

# Horicon and Fox River

## National Wildlife Refuges

### Comprehensive Conservation Plan Approval

**Submitted by:**

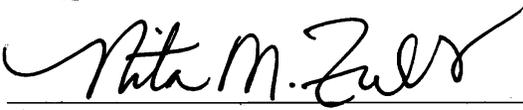
  
Patti Meyers  
Refuge Manager

2/13/07  
Date

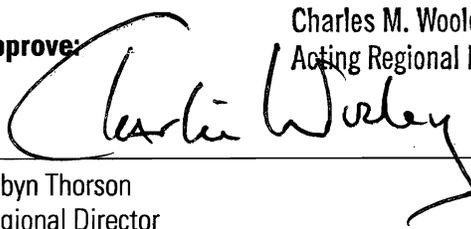
**Concur:**

  
James T. Leach  
Refuge Supervisor, Area 3

2-26-07  
Date

  
Nita M. Fuller  
Regional Chief, National Wildlife Refuge System

2.28.2007  
Date

**Approve:**   
Charles M. Wooley  
Acting Regional Director

 Robyn Thorson  
Regional Director

3/16/07  
Date



# Horicon

## *National Wildlife Refuge*

### Comprehensive Conservation Plan

#### *Table of Contents*

---

<b>Chapter 1: Introduction and Background .....</b>	<b>1</b>
Introduction .....	1
The U.S. Fish and Wildlife Service .....	1
The National Wildlife Refuge System .....	1
Horicon Marsh .....	2
Horicon National Wildlife Refuge .....	3
Fox River National Wildlife Refuge .....	3
Refuge Purposes .....	3
Refuge Visions .....	3
Horicon National Wildlife Refuge .....	3
Fox River National Wildlife Refuge .....	6
Purpose and Need for Plan .....	6
History and Establishment .....	7
Horicon National Wildlife Refuge .....	7
Fox River National Wildlife Refuge .....	7
Legal Context .....	7
<b>Chapter 2: The Planning Process .....</b>	<b>9</b>
Internal Agency Scoping .....	9
Open Houses .....	9
Focus Group Meeting .....	10
Summary of Issues, Concerns and Opportunities .....	10
Horicon National Wildlife Refuge .....	10
Habitat Management .....	10
Wildlife Management .....	11
Visitor Services .....	11
State Highway 49 Issues .....	11
Cultural Resources .....	11
Visibility of Horicon NWR as a National Resource .....	11
Fox River National Wildlife Refuge .....	11
Wildlife Management .....	11
Habitat Management .....	12
Visitor Services .....	12
Cultural Resources .....	12
Administration and Logistics .....	12
Preparation, Publishing, Finalization and Implementation of the CCP .....	13

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<b>Chapter 3: Refuge Environment .....</b>	<b>14</b>
Horicon National Wildlife Refuge .....	14
Introduction .....	14
Climate .....	15
Geology and Glaciation .....	17
Soils .....	18
Surface Hydrology .....	19
Wilderness Review .....	21
Archeological and Cultural Values .....	21
Social and Economic Context .....	22
Natural Resources .....	27
Habitats .....	27
Wildlife .....	27
Migratory Bird Conservation Initiatives .....	31
Wildlife Species of Management Concern .....	31
Horicon NWR Current Refuge Programs: Where We Are Today .....	31
Habitat Restoration .....	32
Habitat Restoration on the Refuge .....	32
Habitat Management .....	33
Managing Water Impoundments and Moist Soil Units .....	33
Mowing on Grasslands and Wet Meadows .....	36
Haying on Grasslands .....	36
Prescribed Fire on Uplands and Wetlands .....	36
Wildfire Preparedness .....	36
Controlling Invasive Plants .....	36
Habitat Monitoring .....	38
Aerial Infrared – GIS Technology .....	38
Grassland Surveys .....	38
Prescribed Burning .....	38
Wildlife Monitoring and Research .....	38
Surveys and Censuses .....	39
Studies and Investigations .....	40
Wildlife Management .....	41
Disease Monitoring and Control .....	41
Nest Structures .....	42
Predator and Exotic Wildlife Control .....	42
Coordination Activities .....	43
Interagency Coordination .....	43
Public Recreation, Environmental Education and Outreach .....	43
Hunting .....	44
Fishing .....	46
Wildlife Observation .....	46
Wildlife Photography .....	46
Wildlife Interpretation .....	46
Environmental Education .....	46
Volunteer and Friends Contributions .....	47

---

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Outreach .....	47
Archaeological and Cultural Resources .....	47
Law Enforcement .....	47
Fox River National Wildlife Refuge .....	48
Introduction .....	48
Climate .....	48
Topography and Soils .....	48
Surface Hydrology .....	48
Archeological and Cultural Values .....	48
Social and Economic Context .....	51
Natural Resources .....	53
Habitats .....	53
Wildlife .....	56
Fox River NWR Current Refuge Programs: Where We Are Today .....	57
Habitat Management .....	57
Habitat Restoration .....	57
Wetland Restoration .....	57
Dry Prairie Restoration .....	58
Oak Savanna Restoration .....	58
Water Level Management .....	59
Moist Soil Management .....	59
Prescribed Fire .....	60
Haying .....	60
Controlling Invasive Plants .....	60
Vegetation Surveys .....	60
Vegetation and Habitat Surveys .....	60
Wildlife Management .....	60
Wildlife Surveys and Censuses .....	61
Nest Structures .....	64
Pest, Predator, and Exotic Animal Control .....	65
Coordination Activities .....	65
Interagency Coordination .....	65
Partners, Volunteers and Cooperating Organizations .....	65
Public Recreation, Environmental Education and Outreach .....	66
Deer Hunting .....	66
Law Enforcement .....	66
<b>Chapter 4: Refuge Management .....</b>	<b>67</b>
Horicon National Wildlife Refuge .....	67
Future Management Direction: Tomorrow's Vision .....	67
Refuge Vision .....	67
Goals, Objectives and Strategies .....	67
Fox River National Wildlife Refuge .....	79
Future Management Direction: Tomorrow's Vision .....	79
A Vision for Fox River National Wildlife Refuge .....	79
Goals, Objectives and Strategies .....	79

---

---

<b>Chapter 5: Plan Implementation</b> .....	<b>88</b>
New and Existing Projects .....	88
Horicon NWR Operating Needs Projects .....	88
Fox River Refuge Operating Needs Projects .....	91
Future Staffing Requirements .....	92
Partnership Opportunities .....	92
Step-down Management Plans .....	92
Archeological and Cultural Values .....	92
Monitoring and Evaluation .....	95
<b>Appendix A: Finding of No Significant Impact</b> .....	<b>97</b>
<b>Appendix B: Glossary</b> .....	<b>101</b>
<b>Appendix C: Species List</b> .....	<b>105</b>
<b>Appendix D: Compatibility Determinations</b> .....	<b>123</b>
<b>Appendix E: Compliance Requirements</b> .....	<b>125</b>
<b>Appendix F: Priority Refuge Operational and Maintenance Needs</b> .....	<b>131</b>
<b>Appendix G: Wildlife Species of Management Concern, Horicon NWR</b> .....	<b>133</b>
<b>Appendix H: Mailing List</b> .....	<b>143</b>
<b>Appendix I: List of Preparers</b> .....	<b>147</b>
<b>Appendix J: Bibliography and References Cited</b> .....	<b>151</b>
<b>Appendix K: Response to Comments on the Draft CCP</b> .....	<b>157</b>

# Horicon

## *National Wildlife Refuge*

### **Comprehensive Conservation Plan**

#### *List of Tables*

---

Table 1:	Watershed Characteristics, Horicon Marsh, Horicon NWR .....	19
Table 2:	Socioeconomic Characteristics Dodge and Fond du Lac Counties, Wisconsin .....	23
Table 3:	Area of Land by Land-Use Class For Dodge and Fond du Lac Counties (thousands of acres) .....	24
Table 4:	Dodge County Employment and Industry Data .....	25
Table 5:	Fond du Lac County Employment and Industry Data .....	26
Table 6:	1995 Recreation-related Expenditures (1995 \$ in thousands) of Visitors to Horicon NWR .....	26
Table 7:	Mississippi Valley Canada Goose Population Estimates (1948-1990) .....	27
Table 8:	Furbearer Trapping Totals, 2000-2005, Horicon NWR .....	43
Table 9:	Socioeconomic Characteristics, Marquette County, Wisconsin .....	51
Table 10:	Marquette County Employment and Industry Data .....	52
Table 11:	Summary of Spring 2004 Waterbird Surveys, Fox River NWR .....	61
Table 12:	Marsh Birds Detected Per Point, Fox River NWR .....	61
Table 13:	Ten Most Common Bird Species Documented on Fox River NWR, Summer 2003 .....	62
Table 14:	Bird Counts by Habitat Type, Fox River NWR .....	62
Table 15:	Frog and Toad Point Count Surveys, Fox River NWR .....	63
Table 16:	Sandhill Crane Survey Results, 1994-2005, Fox River NWR .....	63
Table 17:	Long Lake Fish Population Survey, 2004, Fox River NWR .....	64
Table 18:	Fox River and Backwaters Fish Population Survey, 2004, Fox River NWR .....	64
Table 19:	Muir Creek Fish Population Survey, 2004, Fox River NWR .....	65
Table 20:	Additional Staffing Required to Fully Implement the CCP by 2021, Horicon NWR .....	92
Table 21:	Step-down Management Plan Schedule, Horicon NWR .....	94
Table 22:	Step-down Management Plan Schedule, Fox River NWR .....	94

# Horicon

## *National Wildlife Refuge*

### **Comprehensive Conservation Plan**

#### *List of Figures*

---

Figure 1: Location of Horicon NWR, Dodge and Fond Du Lac Counties, Wisconsin .....	4
Figure 2: Location of Fox River NWR, Marquette County, Wisconsin .....	5
Figure 3: Historic Vegetation of the Horicon Marsh (1850s) .....	8
Figure 4: Southeast Wisconsin and Location of Horicon NWR .....	15
Figure 5: Conservation Lands in Southeastern Wisconsin, Horicon NWR .....	16
Figure 6: Location of Rock River Watershed, Horicon NWR .....	20
Figure 7: Current Landcover of Horicon NWR (2006 Classification) .....	28
Figure 8: Impoundments, Horicon NWR .....	34
Figure 9: Existing Visitor Facilities, Horicon NWR .....	45
Figure 10: Current Land Cover, Fox River NWR .....	49
Figure 11: Historic Vegetation of the Fox River NWR .....	50
Figure 12: Future Habitat Conditions of Horicon NWR .....	72
Figure 13: Proposed Visitor Facilities, Horicon NWR .....	76
Figure 14: Future Vegetation Cover, Fox River NWR .....	81
Figure 15: Current and Proposed Visitor Facilities, Fox River National Wildlife Refuge .....	85
Figure 16: Current Staffing Chart, Horicon NWR .....	93

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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 NWR 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 NWR 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:

- # Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- # Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

- # Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts. Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- # Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

## 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.



Lesser Yellowlegs. USFWS

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 Waupun 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 NWR, 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. More than 300 cranes use the Refuge 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. Visitor facilities and opportunities are minimal but include two parking areas, signs, and an annual deer hunt.

Fox River NWR 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 NWR 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 NWR 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

