ho-Chunk) as well as the Potowatomi and Menominee. Other tribes within Wisconsin that may have visited the Refuge area include the Ottawa, Huron, Fox, Sauk, Miami, Mascouten, and Ojibwa. Historic tribal archeological sites are located on and near Horicon Refuge.

For the historic period, human activities in each Refuge area were different.

The first Western culture settlement appears to have been in the town of Horicon vicinity. Joel Doolittle built the first cabin in 1845. The first dam at Horicon Marsh was probably built in 1845, replaced a year later by a higher dam that raised the marsh water level by nine feet, and led to further settlement and a sawmill, grist mill, blacksmith shop, stores, and the Horicon Hotel; the owners removed the dam in 1869. Other towns originating during this period included Burnett, Waupun, and Mayville. From the time of the first dam Euro-Americans manipulated Horicon Marsh water levels for floating logs downstream to St. Louis and other places in the 1850s; and farmers drained, ditched, and plowed the marsh commencing in the 1870s. Recreational hunting became important in the late 19th and early 20th century as hunting clubs acquired land and built low head dams and hunting lodges. In 1930 another dam was built and water levels elevated for waterfowl habitat, then lowered for farming. Thus for the past 150 years the Horicon Marsh has been subjected to a variety manipulations to support commercial, recreational, and agricultural activities.

The Fox River was part of one of the most important transportation routes, from the Great Lakes to the Mississippi River and to the Gulf of Mexico, during the 17th and 18th centuries. The first steam boat came up the Fox River in 1851. Nevertheless the Refuge area was agricultural until acquired by the FWS. Immediately east of the Refuge is Fountain Lake Farm, the John Muir Farmstead, that is listed on the National Register of Historic Places.

The two Refuges have 16 completed cultural resources (archeological) studies. Based on these studies and information from the Wisconsin Historic Preservation Database and other sources, known and reported cultural resources on the two Refuges can be summarized.

3.1.7.1 Horicon National Wildlife Refuge

As of June 9, 2006, the National Register of Historic Places lists 27 properties in Dodge County, which includes the Horicon site on the Refuge and the William Greenfield Farmstead and the Kekoskee Archeological District in the vicinity of Horicon NWR; 39 properties in Fond du Lac County; and five properties in Marquette County including Fountain Lake Farm adjacent to Fox River NWR.

Approximately 90 acres of the Refuge have been subjected to archeological surveys. These surveys have identified 18 sites on Refuge land. Other sources increase the total number of reported sites on the Refuge to 29; and an additional 34 reported sites in the Refuge expansion area. The environmental education barn is not a historic property. Archeological site 47-DO-131, the Horicon site, is listed on the National Register of Historic Places; and all known and unknown cultural resources on the Refuge are considered eligible for the National Register until determined not elligible.

The following listed Indian tribes have been recognized by the Federal government or self-identified by the tribe as having a potential concern for traditional cultural resources, sacred sites, and cultural hunting and gathering areas in the counties in which the Refuge is located.

- Forest County Potawatomi
- Hannahville Indian Community
- Ho-Chunk Nation
- Iowa Tribe of Kansas
- Menominee Indian Tribe of Wisconsin
- Nottawaseppi Huron Band
- Oneida Nation
- Peoria Indian Tribe
- Pokagon Band of Potawatomi
- Prairie Band of Potawatomi
- Sac and Fox Nation of Missouri
- Sac and Fox Nation of Oklahoma
- Sac and Fox Tribe of the Mississippi
- Winnebago Tribe of Nebraska

Although Indian tribes are generally understood to have concerns about traditional cultural properties, other groups such as church congregations, civic groups, and county historical societies could have similar concerns.

3.1.7.2 Fox River National Wildlife Refuge

Approximately 110 acres of the Refuge have been subjected to archeological surveys. These surveys have identified 8 sites on Refuge land.

The following listed Indian tribes have been recognized by the Federal government or self-identified by the tribe as having a potential concern for traditional cultural resources, sacred sites, and cultural hunting and gathering areas in the counties in which the Refuge is located.

- Citizen Potawatomi
- Forest County Potawatomi
- Ho-Chunk Nation
- Kickapoo Tribe
- Menominee Indian Tribe of Wisconsin
- Miami Tribe
- Ottawa Tribe of Oklahoma
- Peoria Indian Tribe
- Prairie Band of Potawatomi
- Sac and Fox Nation of Missouri
- Sac and Fox Nation of Oklahoma
- Sac and Fox Tribe of the Mississippi
- Winnebago Tribe of Nebraska

Although Indian tribes are generally understood to have concerns about traditional cultural properties, other groups such as church congregations, civic groups, and county historical societies could have similar concerns.

3.1.7.3 Museums and Repositories

The Refuges have museum property. Archeological collections are not stored on-site, but 4173 artifacts are stored in non-Federal repositories. Archeological collections are stored under terms of cooperative agreements: two at Great Lakes Archeological Center; one at the University of Wisconsin at Madison; and two at the University of Wisconsin at Milwaukee. Four collections are without cooperative agreements. Artifacts are owned by the Federal Government and can be recalled by the Service at any time.

The Refuges have no other types of museum property such as artwork, historical objects or documents (including photographs), nor natural resources collections. They have no scope of collections statement.

Cultural resources are important parts of the Nation's heritage. The Service is committed to protecting valuable evidence of human interactions with each other and the landscape. Protection is accom-

Table 3: Population Characteristics, Dodgy and Fond du Lac Counties, Wisconsin [1]

Characteristic	Dodge County	Fond du Lac County	Wisconsin
Population, 2004 estimate	88,057	98,663	5,509,026
Population, % change, 2000-2004	2.5%	1.4%	2.7%
Population, 2000	85,897	97,296	5,363,675
Population, % change, 1990-2000	12.2%	8.0%	9.6%
Land Area, 2000 (square miles)	882	723	54,310
Persons per square mile (population density), 2000	97.4	134.6	98.8
White persons, %, 2000	95.3%	96.2	88.9%
Non-Hispanic white persons, %, 2000	93.8%	95.1%	87.3%
Black or African American persons, %, 2000	2.5%	0.9%	5.7%
American Indian persons, %, 2000	0.4%	0.4%	0.9%
Asian persons, %, 2000	0.3%	0.9%	1.7%
Persons of Latino or Hispanic origin, %, 2000	2.5%	2.0%	3.6%
Language other than English spoken at home, %, 2000	4.6%	4.8%	7.3%
Foreign born persons, %, 2000	1.6%	2.0%	3.6%
High school graduates, % of persons age 25+, 2000	82.3%	84.2%	85.1%
Bachelor's degree or higher, % of persons 25+, 2000	13.2%	16.9%	22.4%
Persons with a disability, age 5+, 2000	11,344	12,799	790,917
Median household income, 1999	$45,190	$45,578	$43,791
Per capita money income, 1999	$19,574	$20,022	$21,271
Persons below poverty, %, 1999	5.3%	5.8%	8.7%

1. *Sources: USCB, 2005a; USCB, 2005b; USCB, 2005c*

plished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

3.1.8 Social and Economic Context

Most of Horicon National Wildlife Refuge is located in Dodge County, Wisconsin, with a small portion in the north located in Fond du Lac County, Wisconsin. Table 3 presents social and economic indicators of these two counties in comparison with the State of Wisconsin as a whole.

3.1.8.1 Socioeconomic Characteristics

Dodge and Fond du Lac counties, Wisconsin

Both Dodge and Fond du Lac counties are characterized by a mixture of rural and urban areas, that is, small towns and villages surrounded by predominantly agricultural countryside. The population densities of both counties roughly mirror that of Wisconsin as a whole (98 and 135 vs. 99 persons per square mile, respectively), while the state of Wisconsin has slightly less population density than the USA as a whole (99 vs. 80). However, the USA's figure is somewhat distorted by large, thinly populated Alaska.

In 1990, 39 percent of Dodge County was classified by the Census Bureau as rural, and 61 percent urban. In the same year, Fond du Lac County was 35 percent rural and 65 percent urban.

The populations of both counties are growing relatively slowly at the present time, that is, growing more slowly than the state as well as the nation. Dodge County's population grew by 2.5 percent from 2000 to 2004, and by 12.2 percent in the 1990s, while Fond du Lac County's population grew by 1.4 percent from 2000-2004 and 8 percent from 1990-2000.

Table 4: 1995 Recreation-related Expenditures of Visitors to Horicon NWR (1995 $ in thousands) [1]

Activity	Resident	Non-resident	Total
Non-consumptive	$70.8	$1,772.9	$1,843.7
Hunting	$11.9	$37.3	$49.2
Fishing	$1.5	---	$1.5
Total	$84.2	$1,810.2	$1,894.4

1. *Source: Laughland and Caudill, 1997*

Both counties have lower percentages of minorities than the state as a whole and the country at large, which is very typical of the more rural, northern states. Likewise, there are lower percentages of foreign born and persons who speak languages other than English at home.

Educational attainment is lower in both Dodge and Fond du Lac counties than in Wisconsin overall, with much lower percentages of college graduates in the two counties than in the state. However, this is very representative of rural areas around the country and is a reflection of the labor market and kinds of jobs available in rural vs. urban areas. In spite of having fewer college graduates in their midst, the median household incomes of both counties exceed the state's median household income, which is unusual for areas without large towns or cities.

It is of note that both counties have more than 10,000 residents with at least one disability, which underscores the importance of Horicon NWR having accessible facilities.

Several geographic features are important to the local economy. Mineral resources are extracted and sold, the high quality soil contributes to the success of agriculture, and the climate affords opportunities for many economic activities and causes limitations for others. The surrounding landscape consists of gently rolling hills, flat agricultural land, drained and cropped wetlands, and patches of deciduous forest. Upland sites are dominated by agriculture, especially dairy farming, and contain nine communities with populations from approximately 200 to more than 8,000 people. Little of the native forest cover remains in the two-county area. The main forest species are oak, elm, maple, and other hardwoods. There is limited economic potential from the remaining woodlots since they tend to be small and widely scattered. Many contain residential development and some are located on public lands.

Horicon National Wildlife Refuge was one of the sample Refuges investigated in a national study of the economic benefits to local communities of national wildlife refuge visitation (Laughland and Caudill, 1997). This study found that that in 1995, resident and non-resident visitors to Horicon NWR spent about $1.9 million in the Refuge (Table 4). When this spending had cycled through the economy, the Refuge had generated $1.53 million in final demand, $616,000 in employee compensation, and 44 jobs.

The study concluded that Horicon NWR had a net economic value of $1,840,200. Every dollar of budget expenditure at the Refuge generated economic effects of $10.12. While the Refuge is a small part of the regional economy, Horicon NWR and the marsh it protects help define the region's character and maintain its quality of life, and thus are important for the promotion of a diverse regional economy (Laughland and Caudill, 1997).

3.1.9 Natural Resources

3.1.9.1 Habitats

Horicon National Wildlife Refuge includes 15,573 acres of marsh and 5,476 acres of associated upland habitat. Marsh habitat is seasonally to permanently flooded and dominated by cattail, river bulrush, common reed grass, sedges, and reed canary grass. Uplands include 2,598 acres of grasslands and 1,878 acres of woodlands.

Of the nearly 16,000 acres of wetlands on the Refuge, approximately 3,000 acres are seasonally flooded (Type I) basins, 12,000 acres are deep (Type IV) freshwater marshes, and 1,000 acres are sub-impoundments. Roughly half of the Refuge consists of dense stands of cattails, either in solid stand or mixed with other species. Other species include soft-stemmed bulrush, hard-stemmed bulrush, slender bulrush, river bulrush, burreed, various sedges, smartweeds, chufas, pigweeds, millets, and sagittaria. There are approximately 2,000 acres of moist soil plants found in and around the edges of the water areas during drawdown condition. These include chufus, smartweeds, pigweeds, etc. About half of the aquatic areas consist of fairly deep lakes, ditches, and other water areas in which stands of submersed

aquatics are found. These include various pondweeds, coontail, elodea, duckweeds, and milfoil (USFWS, 1995).

Of the 2,598 acres of grasslands, fully 1,468 acres (57 percent) are introduced grasslands, 626 acres (24 percent) are forbes, 423 acres (17 percent) are native grasslands, and 81 acres (3 percent) are wet meadows.

Of the 1,878 acres of woodlands, 1,027 acres (55 percent) are willow-dominated, 415 acres (22 percent) are mixed hardwoods, 225 acres (12 percent) are aspen-dominated, 151 acres (8 percent) are willow-cattail, and 58 acres (3 percent) are oak savanna. From these figures, it is evident that almost two-thirds (63 percent) of the Refuge's woodlands are lowland or bottomland and a little more than one-third (37 percent) are upland woodlands.

Resource management at the Refuge involves using a variety of techniques to preserve and enhance habitats for wildlife, with programs both in marsh and upland management. Marsh management involves the manipulation of water levels to achieve a desired succession of wetland plant communities to meet the seasonal needs of wildlife populations. Upland management includes establishing and maintaining grasslands to provide nesting habitat for ducks, Sandhill Cranes, and various song birds. Management objectives include waterfowl production and migratory bird use, with redhead ducks being emphasized.

3.1.9.2 Wildlife

Birds – Horicon Marsh is a major migratory stopover point for waterfowl (ducks, geese, and swans) of the Mississippi Flyway, with use-days reaching six to 12 million annually. Waterfowl production averages about 3,000 per year.

The marsh annually attracts Mississippi Valley Population (MVP) Canada Geese during their travels between Hudson Bay and southern Illinois/western Kentucky. The geese are on the marsh from late February to mid-April and from mid-September until freeze-up, with peak numbers in mid-October. The marsh is an important staging area which fuels their journey north and furnishes energy for reproduction.

Up to one million Canada Geese migrate through the Refuge each fall. On a peak fall day, there may be as many as 300,000 geese in the area. Most of the Canada Geese that stop at Horicon Marsh fly to their winter range in the area where the Ohio River joins the Mississippi River, about 450 miles away. The rest of the Mississippi Valley population of Canada Geese that migrate through Michigan, Ohio, and Indiana join these birds on the wintering grounds located in southern Illinois, Western Kentucky, Tennessee, and Missouri. From about the middle of March until the end of April the birds pass through Horicon Marsh once more to rest and fatten up for the flight to the nesting grounds near Hudson Bay in Canada.

Mallards are the principle species of ducks using the area, but Green-winged and Blue-winged Teal, Wigeon, Redheads, Pintails, Gadwalls, Wood Ducks, Scaup, and Ruddy Ducks are also abundant, with peak numbers traditionally reaching 60,000. The marsh is especially important to Redhead ducks, which have experienced a population decline nationwide. The marsh is the largest nesting area for redhead ducks east of the Mississippi River, with an estimated 2,000 to 3,000 birds utilizing the marsh for this purpose. Historically, a majority of the continent's canvasback population used the region.

For centuries, marsh birds have stopped at food-rich wetlands during their annual migration between Central and South America and their northern U.S., Canadian and Arctic breeding grounds. Horicon Marsh provides an important link in their journey. Four mile island, the Marsh's largest island at 15 acres, harbors Wisconsin's largest rookery with up to 1,000 nesting pairs of Great Blue Herons, Double-crested Cormorants, Black-crowned Night Herons, and Great Egrets. Common marsh and water birds on the Refuge include the Pied-billed Grebe, American Bittern, Common Gallinule, Sora and Virginia Rails, and Sandhill Cranes. Tremendous numbers of shorebirds utilize low water pools with counts of a single species typically numbering over 5,000.

Horicon NWR has documented 267 species of birds on the Refuge, including resident, migratory, and accidental species. Of the 267 species recorded on the Refuge, 223 are expected to be present while 44 birds are listed as "accidental," meaning they are not normally expected to be present. Many birds are present for less than all four seasons, and they may be abundant, common, uncommon, or rare.

Mammals – Horicon Marsh also supports an array of resident mammals – approximately 20 species have been documented – including white-tailed deer, woodchucks, red fox, squirrels, raccoons, muskrat, skunk, mink, otter, opossum, and coyote. Mammals tend to be most abundant in and around the wetland habitat due to the abundant food and cover available. Muskrats play an important role in striking a balance between the stands of cattails and the open water zones.

Fish – At one time Horicon Marsh supported a population of game fish that included northern pike, crappie, bluegill, and bass. However, due to habitat degradation associated with turbidity and filling in of the marsh, game fish populations have dramatically declined.

Carp populations have become a serious problem in the marsh due to their high number, aquatic plant diet, and habit of markedly increasing water turbidity during feeding. Carp are extremely prolific, spawning semi-annually, with females producing as many as 60,000 eggs per pound of fish. They retard the growth of aquatic vegetation by consuming it and by roiling the water so that increased turbidity reduces photosynthetic efficiency which is essential for wetland food chains. Current management strategies at controlling carp include physical removal, water level manipulation, chemical eradication, and stocking of predators, especially northern pike (USFWS, 1995).

Amphibians and Reptiles – Amphibians and reptiles are two natural and distinct classes of vertebrates common to the area. Several species of turtles and snakes are found in the area. Salamanders, newts, toads, and frogs depend on quality wetland habitat for their survival. Nine species of amphibians and five species of reptiles have been recorded at Horicon NWR.

Threatened and Endangered Species – At present, the only Federally-listed threatened or endangered wildlife species that uses the marsh is the Bald Eagle. State-listed endangered species at Horicon NWR include the Osprey, Forster's tern, Common Tern, and Barn Owl.

3.1.10 Fire Management

This section contains detail about the prescribed fire and wildfire suppression procedures used on the Horicon and Fox River Refuges. We have included more detail on this subject here and in Chapter 4 of the EA in order to fully document each Refuge's Fire Management Plan (FMP) in compliance with the National Environmental Policy Act.

3.1.10.1 Prescribed Fire

Prescribed fire is used regularly on the Refuges as a habitat management tool. Periodic burning of grasslands and wet meadows reduces encroaching woody vegetation. Fire also encourages the growth of desirable species such as native, warm-season grasses, sedges and forbs. Trained and qualified personnel perform all prescribed burns under precise plans. The Refuges have an approved FMP that describes in detail how prescribed burning will be conducted. A burn is conducted only if it meets specified criteria for air temperature, fuel moisture, wind direction and velocity, soil moisture, relative humidity, and several other environmental factors. The specified criteria (prescription) minimize the chance that the fire will escape and increase the likelihood that the fire will have the desired effect on the plant community.

There are two burning seasons on the Refuges. The first burning season starts as soon as spring thawing conditions will allow burning. This is usually in late March or April and extends until May. The second season (fall) starts in late September and continues until fall rains, snow or low temperatures eliminate burning conditions. Refuge staff is currently trying burns in late June to early July on cattail fuels to stress them at their weakest period of the year. How often established units are burned depends on management objectives, historic fire frequency, and funding. The interval between burns may be 2 to 5 years or longer. As part of the prescribed fire program, we will conduct a literature search to determine the effects of fire on various plant and animal species, and we will begin a monitoring program to verify that objectives are being achieved.

Prescribed fires will not be started without the approval of the Regional Fire Management Coordinator when the area is at an extreme fire danger level or the National Preparedness level is V. In addition, we will not start a prescribed fire without first getting applicable concurrence when local fire protection districts or the State of Wisconsin have instituted burning bans. Spot fires and escapes may occur on any prescribed fire. The spot fires and escapes may result from factors that cannot be anticipated during planning. A few small spot fires and escapes on a prescribed burn can usually be controlled by the burn crew. If so, they do not constitute a wildland fire. The burn boss is responsible for evaluating the frequency and severity of spot fires and escapes and, if necessary, slowing down or stopping the burn operation, getting additional help from the Refuge staff, or extinguishing the prescribed burn. If the existing crew cannot control an escaped fire and it is necessary to get help from the Wisconsin DNR or other local fire units, the escape will be classified as a wildland fire and controlled accordingly. Once controlled, we will stop the prescribed burning for the burning period.

3.1.10.2 Fire Prevention and Detection

In any fire management activity, firefighter and public safety will always take precedence over property and resource protection. Historically, fire influenced the vegetation on the Refuges. Now, fires burning without a prescription are likely to cause unwanted damage. In order to minimize this damage, we will seek to prevent and quickly detect fires by discussing fire prevention at safety meetings prior to the fire season and during periods of high fire danger and periodically training staff in fire prevention. The Refuge will also posting warnings at visitor information stations, and notify the public via press releases and personal contacts, during periods of extreme fire danger. Trained staff will investigate all fires suspected of having been set illegally and taking appropriate action. We will also depend upon neighbors, visitors, cooperators, and staff to detect and report fires.

3.1.10.3 Wildfire History

Wildfires were known in this area prior to the establishment of the Refuge in 1941. From 1942 to 2005, 51 wildfires consumed approximately 7990 acres. This is an average of 157 acres per wildfire. Most fires are less than 2 acres or more than 250 acres. The most acres burned was in 1964 when 1900 acres where consumed in three fires. Over this 63 year period, zero to three fires were reported each year except in 1994 when six fires were documented. In addition to the documented fires we know that fires occurred on the refuges that were extinguished by local fire units that did not get documented. From 1970 to 1999, 26 wildfires were documented with lightening causing only two fires while 24 were human caused. Human caused fires include campfire, smoking, debris burning, incendiary, equipment use, railroads and children. The above list of wildfires does not include fires that threatened refuge properties, many of these occur every spring.

The period of highest fire danger occurs from 1 April to 15 May and 1 September to 15 November. Generally, spring rains and vegetative green up have occurred by Memorial Day; in the fall, precipitation and colder temperatures reduce the fire hazard by early November. Horicon NWR contains 17 water impoundments, most of which are surrounded by firebreaks such as a road, trail, dike, ditch or large bay of open water. These firebreaks have reduced widespread wildfires in recent history. However, weather still has the greatest influence on wildfires in this area. A combination of prolonged drought conditions, lack of winter snow fall or delayed early spring rains can result in wildfire potential.

3.1.10.4 Fire Suppression

We are required by Service Policy to use the Incident Command System (ICS) and have firefighters who meet National Wildfire Coordinating Group (NWCG) qualifications for fires occurring on Refuge property. Our suppression efforts will be directed towards safeguarding life while protecting Refuge resources and property from harm. Mutual aid resources responding from Cooperating Agencies will not be required to meet NWCG standards, but must meet the standards of their Agency. All wildland fires occurring on the Refuges and staffed with Service employees will be supervised by a qualified Incident Commander (IC). The IC will be responsible for all management aspects of the fire. The IC will obtain the general suppression strategy from the Fire Management Plan, but it will be up to the IC to implement the appropriate tactics. Minimum impact suppression tactics will be used whenever possible. As a guide, on low intensity fires (generally flame lengths less than 4 feet) the primary suppression strategy will be direct attack with hand crews and engines. On higher intensity fires (those with flame lengths greater than 4 feet) we may use indirect strategies of back fires or burning out from natural and human-made fire barriers. The barriers will be selected based on their ability to safely suppress the fire, minimize resource degradation, and be cost effective.