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

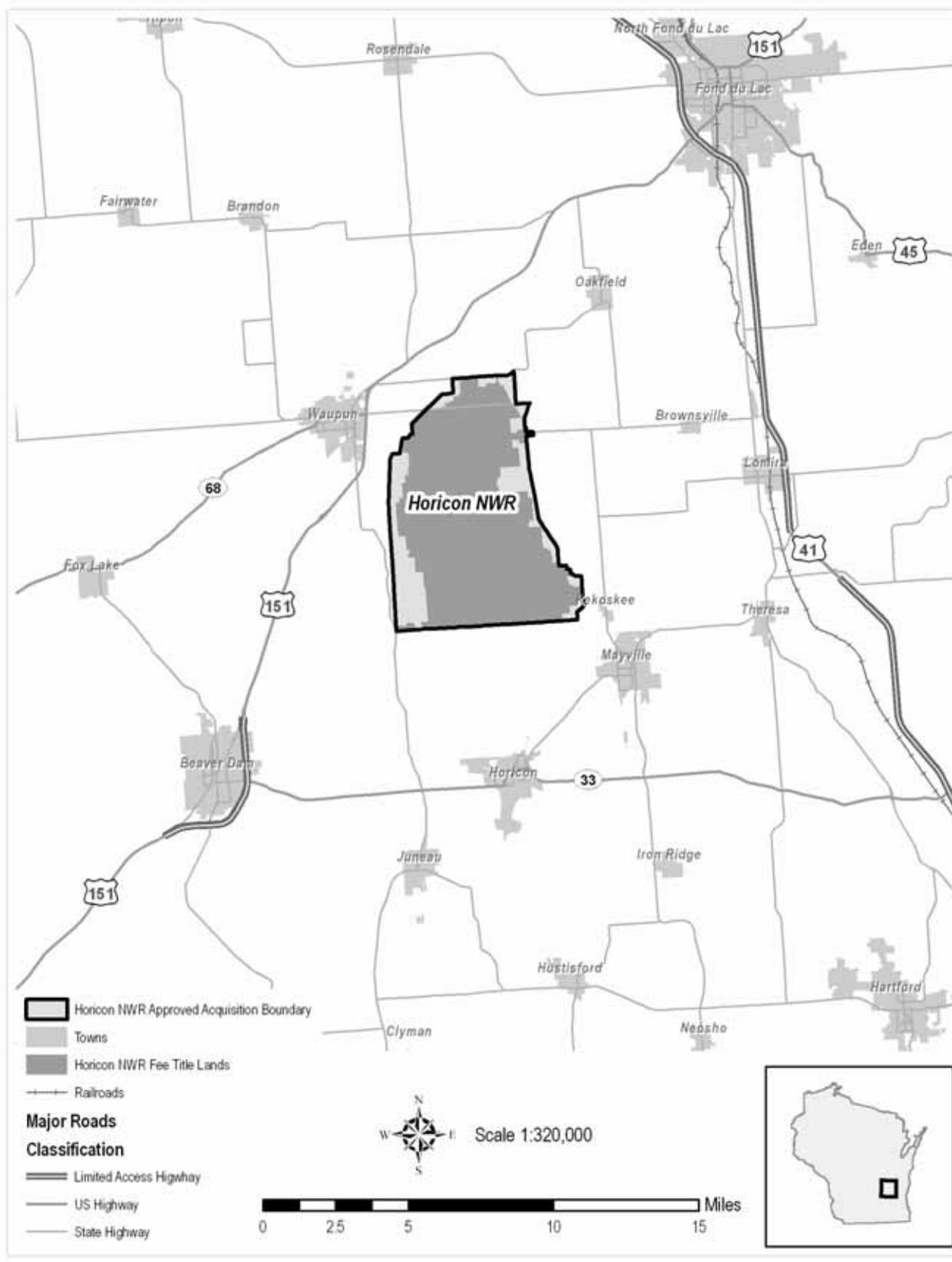
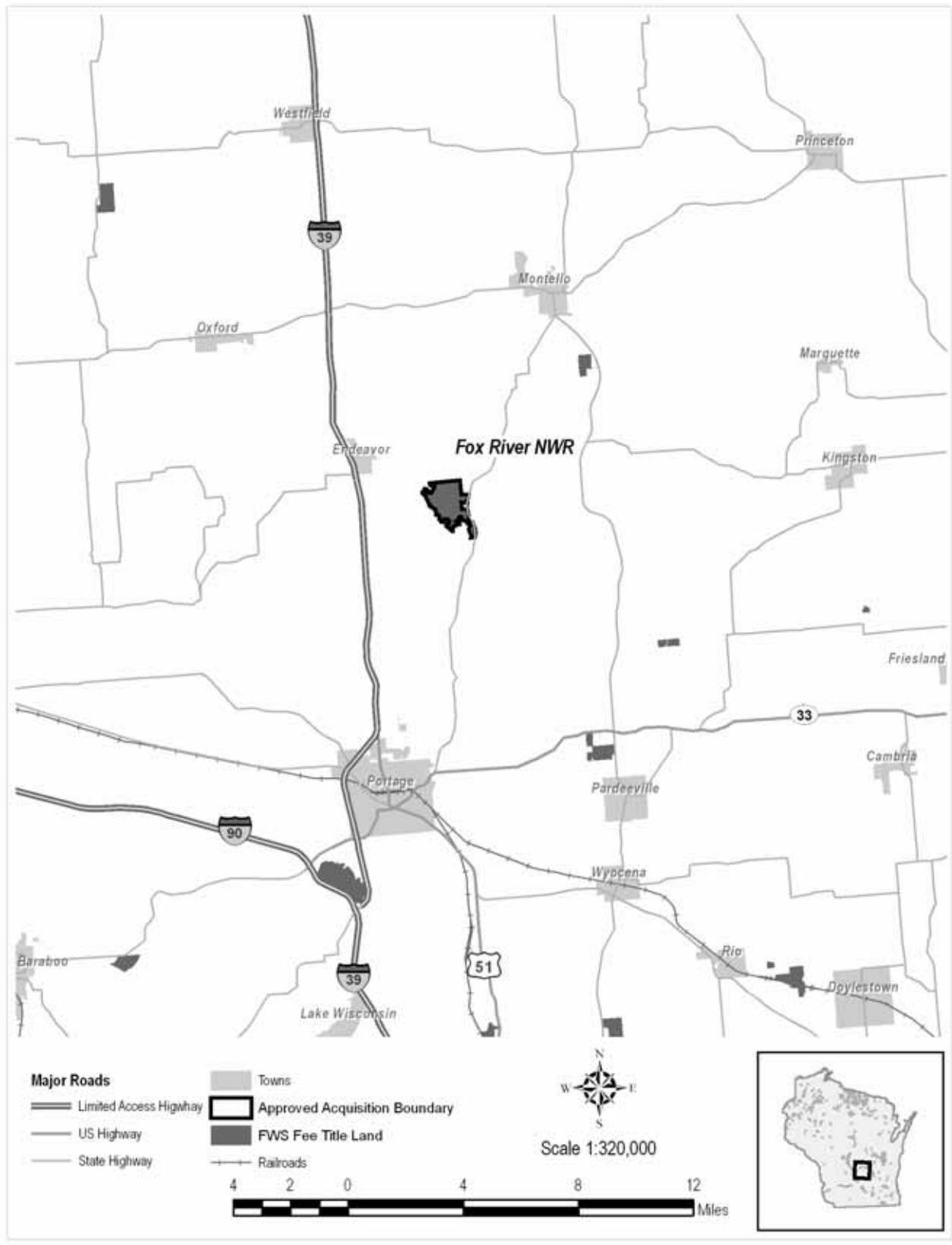


Figure 2: Location of Fox River NWR, Marquette County, Wisconsin



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



*School visit to Horicon NWR.*

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.

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

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 (Figure 3.).

### Fox River National Wildlife Refuge

Fox River NWR 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



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.

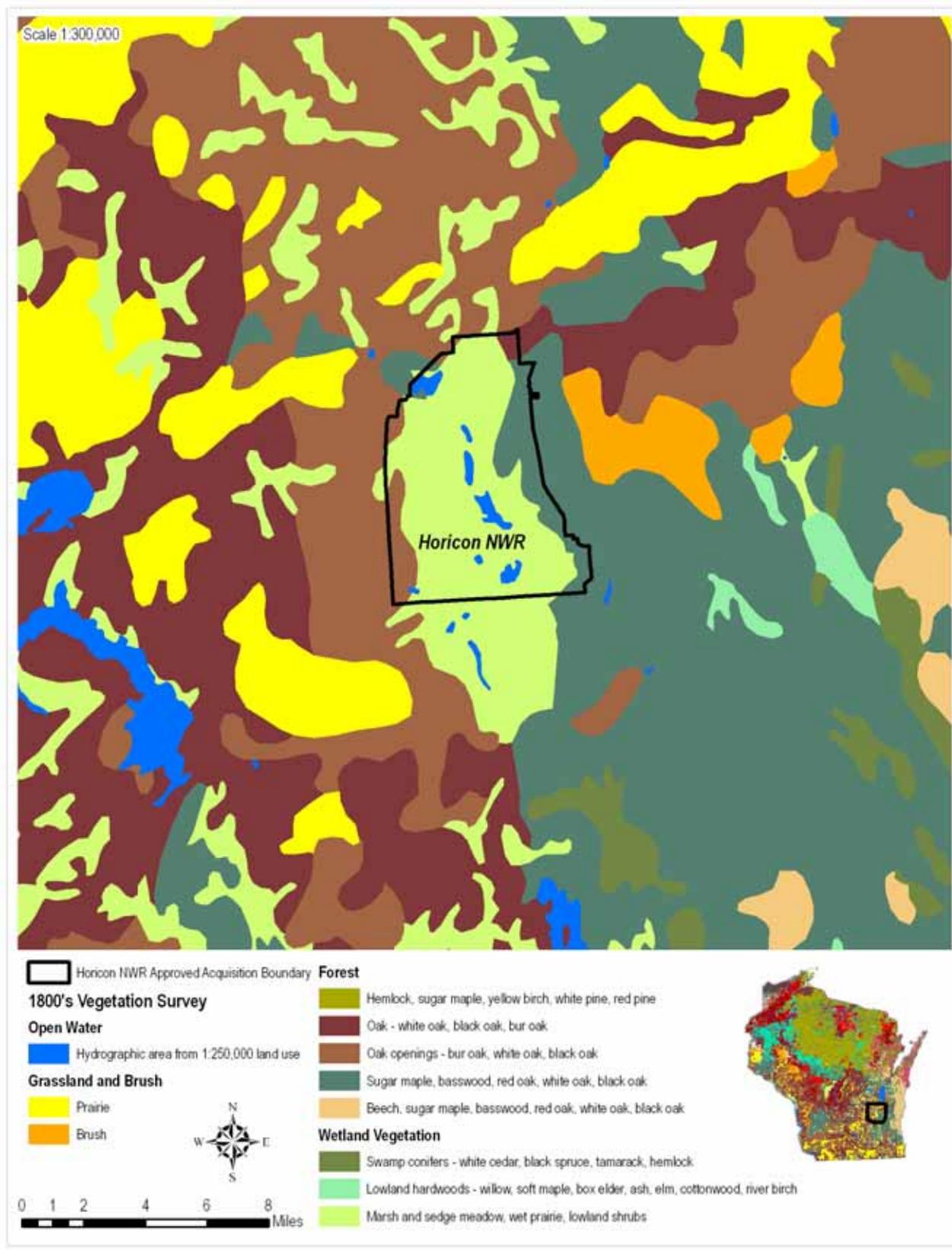
Subsequently, the court issued a Consent Decree whereby the Service agreed to purchase the subject 631-acre property after a specified amount of restoration. Fox River NWR was formally established during the spring of 1979 when the Service acquired the property to fulfill the Consent Decree.

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.

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



# Chapter 2: The Planning Process

The 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 Horicon NWR.

## 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



*Prairie habitat, Horicon NWR. USFWS*

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

Analysis of 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 been using the Refuge for 4 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. 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 Highway 49 is excessive. In addition, contaminants from Highway 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 declin-

ing 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.

### 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



Visitors to Horicon NWR. USFWS

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 Horicon and Fox River NWR CCP was prepared by a team consisting of Refuge and Regional Office staff. The CCP was published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Draft Environmental Assessment, published as Appendix A in the Draft CCP, presented a range of alternatives for future management and identified the preferred alternative. The alternative that was selected has become the basis of the Final CCP. This document then becomes the source for guiding management on the Refuge over the coming 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas and it will underpin the annual budgeting process through submissions to the Refuge Operating Needs System (RONS) and Maintenance Management System (MMS). Most importantly, it lays out the general approach to managing habitat, wildlife, and people at Horicon and Fox River Refuges that will direct day-to-day decision-making and actions.

The Draft CCP/EA was released for public review and comment on July 10, 2006. A Draft CCP/EA or a summary of the document was sent to more than 600 individuals, organizations, and local, state, and federal agencies and elected officials. Open house events were held on August 9, 2006, at the Horicon NWR Headquarters and August 10, 2006, at Moundville Town Hall (Fox River) following release of the draft document. We received a total of 35 comment letters and e-mails during the 45-day review period. Appendix K of the CCP summarizes these comments and our responses. Several of the comments resulted in changes in the CCP.

## 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 DNR 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



Aerial photograph shows Horicon NWR. USFWS

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.

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



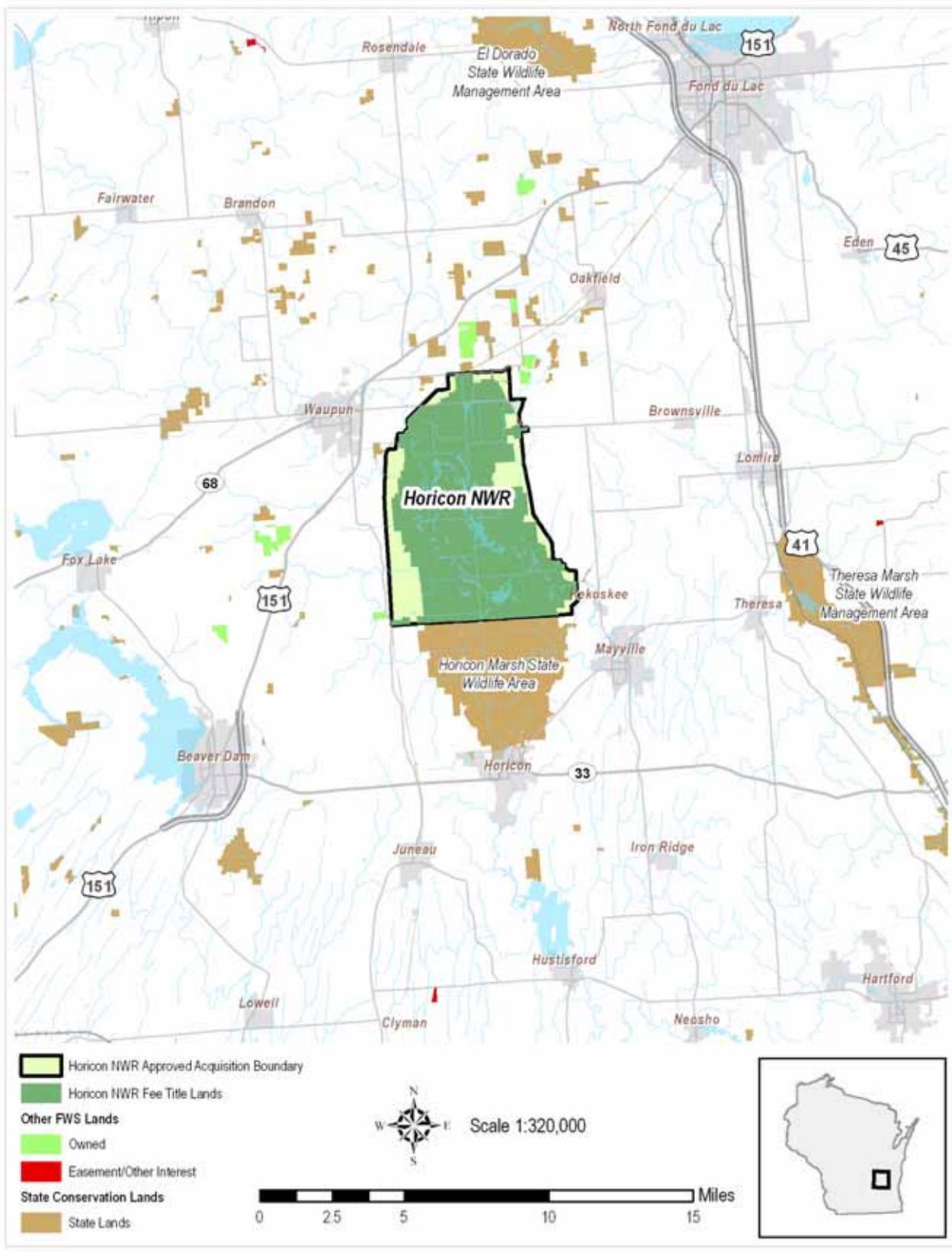
The ecological importance of Horicon Marsh is recognized not just nationally but internationally. In 1990, Horicon Marsh was designated a “Wetland of International Importance” by the Ramsar Convention, an intergovernmental treaty that obligates 45 signatory nations to consider wetland conservation through 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) 2 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(CO<sub>3</sub>)<sub>2</sub>] 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, Illinoian, 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 today.

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

**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) <sup>1</sup>	-	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.

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 1 to 2 feet in diameter. Depth of groundwater is 0 to 3 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

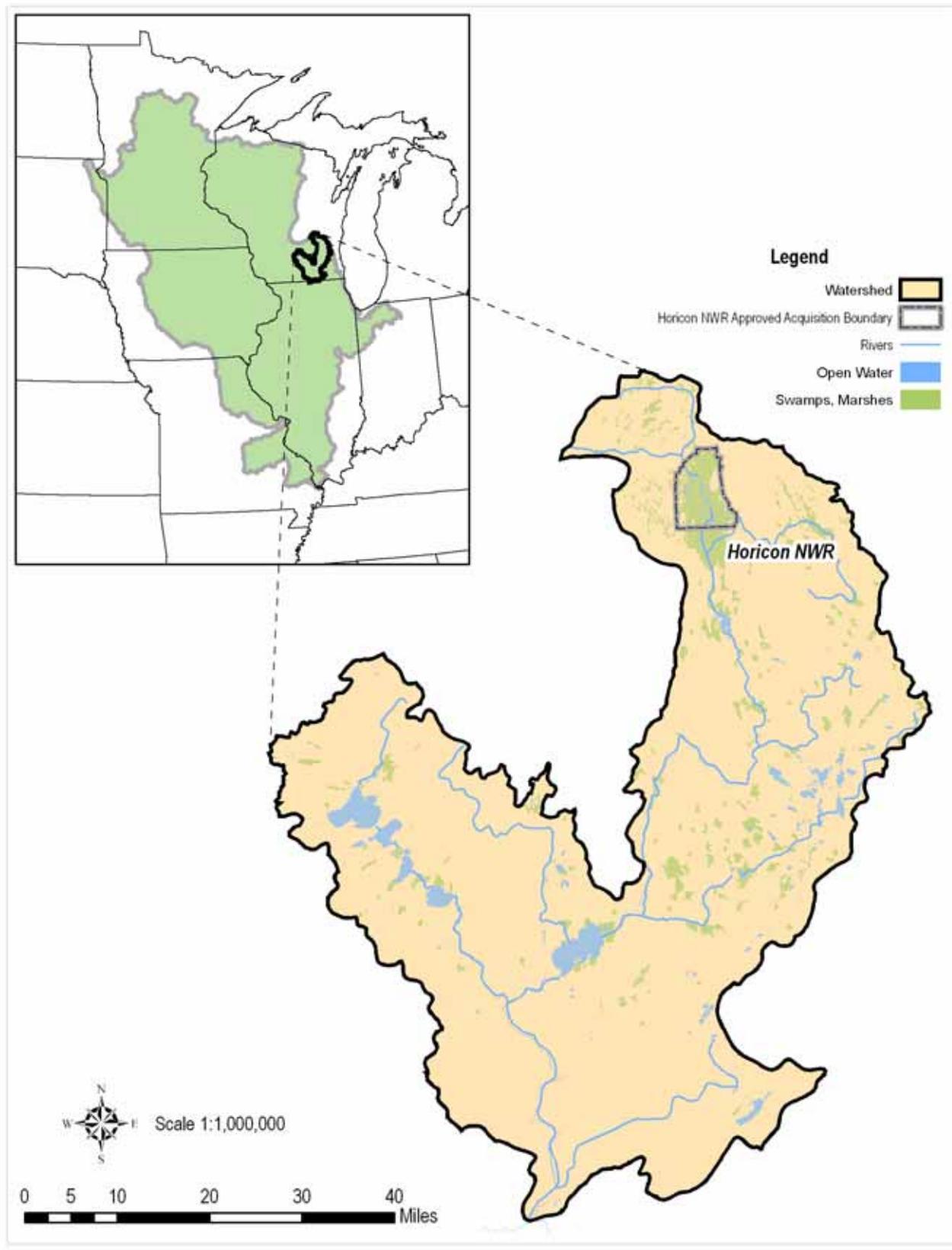
Horicon Marsh is located in the headwater region of the Upper Rock River Watershed (Figure 6). The marsh occupies a long north-south trending valley excavated by glacial action, with

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,

**Figure 6: Location of Rock River Watershed, Horicon NWR**



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.

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 varied 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 spear-points. 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 NWR 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 NWR area specifically included the Winnebago (some of which are known as the Ho-Chunk) as well as the Potawatomi 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 NWR.

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,



Otter tracks, Horicon NWR

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 of 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.

## 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.

Both Dodge and Fond du Lac Counties are characterized by a mixture of rural and urban areas, that is, small towns and villages surrounded

**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*

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 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.

**Table 3: Area of Land by Land-Use Class For Dodge and Fond du Lac Counties (thousands of acres)<sup>1</sup>**

County	Forest	Cropland	Pasture	Wetland <sup>2</sup>	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*

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.



*Woodsedge, Horicon NWR*

Table 4 on page 25 and Table 5 on page 26 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. For example, in Dodge County agriculture includes hundreds of family-owned farms and 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,

**Table 4: Dodge County Employment and Industry Data**

Occupation	Number	Percentage
Employed civilian population 16 years and over	43,197	100.0
<b>Occupation</b>		
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
<b>Industry</b>		
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
<b>Class of Worker</b>		
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
<i>Source: USCB, 2000a</i>		

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.

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**

Occupation	Number	Percentage
Employed civilian population 16 years and over	51,374	100.0
<b>Occupation</b>		
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
<b>Industry</b>		
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
<b>Class of Worker</b>		
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
<i>Source: USCB, 2000b</i>		

**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
<i>Source: Laughland and Caudill, 1997</i>			

**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

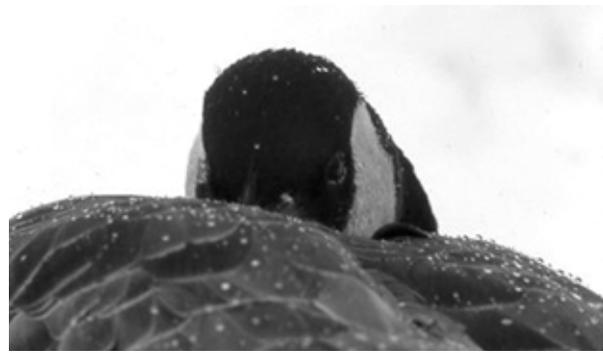
The study concluded that Horicon NWR had a net economic value of \$1,840,200. Every dollar of budget expenditure at the Refuge generated economic effects of \$10.12. While the Refuge is a small part of the regional economy, Horicon NWR and the marsh it protects help define the region's character and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

## 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 (phragmites), sedges, and reed canary grass. Uplands include nearly 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).



Canada Goose, Horicon NWR

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.

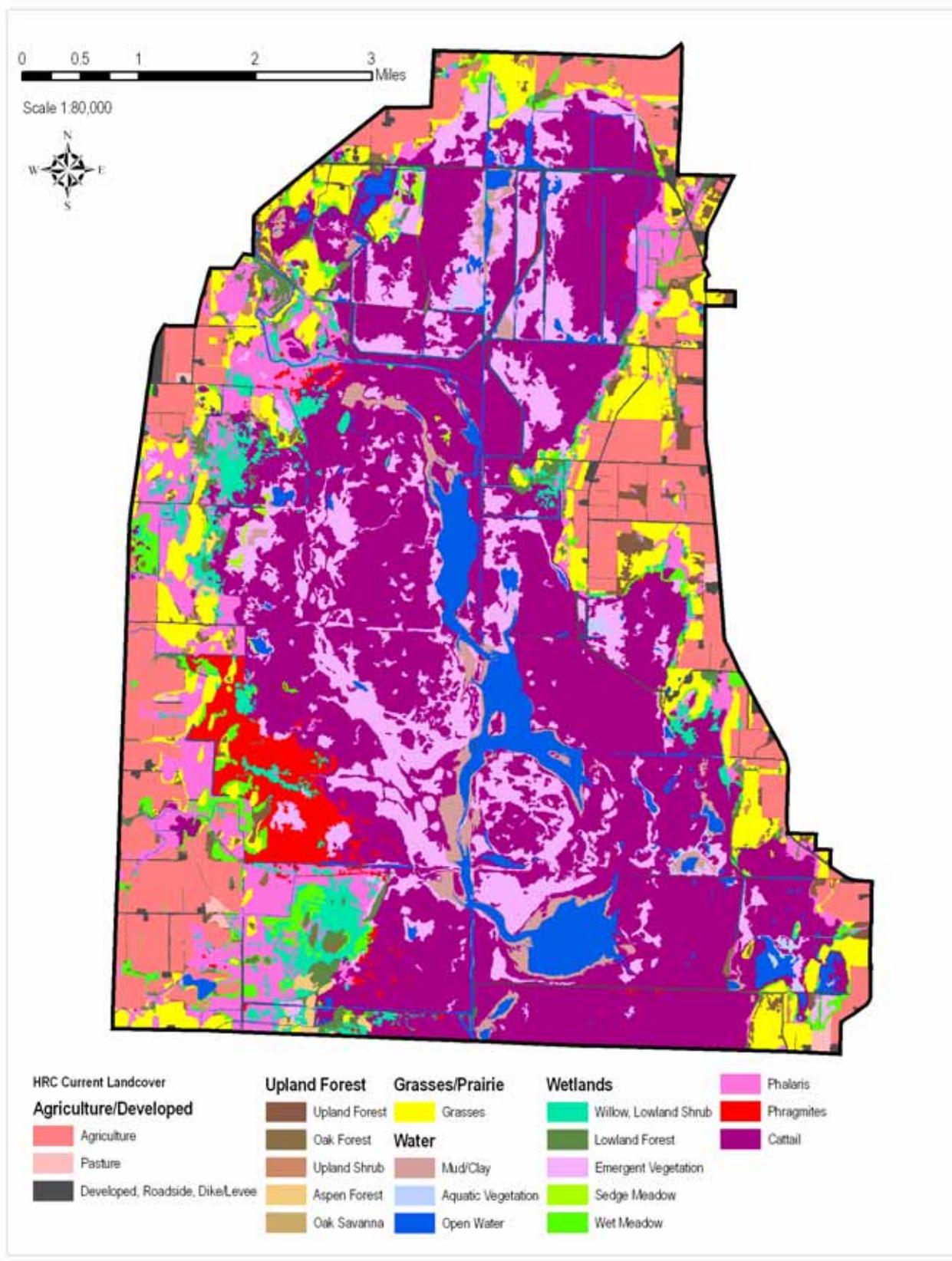
### Wildlife

#### **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

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



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 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 Redheads, 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 Moorhen, 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).



*Snapping turtle, Horicon NWR*

### **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
- # 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



*Great Egret, Horicon NWR*

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 an overabundant or invasive species.

## 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 dabbling ducks

- # Waterfowl Maintenance – Diver and dabbling 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.



*Black-eyed Susan, Horicon NWR*

### 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 savanna 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 savanna habitat. Staff will also be experimenting with particularly hot prescribed burns as a means of restoring and maintaining oak savanna.

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 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.

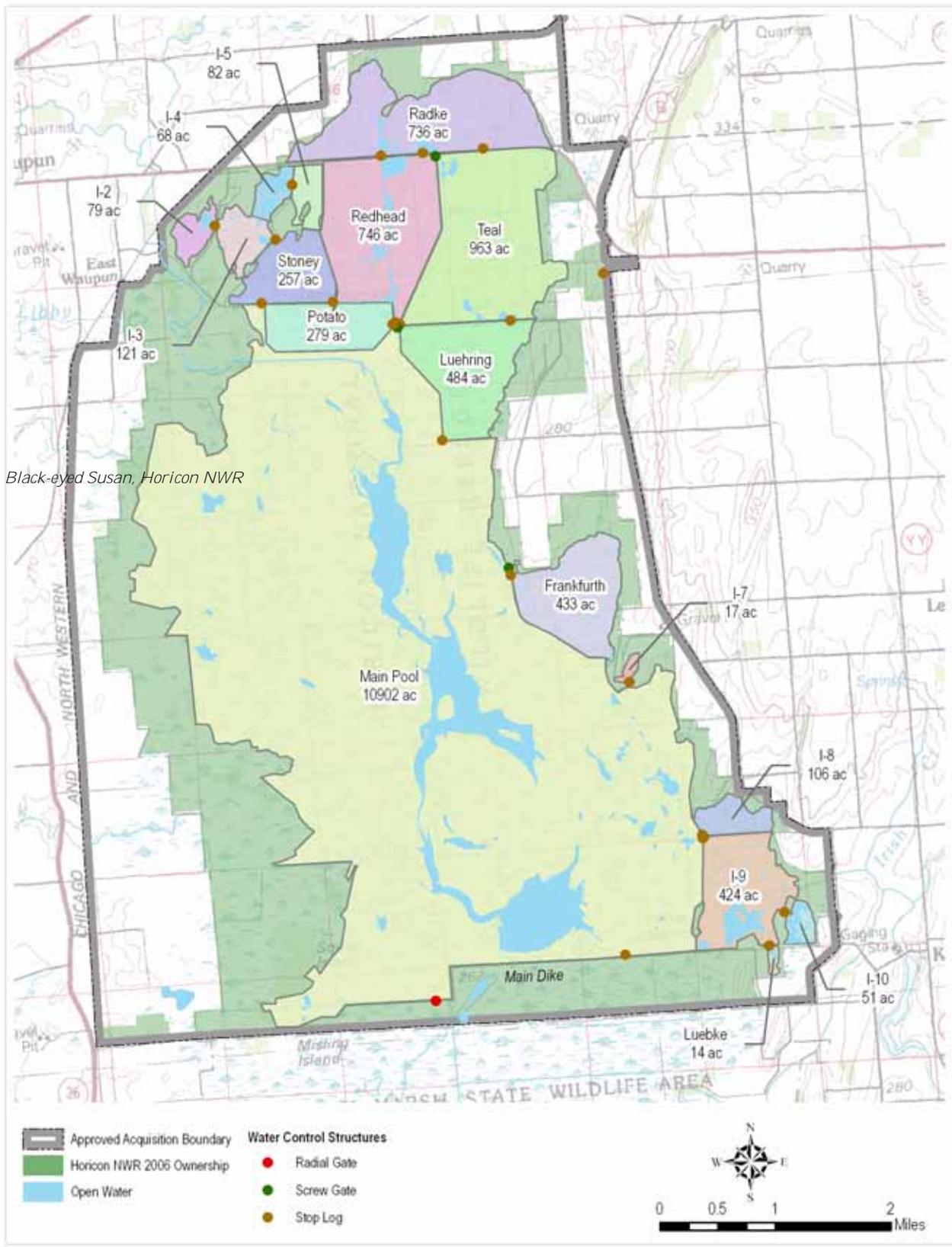
Similarly, for decades wildlife biologists (particularly waterfowl managers) encouraged the planting of dense nesting cover for waterfowl nesting. This method of seeding planted a very thick stand of warm season grass, usually only one or two species with little forb diversity. However, by the late 1990s,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

Figure 8: Impoundments, Horicon NWR



Black-eyed Susan, Horicon NWR

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 temporarily 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 2005. Objectives 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



*Marsh, Horicon NWR*

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.

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 several 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



*Purple loosestrife, Horicon NWR*

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*, *Aphthona cyparissiae*,

*Apthona czwalinae* and a long-horned stem miner called *Oberia erythrocephala*. Monitoring of leafy spurge and beetle survival continues.

*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 obser-

tion 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. A prescribed burn was conducted on this area 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 basic 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.



*Snowy Plover, Horicon NWR*

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.

*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 migra-

tion, 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 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



*Pike, Horicon NWR*

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 in the fall of 2005 prior to any grazing. In the spring of 2006, sheep were 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 4-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, if CWD is discovered in Dodge County, Refuge staff will continue to 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. However, if CWD continues to spread after discovery in Dodge County, Refuge staff will incorporate management activities and objectives consistent with the DNR disease management activities. 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



Wild Turkey, Horicon NWR

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.