3.1.10.5 Wildland Urban Interface

Wildland Urban Interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires, habitat fragmentation, invasive species, and biodiversity decline. FIREWISE is a community safety program developed to educate the public to the wildland urban interface and corrective measures needed. Additional examples include working toward a comprehensive social awareness and support system to inform the public concerning the benefits of management ignition in fire adapted ecosystems.

The size of Horicon NWR, and agricultural uses on adjoining lands, somewhat diminishes the WUI presence but still creates the need to reduce wildland and urban intermix fire threats. The fire management program will mitigate any interface risks

by a combination of mechanical fuels treatments near any buildings and prescribed fire to reduce and eliminate hazard fuel loadings while creating wide buffers around developed areas and adjacent to private property.

3.1.10.6 Mechanical Fuel Treatments

Mechanical fuel reduction is the use of mechanical equipment (i.e. weed whackers, chainsaws, dozers, rubber tired skidders, chippers, mowers, etc.) to cut and remove, or prepare for burning, woody fuels. Mechanical treatments are intended to help in achieving resource management goals and objectives, most often a combination of ecosystem restoration and reduction of high hazard fuel loadings. Mechanical fuel treatments must be described in a fuels project plan. The plan will contain a prescription defining goals, objectives, and treatment methods employed to achieve the objectives.

Mechanical fuel treatment is often used in concert with prescribed fire treatment. High hazard fuel conditions can be reduced while meeting structural objectives in areas immediately adjacent to buildings or on boundary areas through a mix of mechanical treatment and prescribed fire. Mechanical treatment can be used as the primary method of reaching structural goals while prescribed fire actually removes and eliminates the hazardous fuels.

3.1.11 Refuge Recreation

Annual visitation is about 450,000 each year for priority public uses on the Refuge.

3.1.11.1 Hunting

Hunting opportunities on the Refuge include ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer. Closed areas include the viewing area and interpretive displays on Highway 49, the Bud Cook Hiking Area, and a small area around the office/visitor center. The auto tour route/hiking trail complex is closed to all hunting except during the deer gun season; a 600-acre area around the office/visitor center is closed to all hunting except for special hunts for hunters with disabilities; and the former Stensaas unit is closed to all hunting except for youth and novice pheasant hunters. The Refuge is closed to migratory bird hunting, other than a controlled Youth Waterfowl Hunt. State regulations apply to all Refuge hunters, except that currently all seasons close at the end of the deer gun season on the Refuge.

3.1.11.2 Fishing

Fishing opportunities are limited to the public due to shallow water conditions and the absence of a variety of game fish. Boats are not allowed on the Refuge. Bank fishing in accordance with Wisconsin State fishing regulations is permissible on the Refuge at three locations: Main Dike Road, Ledge Road and Peachy Road. Main Dike Road and Ledge Road have accessible fishing piers on location but lack welcome kiosks. The Peachy Road access is currently in the planning process for reconstruction. Game fish are stocked each year at various locations throughout the Refuge. One youth fishing event is held on the Refuge during the summer in celebration of National Fishing Week.

3.1.11.3 Wildlife Observation

Wildlife observation is popular at the Refuge. At least 267 different species of birds have been documented on the Refuge over the years. The Refuge is recognized as both a state and globally important bird area. Between mid-September and mid-November, visitation is at its peak due to the fall migration of over 200,000 geese that use the Refuge as a stopping point in their nearly 850-mile migration to southern wintering areas. The 3-mile paved Horicon Ternpike Auto Tour Route is an excellent place for wildlife observation and receives the highest annual visitation of any sites throughout the Refuge. Many public events and interpretive programs occur on the Refuge that focus on wildlife observation, mainly bird-watching, such as the Horicon Marsh Bird Festival, guided birding tours, and Marsh Melodies.

3.1.11.4 Wildlife Photography

Consistent with the opportunities to view wildlife, many Refuge visitors also photograph the many birds, mammals, and other creatures that they observe on the Refuge. No photo blinds have been constructed at this time but future locations are being considered.

3.1.11.5 Wildlife Interpretation

The Refuge lacks a Visitor Services Plan and a primary interpretive theme to provide guidance for Refuge management and staff on matters related to visitor management. Developing a plan and interpretive themes was one of the recommendations outlined in the 2005 visitor services review report. The plan, when developed, will provide interpretive methods and concepts, specify compatible forms of recreation, and identify existing and proposed public use areas and facilities for the Refuge. Currently, numerous interpretive programs are conducted on and off the Refuge for ages ranging from pre-school children to

adults. Primary topics include the history of Horicon Marsh, habitat management and resource issues.

3.1.11.6 Environmental Education

Environmental education is the most developed component of the visitor services program to date. The Refuge piloted the Rhythms of the Refuge curriculum for Region 3 and has used activities found in the curriculum in numerous programs for local public, private and home-schooled groups, Scouts groups and community-based service organizations. Program participants range from preschool to adult, with the majority being elementary and middle school students. Activities are conducted at the visitor center, the Environmental Education barn, the Egret Trail and boardwalk, off-site in the classroom and through distance learning sessions. All programs are free and are led by trained volunteers and Refuge staff.

3.2 Fox River National Wildlife Refuge

3.2.1 Introduction

Fox River National Wildlife Refuge consists of 1,004 acres of wetland and upland habitat astride the Fox River in Marquette County, approximately 35 miles west of Horicon National Wildlife Refuge. Fox River NWR was established in 1979 under the U.S. Fish and Wildlife Service's Unique Wildlife Ecosystem Program to protect an area known as the Fox River Sandhill Crane Marsh from further drainage and to preserve associated upland habitat. The Refuge protects an important breeding and staging area for the Sandhill Crane. The majority of the Refuge contains sedge meadow, wet prairie, and shallow marsh wetlands.

The uniqueness of the Refuge is not just because of its importance to nesting Sandhill Cranes, but for the diversity of wildlife within this wetland/upland complex. The Refuge has 10 distinct plant communities – ranging from upland coniferous and deciduous woodlands to five wetland communities. This diversity of vegetation communities is responsible for the presence of about 150 different species of wildlife on the Refuge. Wildlife diversity to this extent within such a relatively small, confined area is not encountered elsewhere in Wisconsin.

3.2.2 Climate

As would be expected, given its proximity to Horicon NWR, Fox River NWR's continental climate, characterized by cold winters and warm summers, is very similar to Horicon's. In the nearby county seat of Montello, July is the warmest month with average highs of 78 degrees Fahrenheit and January the coldest month with average lows of 4 degrees Fahrenheit. Annual precipitation is about 32 inches, with April through September the wettest months. Average snowfall is approximately 40 inches. The median growing season is 144 days.

3.2.3 Topography and Soils

Local relief is quite gentle, sloping to the Fox River and adjacent marshes. Elevations range from the river at 770 feet above mean sea level (msl) to an island in the marsh which rises to 816 feet msl. Soils are predominantly muck and peat underlain by sandy alluvium deposited by the Fox River. The island and upland edges have sandy soils, ranging from loamy sand to sandy loam.

3.2.4 Surface Hydrology

The surface hydrology of the Refuge is dominated by the Fox River, which bisects it. The majority of habitats on the Refuge consist of sedge meadow, wet prairie, and shallow marsh wetlands, dominated by many species of sedges, grasses, and cattail. These are all considered wetland habitats and many would qualify as "jurisdictional wetlands" or "waters of the United States." That is, these areas are under the jurisdiction of Section 404 of the Clean Water Act and the Army Corps of Engineers for the purpose of actions that might deposit fill in these waters/wetlands or otherwise alter their values and functions.

3.2.5 Archeological and Cultural Resources and Historical Preservation

See the discussion in Chapter 3, " Archeological and Cultural Resources and Historical Preservation" on page 136.

3.2.6 Social and Economic Context

Marquette County, where Fox River NWR is located, is a more rural county than either Dodge or Fond du Lac counties, where Horicon NWR is situated. Table 5 presents data on socioeconomic features of the county in comparison with Wisconsin as a whole.

Marquette County has a substantially smaller population as well as a lower population density than either Dodge or Fond du Lac counties. Its population has declined slightly since 2000, although it grew very

Table 5: Socioeconomic Characteristics Marquette County, Wisconsin [1]

Characteristic	Marquette County	Wisconsin
Population, 2004 estimate	14,973	5,509,026
Population, % change, 2000-2004	- 5.4%	2.7%
Population, 2000	15,832	5,363,675
Population, % change, 1990-2000	28.5%	9.6%
Land Area, 2000 (square miles)	455	54,310
Persons per square mile (population density), 2000	35	98.8
White persons, %, 2000	93.7%	88.9%
Non-Hispanic white persons, %, 2000	92.0%	87.3%
Black or African American persons, %, 2000	3.4%	5.7%
American Indian persons, %, 2000	1.0%	0.9%
Asian persons, %, 2000	0.3%	1.7%
Persons of Latino or Hispanic origin, %, 2000	2.7%	3.6%
Language other than English spoken at home, %, 2000	6.2%	7.3%
Foreign born persons, %, 2000	1.5%	3.6%
High school graduates, % of persons age 25+, 2000	78.8%	85.1%
Bachelor's degree or higher, % of persons 25+, 2000	10.1%	22.4%
Persons with a disability, age 5+, 2000	2,863	790,917
Median household income, 1999	$35,746	$43,791
Per capita money income, 1999	$16,924	$21,271
Persons below poverty, %, 1999	7.7%	8.7%

1. *Sources: USCB, 2005c; USCB, 2005d*

rapidly in the 1990s, three times as quickly as the state did. Still, the county population density is only one-third of Wisconsin's average density.

Except for American Indians, Marquette County has a lower percentage of minorities than the state as a whole and the country at large, which is very typical of the more rural, northern states. Likewise, there are lower percentages of foreign born and persons who speak languages other than English at home than in Wisconsin generally.

Educational attainment is substantially lower than in Wisconsin overall, with the percentage of college graduates in the county less than half the percentage of college graduates in the state (10 percent vs. 22 percent). However, as stated earlier in the case of Dodge and Fond du Lac counties, this is very typical of rural areas around the country. Both median household income and per capita money income in Marquette County are substantially below the state figures (18 percent and 20 percent, respectively).

Low employment and industry figures for agriculture belie its prominent place in the landscape of Marquette County. Farmers own and manage 145,552 acres in the county – including pastures, cropland and tree farms – fully half of all the land in Marquette County. Individuals or families own 90 percent of these farms, with family partnerships, family-owned corporations, and non-family corporations accounting for the remainder.

Marquette County ranks consistently among Wisconsin's top five producers of mint oil and Christmas trees and also has significant potato and sweet corn production. The county has a rich history of dairy as well as cash grain crops. It also has several large nursery producers and sod farms. Production of landscape trees and plants as well as landscape and

grounds maintenance is rapidly growing segments of Marquette County's agricultural industry. Greenhouses, tree farms, nurseries, sod farms and other horticultural businesses contribute to the diversity of agriculture in the county.

Overall, agriculture accounts for 1,779 jobs in Marquette County and $167 million in economic activity. It contributes $55 million to the county's total income and $5 million in taxes

3.2.7 Natural Resources

3.2.7.1 Habitats

Ten plant communities are recognized on the Refuge: upland deciduous forest, pine plantation, upland old field, lowland forest, low prairie, fen, sedge meadow-shrub carr, shallow and deep marsh, and submerged aquatic plants in open water. Only three of these ten (upland deciduous forest, pine plantation, and upland old field) are upland habitats; the others are lowland, wetland, or bottomland habitats with high moisture or saturated soils. Two features of the wetlands are acid sands and alkaline seeps; in combination, they give the wetlands an unusual floristic diversity. The diversity and structure of the vegetation communities offer an outstanding variety of habitats for wildlife.

Another habitat feature which contributes to diversity is a 40-acre upland island in the center of the marsh. This island is generally inaccessible to humans or cattle during the summer and represents an excellent example of an undisturbed climax oak-hickory woodlot.

The majority of the Refuge consists of sedge meadow, wet prairie, and shallow marsh wetlands dominated by many species of sedges, grasses, and cattail. However, other wetland types such as fens, lowland forest, shrub-carr thickets, deep marsh, and open water occur on the refuge as well.

In Wisconsin generally, sedge meadows are dominated by sedges, most of which belong to the genus *Carex*, growing on saturated soils. Other sedges found in sedge meadows include spike rushes (*Eleocharis* sp,), bulrushes (*Scirpus* sp.) and nutgrasses (*Cyperus* sp.). Grasses (*Poaceae*) and true rushes (*Juncus* spp.) are also found in sedge meadows. The forb species are diverse but scattered and may flower poorly under intense competition with the sedges. Sedge meadows often grade into shallow marshes, calcareous fens, low prairies and bogs.

Fens are a very rare wetland type in Wisconsin and harbor many state threatened and endangered plants. Shrub-carr thickets are a wetland community dominated by tall shrubs such as red-osier dogwood, meadow-sweet, and various willows. Canada bluejoint grass is often very common.

Upland habitats consist of closed canopy upland deciduous forest dominated by white, black, and bur oak, upland dry prairie, and oak savanna. Three spring-fed creeks flow through the Refuge, adding to the diversity of the area.

In 2003, the Service conducted surveys of six broad habitat types on the Refuge in order to monitor vegetation and wildlife communities, as well as abiotic conditions, namely the hydrologic regime.

3.2.8 Wildlife

3.2.8.1 Birds

The Fox River Marsh is important to nesting Sandhill Cranes and has some of the most productive crane habitat in southern Wisconsin. The marsh supports at least five breeding pairs each year; in addition, it supports a resident flock of 50-60 non-breeding cranes throughout the summer. It is also one of four major staging areas for Sandhill Cranes in southern Wisconsin and is utilized by 300-400 migrating cranes each autumn.

Due to its relatively undisturbed condition, the wooded island in the center of the marsh supports a rookery of herons, including Great Blue Herons, Great Egrets, and Black-crowned Night Herons. In addition to these colonial nesting herons, American Bitterns have been observed nesting in the marsh and Least Bitterns occur during the summer.

Waterfowl numbers in the area are relatively high, with fall censuses having counted approximately 3,000-5,000 ducks and 10,000 coots on nearby Buffalo Lake. Ducks in the Refuge are mostly Blue-Winged Teal and Mallards. Estimates of breeding pairs per square mile have averaged five pairs of Mallard and 27 pairs of Blue-Winged Teal at the French Creek Wildlife Management area, which has waterfowl habitat similar to that found on Fox River NWR.

Altogether, approximately 100 species of birds representing 21 families have been observed at the Refuge. Breeding on the Refuge has been documented for 51 of these species.

3.2.8.2 Mammals

About 26 species of mammals have been recorded at the Refuge. One of them is Richardson's squirrel, typically a western prairie species. Furbearers include mink, muskrats, beaver, and raccoon. Mar-

quette County has had high densities of white-tailed deer, up to 60 deer per square mile.

3.2.8.3 Amphibians and Reptiles

At least 15 species of amphibians and reptiles have been identified at the Refuge. This tally includes six species of frogs, five species of turtles, and four species of snakes.

3.2.8.4 Aquatic Life

Fox River and nearby Buffalo Lake contain an abundance and diversity of fresh water aquatic plant and animal life. Portions of the river and the lake have been chemically treated at times to remove undesirable non-game fish and excessive aquatic vegetation. Game fish included perch, bass and northern pike. Six species of freshwater clams have been reported at the Refuge, providing food for many wildlife species (USFWS, 1979).

3.2.8.5 Threatened and Endangered Species

No species on the federal threatened and endangered species list are known to exist at Fox River NWR. However, several state-listed species are present, including the Double-Crested Cormorant, Great Egret, Red-Shouldered Hawk, and wood turtle and Blanding's turtle.

3.2.9 Refuge Recreation

Facilities at Fox River NWR include two parking lots that border County Road F. A two-panel kiosk is in place at each parking lot. These kiosks will provide information on the Refuge system, Refuge regulations and maps, and interpretive information regarding the habitats and wildlife of Fox River NWR.

The Refuge biologist has given tours of Refuge fens, shallow marshes, oak savannas, and prairies to school groups. Flora and fauna were identified and natural processes such as fire and flooding were discussed. Not only did these school groups learn a lot about the Refuge and the environment, but they had the chance to get their hands dirty and provide wonderful help on the Refuge's 85-acre prairie restoration project (cedar cutting/piling, prairie seed collection, and prairie planting).

Currently, the only staff-unaccompanied public use permitted on the Refuge is deer hunting. The Refuge is open to deer hunting during all state deer seasons in Unit 67A. No Refuge permits are required.

Chapter 4: Environmental Consequences

4.1 Effects Common to All Alternatives at Both Refuges

Specific environmental and social impacts of implementing each alternative are examined according to the five broad issue categories: habitat management, water management, wildlife management, landscape and watershed, and visitor services. However, several potential effects will be very similar under each alternative and are summarized below:

4.1.1 Air Quality

Air quality in much of southern Wisconsin is not particularly good. Graded on a scale from A (Best/Cleanest in the U.S.) to F (Worst/Dirtiest in U.S.) in one evaluation, Dodge, Fond du Lac, and Marquette counties received a "D". The U.S. Environmental Protection Agency (EPA) has designated a number of counties along the eastern edge of Wisconsin as "non-attainment areas" for ozone. While Dodge, Fond du Lac and Marquette counties are in attainment for ozone, they are close to these non-attainment areas. Ozone (O_3), a primary chemical constituent of smog, forms when volatile organic compounds (VOCs) and oxides of nitrogen (NOx) react in the presence of sunlight. Elevated ozone levels can produce distinctive stippling and chlorosis in sensitive plant species in addition to causing adverse effects on human health.

None of the management alternatives at either refuge would have appreciable, long-term impacts on ambient air quality conditions in the area. At both refuges, habitat management involving prescribed fire would occur under each alternative, but prescribed fire would be used only under ideal weather conditions. Approved smoke management practices developed by state and federal land management agencies would be implemented in all burning events. The generally low population densities of the farmlands bordering the refuges would help to minimize temporary smoke-related, air quality impacts by reducing the number of potential "sensitive receptors" that could be affected by excessive smoke. Nevertheless, under each alternative at both refuges there would be some potential for temporary air quality impacts from smoke in areas beside the refuges.

Tailpipe emissions from operation of refuge equipment and from visitation to the refuges by the motoring public are negligible in comparison with overall regional emissions.

4.1.2 Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives for either refuge described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income popula-

tions. The percentage of minorities in the three counties in which the two refuges are located is lower than in Wisconsin (and much lower than the United States) as a whole. Average incomes and poverty rates within these counties are comparable to other rural counties in the state. Public use activities that would be offered under each of the alternatives at both Horicon and Fox River NWRs would be available to any visitor regardless of race, ethnicity or income level.

4.1.3 Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies, under its direction, that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The increase of carbon dioxide (CO_2) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's "*Carbon Sequestration Research and Development*" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric CO_2. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. One Service activity in particular – prescribed burning – releases CO_2 directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air. Overall, there should be little or no net change in the amount of carbon sequestered at Horicon or Fox River NWRs from any of the proposed management alternatives. Conversion of closed forest to more open savanna would entail the reduction of standing biomass at Fox River NWR, but this would occur under both alternatives and would not be significant.

Preserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this CCP would preserve or restore land and habitat, and would thus retain existing carbon sequestration on both refuges. This in turn contributes positively to efforts to mitigate human-induced global climate change.

4.1.4 Cultural Resources

The USFWS is responsible for managing archeological and historic sites found on national wildlife refuges. The consequences for cultural resources for each management alternative in this Draft EA are the same.

Undertakings accomplished on the Refuges have the potential to impact cultural resources. Although the presence of cultural resources including historic properties cannot stop a Federal undertaking, the undertakings are subject to Section 106 of the National Historic Preservation Act and sometimes other laws.

Thus the Refuge Manager will, during early planning, provide the Regional Historic Preservation Officer a description and location of all projects, activities, routine maintenance and operations that affect ground and structures, and requests for permitted uses; and of alternatives being considered. The RHPO will analyze these undertakings for potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. The Refuge Manager will notify the public and local government officials to identify concerns about impacts by the undertaking; this notification will be at lease equal to, preferably with, public notification accomplished for NEPA and compatibility.

Archeological investigations and collecting are performed only in the public interest by qualified archeologists or by persons recommended by the Governor of Wisconsin working under an Archaeological Resources Protection Act permit issued by the Regional Director. Refuge personnel take steps to prevent unauthorized collecting by the public, contractors, and Refuge personnel; violators are cited or other appropriate action taken. Violations are reported to the Regional Historic Preservation Officer.

4.1.5 Prescribed Fire

Social Implications – A prescribed burn on the Refuges will benefit the public in creating recreational opportunities through increased wildlife

populations for hunting and observation. If a wildland fire occurs on or near the Refuges, the areas that were prescribed burned and the firebreaks intended for prescribed burning will help in controlling the fire. Smoke from a Refuge fire could impair visibility on roads and become a hazard. All efforts will be taken to assure that smoke does not impact smoke sensitive areas such as roads and local residences. The impact of smoke can be reduced through management actions, which include: use of traffic control, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement officers to assist with control traffic. Burning will be done only when the smoke will not be blown across the community or when the wind is sufficient to prevent heavy concentrations.

Combustion of fuels during prescribed fire operations may temporarily impact air quality, but the impacts are mitigated by small burn unit size, direction of wind, and distance from population centers. In the event of wind direction change, mitigation measures will be taken to assure public safety and comfort. Refuge staff will work with neighboring agencies and State air quality personnel to address smoke issues that require additional mitigation. The Prescribed Fire Plan describes specific measures to deal with smoke management problems for each unit. Any smoke from a Refuge may cause some public concern. This concern will be reduced through a concerted effort by Refuge personnel to inform the local citizens about the prescribed burning program, emphasizing the benefits to wildlife and the safety precautions that are taken. Interpretive programs, explaining the prescribed burning program, may also be conducted on and off the Refuges.

Cultural and Archaeological Resources – There may be archaeological sites within prescribed burn units. When these units are burned, it is doubtful that the fire will have any adverse impact on the sites. The fire will be only a temporary disturbance to the vegetation in the area and in no way destroy or reduce the archaeological value, since artifacts are buried beneath the surface. No known sites will be impacted by prescribed burning operations. Constructing firebreaks usually involves some shallow ground disturbance that could damage or destroy these resources. If a firebreak is needed on undisturbed ground, the area will be surveyed prior to construction to protect any cultural or archaeological resources.

Flora – The prescribed burning program will have a visible impact on vegetation and the land. Immediately after a fire much of the land will be blackened. There will be few grasses or ground forbs remaining and most of the brush will be scorched. Trees may be scorched. Because of wet ground conditions or discontinuous fuel, there may be areas within the burn unit that are untouched by the fire. In spring, grasses and forbs will begin to grow within a few days of the burn. The enriched soil will promote rapid growth such that after two or three weeks the ground will be covered. In some cases, young trees will re-sprout. Some of the less fire resistant trees will show signs of wilting and may succumb. After one season of regrowth, most signs of the prescribed burn will be difficult to detect without close examination.