### 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

**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

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. 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 ref-

uges 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 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 state-wide 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.

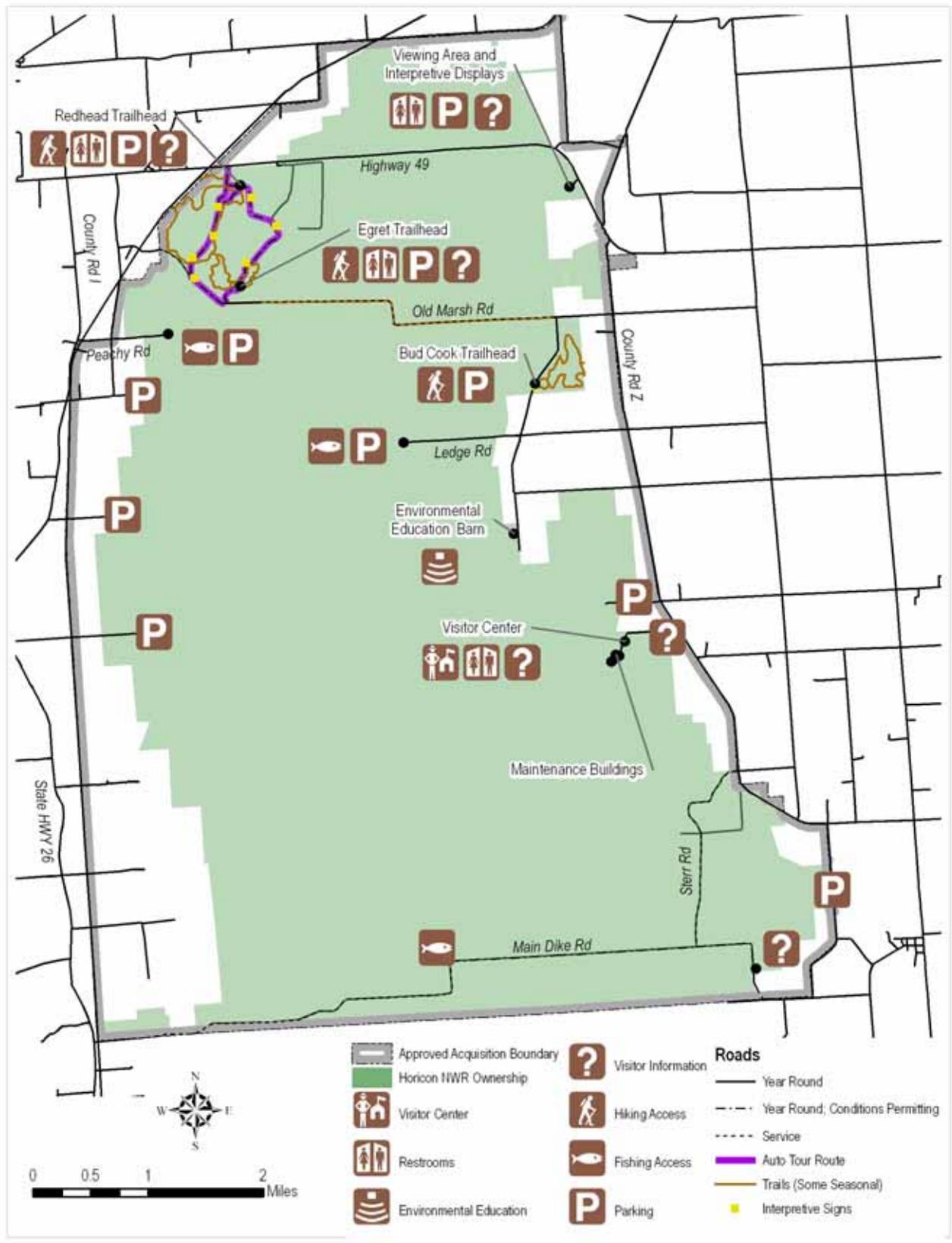
## Hunting

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 9-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

Figure 9: Existing Visitor Facilities, Horicon NWR



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 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. 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 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.

### 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.



*Students working on nature journals, Horicon NWR*

### 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



Muskrat, Horicon NWR

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.

## 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 NWR. 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 to an upland hill that rises to 816 feet. 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 21 for a combined history of the two refuges.

Figure 10: Current Land Cover, Fox River NWR

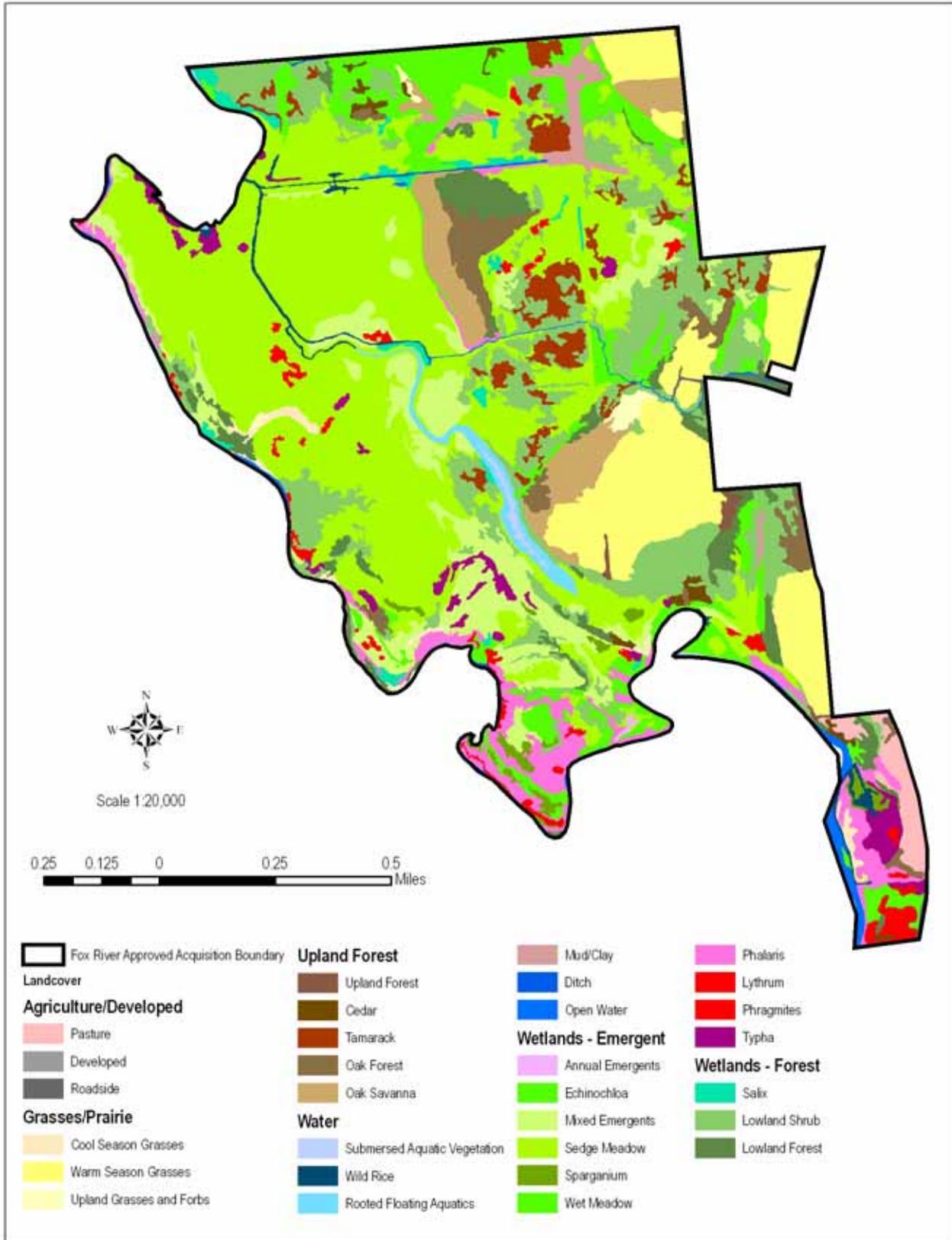
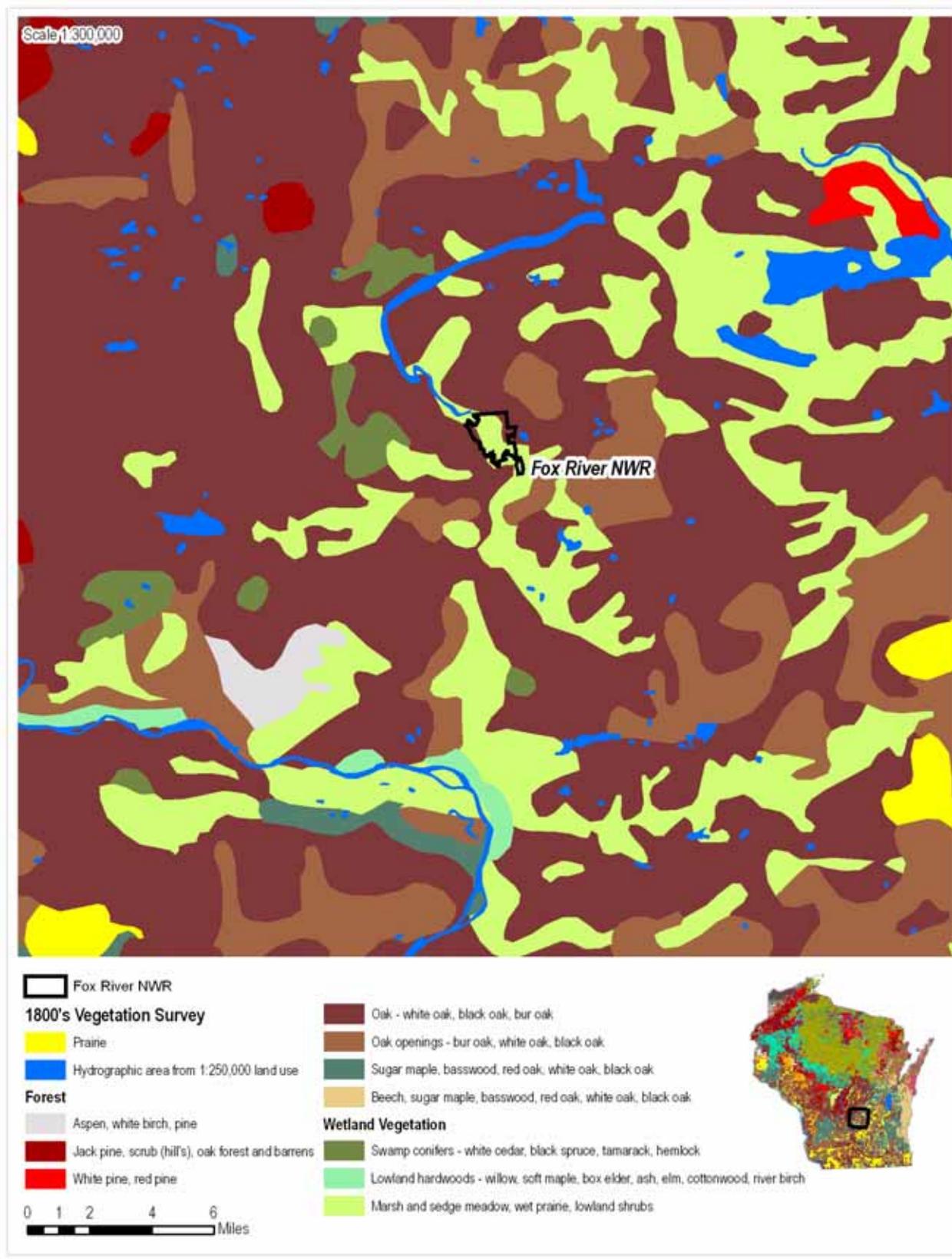


Figure 11: Historic Vegetation of the Fox River NWR



**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		

## 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.

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 NWR 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

**Table 10: Marquette County Employment and Industry Data**

Workforce	Number	Percentage
Employed civilian population 16 years and over	6,621	100.0
<b>Occupation</b>		
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
<b>Industry</b>		
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
<b>Class of Worker</b>		
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
<i>Source: USCB, 2000c</i>		

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.

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).



*Falsenettle, Horicon NWR*

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 tussock 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., 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 lacustris*), *Carex lasiocarpa*, 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., *Sagittaria* 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).



Northern Cardinal, Horicon NWR

### **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, 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., 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, 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) were present on Refuge open water wetlands. SAV consisted of water lilies, Potamogeton 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.

### ***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



*White-tail deer buck, Horicon NWR*

each year. It is also one of four major staging areas for Sandhill Cranes in southern Wisconsin and is used by 300-400 migrating cranes each autumn (USFWS, 1979).

Due to its relatively undisturbed condition, the wooded island in the center of the marsh has historically supported a small rookery of herons, including Great Blue Herons, Great Egrets, and Black-crowned Night Herons (USFWS 1979). 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. Nesting 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, 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

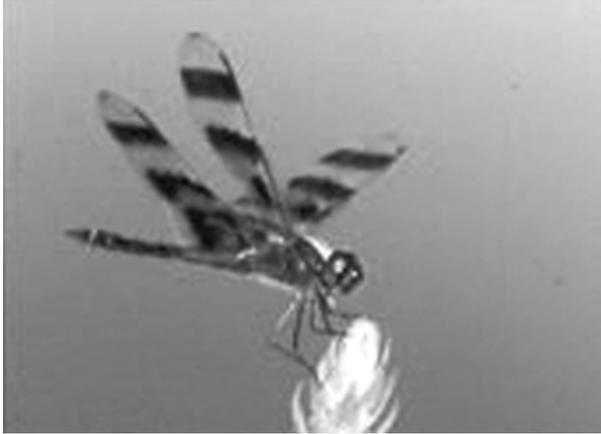
Virtually all the work completed on Fox River NWR to date has been some kind of habitat restoration. After completion of wetland and upland restoration activities, Fox River NWR will provide wonderful examples of habitats present before European settlement of the area in 1850. The area will then be managed 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 (d) 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 approxi-



*Dragonfly, Horicon NWR*

mately 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 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 Shoeberg 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 re-sprouted 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, 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



*Cattails, Horicon NWR*

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 Fox River NWR 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, 100 survey points were randomly placed in six broad habitat types on the Refuge in 2003 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

**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

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. More than 300 Sandhill Cranes have been observed using the Refuge as a staging area during 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. 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

**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

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 lasiosa* 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 the edge of the respective habitat type.

#### **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

**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

**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

Wisconsin, thus monitoring their status on the Refuge 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 3 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 by 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 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 was prepared by the Lacrosse Fisheries Office. A summary of the species composition in each water body is listed in 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 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. Centrarchids 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.

**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			

**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			

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 mea-

sured 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

**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
<b>Total</b>	<b>131</b>	<b>668.37</b>

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 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 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 NWRs, 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



*Eastern cotton-tail, Horicon NWR*

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.