Other signs of the burn will remain for longer periods. The firebreaks will be maintained for use in containing wildland fires and future prescribed burns. Vehicle tracks through the burn are visible on the freshly burned ash and may be longer lived if the vehicle created ruts in the ground. Travel across the burn area will be kept to a minimum. Vehicle travel is necessary in some instances, such as lighting the fire lines or quickly getting water to an escape point. A fire plow will be used only in the event that an escape occurs and cannot be controlled by any other method. The trench of the plow would be repaired by filling, which would eliminate it from view after several years.

Listed Species – Precautions will be taken to protect threatened and endangered species during prescribed burning. Nesting trees for Bald Eagles will be protected and burning will not be conducted at a time or in a way to negatively impact any nesting eagles. If any of the known populations of listed plant species are in or near a burn unit, precautions will be taken to avoid the plants.

Soils – The effect of fire on soil is dependent largely on the fire intensity and duration. On areas with high fuel loads, a slow backing fire is usually required for containment and desirable results. The intense heats generated by a slow backing fire will have a greater effect on the soils than fast, cooler head-fires. The cool, moist soils of wetter areas in the burn units or areas with little fuel will be minimally affected by the fire. The degree of impact to the soil is a function of the thickness and composition of the organic mantle. In cases where only the top layer of the mantle is scorched or burned, there will be no effect on the soil. This usually occurs in

the forested areas of the burn units. On open grassland sites, the blackening of the relatively thin mantle will cause greater heat absorption and retention from the sun. This will encourage earlier germination during the spring growing season. Nutrient release occurs as a result of the normal decomposition process. Fire will speed up the nutrient release process. The rate and amount of nutrients released will be dependent on the fire duration and intensity as well as the amount of humus, duff and other organic materials present in the mantle. The increase, immediately after a burn, of calcium, potash, phosphoric acid and other minerals will give the residual and emergent vegetation a short-term boost. There is no evidence to show that the direct heating of soil by a fire of low intensity above it has any significant adverse affect. Fire of this type has little total effect on the soil, and in most cases would be beneficial.

Peat Fires – An ecological impact that can result from wildfire is ignition of peat soils. Most of the Refuge's wetland soils contain peat varying in depth from a few inches to 6 feet or more. Once started, peat is often difficult to extinguish and can burn down to mineral soils. This can change the vegetation composition in an area. Peat fire suppression efforts can also have an adverse effect on the vegetation through the use of heavy equipment (dozers, fire trucks, etc). Examination of some previously burned areas with prolonged peat fires has shown that the resulting habitat has become exceptional for waterfowl. The burned-out areas created potholes in what were otherwise temporary or cattail-choked wetlands. The damages versus benefits of burning peat will need to be addressed on a case by case basis.

Escaped Fire – The possibility exists that prescribed fire may escape to the surrounding area. An escape can be caused by factors that may, or may not, be preventable. Inadequate firebreaks, too few personnel, unpredicted changes in weather conditions, peculiar fuel type, and insufficient knowledge of fire behavior are factors that can lead to a loss of control. An escaped fire can turn into a very serious situation. On the Refuge's wildlands, an escaped fire would cause less severe damage than on land where buildings, equipment, and land improvements could be damaged. Many of the prescribed burn areas are well within the Refuges and of minimal threat to private or other improved lands. We will exercise extreme care, careful planning, and adherence to the unit prescription when we conduct all prescribed burns. We will place an extra emphasis on control when burning areas that are near developed areas or the Refuge boundary.

In the event that a prescribed fire does jump a firebreak and burn into unplanned areas, there is a high probability of rapid control with minimal adverse impact. In general, prescribed burns will have light fuel loads (0.25 to 3 tons of fuel per acre), will be burned under low fuel moisture conditions, and will be burned under specific wind direction and atmosphere stability conditions. The network of firebreaks and roads will greatly assist in rapid containment. In most cases all of the Refuge fire fighting equipment will be immediately available at the scene with all nearby water sources previously located. The applicable WIDNR fire suppression crews and local fire departments will always be notified of a prescribed burn. Thus, maximum numbers of experienced personnel and equipment are immediately available for wildfire suppression activities.

4.1.6 Other Common Effects

None of the alternatives at either Refuge would have more than negligible or at most minor effects on soils, topography, noise levels, land use patterns in and around the Refuges, transportation and traffic, waste management, human health and safety, or visual resources.

4.2 Horicon National Wildlife Refuge

4.2.1 Alternative A – Current Management Direction (No Action)

Under the No Action Alternative – Alternative A – nearly all of the Refuge's uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. This restoration of a habitat that has been in regional decline is a positive effect in and of itself and it would also represent a beneficial impact for nesting grassland birds and waterfowl. The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of preventing the spread of these species, which tend to supplant native flora and reduce habitat value for wildlife. The pro-

posed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

This alternative would continue to manage water impoundments to provide a variety of water conditions for waterbirds including ducks, geese, shorebirds, and wading birds during spring, summer, and fall. Water management is conducted on 17 impoundments or approximately 17,000 acres of wetland habitat. It is expected that habitat benefits to these birds would continue under Alternative A.

Landscape and watershed involvement by Service employees would continue to be limited due to staffing constraints. This alternative would not rigorously address the serious, long-term threat Horicon Marsh faces from sedimentation. Thus, it is reasonable to assume that for the duration of the CCP, sedimentation rates would continue unabated and the Marsh would continue to fill in, to its detriment and the detriment of the water-associated birds that depend on it. Excessive nutrient and sediment inflow would continue to aggravate the ongoing spread of thick cattail stands of limited utility to wildlife. In essence, pursuing the Current Management Direction Alternative would not affect the inevitable "day of reckoning" with regard to sedimentation's long-term impacts on wetland habitat quality in the marsh.

This alternative would not advance the Region's interest in promoting Regional Conservation Priority Species. If any of these species were to become established and thrive on the Refuge, it would not be from any proactive measures on the Refuge's part.

Horicon NWR's deer population may increase somewhat under Alternative A, due to the proposed increase in grasslands and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Wildlife/auto collisions along Highway 49 in the northern part of Horicon Marsh would continue at approximately current levels under this alternative, which would not propose or implement any new measures to reduce mortality along that corridor. This mortality would represent a continuing source of downward pressure on populations of various species, though whether this would be to a decisive extent is unknown.

The Current Management Direction Alternative would maintain existing hunting opportunities on the Refuge, including hunts for ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer. Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge's boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Existing fishing facilities and opportunities would also be maintained. These are limited to Main Dike Road, Ledge Road and Peachy Road. Main Dike Road and Ledge Road would continue to have accessible fishing piers on location but lack welcome kiosks. Game fish would continue to be stocked each year at various locations throughout the Refuge. One youth fishing event would be held on the Refuge in celebration of National Fishing Week. The impact of this alternative on fishing would be neither beneficial nor adverse.

The Refuge's active environmental education, interpretation, and outreach programs would all continue as they are at present under Alternative A.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under this alternative, meeting the Service's obligation to protect these irreplaceable assets.

4.2.2 Alternative B: A Free-Flowing Rock River (Preferred Alternative)

Under Alternative B – A Free-Flowing Rock River – which is the preferred alternative and the basis for the CCP, nearly all of the Refuge's uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. Upland habitat management objectives and strategies proposed under Alternative B are essentially identical to those of Alternative A. Restoration of native grasslands and oak savanna, which have been in regional decline, are positive outcomes in and of themselves. This restoration, if fully implemented, would also represent a beneficial impact for nesting grassland birds and waterfowl.

The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed, intensified control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of reducing the size of current infestations of these species, which tend to supplant native flora and reduce habitat value for wildlife. Reducing 50% of current invasive plant infestations and preventing new ones during the life of the CCP would open niches for native flora and benefit the wildlife that depend on it. The proposed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

This alternative would seek to re-establish a braided river system flowing into the north end of the Horicon Marsh. The radial gate would remain open so that the marsh is managed as an open system. In theory, this should facilitate flushing nutrients and sediments out of the Marsh, which in turn would help reduce the accretion of sediments and the spread of dense cattail stands that now threaten to eliminate open water areas and patchy hemi-marsh. By practicing adaptive resource management, Service and Refuge staff can monitor changes in water and sediment levels and cattail distribution, density and abundance. Depending on the behavior of the system, management strategies could be experimented with or adjusted to continue aiming for an expansion in acreage of open water and hemi-marsh.

Under Alternative B, water management would continue on the 16 sub-impoundments as in Alternative A. These sub-impoundments would continue to produce seasonal habitats and food sources for waterfowl, shorebirds, and wading birds.

The proposed increase in landscape and watershed involvement by staff and partners to pursue the dual objectives of reducing sedimentation and improving water quality in the Horicon Marsh may succeed, but it is impossible to predict how successful this will be. The technical approaches needed to succeed are generally well-known, but developing the trust and positive working relationship with the agricultural community – as well as the financial or other incentives for farmers – needed to reduce erosion, sedimentation and nutrient loss will require patience and dedication extending over decades.

This alternative would actively advance the Region's interest in promoting Regional Conservation Priority Species. Horicon NWR would explicitly seek to introduce or assist priority species that historically occurred in the area. Over a 15-yrear period, these efforts would likely improve the status of various priority species in the state and region.

Horicon NWR's deer population may increase somewhat under Alternative B, due to the proposed increase in grasslands and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Under Alternative B, a number of strategies are proposed to address the problem of wildlife/auto collisions along State Highway 49. Several of these can be pursued concurrently. The most costly and politically challenging solution – relocation of Hwy. 49 – would be the most effective one in reducing collisions and mortality, but also the one least likely to occur within the 15-year life of the CCP. Other strategies are more feasible but would probably be less successful in cutting down on the number of collisions.

The Preferred Alternative would maintain existing hunts for ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer as well as modestly increase hunting opportunities on the Refuge. The addition of a spring wild turkey hunt would benefit hunters. As in Alternative A, Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge's boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Under Alternative B, fishing would continue not to be a main public use emphasis at Horicon NWR. Existing, fairly small fishing facilities and opportunities would be maintained and slightly increased under this alternative. The impact of this alternative on sport fishing would be modestly beneficial.

The Refuge already has active environmental education, interpretation, and outreach programs. Under the Preferred Alternative, each would continue

approximately as they are at present, so that this alternative would not have any impacts, positive or negative, on these programs.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under this alternative, meeting the Service's obligation to protect these irreplaceable assets.

4.2.3 Alternative C: The Big Pool

Alternative C would seek to manage the majority of Horicon Marsh, approximately 10,845 acres, as one large waterbody. The main dike would be removed and the natural sinuosity of the Rock River would be encouraged. The removal of the southern dam, operated by the WIDNR, would also be explored. The problem of marsh sedimentation would be solved under this alternative by dredging the main channel. The nutrient-rich dredge spoil could be sold to farmers within the watershed to enhance depleted cropland soils. Water management control would still exist on 16 sub-impoundments or approximately 5,000 acres of wetland habitat.

Under Alternative C, as with Alternatives A and B, nearly all of the Refuge's uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. Upland habitat management objectives and strategies proposed under Alternative C are essentially identical to those of Alternatives A and B. Restoration of native grasslands and oak savanna, which have been in regional decline, are positive outcomes in and of themselves. This restoration, if fully implemented, would also represent a beneficial impact for nesting grassland birds and waterfowl.

The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed, intensified control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of reducing the size of current infestations of these species, which tend to supplant native flora and reduce habitat value for wildlife. Reducing 50 percent of current invasive plant infestations and preventing new ones during the life of the CCP would open niches for native flora and benefit the wildlife that depend on it. The proposed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

As stated above, under the Big Pool Alternative, the main dike would be removed and the natural sinuosity of the Rock River would be encouraged. In theory, both these steps should facilitate flushing nutrients and sediments out of the Marsh, which in turn would help reduce the accretion of sediments and the spread of dense cattail stands that now threaten to eliminate open water areas and patchy hemi-marsh. An additional step, dredging the Marsh as necessary to remove accumulated sediments, would be highly beneficial – perhaps even indispensable – to restoring habitat values and maintaining the marsh over the long term. However, dredging would be expensive and the measure proposed to offset this cost – sale of dredge spoil to farmers – must be regarded as speculative, though it certainly holds promise.

Under Alternative C, water management would continue on the 16 sub-impoundments as in Alternatives A and B. These sub-impoundments would continue to produce seasonal habitats and food sources for the benefit of waterfowl, shorebirds, and wading birds.

Under this alternative, as in Alternative B, the proposed increase in landscape and watershed involvement by staff and partners to pursue the dual objectives of reducing sedimentation and improving water quality in the Horicon Marsh may succeed, but it is impossible to predict how successful this will be. The technical approaches needed to succeed are generally well-known, but developing the trust and positive working relationship with the agricultural community – as well as the financial or other incentives for farmers – needed to reduce erosion, sedimentation and nutrient loss will require patience and dedication extending over decades.

Like Alternative B, Alternative C would also actively advance the Region's interest in promoting Regional Conservation Priority Species. Horicon NWR would explicitly seek to introduce or assist priority species that historically occurred in the area. Over a 15-yrear period, these efforts would likely improve the status of various priority species in the state and region.

As in the first two alternatives, Horicon NWR's deer population may increase somewhat under Alternative C, due to the proposed increase in grasslands

and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Under Alternative C, as in Alternative B, a number of strategies are proposed to address the problem of wildlife/auto collisions along State Highway 49. Several of these can be pursued concurrently. The most costly and politically challenging solution – relocating Hwy. 49 outside the Refuge – would be the most effective one in reducing collisions and mortality, but also the one least likely to occur within the 15-year life of the CCP. Other strategies are more feasible but would probably be less successful in cutting down on the number of collisions.

Alternative C would maintain existing hunts for Ring-necked Pheasant, Gray Partridge, cottontail rabbit, squirrel, and deer as well as modestly increase hunting opportunities on the Refuge. The proposed addition of a spring wild turkey hunt would benefit hunters. As in Alternative A, under Alternative C Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge's boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Under Alternative C, fishing would continue not to be a main public use emphasis at Horicon NWR. Existing, fairly small fishing facilities and opportunities would be maintained and slightly increased under this alternative. The impact of this alternative on sport fishing would be modestly beneficial.

The Refuge already has active environmental education, interpretation, and outreach programs. Under Alternative C, each would continue approximately as they are at present, so that this alternative would not have any impacts, positive or negative, on these programs.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under Alternative C, meeting the Service's obligation to protect these irreplaceable assets.

Table 6 summarizes and compares the impacts of each of the Horicon NWR management alternatives evaluated in this EA.

4.2.4 Cumulative Impacts Analysis

"Cumulative environmental impacts" refer to effects that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impact of each alternative is discussed in terms of Horicon Marsh sedimentation and environmental education.

Horicon Marsh began filling in with sediments the moment farmers dragged plows across virgin prairie and converted oak savanna to cultivated fields in the drainage area of the Rock River upstream of the Refuge. Conducted on tens of thousands of acres, these soil and sod disturbing agricultural activities inevitably exposed soils to wind, rainfall, erosion and subsequent sedimentation in water courses down-slope. Because it is a basin with little or no gradient, Horicon Marsh is filling in with the materials deposited by the Rock River, which loses kinetic energy when flowing across the Marsh's flat surface and can no longer transport its sediment load, thus depositing it in the Marsh. This deposition and gradual filling in is a natural process, one that is repeated across the planet and one that has occurred for millions of years. The problem is that human activities in the watershed have accelerated this natural process by at least an order of magnitude.

Alternative A, the No Action or Current Management Direction Alternative, would continue to not actively intervene in the processes by which sediment is generated from the agricultural activities of the watershed. These are gradually resulting in the Marsh's disappearance and its succession from a marsh that includes open water and hemi-marsh through a dense cattail phase with less and less open water, and ultimately, to a wet and then a semi-wet meadow. The loss of marshland over the long term under this alternative would represent a long-term, cumulative adverse impact to waterfowl, shorebirds, wading birds and other water-dependent avifauna.

Alternative B – a free-flowing Rock River and the preferred alternative – aims to interrupt the historic pattern of erosion and sedimentation that threaten the Marsh's values. Whether this alternative actually enables the river to flush out the nutrients and sediments now being deposited will await the results of long-term monitoring of water levels and volumes in the Marsh and the relative areas of open water and

Table 6: Summary of Environmental Consequences for Management Alternatives for Horicon National Wildlife Refuge

Issue	Alternative A Current Direction (No Action)	Alternative B A Free-flowing Rock River (Preferred Alt.)	Alternative C The Big Pool
Oak Savanna Habitat	Increase over current acreage	Same as Alt. A	Same as Alt. A
Marsh /Open Water Habitat	Continues to degrade at current rate from sedimentation and cattail growth	More natural water flow regime established; encroachment of cattails curtailed	Similar to Alt. B but likely on larger scale
Mudflats for Shorebirds	Maintains current acreage and mgmt.	Same as Alt. A	Same as Alt. A
Sedimentation of Marsh	Continues or accelerates	Likely to continue but at reduced rate from Alt. A	Sedimentation would continue as in Alt. B, but periodic dredging would hold in check
Invasive Plant Species	Would continue to be controlled but not eradicated	Infestations reduced from current levels	Same as Alt. B
Regional Conservation Priority Species	Occurrence on Refuge incidental	Would be assisted by greater Refuge efforts	Same as Alt. B
Deer Population	Hunting continues to control at density of 15-20 per square mile; oak savanna restoration may increase carrying capacity	Same as Alt. A	Same as Alt. A
Wildlife/Auto Collisions	High mortality continues along Hwy. 49	Reduced collisions and mortality along Hwy. 49	Same as Alt. B
Hunting	Existing hunting opportunities maintained	Hunting opportunities expanded slightly	Same as Alt. B
Fishing	Limited fishing opportunities continue	Modestly expanded fishing facilities and opportunities	Same as Alt. B
Wildlife Observation and Photography	Current emphasis and high level of public participation continue	Slight increase in current high emphasis and public participation	Same as Alt. B
Environmental Education and Interpretation	Current high levels of both EE and interpretation are maintained	Same as Alt. A	Same as Alt. A
Cultural Resources	Current levels of protection maintained	Same as Alt. A	Same as Alt. A

hemi-marsh. If successful in achieving its aims, Alternative B would lessen and perhaps reverse cumulative impacts on the Marsh.

Alternative C – The Big Pool – also aims to interrupt the historic pattern of erosion and sedimentation that threaten the Marsh's values. As with Alternative B, if successful in achieving its aims, Alternative C would reduce and maybe reverse cumulative impacts of excessive sedimentation in Horicon Marsh. Whether it actually succeeds will depend both on wetland and riverine functioning as well as whether funds can be obtained to dredge the Marsh and the agricultural community can be convinced to buy or at least receive dredged materials.

Environmental education (EE) is provided by a variety of institutions inside and outside of the formal classroom. In addition to K-12 public schools, in which environmental education is generally included under the life and physical sciences, especially biology, but also within chemistry, geography, civics, and history, museums, zoos, parks, libraries, television and the news media (e.g., newspapers, magazines, the Internet) all contribute to improving environmental education for American students and citizens. As a result of the cumulative impact of these combined efforts, in recent decades the average American's level of environmental knowledge and awareness appear to have gradually increased.

At present, Horicon NWR provides a substantial amount of environmental education on and off the Refuge. The Refuge has one full-time staff person – the Visitor Services Specialist – who is responsible for environmental education, interpretation, and outreach, as well as promoting and managing other compatible public uses on the Refuge. These efforts are focused primarily on wildlife, habitat, and water management, which is appropriate for a national wildlife refuge. Efforts and results are somewhat constrained by staffing and budgetary limitations; Horicon NWR is not able to dedicate one entire staff person's efforts to environmental education; rather it is a collateral duty of the Visitor Services Specialist. Efforts include both on and off-Refuge educational activities. Under all three alternatives, this would continue to be the case. All three alternatives, then, would equally continue to make a contribution to overall environmental education efforts in the region for the public at large, and especially for the school-aged population. The ongoing EE program would likely lead to a concomitant cumulative, beneficial impact on the level of environmental knowledge and awareness in the citizens of south-central Wisconsin.

4.3 Fox River National Wildlife Refuge

4.3.1 Alternative A – Current Management Direction

The Current Direction Alternative would continue with ongoing restoration and management activities on Refuge wetlands and uplands. These activities aim to create a mosaic of habitat conditions that were present prior to European settlement, in particular dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands. Once reestablished, these habitats would then be managed to perpetuate a variety of native plant and wildlife species, especially those of priority to the Service. If successful, these restoration and management efforts would represent a benefit for biodiversity in Wisconsin, in that each one of the habitats in question has suffered declines since Euro-American settlement and conversion of natural habitats into agricultural lands in the region began in earnest more than a century ago.

However, restoring these habitats would render much larger ecological benefits – especially to wildlife – if the areas involved were larger. The small size of Fox River NWR limits the likely extent of benefits that would actually occur. Advances in the field of island biogeography in the last 20-30 years have demonstrated that intact ecosystems and self-sustaining populations of the species that comprise them, especially wider-ranging, larger animals with larger spatial requirements, simply cannot endure over the long run without sufficient area. Nevertheless, over the long run, the Fox River NWR habitat restoration efforts may serve to instigate other efforts on state and private-owned tracts in the area, and thus have a positive cumulative effect.

The above discussion assumes that funding, expertise and personnel would be available to continue to implement habitat restoration and hold encroachment by other habitat types or even natural succession in check.

Proposed invasive species control efforts would also help to preserve the integrity of native habitats.

The only visitor services provided by the Current Direction Alternative would be an annual deer hunt. The Refuge would continue to be closed to unsupervised visitors the remainder of the year, although there would continue to be a small number of Service-led educational excursions for students. Thus, this alternative would not allow for any increase in the six priority public uses of national wildlife refuges, or any other forms of consumptive or non-consumptive outdoor recreation.

With regard to facilities and administration, there would continue to be no facilities on the Refuge, and it would continue to be administered entirely from Horicon NWR. Thus, there would be no additional Service presence on the Refuge to serve as a deterrent to would-be law breakers, deal with enforcement issues, or to assist and work with visitors and Refuge neighbors. There would continue to be limited participation in pursuing the Refuge's goals, objectives and strategies by partners and volunteers.

4.3.2 Alternative B: Historic Habitat Conditions and Enhanced Visitor Services

The impacts of Alternative B on habitat and wildlife populations would be very similar to those of the Current Management Direction (Alternative A), because the objectives and strategies are almost identical. The one area in which there may be differences concerns Regional Conservation Priority (RCP) Species. More of an emphasis on restoring those wildlife species that originally occurred in this area and that were extirpated sometime over the last century or that have become regionally scarce would be made under Alternative B than in Alternative A. This greater emphasis could further the Service's mission to serve as a steward of the nation's living resources.