### 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



*Horicon NWR*

Refuge staff. The goals are organized into the broad categories of wildlife, habitat, and people.

#### 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 staff's 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. The allowable deer density can be modified based on the health of the herd and/or changes in state regulations.

**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: Over-abundant 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.

Over-abundant populations of mammalian predators, such as mink and raccoon, can have detrimental impacts on a wide variety 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 3 on page 8). The habitat goal seeks to restore natural landscapes and processes, to the extent feasible, within the constraints imposed by the



Wetland tour, Horicon NWR

Refuge's 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 breach 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 phos-

phorus, 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 breach 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 are 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 interspersed 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 over-water 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:*

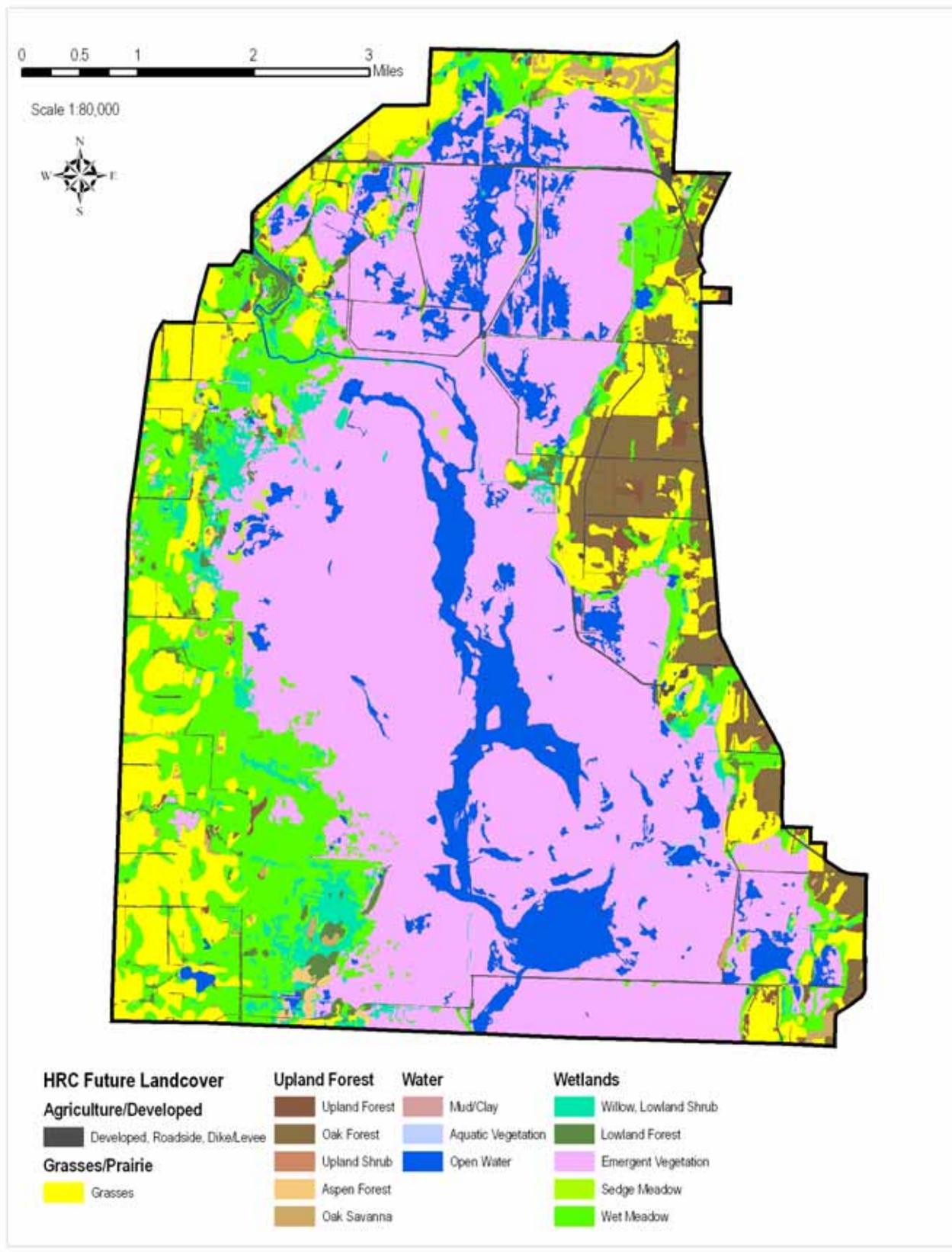
1. Document the location and size of invasive populations on the Refuge with GIS mapping.
2. Use biological control when available as a preferred strategy.
3. Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed.
4. Use fire and 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 (Figure 12).

**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 imper-

Figure 12: Future Habitat Conditions of Horicon NWR



iled globally because they are very rare throughout 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 per-



*Aquatic buttercup, Horicon NWR*

cent 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. 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 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.



*Deer hunter on Horicon NWR.*

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.

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. In order to avoid migratory bird disturbance, 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. Amend restricted use hunting areas (areas D, E, and F on the Refuge hunting brochure map). 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 (Figure 13).

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**

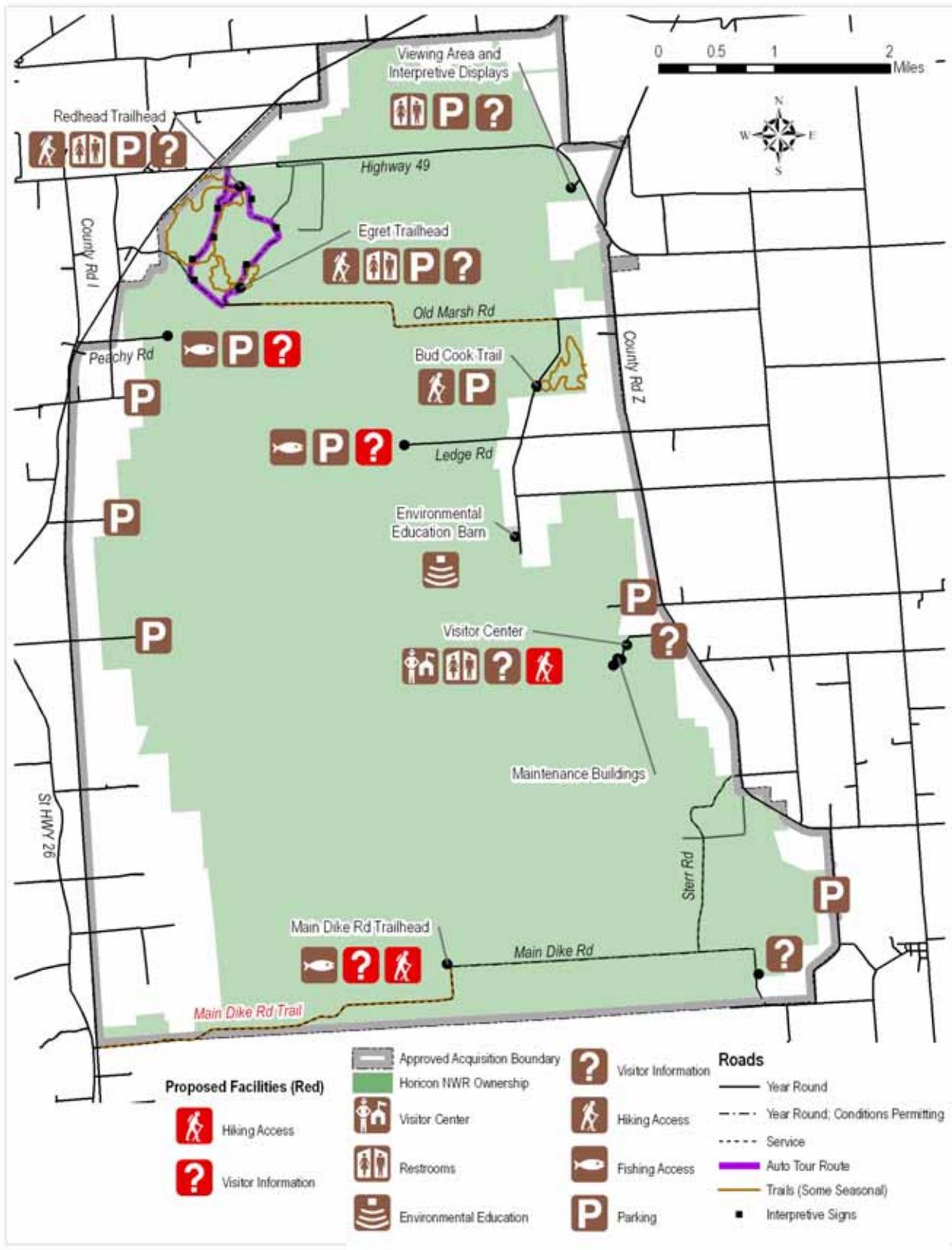
Provide year-round opportunities for up to 400,000 visitors annually to observe and photograph wildlife and habitat.

**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.

People walking and riding bicycles along Refuge trails and dike roads cause some disturbance to wildlife. Resting waterfowl may flush and move to other areas and birds sitting on a nest may temporarily leave. Overall, disturbance is limited to a small portion of the entire Refuge. The following strategies to increase wildlife observation and photography would cause only minor disturbance to wildlife because the open areas and designated times were determined on the basis of wildlife needs. However, 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.

Chapter 5 of this CCP lists a proposal to 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. This study would provide staff with information on the impacts of activities on closed and open areas of the Refuge and may lead to adjustments in specific strategies.

Figure 13: Proposed Visitor Facilities, 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, weather conditions permitting. The Refuge does not intend to plow the route after significant snowfall.
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. Open Old Marsh Road every weekend 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. Develop an interpretive loop trail from the visitor center.
10. Due to maintenance concerns and low visitor use, reduce the length of the Bud Cook Trail.
11. 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.
12. Document current use of the Environmental Education Barn and determine if use justifies the future cost of maintenance.

**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 prob-

lems 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. Develop a partnership with the Wisconsin DNR and the Horicon Marsh Internal Education Center to meet shared goals and save time and money.
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 shel-

ter, and an observation deck. The site should be staffed with volunteers during peak migrations.

11. Develop interpretive themes based on resource issues and update all interpretive panels to reflect these themes.

**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.
2. Seek to form a partnership among the Service, the Wisconsin DNR, and the Rock River Archaeological Society to promote the story of the Horicon Marsh.

# 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 pos-



*Columbine, Horicon NWR*

sibility 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 20 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.
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.



*Mallard drake, USFWS*

**Goal 2: Habitat**

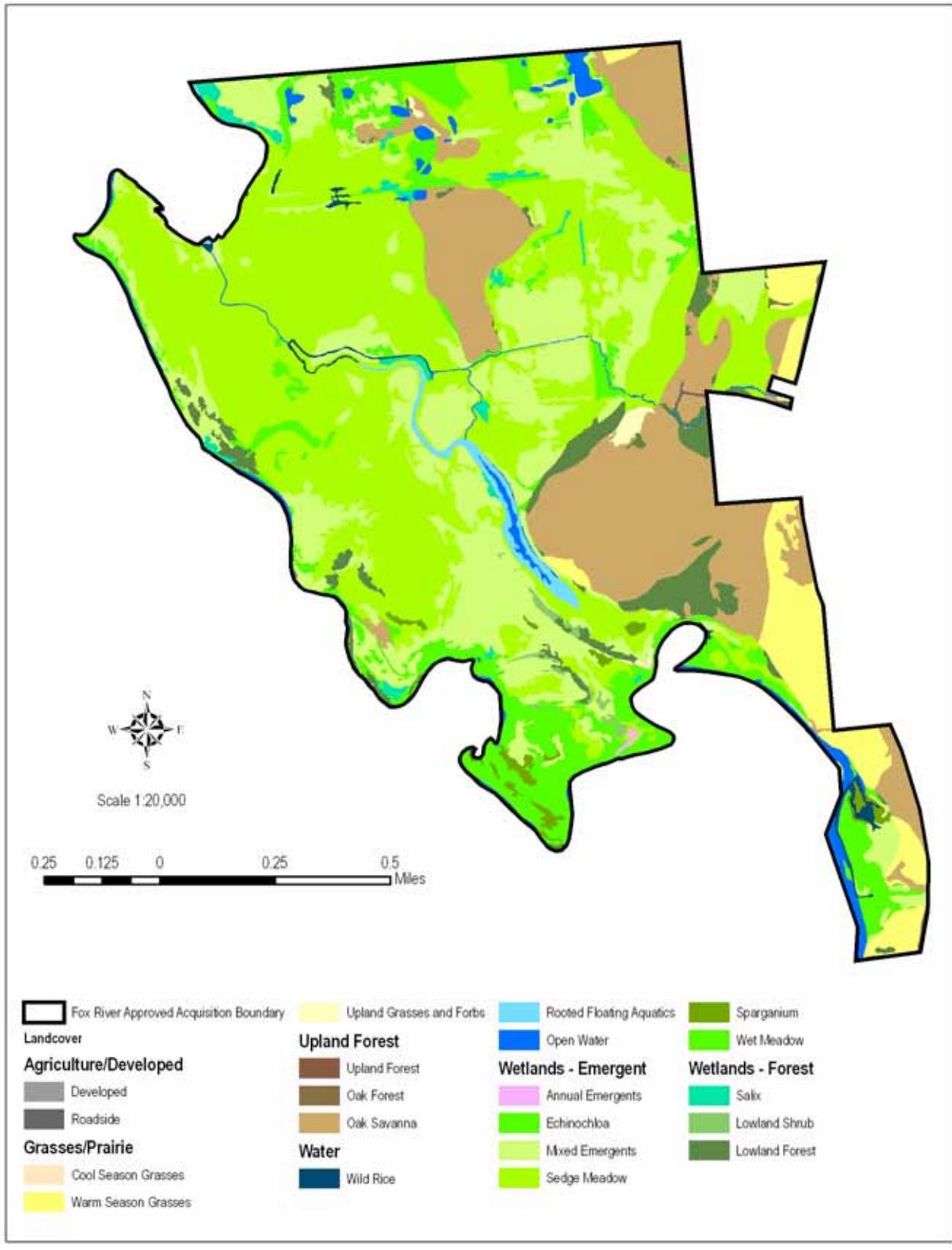
**Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow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

Figure 14: Future Vegetation Cover, Fox River NWR



*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.

**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 depen-



Spider, Horicon NWR

dent on this habitat type such as the Yellow Rail, American Bittern, Sedge Wren, Mallard, Canada Goose, and Sandhill Crane, among others.

**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, 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
- # multiflora rose

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.