Alternative B would include more opportunities for wildlife-dependent recreation on the Refuge than Alternative A, including additional hunting opportunities, the initiation of a fishing program, new wildlife observation and photography opportunities, and the beginning of an environmental education and interpretation program. All of these would represent benefits for the public.

Specifically, initiating a spring season for wild turkeys and ice fishing on Refuge water bodies would benefit local hunters and anglers. If the proposed Wisconsin Ice Age State and National Trail segment were to be built across Refuge lands, it could serve Refuge visitors by providing access for wildlife observation and photography, hunting, and environmental education and interpretation.

Refuge staffing would likely remain limited and insufficient under Alternative B, although the possible addition of a part-time position dedicated to the Refuge would help management. Overall, however, Refuge facilities and administration would change little under Alternative B. Table 7 summarizes the impacts of the two proposed management alternatives by issue.

4.3.3 Cumulative Impacts Analysis

"Cumulative environmental impacts" refer to those that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impact of each alternative is discussed in terms of two rare wetland habitats: fens and sedge meadow.

Fens are an open wetland type found in southern Wisconsin; they are often underlain by a calcareous substrate, through which carbonate-rich groundwater percolates. Some fens have significant prairie or sedge meadow components, and intergrade with those communities. Calcareous fens are the rarest wetland plant community in Minnesota and Wisconsin, and perhaps one of the rarest in North America. Only a select group of calcium-tolerant plants, known as calciphiles, can tolerate the extreme conditions found in fens. Characteristic species include shrubby cinquefoil, sterile sedge, wild timothy, beaked spikerush, Ohio goldenrod, common valerian and lesser fringed gentian. Fen communities in general have a disproportionate number of rare, threatened, and endangered plant species compared to other plant communities in the Great Lakes Region. Over the past century, fens have declined in area not only in the Great Lakes Region of North America, but throughout much of the continent and indeed, over in Europe as well.

Although they have declined generally, sedge meadows are still widespread in southern Wisconsin. This open wetland community is dominated by sedges and grasses, most typically tussock sedge and Canada bluejoint grass. Common associates are water-horehound, panicled aster, blue flag, Canada goldenrod, spotted joe-pye-weed, broad-leaved cat-tail, and swamp milkweed. Reed canary grass may be dominant in grazed and/or ditched stands. Ditched stands can succeed quickly to Shrub-Carr.

Both Alternative A and Alternative B, by providing 100 acres and 600-650 acres of fen and sedge meadow habitats, respectively, would contribute incrementally in a beneficial way toward efforts to reverse the historic loss of these two wetland habitats.

Table 7: Summary of Environmental Consequences for Management Alternatives for Fox River NWR

Issue	Alternative A Current Direction (No Action)	Alternative B Historic Habitat Conditions & Enhanced Visitor Services (Preferred Alt.)
Oak savanna habitat	Increase over current acreage	Same as Alternative A
Grasslands	Increase over current acreage	Same as Alternative A
Fen and wet prairie	Increase over current acreage	Same as Alternative A
Sedge meadow and shallow emergent marsh	Increase over current acreage	Same as Alternative A
Invasive plant species	Would continue to be controlled but not eradicated	Same as Alternative A
Regional Conservation Priority Species	Occurrence on Refuge incidental	Would be assisted by greater Refuge efforts
Deer population	Hunting continues to control at density of 15-20 per square mile; oak savanna restoration may increase carrying capacity	Same as Alternative A
Land conservation	Additional lands conserved within and near Refuge	Same as Alternative A
Hunting	Existing deer hunting opportunities maintained	Hunting opportunities expanded by adding spring wild turkey hunt
Fishing	Fishing continues to be prohibited	Modestly expanded fishing opportunities (ice fishing on Long Lake)
Wildlife Observation and Photography	Refuge continues to be closed to wildlife observation and photography	Observation and photography opportunities would increase
Environmental Education and Interpretation	Current low levels of EE and interpretation would be maintained	Same as Alternative A
Administration and Logistics	Continued management from Horicon NWR signifies low Service profile on Refuge	Similar to Alternative A but possible increase in volunteers, partners, and part-time staff
Cultural Resources	Current levels of protection maintained	Same as Alternative A

Chapter 5: List of Preparers

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Chapter 6: Consultation and Coordination With Stakeholders

The Service and Refuges have conducted extensive consultation and coordination over several years with stakeholders in developing the CCP and EA for Horicon and Fox River national wildlife refuges. In the course of scoping and focus group meetings for the two refuges, the Service consulted with more than two dozen individuals representing Wisconsin DNR, conservation organizations, neighboring communities, Refuge users, and other stakeholders. See Chapter 2 of the CCP for a more detailed description of the process and Appendix H for a listing of contacts.

Appendix B: Glossary

Appendix B: Glossary

Alternative	A set of objectives and strategies needed to achieve refuge goals and the desired future condition.
Biological Diversity	The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.
Compatible Use	A wildlife-dependent recreational use, or any other use on a refuge that will not materially interfere with or detract from the fulfillment of the mission of the Service or the purposes of the refuge.
Comprehensive Conservation Plan (CCP)	A document that describes the desired future conditions of the refuge, and specifies management direction to achieve refuge goals and the mission of the National Wildlife Refuge System.
Community	A distinct assemblage of plants that develops on sites characterized by particular climates and soils, and the species and populations of wild animals that depend on the plants for food, cover and/or nesting.
Ecosystem	A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.
Ecosystem Approach	A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.
Ecosystem Management	Management of an ecosystem that includes all ecological, social and economic components that make up the whole of the system.
Ecotone	Edge or transition zone between two or more adjacent but different plant communities, ecosystems, or biomes.
Endangered Species	Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the *Federal Register*.

Environmental Assessment (EA)	A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.
Extirpation	The localized extinction of a species that is no longer found in a locality or country, but still exists elsewhere in the world.
Goals	Descriptive statements of desired future conditions.
Issue	Any unsettled matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or in the presence of an undesirable resource condition.
National Wildlife Refuge System	All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife and plant resources.
Objectives	Actions to be accomplished to achieve a desired outcome or goal. Objectives are more specific, and generally more measurable, than goals.
Preferred Alternative	The Service's selected alternative identified in the Draft Comprehensive Conservation Plan.
Scoping	A process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues. Involved in the scoping process are federal, state and local agencies; private organizations; and individuals.
Species	A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. In taxonomy, a category of biological classification that refers to one or more populations of similar organisms that can reproduce with each other but is reproductively isolated from – that is, incapable of interbreeding with – all other kinds of organisms.
Strategies	A general approach or specific actions to achieve objectives.
Wildlife-dependent Recreation	A use of refuge that involves hunting, fishing, wildlife observation and photography, or environmental education and interpretation, as identified in the National Wildlife Refuge System Improvement Act of 1997.

Threatened Species	Those plant or animal species likely to become endangered species throughout all of or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the *Federal Register*.
Vegetation	Plants in general, or the sum total of the plant life in an area.
Vegetation Type	A category of land based on potential or existing dominant plant species of a particular area.
Watershed	The entire land area that collects and drains water into a stream or stream system.
Wetland	Areas such as lakes, marshes, bogs, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and that do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.
Wildlife Diversity	A measure of the number of wildlife species in an area and their relative abundance.

Appendix C: Species List

Horicon NWR Species Lists

Bird List, Horicon NWR

Common Name	Scientific Name	Sp	Su	Fa	Wi
Grebes					
Pied-billed Grebe*	*(Podilymbus podiceps)*	C	C	C	
Horned Grebe	*(Podiceps auritus)*	R		R	
Red-necked Grebe	*(Podiceps grisegena)*	R		R	
Pelicans					
American White Pelican*	*(Pelecanus erythrorhynchos)*	C	C	C	
Cormorants					
Double-crested Cormorant*	*(Phalacrocorax auritus)*	C	C	C	
Herons and Bitterns					
American Bittern*	*(Botaurus lentiginosus)*	U	U	U	
Least Bittern*	*(Ixobrychus exilis)*	U	U	U	
Great Blue Heron*	*(Ardea herodias)*	C	C	C	U
Great Egret*	*(Ardea alba)*	C	C	C	
Snowy Egret	*(Egretta thula)*	R	R	R	
Cattle Egret	*(Bubulcus ibis)*	R	R	R	
Green Heron*	*(Butorides virescens)*	U	U	U	
Black-crowned Night-Heron*	*(Nycticorax nycticorax)*	C	A	A	
Yellow-crowned Night-Heron	*(Nyctanassa violacea)*	R	R	R	
Vultures					
Turkey Vulture	*(Cathartes aura)*	U	U	R	
Swans, Geese and Ducks					
Greater White-fronted Goose	*(Anser albifrons)*	R		R	
Snow Goose	*(Chen caerulescens)*	U		U	
Canada Goose*	*(Branta canadensis)*	A	C	A	C
Trumpeter Swan	*(Cygnus buccinator)*	R		R	
Tundra Swan	*(Cygnus columbianus)*	U		U	
Wood Duck*	*(Aix sponsa)*	C	C	C	

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Gadwall*	*(Anas strepera)*	U	U	C	
American Wigeon*	*(Anas americana)*	U	U	C	
American Black Duck	*(Anas rubripes)*	U	U	U	R
Mallard*	*(Anas platyrhynchos)*	A	A	A	U
Blue-winged Teal*	*(Anas discors)*	C	C	C	
Northern Shoveler*	*(Anas clypeata)*	C	U	C	
Northern Pintail	*(Anas acuta)*	U	U	U	
Green-winged Teal*	*(Anas crecca)*	C	U	A	
Canvasback	*(Aythya valisineria)*	U	R	U	
Redhead*	*(Aythya americana)*	C	C	C	
Ring-necked Duck	*(Aythya collaris)*	C	U	C	
Greater Scaup	*(Aythya marila)*	R		R	
Lesser Scaup	*(Aythya affinis)*	C	U	C	
Bufflehead	*(Bucephala albeola)*	U		U	R
Common Goldeneye	*(Bucephala clangula)*	U		U	
Hooded Merganser*	*(Lophodytes cucullatus)*	U	U	U	R
Common Merganser	*(Mergus merganser)*	U		U	R
Red-breasted Merganser	*(Mergus serrator)*	R		R	
Ruddy Duck*	*(Oxyura jamaicensis)*	C	U	C	
Hawks and Eagles					
Osprey	*(Pandion haliaetus)*	R	R	R	
Bald Eagle*	*(Haliaeetus leucocephalus)*	U	C	C	U
Northern Harrier*	*(Circus cyaneus)*	C	C	C	C
Sharp-shinned Hawk*	*(Accipiter striatus)*	U	R	U	R
Cooper's Hawk*	*(Accipiter cooperii)*	U	R	U	R
Red-shouldered Hawk	*(Buteo lineatus)*	U		U	
Broad-winged Hawk	*(Buteo platypterus)*	U		U	
Red-tailed Hawk*	*(Buteo jamaicensis)*	C	C	C	C
Rough-legged Hawk	*(Buteo lagopus)*	C		C	C
Falcons					
American Kestrel*	*(Falco sparverius)*	C	C	C	C
Peregrine Falcon	*(Falco peregrinus)*	R		R	R
Upland Game Birds					
Gray Partridge*	*(Perdix perdix)*	U	U	U	U

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Ring-necked Pheasant*	*(Phasianus colchicus)*	C	C	C	C
Wild Turkey*	*(Meleagris gallopavo)*	A	C	A	C
Ruffed Grouse*	*(Bonasa umbellus)*	R	R	R	
Rails and Coots					
Yellow Rail*	*(Coturnicops noveboracensis)*	R			
King Rail*	*(Rallus elegans)*	U	U	R	
Virginia Rail*	*(Rallus limicola)*	C	C	C	
Sora*	*(Porzana carolina)*	C	C	C	
Common Moorhen*	*(Gallinula chloropus)*	C	C	C	
American Coot*	*(Fulica americana)*	A	A	A	
Cranes					
Sandhill Crane*	*(Grus canadensis)*	C	C	C	C
Whooping Crane	*(Grus americana)*	U	U	U	
Shorebirds					
Black-necked Stilt*	*(Himantopus mexicanus)*	U	R	U	
Black-bellied Plover	*(Pluvialis squatarola)*	U	R	U	
American Golden-Plover	*(Pluvialis dominica)*	R	R	R	
Semipalmated Plover	*(Charadrius semipalmatus)*	U	U	U	
Killdeer*	*(Charadrius vociferus)*	C	C	C	
Greater Yellowlegs	*(Tringa melanoleuca)*	C	U	C	
Lesser Yellowlegs	*(Tringa flavipes)*	C	U	C	
Solitary Sandpiper	*(Tringa solitaria)*	U	U	U	
Spotted Sandpiper*	*(Actitis macularia)*	R	R	R	
Semipalmated Sandpiper	*(Calidris pusilla)*	C	U	C	
Least Sandpiper	*(Calidris minutilla)*	C	U	C	
White-rumped Sandpiper	*(Calidris fuscicollis)*	R	R	R	
Baird's Sandpiper	*(Calidris bairdii)*	R		R	
Pectoral Sandpiper	*(Calidris melanotos)*	U	U	C	
Dunlin	*(Calidris alpina)*	C	U	C	
Stilt Sandpiper	*(Calidris himantopus)*	R	R	U	
Buff-breasted Sandpiper	*(Tryngites subruficollis)*	R	R	R	
Short-billed Dowitcher	*(Limnodromus griseus)*	R	R	U	
Long-billed Dowitcher	*(Limnodromus scolopaceus)*	U	R	U	
Wilson's Snipe*	*(Gallinago delicata)*	C	U	C	

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
American Avocet	*(Recurvirostra americana)*	R	U	R	
Ruddy Turnstone	*(Arenaria interpres)*	R	R	R	
American Woodcock*	*(Scolopax minor)*	C	U	U	
Wilson's Phalarope*	*(Phalaropus tricolor)*	R	R	R	
Red-necked Phalarope	*(Phalaropus lobatus)*	R		R	
Gulls and Terns					
Bonaparte's Gull	*(Larus philadelphia)*	U		U	
Ring-billed Gull	*(Larus delawarensis)*	C	U	C	
Herring Gull	*(Larus argentatus)*	C	U	C	U
Forster's Tern*	*(Sterna forsteri)*	C	C	U	
Black Tern*	*(Chlidonias niger)*	C	C	U	
Doves					
Rock Dove*	*(Columba livia)*	C	C	C	C
Mourning Dove*	*(Zenaida macroura)*	C	C	C	C
Cuckoos and Roadrunners					
Black-billed Cuckoo*	*(Coccyzus erythropthalmus)*	U	U	U	
Yellow-billed Cuckoo*	*(Coccyzus americanus)*	U	U	U	
Owls					
Eastern Screech-Owl*	*(Megascops asio)*	C	C	C	C
Great Horned Owl*	*(Bubo virginianus)*	C	C	C	C
Snowy Owl	*(Nyctea scandiacus)*	R			R
Barred Owl	*(Strix varia)*	U	U	U	U
Long-eared Owl	*(Asio otus)*	R		R	R
Short-eared Owl	*(Asio flammeus)*	U	R	U	U
Nighthawks and Nightjars					
Common Nighthawk*	*(Chordeiles minor)*	U	U	U	
Swifts					
Chimney Swift*	*(Chaetura pelagica)*	U	U	U	
Hummingbirds					
Ruby-throated Hummingbird*	*(Archilochus colubris)*	U	U	U	
Kingfishers					
Belted Kingfisher*	*(Ceryle alcyon)*	U	U	U	
Woodpeckers					

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Red-headed Woodpecker	*(Melanerpes erythrocephalus)*	U	U	U	
Red-bellied Woodpecker	*(Melanerpes carolinus)*	U	U	U	U
Yellow-bellied Sapsucker	*(Sphyrapicus varius)*	U		U	
Downy Woodpecker*	*(Picoides pubescens)*	C	C	C	C
Hairy Woodpecker*	*(Picoides villosus)*	C	C	C	C
Northern Flicker*	*(Colaptes auratus)*	C	C	C	
Flycatchers					
Olive-sided Flycatcher	*(Contopus cooperi)*	R		R	
Eastern Wood-Pewee*	*(Contopus virens)*	C	C	C	
Yellow-bellied Flycatcher	*(Empidonax flaviventris)*	R		R	
Alder Flycatcher	*(Empidonax alnorum)*	U	U	U	
Willow Flycatcher*	*(Empidonax traillii)*	C	C	C	
Least Flycatcher*	*(Empidonax minimus)*	C	C	C	
Eastern Phoebe*	*(Sayornis phoebe)*	C	C	C	
Great Crested Flycatcher*	*(Myiarchus crinitus)*	C	C	C	
Eastern Kingbird*	*(Tyrannus tyrannus)*	C	C	C	
Shrikes					
Northern Shrike	*(Lanius excubitor)*	R			U
Vireos					
Yellow-throated Vireo*	*(Vireo flavifrons)*	U	U	U	
Blue-headed Vireo	*(Vireo solitarius)*	U		U	
Warbling Vireo*	*(Vireo gilvus)*	C	C	C	
Philadelphia Vireo	*(Vireo philadelphicus)*	U	R	U	
Red-eyed Vireo*	*(Vireo olivaceus)*	C	C	C	
Jays, Magpies and Crows					
Blue Jay*	*(Cyanocitta cristata)*	C	C	C	C
American Crow*	*(Corvus brachyrhynchos)*	C	C	C	C
Larks					
Horned Lark*	*(Eremophila alpestris)*	C	U	C	C
Swallows					
Purple Martin*	*(Progne subis)*	C	C	C	
Tree Swallow*	*(Tachycineta bicolor)*	A	A	A	
Northern Rough-winged Swallow*	*(Stelgidopteryx serripennis)*	U	U	U	

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Bank Swallow*	*(Riparia riparia)*	U	U	U	
Cliff Swallow*	*(Petrochelidon pyrrhonota)*	U	U	U	
Barn Swallow*	*(Hirundo rustica)*	C	C	C	
Chickadees and Titmice					
Black-capped Chickadee*	*(Poecile atricapillus)*	C	C	C	C
Nuthatches					
Red-breasted Nuthatch	*(Sitta canadensis)*	R		R	R
White-breasted Nuthatch*	*(Sitta carolinensis)*	U	U	U	U
Creepers					
Brown Creeper	*(Certhia americana)*	U		U	U
Wrens					
House Wren*	*(Troglodytes aedon)*	C	C	C	
Winter Wren	*(Troglodytes troglodytes)*	U	R	U	
Sedge Wren*	*(Cistothorus platensis)*	C	C	C	
Marsh Wren*	*(Cistothorus palustris)*	A	A	C	R
Kinglets, Bluebirds and Thrushes					
Golden-crowned Kinglet	*(Regulus satrapa)*	C		C	R
Ruby-crowned Kinglet	*(Regulus calendula)*	C		C	
Blue-gray Gnatcatcher*	*(Polioptila caerulea)*	U	U	U	
Eastern Bluebird*	*(Sialia sialis)*	U	U	U	
Veery*	*(Catharus fuscescens)*	U	U	U	
Gray-cheeked Thrush	*(Catharus minimus)*	U		U	
Swainson's Thrush	*(Catharus ustulatus)*	U		U	
Hermit Thrush	*(Catharus guttatus)*	U		U	
Wood Thrush*	*(Hylocichla mustelina)*	U	U	U	
American Robin*	*(Turdus migratorius)*	C	C	C	R
Mimics					
Gray Catbird*	*(Dumetella carolinensis)*	C	C	C	
Brown Thrasher*	*(Toxostoma rufum)*	U	U	U	
Starlings					
European Starling*	*(Sturnus vulgaris)*	C	C	C	C
Waxwings					
Cedar Waxwing*	*(Bombycilla cedrorum)*	U	C	C	R

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Warblers					
Blue-winged Warbler	*(Vermivora pinus)*	U	R	R	
Golden-winged Warbler	*(Vermivora chrysoptera)*	U	R	R	
Tennessee Warbler	*(Vermivora peregrina)*	C	R	C	
Orange-crowned Warbler	*(Vermivora celata)*	U		U	
Nashville Warbler	*(Vermivora ruficapilla)*	C	R	C	
Northern Parula	*(Parula americana)*	U	R	U	
Yellow Warbler*	*(Dendroica petechia)*	A	C	C	
Chestnut-sided Warbler	*(Dendroica pensylvanica)*	C	R	C	
Magnolia Warbler	*(Dendroica magnolia)*	C	R	C	
Cape May Warbler	*(Dendroica tigrina)*	U		U	
Yellow-rumped Warbler	*(Dendroica coronata)*	A		A	
Black-throated Green Warbler	*(Dendroica virens)*	C		C	
Blackburnian Warbler	*(Dendroica fusca)*	U	R	U	
Yellow-throated Warbler	*(Dendroica dominica)*	R	R	R	
Pine Warbler	*(Dendroica pinus)*	R		R	
Palm Warbler	*(Dendroica palmarum)*	C		C	
Bay-breasted Warbler	*(Dendroica castanea)*	U	R	U	
Blackpoll Warbler	*(Dendroica striata)*	U		C	
Black-and-white Warbler	*(Mniotilta varia)*	C	R	C	
American Redstart*	*(Setophaga ruticilla)*	C	U	C	
Ovenbird*	*(Seiurus aurocapilla)*	U	U	U	
Northern Waterthrush	*(Seiurus noveboracensis)*	U	R	U	
Louisiana Waterthrush	*(Seiurus motacilla)*	R		R	
Connecticut Warbler	*(Oporornis agilis)*	R		R	
Mourning Warbler	*(Oporornis philadelphia)*	U		U	
Common Yellowthroat*	*(Geothlypis trichas)*	A	A	A	
Wilson's Warbler	*(Wilsonia pusilla)*	U		U	
Canada Warbler	*(Wilsonia canadensis)*	U	R	U	
Tanagers					
Scarlet Tanager*	**(Piranga olivacea)**	U	U	U	
Sparrows, Buntings and Grosbeaks					
Eastern Towhee*	**(Pipilo erythrophthalmus)**	U	U	U	