*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 1-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:*

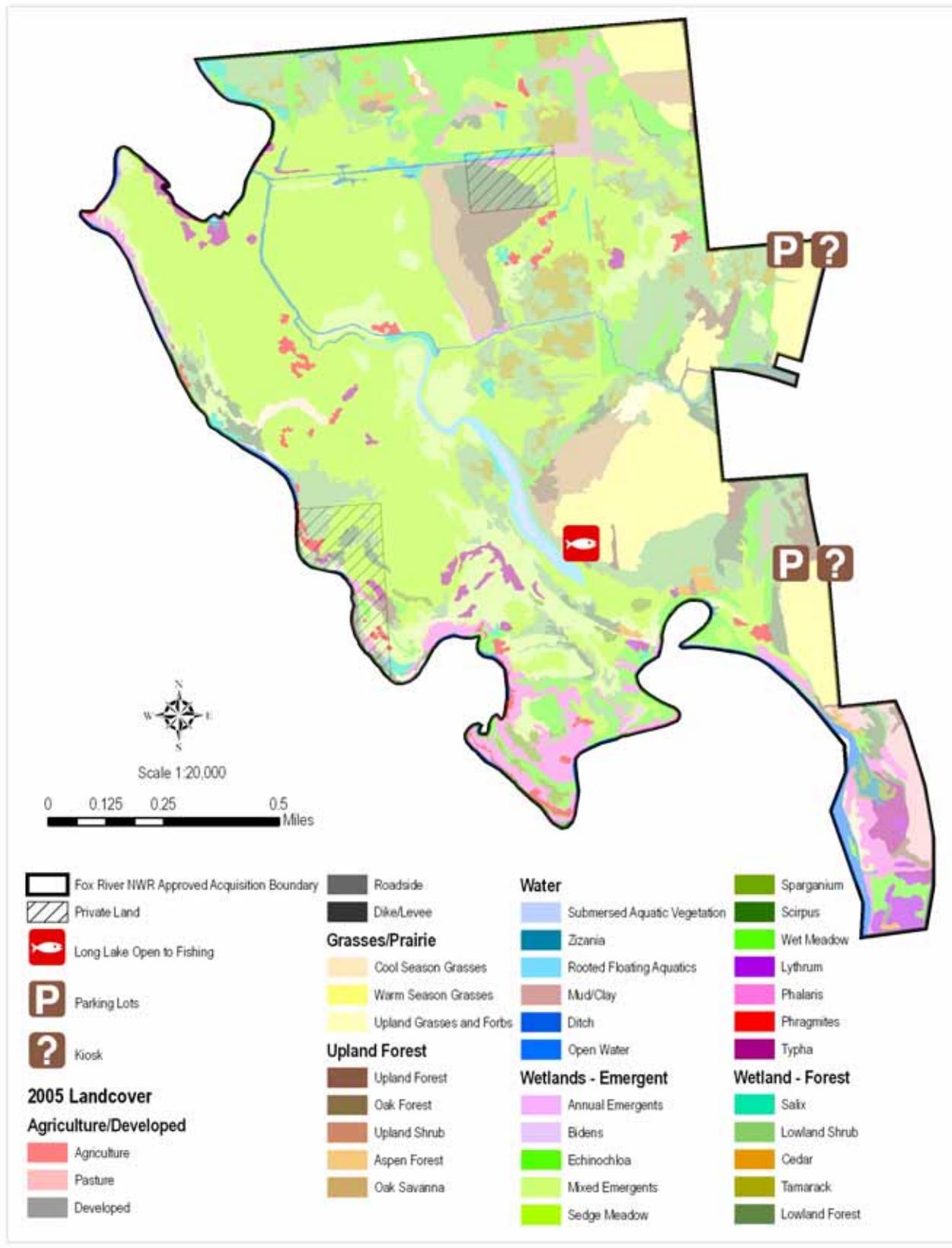
1. Provide fishing on designated areas of the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan.
2. Monitor litter and provide signs to educate anglers to always carry out trash.

**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

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



Ice Age State and National Trail may traverse the Refuge from Muir Park to the north if needed to connect properties.

*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 on-site visitation of 100 students and two to four group visits.

**Discussion:** A limited amount of on-site 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 support. 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



*Birding, Horicon NWR*

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 NWR 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 NWR 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



River otter, Horicon NWR

birds. Strategies 2.1-3 and 2.2.1-5; Estimated cost: \$150,000.

# 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 NWR 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 NWR 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 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 brochures, bird lists, hunting brochures, and maps. Thousands of publications are distributed to vis-

- itors by mail. Tourism groups and local businesses facilitate further distribution. Currently, in partnership with the Wisconsin DNR, a combined hunter map and a combined visitor map are developed and printed each year. Each year, the Wisconsin DNR 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 an over-abundant species that impact 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 sites. 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.
- # 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. Fox River NWR contains a 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 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 NWR 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 NWR. 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

## 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.

**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

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 NWR. 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 (Figure 16). Table 20 identifies additional staff needed to fully implement this plan by Fiscal Year 2021.

## 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 on page 94 and Table 22 on page 94 will be reviewed, revised, or developed as necessary to achieve the results anticipated in this draft CCP.

## Archeological and Cultural Values

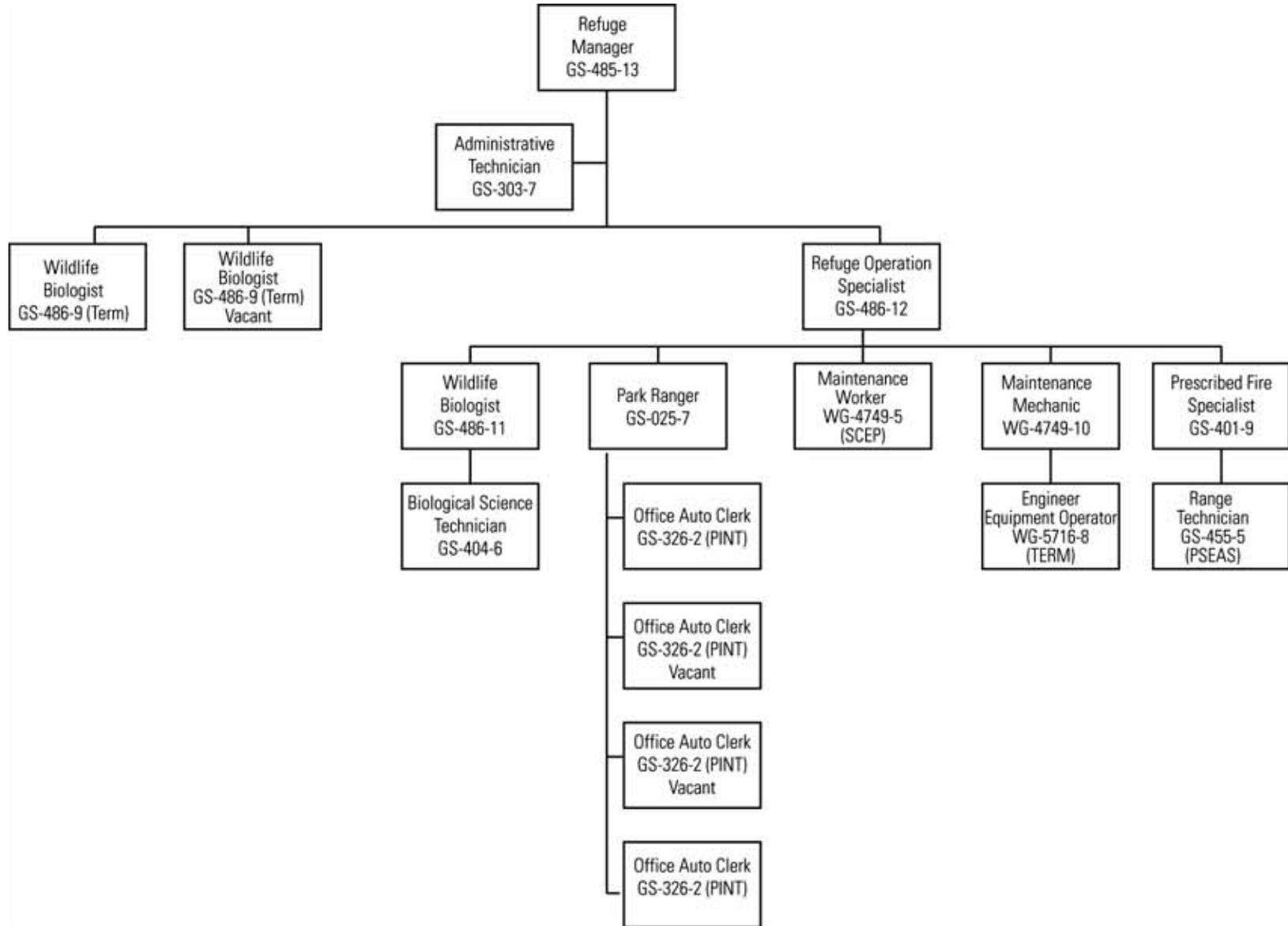
As part of its larger conservation mandate and ethic, the Service through the Refuge Manager applies the several historic preservation laws and regulations to ensure historic properties are identified and are protected to the extent possible within its established purposes and Refuge System mission.

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 Archeological 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 lands to identify archeological resources and for developing a preservation program to meet the requirements of Section 14 of the Archeological

Figure 16: Current Staffing Chart, Horicon NWR



**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 <sup>1</sup>	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 <sup>1</sup>	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*

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.



# **Appendix A: Finding of No Significant Impact**



## Finding of No Significant Impact

### Environmental Assessment and Comprehensive Conservation Plan for the Horicon and Fox River National Wildlife Refuges, Wisconsin

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of the Horicon and Fox River National Wildlife Refuges. The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated three alternatives for the future management of Horicon NWR, and two alternatives for Fox River NWR.

The alternative selected for implementation on each refuge is *Alternative B*. The preferred alternative for Horicon includes increased opportunities for hunting, fishing, wildlife observation and photography, environmental education and interpretation. Landscape and watershed involvement by staff and partners would be increased to reduce sedimentation rate and improve water quality in the Horicon Marsh. Habitat management efforts would seek to re-establish a braided river system flowing into the north end of the Horicon Marsh. Refuge uplands would continue to be restored and maintained as open grasslands and oak savanna, which is typical of habitat types prior to European settlement and represents a declining and rare habitat type.

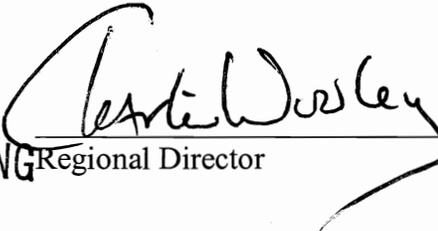
The preferred alternative for Fox River would include more hunting opportunities, the initiation of a fishing program, new wildlife observation and photography opportunities, and the beginning of an environmental education and interpretation program. Habitat restoration and management would continue to perpetuate a variety of native plant and wildlife species, especially those of priority to the Service.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative B as the management alternative for each refuge is not a major federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2) (c) of the National Environmental Policy Act of 1969.

#### Additional Reasons:

1. Future management actions will have a neutral or positive impact on the local economy.
2. This action will not have an adverse impact on threatened or endangered species.

Supporting References:  
Environmental Assessment  
Comprehensive Conservation Plan

  
ACTING Regional Director

3/16/07  
Date



# 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
<b>Grebes</b>					
Pied-billed Grebe*	<i>(Podilymbus podiceps)</i>	C	C	C	
Horned Grebe	<i>(Podiceps auritus)</i>	R		R	
Red-necked Grebe	<i>(Podiceps grisegena)</i>	R		R	
<b>Pelicans</b>					
American White Pelican*	<i>(Pelecanus erythrorhynchos)</i>	C	C	C	
<b>Cormorants</b>					
Double-crested Cormorant*	<i>(Phalacrocorax auritus)</i>	C	C	C	
<b>Hérons and Bitterns</b>					
American Bittern*	<i>(Botaurus lentiginosus)</i>	U	U	U	
Least Bittern*	<i>(Ixobrychus exilis)</i>	U	U	U	
Great Blue Heron*	<i>(Ardea herodias)</i>	C	C	C	U
Great Egret*	<i>(Ardea alba)</i>	C	C	C	
Snowy Egret	<i>(Egretta thula)</i>	R	R	R	
Cattle Egret	<i>(Bubulcus ibis)</i>	R	R	R	
Green Heron*	<i>(Butorides virescens)</i>	U	U	U	
Black-crowned Night-Heron*	<i>(Nycticorax nycticorax)</i>	C	A	A	
Yellow-crowned Night-Heron	<i>(Nyctanassa violacea)</i>	R	R	R	
<b>Vultures</b>					
Turkey Vulture	<i>(Cathartes aura)</i>	U	U	R	
<b>Swans, Geese and Ducks</b>					
Greater White-fronted Goose	<i>(Anser albifrons)</i>	R		R	
Snow Goose	<i>(Chen caerulescens)</i>	U		U	
Canada Goose*	<i>(Branta canadensis)</i>	A	C	A	C
Trumpeter Swan	<i>(Cygnus buccinator)</i>	R		R	
Tundra Swan	<i>(Cygnus columbianus)</i>	U		U	
Wood Duck*	<i>(Aix sponsa)</i>	C	C	C	

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Gadwall*	<i>(Anas strepera)</i>	U	U	C	
American Wigeon*	<i>(Anas americana)</i>	U	U	C	
American Black Duck	<i>(Anas rubripes)</i>	U	U	U	R
Mallard*	<i>(Anas platyrhynchos)</i>	A	A	A	U
Blue-winged Teal*	<i>(Anas discors)</i>	C	C	C	
Northern Shoveler*	<i>(Anas clypeata)</i>	C	U	C	
Northern Pintail	<i>(Anas acuta)</i>	U	U	U	
Green-winged Teal*	<i>(Anas crecca)</i>	C	U	A	
Canvasback	<i>(Aythya valisineria)</i>	U	R	U	
Redhead*	<i>(Aythya americana)</i>	C	C	C	
Ring-necked Duck	<i>(Aythya collaris)</i>	C	U	C	
Greater Scaup	<i>(Aythya marila)</i>	R		R	
Lesser Scaup	<i>(Aythya affinis)</i>	C	U	C	
Bufflehead	<i>(Bucephala albeola)</i>	U		U	R
Common Goldeneye	<i>(Bucephala clangula)</i>	U		U	
Hooded Merganser*	<i>(Lophodytes cucullatus)</i>	U	U	U	R
Common Merganser	<i>(Mergus merganser)</i>	U		U	R
Red-breasted Merganser	<i>(Mergus serrator)</i>	R		R	
Ruddy Duck*	<i>(Oxyura jamaicensis)</i>	C	U	C	
<b>Hawks and Eagles</b>					
Osprey	<i>(Pandion haliaetus)</i>	R	R	R	
Bald Eagle*	<i>(Haliaeetus leucocephalus)</i>	U	C	C	U
Northern Harrier*	<i>(Circus cyaneus)</i>	C	C	C	C
Sharp-shinned Hawk*	<i>(Accipiter striatus)</i>	U	R	U	R
Cooper's Hawk*	<i>(Accipiter cooperii)</i>	U	R	U	R
Red-shouldered Hawk	<i>(Buteo lineatus)</i>	U		U	
Broad-winged Hawk	<i>(Buteo platypterus)</i>	U		U	
Red-tailed Hawk*	<i>(Buteo jamaicensis)</i>	C	C	C	C
Rough-legged Hawk	<i>(Buteo lagopus)</i>	C		C	C
<b>Falcons</b>					
American Kestrel*	<i>(Falco sparverius)</i>	C	C	C	C
Peregrine Falcon	<i>(Falco peregrinus)</i>	R		R	R
<b>Upland Game Birds</b>					
Gray Partridge*	<i>(Perdix perdix)</i>	U	U	U	U