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
American Tree Sparrow	**(Spizella arborea)**	C	U	C	C
Chipping Sparrow*	**(Spizella passerina)**	U	U	U	
Clay-colored Sparrow	**(Spizella pallida)**	R		R	
Field Sparrow*	**(Spizella pusilla)**	U	U	U	
Vesper Sparrow*	**(Pooecetes gramineus)**	U	U	U	
Savannah Sparrow*	**(Passerculus sandwichensis)**	C	C	C	
Grasshopper Sparrow*	**(Ammodramus savannarum)**	U	U	R	
Henslow's Sparrow*	**(Ammodramus henslowii)**	U	U	R	
Fox Sparrow	**(Passerella iliaca)**	C		C	
Song Sparrow*	**(Melospiza melodia)**	A	C	C	U
Lincoln's Sparrow	**(Melospiza lincolnii)**	U		U	
Swamp Sparrow*	**(Melospiza georgiana)**	A	A	A	U
White-throated Sparrow	**(Zonotrichia albicollis)**	C		C	
Harris's Sparrow	**(Zonotrichia querula)**	R		R	
White-crowned Sparrow	**(Zonotrichia leucophrys)**	U		U	
Dark-eyed Junco	*(Junco hyemalis)*	C		U	C
Lapland Longspur	*(Calcarius lapponicus)*	U		U	U
Snow Bunting	*(Plectrophenax nivalis)*	U		U	U
Northern Cardinal*	*(Cardinalis cardinalis)*	C	C	C	C
Rose-breasted Grosbeak*	*(Pheucticus ludovicianus)*	C	C	C	
Indigo Bunting*	*(Passerina cyanea)*	C	C	C	
Dickcissel*	*(Spiza Americana)*	U	U	U	
Blackbirds and Orioles					
Bobolink*	*(Dolichonyx oryzivorus)*	C	C	U	
Red-winged Blackbird*	*(Agelaius phoeniceus)*	A	A	A	C
Eastern Meadowlark*	*(Sturnella magna)*	U	U	U	R
Western Meadowlark*	*(Sturnella neglecta)*	R	R	R	
Yellow-headed Blackbird*	*(Xanthocephalus xanthocephalus)*	C	C	C	R
Rusty Blackbird	*(Euphagus carolinus)*	C		C	R
Brewer's Blackbird	*(Euphagus cyanocephalus)*	A	U	A	R
Common Grackle*	*(Quiscalus quiscula)*	C	C	C	U
Brown-headed Cowbird*	*(Molothrus ater)*	C	C	C	U
Baltimore Oriole*	*(Icterus galbula)*	U	U	U	

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Finches					
Purple Finch	*(Carpodacus purpureus)*			U	U
House Finch*	*(Carpodacus mexicanus)*	U	U	U	U
Common Redpoll	*(Carduelis flammea)*				R
American Goldfinch*	*(Carduelis tristis)*	C	C	C	U
Evening Grosbeak	*(Coccothraustes vespertinus)*				R
Old World Sparrows					
House Sparrow*	*(Passer domesticus)*	C	C	C	C
Definitions Status: A… Abundant: common species that is very numerous C… Common: certain to be seen or heard in suitable habitat, not in large numbers U… Uncommon: Present but not certain to be seen R… Rare: Seen at irregular intervals of 2-5 years *… Denotes species nesting on the refuge					
Data taken from Horicon National Wildlife Refuge Bird Checklist					
Accidentals					
Common Loon	Sanderling				
Western Grebe	Ruff				
Little Blue Heron	Caspian Tern				
Glossy Ibis	Common Tern				
White-faced Ibis	Great Grey Owl				
Mute Swan	Barn Owl				
Ross' Goose	Saw-whet Owl				
Brant	Whip-poor-will				
Cinnamon Teal	Tufted Titmouse				
Black Scoter	Carolina Wren				
White-winged Scoter	Northern Mockingbird				
Long-tailed Duck (Old-squaw)	Loggerhead Shrike				
Golden Eagle	Bell's Vireo				
Northern Goshawk	Prothonotary Warbler				
Merlin	Cerulean Warbler				
Northern Bobwhite	Black-throated Blue Warbler				

Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Red Knot	Worm-eating Warbler				
Willet	Yellow-breasted Chat				
Upland Sandpiper	Lark Sparrow				
Marbled Godwit	Pine Siskin				
Hudsonian Godwit	Pine Grosbeak				

Mammals, Horicon NWR

Common Name	Scientific Name	Savanna/ Prairie	Aspen/ Lowland Shrub	Marsh and Open Water
Shrews				
Masked shrew	*Sorex cinereus*	s	s	
Short-tailed shrew	*Blarina brevicauda*	u	s	s
Moles				
Star-nosed mole	*Condylura cristata*		u	u
Bats				
Little brown bat	*Myotis lucifugus*	c		c
Big brown bat	*Epteicus fuscus*	c	c	c
Red bat	*Lasiurus borealis*		s	s
Hoary bat	*Lasiurus cinereus*		s	
Rabbits and Hares				
Eastern cottontail	*Sylvilagus floridanus*	a	c	
Rodents				
Woodchuck	*Marmota monax*	c		
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	c		
Eastern chipmunk	*Tamias striatus*		c	
Gray squirrel	*Sciurus carolinensis*	u	c	
Fox squirrel	*Sciurus niger*		c	
Beaver	*Castor canadensis*		u	u
Deer mouse	*Peromyscus maniculatus*	u		
White-footed mouse	*Peromyscus leucopus*	s	s	
Meadow vole	*Microtus pennsylvanicus*	c		
Muskrat	*Ondatra zibethica*		u	a
Norway rat	*Rattus norvegicus*	u		
House mouse #	*Mus musculus*	u		
Meadow jumping mouse	*Zapus hudsonius*	s	s	
Canines				
Coyote	*Canis latrans*	s	s	o
Red fox	*Vulpes vulpes*	c	c	o
Gray fox	*Urocyon cinereoargenteus*	r		
Other Carnivores				
Raccoon*	*Procyon lotor*	c	c	c
Opposum	*Didelphis virginiana*	c	c	c

Mammals, Horicon NWR (Continued)

Common Name	Scientific Name	Savanna/ Prairie	Aspen/ Lowland Shrub	Marsh and Open Water
Weasel Family (Mustelidae)				
Ermine (Short-tailed weasel)	*Mustela erminea*		u	
Least weasel	*Mustela nivalis*	u		
Long-tailed weasel	*Mustela frenata*		c	c
Mink	*Mustela vison*	o	c	a
Badger	*Taxidea taxus*	r		
Striped skunk	*Mephitis mephitis*	c	c	c
River otter	*Lutra canadensis*		u	u
Deer Family				
White-tailed deer	*Odocoileus virginianus*	a	a	a

#=Exotic species
**=No native to the area before colonial settlement*
***=Not a resident mammal of the Refuge*
a=abundant
c=common
u=uncommon
o=occasional; seen only a few times during the season
r=rare; seen every 2 to 5 years
s=secretive; common to abundant but rarely observable

Amphibians, Horicon NWR

Common Name	Scientific Name	Savanna/ Prairie	Aspen/ Lowland Shrub	Marsh and Open Water
Wood frog	*Rana sylvatica*		c	c
Western chorus frog	*Pseudacris triseriata*		a	a
Spring peeper	*Pseudacris crucifer*		r	r
Northern leopard frog	*Rana pipiens*		a	a
American toad	*Bufo americanus*	c	c	c
Green frog	*Rana clamitans*		a	a
Eastern gray treefrog	*Hyla versicolor*		c	c
Tiger salamander	*Ambystoma tigrinum*		u	u

a=abundant
c=common
u=uncommon
o=occasional; seen only a few times during the season
r=rare; seen every 2 to 5 years
s=secretive; common to abundant but rarely observable

Reptiles, Horicon NWR

Common Name	Scientific Name	Savanna/ Prairie	Lowland Shrub	Marsh and Open Water
Snapping turtle	Chelydra serpentina			c
Eastern painted turtle	Chrysemys picta			a
Spiny softshell turtle	Apalone spinifera			r
Eastern garter snake	Thamnophis sirtalis sirtalis	a	a	a
Northern redbelly snake	Storeria occipitomaculata		c	
Western fox snake	Elaphe vulpine	c		
Eastern milk snake	Lampropeltis triangulum	u		

a=abundant
c=common
u=uncommon
o=occasional; seen only a few times during the season
r=rare; seen every 2 to 5 years
s=secretive; common to abundant but rarely observable

Fish Species, Horicon NWR

Common Name	Scientific Name	Marsh and Open Water
Minnows		
Golden Shiner	*Notemigonus crysoleucas*	c
Southern Redbelly Dace	*Phoxinus erythrogaster*	u
Fathead Minnow	*Pimephales promelas*	a
Creek Chub	*Semotilus atromaculatus*	r
Common Carp	*Ctenopharyngodon idella*	a
Suckers		
White Sucker	*Catostomus commersoni*	c
Bullhead Catfish		
Black Bullhead	*Ameiurus melas*	a
Brown Bullhead	*Ameiurus nebulosus*	a
Pikes		
Northern Pike	*Esox lucius*	c
Mudminnows		
Central Mudminnow	*Umbra limi*	c
Sticklebacks		
Brook Stickleback	*Culaea inconstans*	c
Sunfish		
Bluegill	*Lepomis macrochirus*	u
Largemouth Bass	*Micropterus salmoides*	u
Black Crappie	*Pomoxis nigromaculatus*	u
Green Sunfish	*Lepomis cyanellus*	a
Pumpkinseed	*Lepomis gibbosus*	u
Perch		
Blackside Darter	*Percina maculate*	r
Yellow Perch	*Perca flavescens*	u
Walleye	*Stizostedion vitreum*	u
a – abundant *c – common* *u – uncommon* *r – rare*		

Mussels, Horicon NWR

Common Name	Scientific Name	Marsh and Open Water
Fingernail clam	*Sphaeriidae*	c
Three ridge	*Amblema plicata*	c
Yellow sand shell	*Lampsilis anodontoides*	c

Appendix D: Draft Compatibility Determinations

DRAFT COMPATIBILITY DETERMINATION

Use: Hunting

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is the hunting of game as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act and the National Wildlife Refuge System. The Horicon Refuge is currently open annually to squirrel, pheasant, partridge, rabbit, and white-tailed deer hunting during State seasons. All hunting has traditionally ended on the last day of the November nine-day deer gun season, with the exception of the December deer gun T-Zone which is a special hunt offered by the State in some years. No waterfowl hunting has been allowed on the Refuge except for a supervised youth hunt each year.

Upon revision of the Refuge Hunt Plan, the Refuge proposes to allow squirrel, pheasant, partridge, rabbit, and white-tailed deer hunting to follow the entire State seasons. In other words, hunting for those species would not end on the last day of the nine-day deer gun season. Squirrel, pheasant, partridge and rabbit would continue through the end of the season as set by the State. Likewise, deer hunting would continue through the year to include the muzzleloader season and the late archery season. In addition to these changes, Refuge staff has proposed to have a delayed opening for all hunting in designated wetland areas to protect migratory birds. Opportunities for hunters with disabilities and youth are also currently offered on the Refuge. Hunters with disabilities can participate in two separate gun hunts on an 800 acre area of the Refuge, which includes accessible blinds; and youth hunters can participate in a special area reserved for pheasant hunting and in a supervised duck hunt. Several areas are closed to all hunting as well. Upon revision of the Refuge Hunt Plan, these closed and restricted areas will be evaluated for possible changes.

Upon revision of the Refuge Hunt Plan, the Refuge proposes to allow a limited turkey hunt in the spring. Only early, selected periods would be open for turkey hunting so as to not conflict with nesting birds.

The Refuge has a large population of deer, as evidenced by browse lines and other deer sign. By allowing deer hunting, the deer population is kept in balance, deer/car collisions are reduced on the adjacent roads, and many people enjoy the opportunity to hunt on public land. In addition, deer hunting allows the Refuge to achieve the deer population goals set by the Wisconsin Department of Natural Resources. Reaching these goals is critical due to the presence of chronic wasting disease (CWD) in deer within the State.

Where is the use conducted? Deer hunting by the general public will be conducted under a hunting management program. Hunting activities will be planned and operated with the Refuge's primary objectives, habitat management requirements, huntable population surpluses, and safety as the guiding principals. Designated hunting areas will be evaluated and identified within the hunt management plan.

In general, hunter access is provided on most of the Refuge. A few areas on the Refuge are closed to all hunting or at certain times of the year.

How is the use conducted? Hunting will be conducted under state and refuge-specific federal regulations. Hunting activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the Refuge objectives and management goals without adversely affecting the primary objectives and mission of the refuge.

Completing this activity under a hunting plan allows the refuge to accomplish its management goals and provide needed safety levels for citizens of the area

without adversely affecting refuge habitats and wildlife populations.

When would the use be conducted? The hunting seasons would follow State seasons with the exception of the delayed opening in designated wetland areas to protect migratory birds. Generally, squirrel hunting begins in mid-September and continues until the end of January. Partridge, rabbit and pheasant season begins in mid-October. Partridge and pheasant season ends at the end of December, with rabbit season continuing until the end of February.

The deer archery season begins in mid-September and continues until the deer gun hunt, which has traditionally been held every year during the nine days of Thanksgiving week (Saturday to Sunday). In some years, the State has also established T-Zone or Earn-a- Buck areas where hunters can use a gun to shoot an antlerless deer. These 4-day seasons are held at the end of October and beginning of December. In addition, a muzzleloader season and late archery season is held in December after the traditional nine-day deer gun season. Deer hunting usually ends at the beginning of January.

The proposed spring turkey season on the refuge would be limited to a permit hunt during the early periods.

The supervised youth duck hunt is held every year on three weekend days, which are set by Refuge staff. The selected days are during the waterfowl season, usually in October. The youth pheasant hunt would follow the State season.

The hunt for hunters with disabilities is offered during the traditional nine-day deer gun season. In addition, the State has established an extra gun season for hunters with disabilities on designated areas. The Refuge has participated in this hunt since 2000, which is held for nine days in the beginning of October. This same designated area on the Refuge is open for deer hunting to everyone during the State's special T-Zone and Earn-a-Buck hunts. It is otherwise closed to all hunting.

Details about when, where and how the new hunts are conducted will be defined in the updated hunt management plan. All hunting activities follow applicable state laws, except where the Refuge administers further restrictions to ensure a quality hunt and visitor and staff safety. Hunting activities can only occur in designated areas listed in the hunt management plan.

Availability of Resources:

Approximately $25,000 of staff time will be required to administer and manage these activities. Most of the cost involves law enforcement, with Refuge officer patrolling the Refuge and issuing notice of violations and warnings. Other staff will participate in outreach efforts by issuing news releases, managing the special hunts, and providing hunter orientations. Some of the costs are offset by the Recreational Fee Program. The hunt for hunters with disabilities is part of this program where each hunter is required to pay $10.00.

In addition, overhead expenses including signs, maps, parking lot and road maintenance is estimated to be about $7,000.

Anticipated Impacts of the Use:

The hunters cause some disturbance to wildlife, but the disturbance is minor and short term. Disturbance to migratory birds in the wetland areas can be a major impact since any flushing depletes the birds' energy reserves needed for the flight south. Because most of the hunting occurs in the fall and winter, nesting animals are not disturbed. Disturbance to nesting animals in the spring from turkey hunters will be minimized by restricting the time periods for turkey hunting to the early periods. During the deer gun hunting seasons which attracts the largest number of hunters, most of the migrating waterfowl have left the Refuge. The exception to this rule is when the State offers an October gun T-Zone hunt. Disturbance to waterfowl can be alleviated by closing sensitive areas on the Refuge to this particular hunt.

The few unethical hunters who leave unsightly gut piles in inappropriate places has caused problems in the past. Illegal use of permanent or overnight tree stands, which is common, is an impact when it results in permanent damage to the tree and results in staff time removing the stands. Litter is also a problem, especially with spent shotgun shells during the deer gun season. Illegal use of toxic shot impacts birds who ingest it.

Impact to the vegetation is minimal and temporary. Vehicles are only permitted on certain roads and mowed paths.

Another impact is the killing of animals, which can be perceived as a negative impact by some people.

User groups have conflicted in the past when the deer gun hunting is open within the auto tour and

hiking trail complex. Visitors who hike are required to wear blaze orange clothing. Posted signs have not necessarily deterred visitors. Usually visitation is low during this time. However, problems have especially arisen when the weather is atypically warm.

User groups have also conflicted within the area set aside for hunters with disabilities. Since 1994, a 600-acre area around the office/visitor center was set aside for hunters with disabilities during the regular nine-day deer gun season at the end of November. This area had previously been closed to all hunting. The area was also opened at that time to archery hunters, through a permit system. This same area has also been open since 2000 for an early, nine-day gun hunt that the State offers to hunters with disabilities every October. In 2003, in order to improve success for the hunters with disabilities, the area was expanded to 880 acres and the archery hunting was eliminated. Problems arose in 2003 with the implementation of these changes since many hunters felt that "their area" was taken from them and they were excluded. The conflict was alleviated for some hunters when the area was open to everyone during the special gun T-Zone and Earn-a-Buck hunts. Access for walking for everyone on one of the dikes also helped.

Hunting on the Refuge follows all applicable laws, regulations and policies; including, 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Horicon NWR goals and objectives. This activity is also compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals, provides for the safety of the area's citizens, and supports several of the primary objectives of the Refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations necessary to ensure compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives the activity can only occur under the following stipulations:

1. All State hunting regulations will apply to hunting on the Refuge unless otherwise stated in the Refuge Hunt Plan.
2. All hunting activities and operations will be reviewed annually to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not diminish the primary purposes of the refuge. This use will meet the mission of the NWRS by providing renewable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

Without a hunting program specifically used as a management tool, the refuge deerpopulation may adversely affect plant communities, and hence alter ecological diversity and succession. This may result in significant negative impacts on both plant and other animal communities including some of special concern or of Service trust responsibility. This impact has been well documented and accepted through research over a period of many years.

In addition, a deer hunting program is necessary to ensure that the Wisconsin Department of Natural Resources deer populations goals are met, especially in controlling the spread of chronic wasting disease within the State's deer population.

Hunting is a recreational opportunity that will provide much enjoyment to the people who are in need of a place to hunt. In addition, the special hunts for youth and hunters with disabilities provide a controlled and quality hunting experience.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Firewood Cutting/Timber Harvest

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is the removal of standing or fallen trees by private individuals on the Horicon Refuge. This use covers all wood removal activities regardless of the ultimate use of the wood (e.g. firewood, pulp, etc.).

Where is the use conducted? The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Harvest sites will vary in size from year to year depending on the site and management objectives.

When is the use conducted? Most of the cutting and wood removal will occur from late summer until late winter, after the nesting season and when the ground is very dry or frozen in order to reduce habitat disturbance. All work will be conducted during daylight hours only.

How is the use conducted? Equipment used for harvest may range from chainsaws and axes, to traditional logging equipment such as feller-bunchers and log skidders. Access may be by car and trailer, pick-up truck, farm tractor, or larger traditional logging equipment. Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal.

Why is this use being proposed? This activity will only occur where the Service has determined that a management need exists to remove wood. Wood removal may be done where trees are encroaching on the open marshes or dikes, grassland areas, oak/savannah restoration areas, or removal of fence lines. Wood cutting is not a priority public use, as defined by the Refuge Improvement Act of 1997, of the National Wildlife Refuge System.

Availability of Resources:

Planning, issuing permits, and monitoring a wood product harvest program would require some commitment of staff hours. In the past, the Refuge has issued approximately 25 permits annually for this activity. All harvest sites are marked with flagging tape by Refuge staff. Based on past activity, we estimate that administering a small timber harvest program will require about $5,000 in staff salary costs. Staff time is actually saved by having a wood product harvest program since private individuals will be cutting the trees in many cases instead of staff. Some of these costs will be offset by a $25 permit issue fee charged to fire wood permittees. By permitting a wood products harvest, the manager has identified a management need and will have secured and prioritized the necessary station resources.

Anticipated Impacts of the Use:

The removal of woody vegetation from historic grassland or sedge habitats positively impacts waterfowl production and the System mission by increasing the amount of nesting habitat and reducing predator habitat. Grassland birds will also be increased by having larger grassland fields without fencelines or encroaching woody vegetation.

Removal of larger trees in grasslands and marsh habitat reduces the fuel and risk factors during prescribed burns.

Some short-term disturbance to wildlife may occur during wood cutting activities, but will be insignificant since most of the work will be conducted after the nesting season or during the winter when most species are not present.

Access for the purpose of removing wood may impact habitat by rutting soils, destroying ground cover, creating weed seed beds, introducing invasive species, and increasing sedimentation due to runoff

in nearby wetlands. These impacts can again be avoided by timing of the activity and requiring equipment be cleaned prior to entering the refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

1. No cutting operations will be permitted from April through July 15 if nesting birds are known to use the site.
2. Standing cavity trees which are actively being used by wildlife will be marked and protected.
3. Vehicle access for wood removal will be limited to existing trails or restricted to the frozen ground period when rutting and damage to growing vegetation would occur.
4. A special use permit will be issued so that site specific impacts can be reduced or eliminated and Service management goals are met.
5. Commercial equipment must be cleaned prior to entering refuge.

Justification:

The removal of dead trees reduces litter buildup and the severity of potential wildfires. Openings created by woodcutting allow light to penetrate and stimulate the understory growth which increases browse production and woodland diversity. Any direct impacts on wildlife production (take, disturbance, etc.) can be largely avoided by timing the activity so that it does not coincide with the breeding/production season.

Impacts to the habitat as a result of access for wood removal purposes are potentially significant, but also easily avoided. Ground disturbance in some areas may actually be desirable due to an improved seedbed that may result. Access to and from these areas will need to be carefully controlled (via special use permit) to avoid impacts such as rutting and increased sedimentation in area wetlands due to run-off. If existing roads are not present, access can be restricted to periods of frozen ground to avoid or minimize impacts to underlying vegetation and soils.

Other indirect impacts are generally considered positive and thus do not materially interfere with or detract from the purpose of the Refuge or the System mission. The removal of trees at strategic locations will benefit waterfowl production by assisting with the restoration of grassland habitat and eliminating predator habitat and perch sites.

Individuals participating in the wood harvest program will be under special use permit and thus site specific stipulations will ensure resource protection and achievement of management goals. Control of woody species encroachment on wetland and grassland habitats is a necessary management activity and directly supports the mission of the National Wildlife Refuge System.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Trapping of Furbearers

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Trapping of resident furbearers on the refuge in accordance with State and refuge regulations. A variety of furbearer species have been traditionally trapped on the refuge: muskrat, mink, raccoon, opossum, red fox, skunk, coyote, and weasel. These species cause problems for the Refuge because the upland predators prey on the ground nesting birds and the muskrat cause damage to the dikes. The number of interested trappers has steadily declined over the years, primarily due to low fur prices and low number of muskrats available. Therefore, interest in the trapping program has been primarily recreational in recent years.

Trapping is not a priority public use, as defined by the Refuge Improvement Act of 1997, of the National Wildlife Refuge System. Each year, the trapping program is reviewed by Refuge staff. Opening a marsh unit to trapping is based on the muskrat population and the need for muskrats within that unit. For example, muskrats may be needed in a marsh unit that is choked with cattail in order to open it up. Dike and upland units are usually available each year to help reduce the dike damage and decrease the predator population. Upon review by Refuge staff, an annual trapping plan is written for the year.

Where is the use conducted? The Refuge is divided into twenty-one marsh units, six dike units, and two upland units. The units are sold through an open auction held each September. However, since the 2000/2001 trapping season, no marsh units have been offered due to low muskrat numbers, which plummeted after a planned draw down of the main pool. Upon approval of the CCP and revision of the trapping plan, the division of trapping units may be changed, especially regarding upland units so that more trappers can trap more predators.

How is the use conducted? Approved traps include leghold traps with jaw spread greater than 5 ½ inch and of the "off-set-jaw" type (jaws with an opening of not less than 3/16" when closed.) Steel leghold traps having teeth, spiked, or serrated jaws (either attached or as part of the trap) are prohibited. No killer traps of the conibear greater than 6" x 6" or 6" in diameter and no floating traps are allowed.

ATVs and vehicles are permitted on interior dikes and over ice. Boats with 20 horsepower or less are permitted on the water. Usually the trappers are trapping under the ice, so open water is not an issue. Airboats and snowmobiles are not allowed.

When would the use be conducted? The trapping season typically runs from late October through the middle of March.

Availability of Resources:

Administrative costs of managing the program amounts to about $3,000 each year. Currently, each unit that is sold requires a minimum bid of $25, but the minimum bid may have to be eliminated in order to increase trapper interest especially if a reduction in predators is desired. A portion of these funds are returned to the station.

Anticipated Impacts of the Use:

Because of the temporal separation of trapping activities and waterfowl using the refuge for production, there are no direct impacts to waterfowl production. The trappers cause some disturbance to wildlife, but the disturbance is minor and short term. Occasional mortality to non-target species has also been a concern, especially when it is a trust species such as a migratory bird.

Any habitat change as a result of the physical impacts of trapping activity (trampling, etc.) is

undetectable and insignificant. Damage to Refuge dikes and roads by vehicles or ATVs when the roads are soft has also been a concern.

Indirect impacts to wildlife production do result from the removal of animals under a trapping program. In many instances, these impacts are positive. Many species which may be trapped are predators on waterfowl at various stages in the production cycle. Controlling populations of predators on waterfowl has generally positive impacts on the refuge purpose.

Managing muskrat populations at reasonable levels through a trapping program results in positive impacts to waterfowl and other aquatic wildlife species. Over abundance of muskrats in particular can lead to an excessive loss in emergent vegetation. This phenomenon is known as an "eat out" of a wetland impoundment. However, muskrats due provide a valuable service by providing open water areas in heavily vegetated impoundments. The goal of a trapping program is to control but not eliminate muskrats from the ecosystem as healthy populations are needed. Muskrat burrowing can also damage the dike infrastructure on the refuge.

Conflicts between other users of the Refuge, such as hunters and hikers (depending on the trapping unit) during trapping season could also be a concern.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about refuge operations during the drafting of the Comprehensive Conservation Plan. This Compatibility Determination was prepared concurrently with, and included in the Draft Comprehensive Conservation Plan. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

1. Trapping activity must be conducted in compliance with existing State regulations.
2. Trappers must comply with existing refuge access and use regulations.
3. Allow only one trapper and helper per unit and require each trapper to attend a pre-trapping meeting with refuge staff.

Justification:

Trapping is an important management tool that the Refuge utilizes in the water management program. Muskrats are an integral part of the marsh ecosystem, creating the hemi-marsh conditions of a 50:50 ratio of open water to vegetation. Each year, the Refuge staff evaluated each marsh unit. Vegetation is measured and mapped. Based on these figures, staff decides the need for muskrats in each unit. The last several years the muskrat population has been low, therefore marsh units have been closed to trapping. Generally, dike trapping and upland trapping are allowed each year. However, in 2005 trapping was not offered due to a noticeable decline in trapper interest and effort the previous year.

Trapping the muskrats at the toe of the dikes alleviates the dike damage that the muskrats cause. Upland trapping helps reduce the predators which eat eggs and/or kill ground nesting birds including waterfowl.

Trapping also offers a recreational and economic activity for many people. Horicon Marsh has been traditionally known for the high quality muskrat pelts produced. Although trapping interest has declined over the years, along with the price of the pelts, many people continue to enjoy the activity, often passing it on to the next generation.

The trapping program is coordinated with other forms of wildlife oriented public use on the Refuge to ensure minimal conflict with non-consumptive users. In addition, several areas of the Refuge are closed or restricted to trapping.

The program is monitored and evaluated yearly so that the seasons, species, areas of the Refuge, and other aspects of the program are carefully planned with population numbers in mind. Refuge staff also coordinate with the Wisconsin Department of Natural Resources, hosting the public auction together.

The trapping program, as managed, does not materially interfere with or detract from the Service's ability to meet refuge purposes or the mission of the National Wildlife Refuge System.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Environmental Education and Interpretation

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education consists of public outreach and onsite activities conducted by refuge staff, volunteers, teachers, and university professors. Interpretation occurs in less formal activities with refuge staff and volunteers or through exhibits, signs, and brochures.

Where is the use conducted? Environmental education and interpretation are carried out within the Office and Visitor Center and Environmental Education Barn, and outside at both locations. No trails currently exist at the office/visitor center site. The Barn has a short trail that leads to a observation platform on the water's edge. The refuge's two Hiking Trails Areas (Highway 49 Complex and the Bud Cook Hiking Trail Complex) and the Viewing Area are also used for environmental education and interpretation. Environmental education and interpretation is also conducted off-site by Refuge staff and volunteers, usually at the schools. A few programs for organizations or clubs are presented at a meeting place or restaurant. Occasionally the Refuge displays a booth or exhibit a major event, such as the Milwaukee Sports Show, Mayville Audubon Days, Ducks Unlimited events or other similar events that reach a diverse and large audience.

When is the use conducted? The uses can occur throughout the year. For the general public, they occur mostly in the spring, summer and fall. For students, they occur during the school year, though not generally in the middle of winter. Most programs are conducted during daylight hours, with a few indoor programs conducted in the evening. Occasionally an outdoor program is conducted after dark, for example a nature hike where participants listen for night time wildlife sounds.

How is the use conducted? All environmental education and interpretation activities are conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors. All programs include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the programs address a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc.

Why is this use being proposed? Permitting this activity would be consistent with the National Wildlife Refuge System Improvement Act, and help accomplish refuge goals and promote understanding, appreciation, and support for its mission.

Availability of Resources:

Approximately 1.5 FTE, or $80,000, of staff time will be required to administer and manage these activities. In addition, maintenance and improvement of refuge interpretive signs, trails, and visitor center displays will periodically be required.

Trained volunteers provide a valuable service in the Refuge's environmental education and interpretation programs. Volunteers assist with the larger groups so that additional staff are not needed. In some cases with smaller groups, volunteers will conduct the entire program. Every effort is made to meet the needs of the group, within reason. If the number in the group is less than ten or the distance of an off-site location makes it impractical, then a group will be turned down.

Anticipated Impacts of the Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species.

Disturbance to wildlife is limited to occasional incidents like flushing wildlife (e.g. deer, waterfowl). Restrictions on locations for environmental education and interpretation and the numbers of users will assure minimal disturbance to wildlife and other public use activities.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Horicon NWR goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating these activities does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge. Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act.

By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment:

This compatibility determination was part of the Draft Horicon National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives, environmental education and interpretation can only occur under the following stipulation:

1. Environmental education and interpretation will only occur in developed areas designated by the CCP or a step-down plan or under the guidance of a refuge staff member, volunteer or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

Environmental education and interpretation are compatible uses at Horicon National Wildlife Refuge. This determination was made as part of the environmental assessment associated with the comprehensive conservation planning process.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Wildlife Observation and Photography (including the means of access)

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? General public access to observe and/or photograph wildlife and refuge habitats including the means of access such as automobile, hiking, bicycling, snowshoeing and cross-country skiing. Since the Auto Tour was paved, non-motorized uses such as rollerblading and scooters have increased. Only leashed dogs are allowed.

Where is the use conducted? Currently, wildlife observation and photography occurs within designated areas of the refuge interior, especially the Auto Tour and Main Dike Road, and along perimeter public roads, especially Highway 49. Other areas currently available for viewing opportunities include the Viewing Area and Interpretive Displays on Highway 49, two hiking trail areas, the Office/Visitor Center, three fishing sites, and seasonally on Old Marsh Road. No forms of boating, (motorized or non-motorized), snowmobiles, or all-terrain vehicles are allowed within the refuge for this use. With the implementation of the CCP and visitor services plan, most of the Refuge is proposed to be open for wildlife observation and photography between December 1 and March 15. In addition, other specific areas of the Refuge would be opened during designated time periods between March 15 and December 1.

When is the use conducted? The uses occur during daylight hours throughout the year. All of the areas, except Old Marsh Road, are open year-round during daylight hours, conditions permitting. Currently Old Marsh Road is open on weekends for hiking and bicycling in June, July, and August. Entry on all or portions of designated routes may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

How is the use conducted? All wildlife observation and photography activities will be conducted with the refuge's primary objectives, habitat management requirements, and goals as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors.

Why is this use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System Lands as identified in the Refuge Improvement Act of 1997. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Access to the Refuge for wildlife observation and photography will meet the goals of the Refuge and the Refuge System.

Availability of Resources: Maintenance needs include mowing; controlling weeds; grading roads; upkeep of directional, interpretive, and informational signs; cleaning and upkeep of bathrooms; snow plowing of parking areas; and general maintenance and repair/ rehabilitation of existing facilities, gates, roads, and trails.

Improvements to the visitor services areas will also be done as time and money permits, including the addition of bathrooms, the additions of a photo blind, or other similar projects.

These areas also require patrol by Refuge staff for the purpose of visitor assistance and law enforcement.

The Comprehensive Conservation Plan recommends some strategies to improve public access opportunities and increase visitor use. Full implementation of these strategies will require additional staff resources.

Anticipated Impacts of the Use: Currently, wildlife observation and photography cause minor disturbance to wildlife. Overall, the disturbance is limited to a small potion of the entire Refuge. Access is typically by walking (hiking) on established trails. In areas where hiking is permitted off trail, the impact is minimal and temporary. Vehicles and bicycles are only permitted on designated auto tours or public roads that border the Refuge. Snowshoeing and cross country skiing pose no impacts to migrating or nesting waterfowl and little to no impact to the vegetation. The winter disturbance to resident wildlife is temporary and minor. The proposed changes outlined in the CCP to increase wildlife observation and photography would cause only minor disturbance to wildlife because the open areas and designated times would be established with wildlife needs first.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and refuge goals and objectives. These activities are compliant with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Wildlife observation and photography are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment: This compatibility determination was part of the Draft Horicon National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public comment.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility: To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives, wildlife observation and photography can only occur under the following stipulations:

1. All modes of access are limited to designated refuge roads, public roads, hiking trails, and parking lots.
2. Camping, overnight use, fires, horses, unleashed dogs (unless used for small game hunting), all terrain vehicles, boats, canoes, snowmobiles and other motorized conveyances (other than vehicles or motorcycles) are prohibited. Other non-motorized modes of transportation are allowed currently as long as the person in engaged in wildlife observation or photography.
3. No photo or viewing blinds may be left over night.
4. Harassment of wildlife or excessive damage to vegetation is prohibited.

Justification:

Wildlife observation and photography are priority public uses and compatible uses at Horicon National Wildlife Refuge. This determination was made as part of the environmental assessment associated with the comprehensive conservation planning process.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Haying

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Haying is the cutting and removal of grass, by baling and transporting to an off-refuge location. Haying is conducted by a private party under authority of a Special Use Permit issued by the Refuge Manager.

Where is the use conducted? Areas of grass, typically reed canary grass or wild parsnip, are identified for haying each year. The areas will typically range from 5 to 40 acres.

When is the use conducted? Generally, haying occurs in mid to late summer, after July 15th. Haying earlier in the growing season is avoided due to the potential destruction of ground-nesting birds.

How is the use conducted? Haying is usually accomplished by a mowing device towed by a tractor. Mowed grass is left to air dry and compiled into bales using a separate piece of equipment. All equipment must be clean prior to haying to reduce the potential of spreading noxious or invasive plants from another location.

Why is this use being proposed? Haying can be an effective management tool as part of an overall grassland management plan to improve and maintain grasslands for the benefit of wildlife. Grasslands need periodic renovation to maintain vigor, diversity, and the structure necessary for migratory bird use. Grasslands on the Refuge can also be invaded by noxious weeds. Typically, the invasive plant, reed canary grass, has been in demand for haying by the local farmers since they use it as feed and/or bedding for their animals.

Haying is an effective alternative for burning or grazing which are two other means used by refuge staff to maintain grassland vigor or reduce invasives. If local site conditions preclude use of prescribe fire due to hazards to neighboring property or a similar problem, removal of accumulated biomass through haying does serve to reduce unwanted overstory, reduce woody plant invasion, etc. Such removal will allow for more vigorous regrowth of desirable species following the haying, although results are not as dramatic as prescribed fire.

Haying may also be used as part of a native grass seeding strategy on old farm fields in need of restoration. Haying of a non-native cool season grass field is an effective step in advance of spraying the field with Round Up or similar chemical designed to kill all existing vegetation. Removal of the heavy grass overstory by haying allows the chemical spray to more effectively treat the target plants. Better removal of the unwanted grasses will in turn ensure better success of the planted native grasses whether they are inter-seeded into the sod or the soil turned over and leveled prior to seeding.

A more limited application for haying involves its use for establishing fire breaks for the prescribed fire program. A permittee would hay the grassland strips in early fall. That area would then green up earlier in the spring and would have no dead overstory biomass, allowing its use as a fire break.

Availability of Resources:

No additional fiscal resources are needed to conduct this use. The needed staff time is already committed and available. Most of the needed work to prepare for this use would be done as part of routine grassland management duties. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit for haying is relatively minor and within existing refuge resources. By permitting haying, the manager has identified a management need. Traditionally, the Refuge has not charged a fee for haying since Refuge staff usually have a management need for the haying.

Anticipated Impacts of the Use:

Haying will result in short-term disturbances and long-term benefits to both resident and migratory wildlife using the refuge. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cutting and removal of standing grasses will also result in short-term loss of habitat for those species requiring tall grasses for feeding and perching such as obligatory grassland species like the bobolink or dickcissel. Long-term benefits will accrue due to the increased vigor of the regrown grasses or the establishment of highly desirable native grass species which will improve conditions for those same species affected by the short-term negative impacts. Longer-term negative impacts may occur to resident wildlife species that would lose overwintering habitat in the hay areas. Strict time constraints placed on this use will limit anticipated impacts to these relatively minor areas.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about refuge operations during the drafting of Comprehensive Conservation Plans. This Compatibility Determination was prepared concurrently with, and included in the Draft Comprehensive Conservation Plan. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

1. Haying will only be allowed after July 15 to minimize disturbance to nesting migratory birds. In normal years, most birds are off the nest by this date.
2. Bales must be removed from the refuge within 2 weeks of baling.
3. Windrowed grass left lying to dry prior to baling must be raked and moved every two days if left on newly seeded native grass and in no cases should remain on the ground more than 6 days prior to baling.

Justification:

Haying will not materially interfere with priority migratory birds if done within the necessary stipulations. Use of haying as a management tool can be a valuable technique for providing longterm habitat improvements to grassland that otherwise would degrade through natural succession or dominance of non-native plants. Without this tool, the areas would suffer encroachment of undesirable woody species or would remain in unwanted non-native cool season grasses such as brome. Use of the areas by trust species such as waterfowl or grassland obligate species such as bobolink, dickcissel, or grasshopper sparrow would slowly decline in the absence of haying or other similar management.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Research

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is research projects conducted by Universities and other academic institutions; government agencies such as the Wisconsin Department of Natural Resources and U. S. Geological Survey (USGS); and private conservation organizations. Research projects will contribute to a better understanding of refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

Written research proposals will be required for review and approval before access will be allowed. If approved, access to refuge lands and waters will be limited to the least invasive means required to accomplish the activities Research will be carried out by professors, students, contractors, and refuge staff and volunteers. Research results will be used to assist refuge staff in making wise management decisions and to support adaptive management processes.

Where is the use conducted? The use will occur within the Horicon NWR (21,000 acres) and often on adjoining state lands (11,000 acres).

How is the use conducted? Research may be conducted by foot, vehicle, canoe, kayak, airboat, and aerial methods. Marking of nests and individual animals may be required. The least invasive means required to accomplish objectives will be used.

When would the use be conducted? Research projects may be conducted year round but usually occur from April to November.

Why is this use being proposed?

Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Availability of Resources:

Some research and monitoring is funded by grants, other government agencies, universities, or conducted by students and volunteers. Refuge staff involvement includes reviewing research proposals, supervising or monitoring research activities, reviewing reports, providing some equipment and vehicles, and occasionally participating in field work. Staff time for development and/or review of research proposals/reports, administration of Special Use Permits, supervision of students and volunteers, maintenance of vehicles, specialized equipment and housing is already available and committed.

Anticipated Impacts of the Use:

Research projects will be evaluated to determine whether the project is aligned with information needs of the refuge and surrounding landscape. Only projects that benefit resource management will be approved to receive a permit or cooperative agreement.

Disturbance or removal of plants and wildlife would be a temporary impact. Repopulation of the removed individuals would be expected to occur over time. Some temporary dispersal of animals around or off the refuge may occur from field activities.

Permit/Cooperative Agreements will be developed to eliminate or minimize impacts to other uses and management activities. Information collected from research project will assist the refuge manager in

fine tuning management activities to maximize productivity of refuge lands.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives the activity can only occur under the following stipulations:

1. Researchers will submit a study proposal and designate specific area(s) on the refuge where activity is to occur.
2. Each project will be evaluated on its merits. All proposals will be reviewed for their potential benefits to future refuge management activities and potential impact(s) to current activities. Permits/Cooperative Agreements will only be issued to those projects which contribute to inventory, monitoring, management impacts, life history needs on species of concern and information needs of the refuge.
3. Coordination will be maintained with the Regional Refuge Wildlife Biologist.
4. A report must be submitted at the end of each field season and at the conclusion of the study.
5. Annually all ongoing activities and operations will be reviewed to ensure compliance with all applicable laws, regulations and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Recreational Fishing

Refuge Name: Horicon National Wildlife Refuge, Dodge and Fond du Lac Counties, WI

Establishing and Acquisition Authorities: Migratory Bird Conservation Act of 1929

Refuge Purpose(s):

> "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is recreational fishing at designated sites on the Refuge. No boats are allowed. All state seasons and regulations apply. Currently only bank fishing is allowed.

Upon revision of the Refuge Fishing Plan, the Refuge proposes to allow ice fishing at the three designated sites. The ice fishing would be allowed within a certain parameter at the site. No permanent ice shanties or motorized access would be allowed.

Where is the use conducted? Fishing activities will be planned and operated with the Refuge's primary objectives, habitat management requirements, population surpluses, and safety as the guiding principals. Designated fishing sites and parameters will be evaluated and identified within the Fishing Plan.

Currently fishing is offered at Peachy Road, Ledge Road, and Main Dike Road. All of these sites are part of channels of the Rock River, which enters the Refuge on the northern end. Two of the sites, Main Dike Road and Ledge Road, have fishing platforms. The Peachy Road fishing site is planned for improvements with the addition of several fishing platforms, construction of an accessible trail, addition of a two-panel kiosk, and possible addition of a pit toilet.

How is the use conducted? Fishing will be conducted under state and refuge-specific federal regulations. Fishing activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the Refuge objectives and management goals without adversely affecting the primary objectives and mission of the refuge.

Completing this activity under a fishing plan allows the refuge to accomplish its management goals and provide needed safety levels for citizens of the area without adversely affecting refuge habitats and wildlife populations.

When would the use be conducted? The fishing seasons would follow State seasons. The only restriction would be if conditions prevented a road, such as Main Dike Road, being open for vehicle access.

Why is this use being proposed? Fishing is a priority public use on National Wildlife Refuge System Lands as identified in the Refuge Improvement Act of 1997. Fishing will not diminish the primary purpose of the Refuge.

Availability of Resources:

Generally, administration costs will be low. Patrol by law enforcement staff will be necessary. Historically, the fishing sites have had problems with vandalism and dumping, especially at the Peachy Road site. Costs associated with the vandalism could be high. The fishing sites will require mowing, weed whipping, brush/tree removal, and litter pick-up.

Anticipated Impacts of the Use:

Disturbance is a minor and temporary impact. Damage to natural vegetation from off-trail use is another impact. The biggest impact is litter and vandalism.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives the activity can only occur under the following stipulations:

1. All State fishing regulations will apply to fishing on the Refuge unless otherwise stated in the Refuge Fishing Plan.
2. All fishing activities and operations will be reviewed annually to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use is a priority public use and will not diminish the primary purpose of the Refuge. This recreational opportunity will provide much enjoyment to the people who are in need of a place to fish. In addition, over 100 school-aged children use the three fishing sites every year during the Refuge's fishing expedition, an event that is held in honor of National Fishing Week. The children learn how to fish by rotating through numerous fishing stations in the morning and then spend the afternoon fishing at the sites, putting their newly learned skills to use.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Permit Archeological Investigations

Refuge Name: Horicon and Fox River National Wildlife Refuges

Establishing and Acquisition Authorities:

Horicon NWR: Migratory Bird Conservation Act of 1929

Fox River NWR: The Refuge Recreation Act of 1962

Refuge Purposes

Horicon NWR: "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds...." 18 U.S.C. § 715d (Migratory Bird Conservation Act)

Fox River NWR: "... for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C. 742(a)(4)

Refuge System Mission:

The Mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

(a) Permitted archeological investigations are those requested by archeologists who are pursuing their own or institutional research or are working for non Fish and Wildlife Service parties that will be conducting authorized undertakings on the Refuge, or as requested by the Governor, under the Antiquities Act or the Archaeological Resources Protection Act (ARPA). (For archeologists employed by or working for the Fish and Wildlife Service under contract, employment or the contract is in lieu of an archeological permit.) Archeological investigations are not priority public uses.

(b) Permitted archeological investigations would occur on Federally-owned land and on easement land (depending on the nature of the Federal interest on the easement); on lands managed by the Refuge Manager, Horicon National Wildlife Refuge. Each archeological permit would be for a specific location.

(c) Archeologists could conduct investigations at any time of the year. Investigations may be as short as a few hours or continue for months, depending on the research objectives. Archeological permits are issued for one year or less, but can be extended year by year.

(d) The archeologist could use a variety of techniques to conduct the investigation depending on the research objectives. Techniques could involve surface collections of archeological materials and excavations ranging from shovel testing to one or multiple meter pit excavations to machine soil surface stripping to trenching or other authorized methods.

(e) Archeological investigations occur where the archeological resources are located or where they are likely to be located, or where the authorized undertaking could impact archeological resources. Research archeologists need to conduct their investigations on Refuge land if that is where the resources are located. And when the federally-authorized undertaking occurs on Refuge land, that is where the archeologist must investigate to prevent the Fish and Wildlife Service from breaking historic preservation law.

Availability of Resources:

ARPA/Antiquities permits are received by the Regional Historic Preservation Officer and issued by the Regional Director as part of normal duties.

The Refuge Manager has resources available to administer this use. This activity will require the Refuge Manager to develop and issue a Special Use Permit to the archeologist.