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Ring-necked Pheasant*	<i>(Phasianus colchicus)</i>	C	C	C	C
Wild Turkey*	<i>(Meleagris gallopavo)</i>	A	C	A	C
Ruffed Grouse*	<i>(Bonasa umbellus)</i>	R	R	R	
<b>Rails and Coots</b>					
Yellow Rail*	<i>(Coturnicops noveboracensis)</i>	R			
King Rail*	<i>(Rallus elegans)</i>	U	U	R	
Virginia Rail*	<i>(Rallus limicola)</i>	C	C	C	
Sora*	<i>(Porzana carolina)</i>	C	C	C	
Common Moorhen*	<i>(Gallinula chloropus)</i>	C	C	C	
American Coot*	<i>(Fulica americana)</i>	A	A	A	
<b>Cranes</b>					
Sandhill Crane*	<i>(Grus canadensis)</i>	C	C	C	C
Whooping Crane	<i>(Grus americana)</i>	U	U	U	
<b>Shorebirds</b>					
Black-necked Stilt*	<i>(Himantopus mexicanus)</i>	R	R	R	
Black-bellied Plover	<i>(Pluvialis squatarola)</i>	U	R	U	
American Golden-Plover	<i>(Pluvialis dominica)</i>	R	R	R	
Semipalmated Plover	<i>(Charadrius semipalmatus)</i>	U	U	U	
Killdeer*	<i>(Charadrius vociferus)</i>	C	C	C	
Greater Yellowlegs	<i>(Tringa melanoleuca)</i>	C	U	C	
Lesser Yellowlegs	<i>(Tringa flavipes)</i>	C	U	C	
Solitary Sandpiper	<i>(Tringa solitaria)</i>	U	U	U	
Spotted Sandpiper*	<i>(Actitis macularia)</i>	R	R	R	
Semipalmated Sandpiper	<i>(Calidris pusilla)</i>	C	U	C	
Least Sandpiper	<i>(Calidris minutilla)</i>	C	U	C	
White-rumped Sandpiper	<i>(Calidris fuscicollis)</i>	R	R	R	
Baird's Sandpiper	<i>(Calidris bairdii)</i>	R		R	
Pectoral Sandpiper	<i>(Calidris melanotos)</i>	U	U	C	
Dunlin	<i>(Calidris alpina)</i>	C	U	C	
Stilt Sandpiper	<i>(Calidris himantopus)</i>	R	R	U	
Buff-breasted Sandpiper	<i>(Tryngites subruficollis)</i>	R	R	R	
Short-billed Dowitcher	<i>(Limnodromus griseus)</i>	R	R	U	
Long-billed Dowitcher	<i>(Limnodromus scolopaceus)</i>	U	R	U	
Wilson's Snipe*	<i>(Gallinago delicata)</i>	C	U	C	

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
American Avocet	<i>(Recurvirostra americana)</i>	R	U	R	
Ruddy Turnstone	<i>(Arenaria interpres)</i>	R	R	R	
American Woodcock*	<i>(Scolopax minor)</i>	C	U	U	
Wilson's Phalarope*	<i>(Phalaropus tricolor)</i>	R	R	R	
Red-necked Phalarope	<i>(Phalaropus lobatus)</i>	R		R	
<b>Gulls and Terns</b>					
Bonaparte's Gull	<i>(Larus philadelphia)</i>	U		U	
Ring-billed Gull	<i>(Larus delawarensis)</i>	C	U	C	
Herring Gull	<i>(Larus argentatus)</i>	C	U	C	U
Forster's Tern*	<i>(Sterna forsteri)</i>	C	C	U	
Black Tern*	<i>(Chlidonias niger)</i>	C	C	U	
<b>Doves</b>					
Rock Dove*	<i>(Columba livia)</i>	C	C	C	C
Mourning Dove*	<i>(Zenaida macroura)</i>	C	C	C	C
<b>Cuckoos and Roadrunners</b>					
Black-billed Cuckoo*	<i>(Coccyzus erythrophthalmus)</i>	U	U	U	
Yellow-billed Cuckoo*	<i>(Coccyzus americanus)</i>	U	U	U	
<b>Owls</b>					
Eastern Screech-Owl*	<i>(Megascops asio)</i>	C	C	C	C
Great Horned Owl*	<i>(Bubo virginianus)</i>	C	C	C	C
Snowy Owl	<i>(Nyctea scandiacus)</i>	R			R
Barred Owl	<i>(Strix varia)</i>	U	U	U	U
Long-eared Owl	<i>(Asio otus)</i>	R		R	R
Short-eared Owl	<i>(Asio flammeus)</i>	U	R	U	U
<b>Nighthawks and Nightjars</b>					
Common Nighthawk*	<i>(Chordeiles minor)</i>	U	U	U	
<b>Swifts</b>					
Chimney Swift*	<i>(Chaetura pelagica)</i>	U	U	U	
<b>Hummingbirds</b>					
Ruby-throated Hummingbird*	<i>(Archilochus colubris)</i>	U	U	U	
<b>Kingfishers</b>					
Belted Kingfisher*	<i>(Ceryle alcyon)</i>	U	U	U	
<b>Woodpeckers</b>					

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Red-headed Woodpecker	<i>(Melanerpes erythrocephalus)</i>	U	U	U	
Red-bellied Woodpecker	<i>(Melanerpes carolinus)</i>	U	U	U	U
Yellow-bellied Sapsucker	<i>(Sphyrapicus varius)</i>	U		U	
Downy Woodpecker*	<i>(Picoides pubescens)</i>	C	C	C	C
Hairy Woodpecker*	<i>(Picoides villosus)</i>	C	C	C	C
Northern Flicker*	<i>(Colaptes auratus)</i>	C	C	C	
<b>Flycatchers</b>					
Olive-sided Flycatcher	<i>(Contopus cooperi)</i>	R		R	
Eastern Wood-Pewee*	<i>(Contopus virens)</i>	C	C	C	
Yellow-bellied Flycatcher	<i>(Empidonax flaviventris)</i>	R		R	
Alder Flycatcher	<i>(Empidonax alnorum)</i>	U	U	U	
Willow Flycatcher*	<i>(Empidonax traillii)</i>	C	C	C	
Least Flycatcher*	<i>(Empidonax minimus)</i>	C	C	C	
Eastern Phoebe*	<i>(Sayornis phoebe)</i>	C	C	C	
Great Crested Flycatcher*	<i>(Myiarchus crinitus)</i>	C	C	C	
Eastern Kingbird*	<i>(Tyrannus tyrannus)</i>	C	C	C	
<b>Shrikes</b>					
Northern Shrike	<i>(Lanius excubitor)</i>	R			U
<b>Vireos</b>					
Yellow-throated Vireo*	<i>(Vireo flavifrons)</i>	U	U	U	
Blue-headed Vireo	<i>(Vireo solitarius)</i>	U		U	
Warbling Vireo*	<i>(Vireo gilvus)</i>	C	C	C	
Philadelphia Vireo	<i>(Vireo philadelphicus)</i>	U	R	U	
Red-eyed Vireo*	<i>(Vireo olivaceus)</i>	C	C	C	
<b>Jays, Magpies and Crows</b>					
Blue Jay*	<i>(Cyanocitta cristata)</i>	C	C	C	C
American Crow*	<i>(Corvus brachyrhynchos)</i>	C	C	C	C
<b>Larks</b>					
Horned Lark*	<i>(Eremophila alpestris)</i>	C	U	C	C
<b>Swallows</b>					
Purple Martin*	<i>(Progne subis)</i>	C	C	C	
Tree Swallow*	<i>(Tachycineta bicolor)</i>	A	A	A	
Northern Rough-winged Swallow*	<i>(Stelgidopteryx serripennis)</i>	U	U	U	

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
Bank Swallow*	<i>(Riparia riparia)</i>	U	U	U	
Cliff Swallow*	<i>(Petrochelidon pyrrhonota)</i>	U	U	U	
Barn Swallow*	<i>(Hirundo rustica)</i>	C	C	C	
<b>Chickadees and Titmice</b>					
Black-capped Chickadee*	<i>(Poecile atricapillus)</i>	C	C	C	C
<b>Nuthatches</b>					
Red-breasted Nuthatch	<i>(Sitta canadensis)</i>	R		R	R
White-breasted Nuthatch*	<i>(Sitta carolinensis)</i>	U	U	U	U
<b>Creepers</b>					
Brown Creeper	<i>(Certhia americana)</i>	U		U	U
<b>Wrens</b>					
House Wren*	<i>(Troglodytes aedon)</i>	C	C	C	
Winter Wren	<i>(Troglodytes troglodytes)</i>	U	R	U	
Sedge Wren*	<i>(Cistothorus platensis)</i>	C	C	C	
Marsh Wren*	<i>(Cistothorus palustris)</i>	A	A	C	R
<b>Kinglets, Bluebirds and Thrushes</b>					
Golden-crowned Kinglet	<i>(Regulus satrapa)</i>	C		C	R
Ruby-crowned Kinglet	<i>(Regulus calendula)</i>	C		C	
Blue-gray Gnatcatcher*	<i>(Polioptila caerulea)</i>	U	U	U	
Eastern Bluebird*	<i>(Sialia sialis)</i>	U	U	U	
Veery*	<i>(Catharus fuscescens)</i>	U	U	U	
Gray-cheeked Thrush	<i>(Catharus minimus)</i>	U		U	
Swainson's Thrush	<i>(Catharus ustulatus)</i>	U		U	
Hermit Thrush	<i>(Catharus guttatus)</i>	U		U	
Wood Thrush*	<i>(Hylocichla mustelina)</i>	U	U	U	
American Robin*	<i>(Turdus migratorius)</i>	C	C	C	R
<b>Mimics</b>					
Gray Catbird*	<i>(Dumetella carolinensis)</i>	C	C	C	
Brown Thrasher*	<i>(Toxostoma rufum)</i>	U	U	U	
<b>Starlings</b>					
European Starling*	<i>(Sturnus vulgaris)</i>	C	C	C	C
<b>Waxwings</b>					
Cedar Waxwing*	<i>(Bombycilla cedrorum)</i>	U	C	C	R

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
<b>Warblers</b>					
Blue-winged Warbler	<i>(Vermivora pinus)</i>	U	R	R	
Golden-winged Warbler	<i>(Vermivora chrysoptera)</i>	U	R	R	
Tennessee Warbler	<i>(Vermivora peregrina)</i>	C	R	C	
Orange-crowned Warbler	<i>(Vermivora celata)</i>	U		U	
Nashville Warbler	<i>(Vermivora ruficapilla)</i>	C	R	C	
Northern Parula	<i>(Parula americana)</i>	U	R	U	
Yellow Warbler*	<i>(Dendroica petechia)</i>	A	C	C	
Chestnut-sided Warbler	<i>(Dendroica pensylvanica)</i>	C	R	C	
Magnolia Warbler	<i>(Dendroica magnolia)</i>	C	R	C	
Cape May Warbler	<i>(Dendroica tigrina)</i>	U		U	
Yellow-rumped Warbler	<i>(Dendroica coronata)</i>	A		A	
Black-throated Green Warbler	<i>(Dendroica virens)</i>	C		C	
Blackburnian Warbler	<i>(Dendroica fusca)</i>	U	R	U	
Yellow-throated Warbler	<i>(Dendroica dominica)</i>	R	R	R	
Pine Warbler	<i>(Dendroica pinus)</i>	R		R	
Palm Warbler	<i>(Dendroica palmarum)</i>	C		C	
Bay-breasted Warbler	<i>(Dendroica castanea)</i>	U	R	U	
Blackpoll Warbler	<i>(Dendroica striata)</i>	U		C	
Black-and-white Warbler	<i>(Mniotilta varia)</i>	C	R	C	
American Redstart*	<i>(Setophaga ruticilla)</i>	C	U	C	
Ovenbird*	<i>(Seiurus aurocapilla)</i>	U	U	U	
Northern Waterthrush	<i>(Seiurus noveboracensis)</i>	U	R	U	
Louisiana Waterthrush	<i>(Seiurus motacilla)</i>	R		R	
Connecticut Warbler	<i>(Oporornis agilis)</i>	R		R	
Mourning Warbler	<i>(Oporornis philadelphia)</i>	U		U	
Common Yellowthroat*	<i>(Geothlypis trichas)</i>	A	A	A	
Wilson's Warbler	<i>(Wilsonia pusilla)</i>	U		U	
Canada Warbler	<i>(Wilsonia canadensis)</i>	U	R	U	
<b>Tanagers</b>					
Scarlet Tanager*	<b>(Piranga olivacea)</b>	U	U	U	
<b>Sparrows, Buntings and Grosbeaks</b>					
Eastern Towhee*	<b>(Pipilo erythrophthalmus)</b>	U	U	U	