Refuge personnel would be expected to check the progress of the archeological investigation incidental to other Refuge work in the vicinity; i.e., no special on-site visits are anticipated. Refuge personnel costs to administer this permit would be about 0.004 FTE per year.

Anticipated Impacts of the Use:

Short-term impacts would result from the archeologist working in the area: disturbance to wildlife and disruption to vegetation and holes excavated. ARPA permit stipulations require the holes be filled by the archeologist immediately upon completion of testing; and to restore the ground to near-original conditions. Thus no long term direct or indirect impacts would occur. Seasonal access restrictions to avoid disturbance to nesting waterfowl and threatened and endangered species and habitat would be controlled through the special use permit

No cumulative impacts would occur.

Public Review and Comment:

Public information about archeological investigations under permit needs to be restricted due to the potential for vandalism and other inappropriate impacts. Refuge management should not be drawing attention to archeological potential or activities on the Refuge, not for the public or for amateur or professional archeologists. Persons requesting archeological permits do so for specific needs and in the public interest, but not to attract the public to archeological resources on the Refuge. This compatibility determination has been posted at the Refuge headquarters for 14 days.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

Applicant must obtain an Antiquities/ARPA permit from the Regional Director prior to commencing field work. Predetermined stipulations on Antiquities/ ARPA permits and the requirements in 43 CFR Part 7, "Protection of Archaeological Resources: Uniform Regulations," contain protective measures to be accomplished by archeologists.

Applicant must obtain a Special Use Permit issued by the Refuge Manager. The Special Use Permit is to prescribe administrative or management restrictions required by the Refuge Manager.

Justification:

The archeological investigations would be conducted in the public interest for which Federal agencies protect archeological sites; and the results may be included in public interpretive exhibits and other public dissemination. The results of the study could increase Refuge staff understanding of prior human activities on the Refuge and could be part of Refuge interpretive programs. Temporary disruption of habitat and wildlife routine could occur but no long-term harm should come to the natural resources managed by the Refuge.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Reevaluation Date: April 2015

DRAFT COMPATIBILITY DETERMINATION

Use: Hunting

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is the hunting of game as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act and the National Wildlife Refuge System. The Fox River Refuge is currently open annually to deer hunting during all State seasons.

Upon revision of the Refuge Hunt Plan, the Refuge may be able to support a limited spring turkey hunt. Squirrel hunting on the Refuge is also a possibility.

Where is the use conducted? Deer hunting by the general public will be conducted under a hunting management program. Hunting activities will be planned and operated with the Refuge's primary objectives, habitat management requirements, huntable population surpluses, and safety as the guiding principals. Designated hunting areas will be evaluated and identified within the hunt management plan.

In general, hunter access is provided on most of the Refuge. The only areas closed on the Refuge are two small areas that surround houses.

How is the use conducted? Hunting will be conducted under state and refuge-specific federal regulations. Hunting activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the Refuge objectives and management goals without adversely affecting the primary objectives and mission of the refuge.

Completing this activity under a hunting plan allows the refuge to accomplish its management goals and provide needed safety levels for citizens of the area without adversely affecting refuge habitats and wildlife populations.

When would the use be conducted? The hunting seasons would follow State seasons. Deer season begins in mid-September with archery hunting. All deer hunting would end by the beginning of January. If the Refuge held squirrel hunting, it would begin in mid-September and continue until the end of January. The proposed spring turkey season would be limited to a permit hunt during the early periods.

Details about when, where and how the new hunts are conducted will be defined in the updated hunt management plan. All hunting activities follow applicable state laws, except where the Refuge administers further restrictions to ensure a quality hunt and visitor and staff safety. Hunting activities can only occur in designated areas listed in the hunt management plan.

Why is this use being proposed? The Refuge has a large population of deer, as evidenced by browse lines and other deer sign. By allowing deer hunting, the deer population is kept in balance, deer/car collisions are reduced on the adjacent roads, and many people enjoy the opportunity to hunt on public land. In addition, deer hunting allows the Refuge to achieve the deer population goals set by the Wisconsin Department of Natural Resources. Reaching these goals is critical due to the presence of chronic wasting disease (CWD) in deer within the State.

Availability of Resources:

Approximately $5,000 of staff time will be required to administer and manage these activities. Most of the cost involves law enforcement, with Refuge officer patrolling the Refuge and issuing notice of violations and warnings. Other staff will participate in outreach efforts by issuing news releases, managing any special hunts, and providing hunter orientations. Some of the costs could be offset by the Recreational Fee Program if a permit program was established.

In addition, overhead expenses including signs, maps, parking lot and road maintenance is estimated to be about $2,000.

Anticipated Impacts of the Use:

The hunters cause some disturbance to wildlife, but the disturbance is minor and short term. Because most of the hunting occurs in the fall and winter, nesting animals are not disturbed. Disturbance to nesting animals in the spring from turkey hunters will be minimized by restricting the time periods for turkey hunting to the early periods. During the deer gun hunting seasons which attracts the largest number of hunters, most of the migrating waterfowl have left the Refuge. The exception to this rule is when the State offers an October gun T-Zone hunt. Disturbance to waterfowl can be alleviated by closing sensitive areas on the Refuge to this particular hunt.

The few unethical hunters who leave unsightly gut piles in inappropriate places has caused problems in the past. Illegal use of permanent or overnight tree stands, which is common, is an impact when it results in permanent damage to the tree and results in staff time removing the stands. Litter is also a problem, especially with spent shotgun shells during the deer gun season. Illegal use of toxic shot impacts birds that ingest it.

Impact to the vegetation is minimal and temporary. Vehicles are only permitted on certain roads and mowed paths.

Another impact is the killing of animals, which can be perceived as a negative impact by some people.

User groups have conflicted in the past when neighboring landowners have not wanted the Refuge open for deer hunting at all. These landowners want quality deer management, which is managing the deer herd for trophy bucks. The conflicts have subsided over the years, especially with the occurrence of chronic wasting disease.

Hunting on the Refuge follows all applicable laws, regulations and policies; including, 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Horicon NWR goals and objectives. This activity is also compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals, provides for the safety of the area's citizens, and supports several of the primary objectives of the Refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations necessary to ensure compatibility:

To ensure compatibility with National Wildlife Refuge System and Fox River NWR goals and objectives the activity can only occur under the following stipulations:

1. All State hunting regulations will apply to hunting on the Refuge unless otherwise stated in the Refuge Hunt Plan.
2. All hunting activities and operations will be reviewed annually to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not diminish the primary purposes of the refuge. This use will meet the mission of the NWRS by providing renewable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

Without a hunting program specifically used as a management tool, the refuge deer population may adversely affect plant communities, and hence alter ecological diversity and succession. This may result in significant negative impacts on both plant and other animal communities including some of special concern or of Service trust responsibility. This impact has been well documented and accepted through research over a period of many years.

In addition, a deer hunting program is necessary to ensure that the Wisconsin Department of Natural Resources deer populations goals are met, especially in controlling the spread of chronic wasting disease within the State's deer population.

Hunting is a recreational opportunity that will provide much enjoyment to the people who are in need of a place to hunt. In addition, the special hunts

for youth and hunters with disabilities provide a controlled and quality hunting experience.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Firewood Cutting/Timber Harvest

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is the removal of standing or fallen trees by private individuals on the Fox River Refuge. This use covers all wood removal activities regardless of the ultimate use of the wood (e.g. firewood, pulp, etc.).

Where is the use conducted? The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Harvest sites will vary in size from year to year depending on the site and management objectives.

When is the use conducted? Most of the cutting and wood removal will occur from late summer until late winter, after the nesting season and when the ground is very dry or frozen in order to reduce habitat disturbance. All work will be conducted during daylight hours only.

How is the use conducted? Equipment used for harvest may range from chainsaws and axes, to traditional logging equipment such as feller-bunchers and log skidders. Access may be by car and trailer, pick-up truck, farm tractor, or larger traditional logging equipment. Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal.

Why is this use being proposed? This activity will only occur where the Service has determined that a management need exists to remove wood. Wood removal may be done where trees are encroaching on the open marshes or dikes, grassland areas, oak/savannah restoration areas, or removal of fence lines. Wood cutting is not a priority public use, as defined by the Refuge Improvement Act of 1997, of the National Wildlife Refuge System.

Availability of Resources:

Planning, issuing permits, and monitoring a wood product harvest program would require some commitment of staff hours. In the past, the Refuge has issued a few permits annually for this activity. All harvest sites are marked with flagging tape by Refuge staff. Based on past activity, we estimate that administering a small timber harvest program will require about $1,000 in staff salary costs. Staff time is actually saved by having a wood product harvest program since private individuals will be cutting the trees in many cases instead of staff. Some of these costs will be offset by a $25 permit issue fee charged to fire wood permittees. By permitting a wood products harvest, the manager has identified a management need and will have secured and prioritized the necessary station resources.

Anticipated Impacts of the Use:

The removal of woody vegetation from historic grassland or sedge habitats positively impacts waterfowl production and the System mission by increasing the amount of nesting habitat and reducing predator habitat. Grassland birds will also be increased by having larger grassland fields without fencelines or encroaching woody vegetation.

Removal of larger trees in grasslands and marsh habitat reduces the fuel and risk factors during prescribed burns.

Some short-term disturbance to wildlife may occur during wood cutting activities, but will be insignificant since most of the work will be conducted after the nesting season or during the winter when most species are not present.

Access for the purpose of removing wood may impact habitat by rutting soils, destroying ground cover, creating weed seed beds, introducing invasive species, and increasing sedimentation due to runoff in nearby wetlands. These impacts can again be avoided by timing of the activity and requiring equipment be cleaned prior to entering the refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

1. No cutting operations will be permitted from April through July 15 if nesting birds are known to use the site.
2. Standing cavity trees which are actively being used by wildlife will be marked and protected.
3. Vehicle access for wood removal will be limited to existing trails or restricted to the frozen ground period when rutting and damage to growing vegetation would occur.
4. A special use permit will be issued so that site specific impacts can be reduced or eliminated and Service management goals are met.
5. Commercial equipment must be cleaned prior to entering refuge.

Justification:

The removal of dead trees reduces litter buildup and the severity of potential wildfires. Openings created by woodcutting allow light to penetrate and stimulate the understory growth which increases browse production and woodland diversity. Any direct impacts on wildlife production (take, disturbance, etc.) can be largely avoided by timing the activity so that it does not coincide with the breeding/production season.

Impacts to the habitat as a result of access for wood removal purposes are potentially significant, but also easily avoided. Ground disturbance in some areas may actually be desirable due to an improved seedbed that may result. Access to and from these areas will need to be carefully controlled (via special use permit) to avoid impacts such as rutting and increased sedimentation in area wetlands due to run-off. If existing roads are not present, access can be restricted to periods of frozen ground to avoid or minimize impacts to underlying vegetation and soils.

Other indirect impacts are generally considered positive and thus do not materially interfere with or detract from the purpose of the Refuge or the System mission. The removal of trees at strategic locations will benefit waterfowl production by assisting with the restoration of grassland habitat and eliminating predator habitat and perch sites.

Individuals participating in the wood harvest program will be under special use permit and thus site specific stipulations will ensure resource protection and achievement of management goals. Control of woody species encroachment on wetland and grassland habitats is a necessary management activity and directly supports the mission of the National Wildlife Refuge System.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Environmental Education and Interpretation

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education consists of public outreach and onsite activities conducted by refuge staff, volunteers, teachers, and university professors. Interpretation occurs in less formal activities with refuge staff and volunteers or through exhibits, signs, and brochures.

Where is the use conducted? Environmental education and interpretation are carried out directly on the Fox River Refuge. Depending on the program, groups would be lead to a specific area. No trails currently exist on the Refuge. A few programs for organizations or clubs would be presented off-site at a meeting place or restaurant. Occasionally the Refuge would display a booth or exhibit at a major event, such as the Milwaukee Sports Show, Mayville Audubon Days, Ducks Unlimited events or other similar events that reach a diverse and large audience.

When is the use conducted? The uses can occur throughout the year. For the general public, they occur mostly in the spring, summer and fall. For students, they occur during the school year, though not generally in the middle of winter. Most programs are conducted during daylight hours, with a few indoor programs conducted in the evening. Occasionally an outdoor program is conducted after dark, for example a nature hike where participants listen for night time wildlife sounds.

How is the use conducted? All environmental education and interpretation activities are conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors. All programs include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the programs address a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc.

Why is this use being proposed? Permitting this activity would be consistent with the National Wildlife Refuge System Improvement Act, and help accomplish refuge goals and promote understanding, appreciation, and support for its mission.

Availability of Resources:

Because Fox River Refuge has no permanent staff, the environmental education and interpretation for this refuge would be conducted by the Horicon Refuge staff. The demand for this use at Fox River Refuge is not currently high and can easily be absorbed by Horicon staff. However, as demand increases, availability of the Horicon staff will inevitably decrease.

Trained volunteers could provide a valuable service for this use. Volunteers could assist with the larger groups so that additional staff are not needed. In some cases with smaller groups, volunteers could conduct the entire program. Every effort will be made to meet the needs of the group, within reason. If the number in the group is less than ten or the distance of an off-site location makes it impractical, then a group will be turned down.

Maintenance and improvement of refuge interpretive signs, trails, and visitor center displays would periodically be required.

Anticipated Impacts of the Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species. Disturbance to wildlife is limited to occasional incidents like flushing wildlife (e.g. deer, waterfowl). Restrictions on locations for environmental education and interpretation and the numbers of

users will assure minimal disturbance to wildlife and other public use activities.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Fox River NWR goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating these activities does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge. Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act.

By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment:

This compatibility determination was part of the Draft Fox River National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives, environmental education and interpretation can only occur under the following stipulation:

1. Environmental education and interpretation will only occur in developed areas designated by the CCP or a step-down plan or under the guidance of a refuge staff member, volunteer or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

Environmental education and interpretation are compatible uses at Horicon National Wildlife Refuge. This determination was made as part of the environmental assessment associated with the comprehensive conservation planning process.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Haying

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Haying is the cutting and removal of grass, by baling and transporting to an off-refuge location. Haying is conducted by a private party under authority of a Special Use Permit issued by the Refuge Manager.

Where is the use conducted? Areas of grass, typically reed canary grass or wild parsnip, are identified for haying each year. The areas will typically range from 5 to 40 acres.

When is the use conducted? Generally, haying occurs in mid to late summer, after July 15th. Haying earlier in the growing season is avoided due to the potential destruction of ground-nesting birds.

How is the use conducted? Haying is usually accomplished by a mowing device towed by a tractor. Mowed grass is left to air dry and compiled into bales using a separate piece of equipment. All equipment must be clean prior to haying to reduce the potential of spreading noxious or invasive plants from another location.

Why is this use being proposed? Haying can be an effective management tool as part of an overall grassland management plan to improve and maintain grasslands for the benefit of wildlife. Grasslands need periodic renovation to maintain vigor, diversity, and the structure necessary for migratory bird use. Grasslands on the Refuge can also be invaded by noxious weeds. Typically, the invasive plant, reed canary grass, has been in demand for haying by the local farmers since they use it as feed and/or bedding for their animals.

Haying is an effective alternative for burning or grazing which are two other means used by refuge staff to maintain grassland vigor or reduce invasives. If local site conditions preclude use of prescribe fire due to hazards to neighboring property or a similar problem, removal of accumulated biomass through haying does serve to reduce unwanted overstory, reduce woody plant invasion, etc. Such removal will allow for more vigorous regrowth of desirable species following the haying, although results are not as dramatic as prescribed fire.

Haying may also be used as part of a native grass seeding strategy on old farm fields in need of restoration. Haying of a non-native cool season grass field is an effective step in advance of spraying the field with Round Up or similar chemical designed to kill all existing vegetation. Removal of the heavy grass overstory by haying allows the chemical spray to more effectively treat the target plants. Better removal of the unwanted grasses will in turn ensure better success of the planted native grasses whether they are inter-seeded into the sod or the soil turned over and leveled prior to seeding.

A more limited application for haying involves its use for establishing fire breaks for the prescribed fire program. A permittee would hay the grassland strips in early fall. That area would then green up earlier in the spring and would have no dead overstory biomass, allowing its use as a fire break.

Availability of Resources:

The oversight of this use would be conducted by Horicon Refuge staff. Haying would probably only occur if Refuge staff determines a management need for the grass to be cut. Approximately $1,000 of staff time would be needed to administer this activity.

Anticipated Impacts of the Use:

Haying will result in short-term disturbances and long-term benefits to both resident and migratory wildlife using the refuge. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cutting and removal of standing grasses will also result in short-term loss of habitat for those species requiring tall

grasses for feeding and perching such as obligatory grassland species like the Bobolink or Dickcissel. Long-term benefits will accrue due to the increased vigor of the regrown grasses or the establishment of highly desirable native grass species which will improve conditions for those same species affected by the short-term negative impacts. Longer-term negative impacts may occur to resident wildlife species that would lose overwintering habitat in the hay areas. Strict time constraints placed on this use will limit anticipated impacts to these relatively minor areas.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about refuge operations during the drafting of Comprehensive Conservation Plans. This Compatibility Determination was prepared concurrently with, and included in the Draft Comprehensive Conservation Plan. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

1. Haying will only be allowed after July 15 to minimize disturbance to nesting migratory birds. In normal years, most birds are off the nest by this date.
2. Bales must be removed from the refuge within 2 weeks of baling.
3. Windrowed grass left lying to dry prior to baling must be raked and moved every two days if left on newly seeded native grass and in no cases should remain on the ground more than 6 days prior to baling.

Justification:

Haying will not materially interfere with priority migratory birds if done within the necessary stipulations. Use of haying as a management tool can be a valuable technique for providing longterm habitat improvements to grassland that otherwise would degrade through natural succession or dominance of non-native plants. Without this tool, the areas would suffer encroachment of undesirable woody species or would remain in unwanted non-native cool season grasses such as brome. Use of the areas by trust species such as waterfowl or grassland obligate species such as bobolink, dickcissel, or grasshopper sparrow would slowly decline in the absence of haying or other similar management.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Research

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is research projects conducted by Universities and other academic institutions; government agencies such as the Wisconsin Department of Natural Resources and U. S. Geological Survey (USGS); and private conservation organizations. Research projects will contribute to a better understanding of refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

Written research proposals will be required for review and approval before access will be allowed. If approved, access to refuge lands and waters will be limited to the least invasive means required to accomplish the activities Research will be carried out by professors, students, contractors, and refuge staff and volunteers. Research results will be used to assist refuge staff in making wise management decisions and to support adaptive management processes.

Where is the use conducted? The use will occur within the Fox River Refuge.

How is the use conducted? Research may be conducted by foot, vehicle, canoe, kayak, airboat, and aerial methods. Marking of nests and individual animals may be required. The least invasive means required to accomplish objectives will be used.

When would the use be conducted? Research projects may be conducted year round but usually occur from April to November.

Why is this use being proposed?

Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Availability of Resources:

Some research and monitoring is funded by grants, other government agencies, universities, or conducted by students and volunteers. Refuge staff involvement includes reviewing research proposals, supervising or monitoring research activities, reviewing reports, providing some equipment and vehicles, and occasionally participating in field work. Staff time for development and/or review of research proposals/reports, administration of Special Use Permits, supervision of students and volunteers, maintenance of vehicles, specialized equipment and housing is already available and committed.

Anticipated Impacts of the Use:

Research projects will be evaluated to determine whether the project is aligned with information needs of the refuge and surrounding landscape. Only projects that benefit resource management will be approved to receive a permit or cooperative agreement.

Disturbance or removal of plants and wildlife would be a temporary impact. Repopulation of the removed individuals would be expected to occur over time. Some temporary dispersal of animals around or off the refuge may occur from field activities.

Permit/Cooperative Agreements will be developed to eliminate or minimize impacts to other uses and management activities. Information collected from research project will assist the refuge manager in

fine tuning management activities to maximize productivity of refuge lands.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Fox River NWR goals and objectives the activity can only occur under the following stipulations:

1. Researchers will submit a study proposal and designate specific area(s) on the refuge where activity is to occur.
2. 2. Each project will be evaluated on its merits. All proposals will be reviewed for their potential benefits to future refuge management activities and potential impact(s) to current activities. Permits/Cooperative Agreements will only be issued to those projects which contribute to inventory, monitoring, management impacts, life history needs on species of concern and information needs of the refuge.
3. Coordination will be maintained with the Regional Refuge Wildlife Biologist.
4. A report must be submitted at the end of each field season and at the conclusion of the study.
5. Annually all ongoing activities and operations will be reviewed to ensure compliance with all applicable laws, regulations and policies.

Justification:

This use has been determined compatible provided the above stipulations are

implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/ landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Recreational Fishing

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is recreational fishing. Upon completion of the Refuge Fishing Plan, the Refuge proposes to allow fishing at designated sites on the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan. All state seasons and regulations would apply.

Where is the use conducted? Fishing activities will be planned and operated with the Refuge's primary objectives, habitat management requirements, population surpluses, and safety as the guiding principals. Designated fishing sites and parameters will be evaluated and identified within the fishing plan.

How is the use conducted? Fishing will be conducted under state and refuge-specific federal regulations. Fishing activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the Refuge objectives and management goals without adversely affecting the primary objectives and mission of the refuge.

Completing this activity under a fishing plan allows the refuge to accomplish its management goals and provide needed safety levels for citizens of the area without adversely affecting refuge habitats and wildlife populations.

When would the use be conducted? The fishing seasons would follow State seasons.

Why is this use being proposed? Fishing is a priority public use on National Wildlife Refuge System Lands as identified in the Refuge Improvement Act of 1997. Fishing will not diminish the primary purpose of the Refuge.

Availability of Resources:

Generally, administration costs will be low. Patrol by law enforcement staff will be necessary.

Anticipated Impacts of the Use:

Disturbance is a minor and temporary impact. Damage to natural vegetation from off-trail use is another impact. The biggest impact would be litter and vandalism.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public review.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Horicon NWR goals and objectives the activity can only occur under the following stipulations:

1. All State fishing regulations will apply to fishing on the Refuge unless otherwise stated in the Refuge Fishing Plan.
2. All fishing activities and operations will be reviewed annually to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use is a priority public use and will not diminish the primary purpose of the Refuge. This recreational opportunity will provide much enjoyment to the people who are in need of a place to fish.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10 or 15 year Re-evaluation Date: 2021

DRAFT COMPATIBILITY DETERMINATION

Use: Wildlife Observation and Photography (including the means of access)

Refuge Name: Fox River National Wildlife Refuge, Marquette County, WI

Establishing and Acquisition Authorities: The Refuge Recreation Act of 1962

Refuge Purpose(s):

> "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. 742(a)(4)

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? General public access to observe and/or photograph wildlife and refuge habitats including the means of access such as hiking, bicycling, snowshoeing and cross-country skiing. This use would also include the proposal for having a segment of the Wisconsin Ice Age State and National Trail through the Refuge.

Where is the use conducted? Currently, wildlife observation and photography occurs only from County Road F. All access other than deer hunting is currently closed on the Refuge. This use would allow access on the Refuge, with the addition of a possible Ice Age trail as well. Designated areas for this use would be evaluated and identified within a visitor services plan.

When is the use conducted? The use would occur during daylight hours throughout the year. Entry on all or portions of designated areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

How is the use conducted? All wildlife observation and photography activities will be conducted with the refuge's primary objectives, habitat management requirements, and goals as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors.

Why is this use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System Lands as identified in the Refuge Improvement Act of 1997. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Access to the Refuge for wildlife observation and photography will meet the goals of the Refuge and the Refuge System.

Availability of Resources: Maintenance needs will include mowing; controlling weeds; upkeep of directional, interpretive, and informational signs; maintenance of parking areas; and general maintenance and repair/rehabilitation of existing facilities, gates, and trails.

These areas also require patrol by Refuge staff for the purpose of visitor assistance and law enforcement.

Anticipated Impacts of the Use: Wildlife observation and photography cause minor disturbance to wildlife. Access would be typically by walking (hiking) on an established trail. In areas where hiking is permitted off trail, the impact would be minimal and temporary. Snowshoeing and cross country skiing pose no impacts to migrating or nesting waterfowl and little to no impact to the vegetation. The winter disturbance to resident wildlife is temporary and minor.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and refuge goals and objectives. These activities are compliant with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Wildlife observation and photography are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead

to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment: This compatibility determination was part of the Draft Fox River National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public comment.

Determination:

_____ Use is not compatible

__X__ Use is compatible with the following stipulations

Stipulations Necessary to Ensure Compatibility: To ensure compatibility with National Wildlife Refuge System and Fox River NWR goals and objectives, wildlife observation and photography can only occur under the following stipulations:

1. All modes of access are limited to designated areas as specified in the visitor services plan.
2. Camping, overnight use, fires, horses, unleashed dogs (unless used for small game hunting), all terrain vehicles, boats, canoes, snowmobiles and other motorized conveyances are prohibited.
3. No photo or viewing blinds may be left over night.
4. Harassment of wildlife or excessive damage to vegetation is prohibited.

Justification:

Wildlife observation and photography are priority public uses and compatible uses at Fox River National Wildlife Refuge. This determination was made as part of the environmental assessment associated with the comprehensive conservation planning process.

Signature: Refuge Manager:_____

(Signature and date)

Concurrence: Regional Chief:_____

(Signature and date)

Mandatory 10- or 15-year Re-evaluation Date: 2021

Appendix E: Compliance Requirements

Appendix E / Compliance Requirements

Rivers and Harbor Act (1899) (33 U.S.C. 403)

Section 10 of this Act requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States.

Antiquities Act (1906)

Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Migratory Bird Treaty Act (1918)

Designates the protection of migratory birds as a Federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, Federal or non Federal, to the hunting of migratory birds.

Migratory Bird Conservation Act (1929)

Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Fish and Wildlife Coordination Act (1934), as amended

Requires that the Fish and Wildlife Service and State fish and wildlife agencies be consulted whenever water is to be impounded, diverted or modified under a Federal permit or license. The Service and State agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

Migratory Bird Hunting and Conservation Stamp Act (1934)

Authorized the opening of part of a refuge to waterfowl hunting.

Historic Sites, Buildings and Antiquities Act (1935), as amended

Declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. Provides procedures for designation, acquisition, administration, and protection of such sites.

Refuge Revenue Sharing Act (1935), as amended:

Requires revenue sharing provisions to all fee-title ownerships that are administered solely or primarily by the Secretary through the Service.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act (1948)

Provides that upon a determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred without reimbursement to the Secretary of Interior if the land has particular value for migratory birds, or to a State agency for other wildlife conservation purposes.

Federal Records Act (1950)

Directs the preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act (1956)

Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Refuge Recreation Act (1962)

Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Wilderness Act (1964), as amended

Directed the Secretary of Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System.

Land and Water Conservation Fund Act (1965):

Uses the receipts from the sale of surplus Federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

National Wildlife Refuge System Administration Act (1966), as amended by the National Wildlife Refuge System Improvement Act (1997)16 U.S.C. 668dd668ee. (Refuge Administration Act)

Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Historic Preservation Act (1966), as amended:

Establishes as policy that the Federal Government is to provide leadership in the preservation of the nation's prehistoric and historic resources.

Architectural Barriers Act (1968)

Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

National Environmental Policy Act (1969)

Requires the disclosure of the environmental impacts of any major Federal action significantly affecting the quality of the human environment.

Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended:

Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Endangered Species Act (1973)

Requires all Federal agencies to carry out programs for the conservation of endangered and threatened species.

Rehabilitation Act (1973)

Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal government to ensure that anybody can participate in any program.

Archaeological and Historic Preservation Act (1974)

Directs the preservation of historic and archaeological data in Federal construction projects.

Clean Water Act (1977)

Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Surface Mining Control and Reclamation Act (1977) as amended (Public Law 95-87) (SMCRA)

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Executive Order 11988 (1977)

Each Federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 11990

Executive Order 11990 directs Federal agencies to (1) minimize destruction, loss, or degradation of wetlands and (2) preserve and enhance the nat-

ural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372 (Intergovernmental Review of Federal Programs)

Directs the Service to send copies of the Environmental Assessment to State Planning Agencies for review.

American Indian Religious Freedom Act (1978)

Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Fish and Wildlife Improvement Act (1978)

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Archaeological Resources Protection Act (1979), as amended

Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Federal Farmland Protection Policy Act (1981), as amended

Minimizes the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Emergency Wetlands Resources Act (1986)

Promotes the conservation of migratory waterfowl and offsets or prevents the serious loss of wetlands by the acquisition of wetlands and other essential habitats.

Federal Noxious Weed Act (1990)

Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Native American Graves Protection and Repatriation Act (1990)

Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Americans With Disabilities Act (1992)

Prohibits discrimination in public accommodations and services.

Executive Order 12898 (1994)

Establishes environmental justice as a Federal government priority and directs all Federal agencies to make environmental justice part of their mission. Environmental justice calls for fair distribution of environmental hazards.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996)

Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 13007 Indian Sacred Sites (1996)

Directs Federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

National Wildlife Refuge System Improvement Act (1997)

Considered the "Organic Act of the National Wildlife Refuge System. Defines the mission of the System, designates priority wildlife-dependent public uses, and calls for comprehensive refuge planning.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act (1998)

Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

National Trails System Act

Assigns responsibility to the Secretary of Interior and thus the Service to protect the historic and recreational values of congressionally designated National Historic Trail sites.

Treasury and General Government Appropriations Act of 2001 (Public Law 106-554)

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in Section 515(a). The Office of Budget and Management (OMB) directed agencies to develop their own guidelines to address the requirements of the law. The Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the Act. The U.S. Fish and Wildlife Service has developed "Information Quality Guidelines" to address the law.

Cultural Resources and Historic Preservation

The National Wildlife Refuge System Improvement Act of 1997, Section 6, requires the Service to make a determination of compatibility of existing, new and changing uses of Refuge land; and Section 7 requires the Service to identify and describe the archaeological and cultural values of the refuge.

The National Historic Preservation Act (NHPA), Section 106, requires Federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires Federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires Federal agencies consider Indian tribal values in historic preservation programs, and requires each Federal agency to establish a program leading to inventory of all historic properties on its land.

The Archaeological Resources Protection Act of 1979 (ARPA) prohibits unauthorized disturbance of archeological resources on Federal and Indian land; and other matters. Section 10 requires establishing "a program to increase public awareness" of archeological resources. Section 14 requires plans to survey lands and a schedule for surveying lands with "the most scientifically valuable archaeological resources." This Act requires protection of all archeological sites more than 100 years old (not just sites meeting the criteria for the National Register) on Federal land, and requires archeological investigations on Federal land be performed in the public interest by qualified persons.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

The American Indian Religious Freedom Act (AIRFA) iterates the right of Native Americans to free exercise of traditional religions and use of sacred places.

EO 13007, Indian Sacred Sites (1996), directs Federal agencies to accommodate access to and ceremonial use, to avoid adverse effects and avoid blocking access, and to enter into early consultation.

Appendix F: Priority Refuge Operational and Maintenance Needs

Chapter 5 of the CCP contains a listing and description of the priority operational and maintenance needs for Horicon NWR and Fox River NWR.

Appendix G: Wildlife Species of Management Concern, Horicon NWR

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Mammals								
White-tailed Deer	*Odocoileus virginianus*	Recreation/ economic Abundant	Yes		P	P	P	P
*Muskrat	*Ondatra zibethica*	Recreation/ economic Abundant	Yes		P	P		
Beaver	*Castor canadensis*	Nuisance Uncommon	Yes		P	P		
River Otter	*Lutra canadensis*	Recreation/ economic Uncommon	Yes		P	P		
Birds								
*Red-necked Grebe =	*Podiceps grisegena*	Rare	Yes	SE	M			
*Horned Grebe	*Podiceps auritus*	Rare	Yes	SSC	M			
Double-Crested Cormorant	*Phalacrocorax auritus*	Nuisance Common	Yes	R3 (nuisance)	M, P			

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*American Bittern	*Botarus lentiginosus*	Uncommon	Yes	R3, SSC	M, P			P
*Least Bittern	*Ixobrychus exilis*	Uncommon	Yes	R3, SSC	M, P			
*Black-crowned Night Heron	*Nycticorax nycticorax*	Abundant	Yes	R3	M, P			
Yellow-crowned Night Heron	*Nyctanassa violacea*	Rare	Yes	ST				
*Great Egret	*Casmerodius albus*	Common	Yes	ST	P, M			
Snowy Egret	*Egretta thula*	Rare	Yes	SE				
*Canada Goose - Resident	*Branta canadensis*	Nuisance Abundant	Yes	R3	M, P			
*Canada Goose - Migrant	*Branta canadensis*	Recreation/ economic Abundant	Yes	R3	M,P			
Trumpeter Swan	*Cygnus buccinator*	Recreation/ economic Rare	Yes	R3, SE	M,P			

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*Wood Duck	*Aix sponsa*	Recreation/ economic Common	Yes	R3	M, P		P	
*American Black Duck	*Anas rubripes*	Recreation/ economic Uncommon	Yes	R3, SSC	M			
*Mallard	*Anas platyrhynchos*	Recreation/ economic Abundant	Yes	R3	M, P			P
*Blue-winged Teal	*Anas discors*	Recreation/ economic Common	Yes	R3, SSC	M, P			P
*Northern Pintail	*Anas acuta*	Recreation/ economic Uncommon	Yes	R3	M,P			
*Canvasback	*Aythya valisineria*	Recreation/ economic Uncommon	Yes	R3, SSC	M			
*Redhead Aythya americana		Recreation/ economic	Yes	SSC	M, P			
*Lesser Scaup	*Aythya affinis*	Recreation/ economic	Yes	R3, SSC	M			

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Osprey	*Pandion haliaetus*	Rare	Yes	ST				
*Bald Eagle	*Haliaeetus leucocephalus*	Common	Yes	T, R3, SSC (proposed for delisting from ESA)	M, P		M, P	
Northern Harrier	*Circus cyaneus*	Common	No	R3, SSC	M, P		M, P	M, P
Red-shouldered Hawk	*Buteo lineatus*	Uncommon	No	R3, ST				M
Peregrine Falcon	*Falco peregrinus*	Rare	Yes	R3, SE	M			M
*Yellow Rail	*Coturnicops noveboracensis*	Rare	Yes	R3, ST	M, P			
*King Rail	*Rallus elegans*	Uncommon	Yes	R3, SSC	M, P			
*Common Moorhen	*Gallinula chloropus*	Common	Yes	R3,	M, P			
*Whooping Crane	*Grus americana*	Uncommon	Yes	R3, SSC, T (non-essential experimental population)	M			
*American Golden-Plover	*Pluvialis dominica*	Rare	No	SSC	M			
*Greater Yellowlegs	*Tringa melanoleuca*	Common	No	R3	M			
*Solitary Sandpiper	*Tringa solitaria*	Uncommon	No	SSC	M			
*Dunlin	*Calidris alpina*	Common	No	SSC	M			
*Stilt Sandpiper	*Calidris himantopus*	Rare	No	R3	M			M

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*Buff-breasted Sandpiper	*Tryngites subruficollis*	Rare	No	R3, SSC	M			M
*Short-billed	*Dowitcher Limnodromus griseus*	Uncommon	No	R3, SSC	M			
*Wilson's Phalarope	*Phalaropus tricolor*	Rare	No	R3, SSC	M, P			
*American Woodcock	*Scolopax minor*	Recreation/ economic Uncommon	No	R3, SCC		M, P	M, P	M, P
*Black Tern	*Chlidonias niger*	Common	Yes	R3, SSC	M, P			
*Forster's Tern	*Sterna forsteri*	Common	Yes	R3, SE	M, P			
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Uncommon	No	R3, SSC		M, P	M, P	M, P
Yellow-billed Cuckoo	*Coccyzus americanus*	Uncommon	No	SSC		M, P	M, P	M, P
Long-eared Owl	*Asio otus*	Rare	No	R3			M	
Short-eared Owl	*Asio flammeus*	Uncommon	No	R3, SSC	M			M
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Uncommon	No	R3, SSC			M	
Northern Flicker	*Colaptes auratus*	Common	No	R3			M, P	
Olive-sided Flycatcher	*Contopus cooperi*	Rare	No	R3, SSC			M	
Willow Flycatcher	*Empidonax traillii*	Common	No	SSC			P	

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				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Least Flycatcher	*Empidonax minimus*	Common	No	SSC			P	
Sedge Wren	*Cistothorus platensis*	Common	Yes	R3	M, P	M, P		M, P
Wood Thrush	*Hylocichla mustelina*	Uncommon	No	R3, SSC			M, P	
Veery	*Catharus fuscescens*	Uncommon	No	SSC			M, P	
Brown Thrasher	*Toxostoma rufum*	Uncommon	No	SSC			M, P	
Blue-winged Warbler	*Vermivora pinus*	Rare	No	R3, SSC		M	M	
Golden-winged Warbler	*Vermivora chrysoptera*	Rare	No	R3, SSC		M	M	
Cape May Warbler	*Dendroica tigrina*	Uncommon	No	R3			M	
Louisiana Waterthrush	*Seiurus motacilla*	Rare	No	R3, SSC	M		M	
Connecticut Warbler	*Oporornis agilis*	Rare	No	R3, SSC		M	M	
Canada Warbler	*Wilsonia canadensis*	Uncommon	No	R3, SSC			M	
Yellow-throated Warbler	*Dendroica dominica*	Rare	No	SE			M	
*Field Sparrow	*Spizella pusilla*	Uncommon	Yes	R3, SSC		M, P		M, P
*Vesper Sparrow	*Pooecetes gramineus*	Uncommon	Yes	SSC		M, P		M, P
*Grasshopper Sparrow	*Ammodramus savannarum*	Uncommon	Yes	R3, SSC				M, P
*Henslow's Sparrow	*Ammodramus henslowii*	Uncommon	Yes	R3, ST				M, P
*Dickcissel	*Spiza americana*	Uncommon	Yes	R3, SSC				M, P

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

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				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*Bobolink	*Dolichonyx oryzivorus*	Common	Yes	R3, SSC				M, P
*Eastern Meadowlark	*Sturnella magna*	Uncommon	Yes	R3, SSC				M, P
*Western Meadowlark	*Sturnella neglecta*	Rare	Yes	R3, SSC				M, P
Rusty Blackbird	*Euphagus carolinus*	Common	No	R3, SSC			M	
Amphibians								
*Wood Frog	*Rana sylvatica*	Common	Yes		P			
*Western Chorus Frog	*Pseudacris triseriata*	Abundant	Yes		P			P
*Spring Peeper	*Pseudacris crucifer*	Uncommon	Yes		P			
*Northern Leopard Frog	*Rana pipiens*	Abundant	Yes		P			
*American Toad	*Bufo americanus*	Abundant	Yes		P	P	P	P
*Eastern Gray Treefrog	*Hyla versicolor*	Common	Yes		P	P	P	
*Bullfrog	*Rana catesbeiana*	Common	Yes		P	P	P	
*Green Frog	*Rana clamitans melanota*	Abundant	Yes		P			
*Tiger salamander	*Ambystoma tigrinum*	Uncommon	Yes	R3	P	P		

Wildlife Species of Management Concern to the Horicon National Wildlife Refuge

Species (* = Managing habitat) for these species)	**Scientific Name**	**Refuge Status**	**Monitored on Refuge by staff or WIDNR?**	**Regional/State Status**	**Habitats**			
				R3-Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/ Open water[1]	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Reptiles								
*Painted Turtle	*Chrysemys picta*	Abundant	Yes		P			
*Snapping Turtle	*Chelydra serpentina*	Common	Yes		P			
*Spiny Softshell Turtle	*Apalone spinifera*	Rare	Yes		P			
Northern Red-Bellied Snake	*Storeria occipitomaculata*	Common	Yes			P		
Eastern Garter Snake	*Thamnophis sirtalis*	Common	Yes		P	P	P	
Fishes								
Walleye	*Stizostedion vitreum*	Recreation/ economic Uncommon	Yes	R3	P,M			
*Common Carp	*Ctenopharyngodon idella*	Nuisance Abundant	Yes	R3 (nuisance)	P,M			
Mussels								
Three Ridge	*Amblema plicata*	Recreation/ economic Common	Yes		P			

Appendix H: Mailing List

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The following is an initial list of government offices, private organizations, and individuals who will receive notice of the availability of this CCP. We continue to add to this list.

Elected Officials

- Senator Russ Feingold
- Senator Herb Kohl
- Representative Tom Petri
- Governor Jim Doyle
- State representatives
- Dodge County Sheriff
- Fond du Lac County Sheriff

Tribal Government

- Ho Chunk Nation of Wisconsin
- Ho Chunk Nation Youth Service
- Great Lakes Indian Fish and Wildlife Commission
- Forest County Potawatomi
- Hannahville Indian Community
- Ho-Chunk Nation
- Iowa Tribe of Kansas
- Menominee Indian Tribe of Wisconsin
- Nottawaseppi Huron Band
- Oneida Nation
- Peoria Indian Tribe
- Pokagon Band of Potawatomi
- Prairie Band of Potawatomi
- Sac and Fox Nation of Missouri
- Sac and Fox Nation of Oklahoma
- Sac and Fox Tribe of the Mississippi
- Winnebago Tribe of Nebraska
- Citizen of Potawatomi
- Kickapoo Tribe
- Miami Tribe
- Ottawa Tribe of Oklahoma

Local Government

- City of Waupun
- City of Mayville
- City of Horicon
- City of Beaver Dam
- City of Fond du Lac
- Dodge County
- Fond du Lac County
- Dodge County Soil & Water Conservation District
- Fond du Lac Soil & Water Conservation District
- Town of Leroy
- Town of Williamstown
- Town of Oakfield
- Town of Waupun
- Town of Brownsville
- Town of Chester
- Town of Burnett
- Town of Buffalo
- Town of Moundville

Federal Agencies

- USDA, Natural Resources Conservation Service
- USFWS, Albuquerque, New Mexico; Anchorage, Alaska; Atlanta, Georgia; Denver,
- Colorado; Fort Snelling, Minnesota; Hadley, Massachusetts; Portland, Oregon
- USGS, National Wildlife Health Center

State Agencies

- Wisconsin Department of Natural Resources
- Wisconsin State Historic Preservation Officer

Colleges and Universities

- University of Wisconsin – Stevens Point, Madison, Green Bay, Milwaukee

Organizations

- The Nature Conservancy
- Wisconsin Waterfowl Association

- Pheasants Forever
- Ducks Unlimited
- National Audubon Society
- Wildlife Management Institute
- PEER Refuge Keeper
- The Wilderness Society
- National Wildlife Federation
- Wisconsin Wildlife Federation
- Sierra Club, Midwest Office, Madison, WI
- The National Wildlife Refuge Association
- The Conservation Fund, Arlington, Virginia
- Native Plant Society
- Trust for Public Land
- The Wildlife Society, Wisconsin Chapter
- Wisconsin Prairie Chicken Society
- Animal Protection Institute, California
- Ruffed Grouse Society, Wisconsin Chapter
- The Fund for Animals, Maryland
- Dodge County Historical Society
- Fond du Lac County Historical Society
- Marquette County Historical Society
- Marquette County Parks
- Friends of Horicon National Wildlife Refuge
- The Wisconsin Ornithological Society
- The Horicon Marsh Bird Club
- The Niagara Escarpment Resource Network
- Audubon Bird Club
- Riveredge Bird Club
- Horicon Marsh System Advocates
- America Outdoors
- International Crane Foundation
- Milwaukee County Zoo
- Blue Heron Landing
- Local libraries
- Marsh Haven Nature Center
- Marsh Management Committee
- Wisconsin Trappers Association
- Citizens Natural Resource Association
- Local gun clubs and sportsmans clubs
- Izaak Walton League
- Dodge County Sports Conservation Alliance
- Community Open Space Partnership Wisconsin Prairie Enthusiasts
- Aldo Leopold Foundation
- Rock River Headwaters Inc.
- John Deer Horicon Works
- Local Chambers and Tourism departments
- Girl Scouts of Milwaukee Area

Individuals

Individuals who have requested a copy of the draft CCP

Media

- Madison, Wisconsin State Journal
- Milwaukee, Milwaukee Journal Sentinel
- Beaver Dam, The Daily Citizen
- Fond du Lac, The Fond du Lac Reporter
- Waupun, Neighbors
- Waupun, the Reporter
- Mayville, Mayville News
- Watertown, Watertown Daily Times
- Refuge Reporter
- Blue Goose Flyer
- Madison, Isthmus
- Wisconsin Outdoor News
- Wisconsin Public Radio
- Other local radio stations
- T.V. Stations
- Columbus, Columbus Journal
- Green Bay, Green Bay News Chronicle

Appendix I: List of Preparers

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Refuge Staff:

Patti Meyers, Refuge Manager, Horicon National Wildlife Refuge

Diane Kitchen, Assistant Refuge Manager, Horicon National Wildlife Refuge

Erin Railsback, Visitor Services Specialist, Horicon National Wildlife Refuge

Wendy Woyczik, Wildlife biologist, Horicon National Wildlife Refuge

Shawn Papon, Wildlife Biologist, Fox River National Wildlife Refuge

Regional Office Staff:

Gary Muehlenhardt, Wildlife Biologist/Refuge Planner, Region 3, USFWS

Gabriel DeAlessio, Biologist-GIS, Region 3, USFWS

H. John Dobrovolny, Regional Historic Preservation Officer, Region 3, USFWS

Jane Hodgins, Technical Writer/Editor, Region 3, USFWS

Mangi Environmental Group:

Leon Kolankiewicz, Biologist/Environmental Planner/Consultant

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