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
American Tree Sparrow	( <i>Spizella arborea</i> )	C	U	C	C
Chipping Sparrow*	( <i>Spizella passerina</i> )	U	U	U	
Clay-colored Sparrow	( <i>Spizella pallida</i> )	R		R	
Field Sparrow*	( <i>Spizella pusilla</i> )	U	U	U	
Vesper Sparrow*	( <i>Pooecetes gramineus</i> )	U	U	U	
Savannah Sparrow*	( <i>Passerculus sandwichensis</i> )	C	C	C	
Grasshopper Sparrow*	( <i>Ammodramus savannarum</i> )	U	U	R	
Henslow's Sparrow*	( <i>Ammodramus henslowii</i> )	U	U	R	
Fox Sparrow	( <i>Passerella iliaca</i> )	C		C	
Song Sparrow*	( <i>Melospiza melodia</i> )	A	C	C	U
Lincoln's Sparrow	( <i>Melospiza lincolni</i> )	U		U	
Swamp Sparrow*	( <i>Melospiza georgiana</i> )	A	A	A	U
White-throated Sparrow	( <i>Zonotrichia albicollis</i> )	C		C	
Harris's Sparrow	( <i>Zonotrichia querula</i> )	R		R	
White-crowned Sparrow	( <i>Zonotrichia leucophrys</i> )	U		U	
Dark-eyed Junco	( <i>Junco hyemalis</i> )	C		U	C
Lapland Longspur	( <i>Calcarius lapponicus</i> )	U		U	U
Snow Bunting	( <i>Plectrophenax nivalis</i> )	U		U	U
Northern Cardinal*	( <i>Cardinalis cardinalis</i> )	C	C	C	C
Rose-breasted Grosbeak*	( <i>Pheucticus ludovicianus</i> )	C	C	C	
Indigo Bunting*	( <i>Passerina cyanea</i> )	C	C	C	
Dickcissel*	( <i>Spiza Americana</i> )	U	U	U	
<b>Blackbirds and Orioles</b>					
Bobolink*	( <i>Dolichonyx oryzivorus</i> )	C	C	U	
Red-winged Blackbird*	( <i>Agelaius phoeniceus</i> )	A	A	A	C
Eastern Meadowlark*	( <i>Sturnella magna</i> )	U	U	U	R
Western Meadowlark*	( <i>Sturnella neglecta</i> )	R	R	R	
Yellow-headed Blackbird*	( <i>Xanthocephalus xanthocephalus</i> )	C	C	C	R
Rusty Blackbird	( <i>Euphagus carolinus</i> )	C		C	R
Brewer's Blackbird	( <i>Euphagus cyanocephalus</i> )	A	U	A	R
Common Grackle*	( <i>Quiscalus quiscula</i> )	C	C	C	U
Brown-headed Cowbird*	( <i>Molothrus ater</i> )	C	C	C	U
Baltimore Oriole*	( <i>Icterus galbula</i> )	U	U	U	

## Bird List, Horicon NWR (Continued)

Common Name	Scientific Name	Sp	Su	Fa	Wi
<b>Finches</b>					
Purple Finch	<i>(Carpodacus purpureus)</i>			U	U
House Finch*	<i>(Carpodacus mexicanus)</i>	U	U	U	U
Common Redpoll	<i>(Carduelis flammea)</i>				R
American Goldfinch*	<i>(Carduelis tristis)</i>	C	C	C	U
Evening Grosbeak	<i>(Coccothraustes vespertinus)</i>				R
<b>Old World Sparrows</b>					
House Sparrow*	<i>(Passer domesticus)</i>	C	C	C	C
<i>Definitions</i>					
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					
<b>Accidentals</b>					
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
<b>Shrews</b>				
Masked shrew	<i>Sorex cinereus</i>	s	s	
Short-tailed shrew	<i>Blarina brevicauda</i>	u	s	s
<b>Moles</b>				
Star-nosed mole	<i>Condylura cristata</i>		u	u
<b>Bats</b>				
Little brown bat	<i>Myotis lucifugus</i>	c		c
Big brown bat	<i>Eptesicus fuscus</i>	c	c	c
Red bat	<i>Lasiurus borealis</i>		s	s
Hoary bat	<i>Lasiurus cinereus</i>		s	
<b>Rabbits and Hares</b>				
Eastern cottontail	<i>Sylvilagus floridanus</i>	a	c	
<b>Rodents</b>				
Woodchuck	<i>Marmota monax</i>	c		
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>	c		
Eastern chipmunk	<i>Tamias striatus</i>		c	
Gray squirrel	<i>Sciurus carolinensis</i>	u	c	
Fox squirrel	<i>Sciurus niger</i>		c	
Beaver	<i>Castor canadensis</i>		u	u
Deer mouse	<i>Peromyscus maniculatus</i>	u		
White-footed mouse	<i>Peromyscus leucopus</i>	s	s	
Meadow vole	<i>Microtus pennsylvanicus</i>	c		
Muskrat	<i>Ondatra zibethica</i>		u	a
Norway rat	<i>Rattus norvegicus</i>	u		
House mouse #	<i>Mus musculus</i>	u		
Meadow jumping mouse	<i>Zapus hudsonius</i>	s	s	
<b>Canines</b>				
Coyote	<i>Canis latrans</i>	s	s	o
Red fox	<i>Vulpes vulpes</i>	c	c	o
Gray fox	<i>Urocyon cinereoargenteus</i>	r		
<b>Other Carnivores</b>				
Raccoon*	<i>Procyon lotor</i>	c	c	c
Opposum	<i>Didelphis virginiana</i>	c	c	c

## Mammals, Horicon NWR (Continued)

Common Name	Scientific Name	Savanna/ Prairie	Aspen/ Lowland Shrub	Marsh and Open Water
<b>Weasel Family (Mustelidae)</b>				
Ermine (Short-tailed weasel)	<i>Mustela erminea</i>		u	
Least weasel	<i>Mustela nivalis</i>	u		
Long-tailed weasel	<i>Mustela frenata</i>		c	c
Mink	<i>Mustela vison</i>	o	c	a
Badger	<i>Taxidea taxus</i>	r		
Striped skunk	<i>Mephitis mephitis</i>	c	c	c
River otter	<i>Lutra canadensis</i>		u	u
<b>Deer Family</b>				
White-tailed deer	<i>Odocoileus virginianus</i>	a	a	a
<p># = 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</p>				

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**Amphibians, Horicon NWR**

Common Name	Scientific Name	Savanna/ Prairie	Aspen/ Lowland Shrub	Marsh and Open Water
Wood frog	<i>Rana sylvatica</i>		c	c
Western chorus frog	<i>Pseudacris triseriata</i>		a	a
Spring peeper	<i>Pseudacris crucifer</i>		r	r
Northern leopard frog	<i>Rana pipiens</i>		a	a
American toad	<i>Bufo americanus</i>	c	c	c
Green frog	<i>Rana clamitans</i>		a	a
Eastern gray treefrog	<i>Hyla versicolor</i>		c	c
Tiger salamander	<i>Ambystoma tigrinum</i>		u	u
<i>a</i> = abundant <i>c</i> = common <i>u</i> = uncommon <i>o</i> = occasional; seen only a few times during the season <i>r</i> = rare; seen every 2 to 5 years <i>s</i> = 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		
<i>a=abundant</i> <i>c=common</i> <i>u=uncommon</i> <i>o=occasional; seen only a few times during the season</i> <i>r=rare; seen every 2 to 5 years</i> <i>s=secretive; common to abundant but rarely observable</i>				

## Fish Species, Horicon NWR

Common Name	Scientific Name	Marsh and Open Water
<b>Minnows</b>		
Golden Shiner	<i>Notemigonus crysoleucas</i>	c
Southern Redbelly Dace	<i>Phoxinus erythrogaster</i>	u
Fathead Minnow	<i>Pimephales promelas</i>	a
Creek Chub	<i>Semotilus atromaculatus</i>	r
Common Carp	<i>Ctenopharyngodon idella</i>	a
<b>Suckers</b>		
White Sucker	<i>Catostomus commersoni</i>	c
<b>Bullhead Catfish</b>		
Black Bullhead	<i>Ameiurus melas</i>	a
Brown Bullhead	<i>Ameiurus nebulosus</i>	a
<b>Pikes</b>		
Northern Pike	<i>Esox lucius</i>	c
<b>Mudminnows</b>		
Central Mudminnow	<i>Umbra limi</i>	c
<b>Sticklebacks</b>		
Brook Stickleback	<i>Culaea inconstans</i>	c
<b>Sunfish</b>		
Bluegill	<i>Lepomis macrochirus</i>	u
Largemouth Bass	<i>Micropterus salmoides</i>	u
Black Crappie	<i>Pomoxis nigromaculatus</i>	u
Green Sunfish	<i>Lepomis cyanellus</i>	a
Pumpkinseed	<i>Lepomis gibbosus</i>	u
<b>Perch</b>		
Blackside Darter	<i>Percina maculate</i>	r
Yellow Perch	<i>Perca flavescens</i>	u
Walleye	<i>Stizostedion vitreum</i>	u
<i>a – abundant</i> <i>c – common</i> <i>u – uncommon</i> <i>r – rare</i>		

### Mussels, Horicon NWR

Common Name	Scientific Name	Marsh and Open Water
Fingernail clam	<i>Sphaeriidae</i>	c
Three ridge	<i>Amblema plicata</i>	c
Yellow sand shell	<i>Lampsilis anodontoides</i>	c

## Appendix D: Compatibility Determinations

The following compatibility determinations were presented for public review in the Draft CCP/EA.

Copies of the signed documents are available at the Horicon NWR Headquarters.

### **Horicon NWR**

- #Hunting
- #Firewood Cutting/Timber Harvest
- #Trapping of Furbearers
- #Environmental Education and Interpretation
- #Wildlife Observation and Photography (including means of access)
- #Haying
- #Research
- #Recreational Fishing
- #Permit Archeological Investigations, Horicon NWR and Fox River NWR

### **Fox River NWR**

- #Hunting
- #Firewood Cutting/Timber Harvest
- #Environmental Education and Interpretation
- #Haying
- #Research
- #Recreational Fishing
- #Wildlife Observation and Photography (including means of access)



# 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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Mammals								
White-tailed Deer	<i>Odocoileus virginianus</i>	Recreation/ economic Abundant	Yes		P	P	P	P
*Muskrat	<i>Ondatra zibethica</i>	Recreation/ economic Abundant	Yes		P	P		
Beaver	<i>Castor canadensis</i>	Nuisance Uncommon	Yes		P	P		
River Otter	<i>Lutra canadensis</i>	Recreation/ economic Uncommon	Yes		P	P		
Birds								
*Red-necked Grebe =	<i>Podiceps grisegena</i>	Rare	Yes	SE	M			
*Horned Grebe	<i>Podiceps auritus</i>	Rare	Yes	SSC	M			
Double-Crested Cormorant	<i>Phalacrocorax auritus</i>	Nuisance Common	Yes	R3 (nuisance)	M, P			

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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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*American Bittern	<i>Botarus lentiginosus</i>	Uncommon	Yes	R3, SSC	M, P			P
*Least Bittern	<i>Ixobrychus exilis</i>	Uncommon	Yes	R3, SSC	M, P			
*Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Abundant	Yes	R3	M, P			
Yellow-crowned Night Heron	<i>Nyctanassa violacea</i>	Rare	Yes	ST				
*Great Egret	<i>Casmerodius albus</i>	Common	Yes	ST	P, M			
Snowy Egret	<i>Egretta thula</i>	Rare	Yes	SE				
*Canada Goose - Resident	<i>Branta canadensis</i>	Nuisance Abundant	Yes	R3	M, P			
*Canada Goose - Migrant	<i>Branta canadensis</i>	Recreation/ economic Abundant	Yes	R3	M,P			
Trumpeter Swan	<i>Cygnus buccinator</i>	Recreation/ economic Rare	Yes	R3, SE	M,P			

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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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*Wood Duck	<i>Aix sponsa</i>	Recreation/ economic Common	Yes	R3	M, P		P	
*American Black Duck	<i>Anas rubripes</i>	Recreation/ economic Uncommon	Yes	R3, SSC	M			
*Mallard	<i>Anas platyrhynchos</i>	Recreation/ economic Abundant	Yes	R3	M, P			P
*Blue-winged Teal	<i>Anas discors</i>	Recreation/ economic Common	Yes	R3, SSC	M, P			P
*Northern Pintail	<i>Anas acuta</i>	Recreation/ economic Uncommon	Yes	R3	M,P			
*Canvasback	<i>Aythya valisineria</i>	Recreation/ economic Uncommon	Yes	R3, SSC	M			
*Redhead <i>Aythya americana</i>		Recreation/ economic	Yes	SSC	M, P			
*Lesser Scaup	<i>Aythya affinis</i>	Recreation/ economic	Yes	R3, SSC	M			

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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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Osprey	<i>Pandion haliaetus</i>	Rare	Yes	ST				
*Bald Eagle	<i>Haliaeetus leucocephalus</i>	Common	Yes	T, R3, SSC (proposed for delisting from ESA)	M, P		M, P	
Northern Harrier	<i>Circus cyaneus</i>	Common	No	R3, SSC	M, P		M, P	M, P
Red-shouldered Hawk	<i>Buteo lineatus</i>	Uncommon	No	R3, ST				M
Peregrine Falcon	<i>Falco peregrinus</i>	Rare	Yes	R3, SE	M			M
*Yellow Rail	<i>Coturnicops noveboracensis</i>	Rare	Yes	R3, ST	M, P			
*King Rail	<i>Rallus elegans</i>	Uncommon	Yes	R3, SSC	M, P			
*Common Moorhen	<i>Gallinula chloropus</i>	Common	Yes	R3,	M, P			
*Whooping Crane	<i>Grus americana</i>	Uncommon	Yes	R3, SSC, T (non-essential experimental population)	M			
*American Golden-Plover	<i>Pluvialis dominica</i>	Rare	No	SSC	M			
*Greater Yellowlegs	<i>Tringa melanoleuca</i>	Common	No	R3	M			
*Solitary Sandpiper	<i>Tringa solitaria</i>	Uncommon	No	SSC	M			
*Dunlin	<i>Calidris alpina</i>	Common	No	SSC	M			
*Stilt Sandpiper	<i>Calidris himantopus</i>	Rare	No	R3	M			M

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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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
*Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	Rare	No	R3, SSC	M			M
*Short-billed	<i>Dowitcher</i> <i>Limnodromus griseus</i>	Uncommon	No	R3, SSC	M			
*Wilson's Phalarope	<i>Phalaropus tricolor</i>	Rare	No	R3, SSC	M, P			
*American Woodcock	<i>Scolopax minor</i>	Recreation/ economic Uncommon	No	R3, SCC		M, P	M, P	M, P
*Black Tern	<i>Chlidonias niger</i>	Common	Yes	R3, SSC	M, P			
*Forster's Tern	<i>Sterna forsteri</i>	Common	Yes	R3, SE	M, P			
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Uncommon	No	R3, SSC		M, P	M, P	M, P
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Uncommon	No	SSC		M, P	M, P	M, P
Long-eared Owl	<i>Asio otus</i>	Rare	No	R3			M	
Short-eared Owl	<i>Asio flammeus</i>	Uncommon	No	R3, SSC	M			M
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Uncommon	No	R3, SSC			M	
Northern Flicker	<i>Colaptes auratus</i>	Common	No	R3			M, P	
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Rare	No	R3, SSC			M	
Willow Flycatcher	<i>Empidonax traillii</i>	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 <sup>1</sup>	Lowland shrub	Upland forest Aspen & oak savanna & mixed hardwood	Grasslands
Least Flycatcher	<i>Empidonax minimus</i>	Common	No	SSC			P	
Sedge Wren	<i>Cistothorus platensis</i>	Common	Yes	R3	M, P	M, P		M, P
Wood Thrush	<i>Hylocichla mustelina</i>	Uncommon	No	R3, SSC			M, P	
Veery	<i>Catharus fuscescens</i>	Uncommon	No	SSC			M, P	
Brown Thrasher	<i>Toxostoma rufum</i>	Uncommon	No	SSC			M, P	
Blue-winged Warbler	<i>Vermivora pinus</i>	Rare	No	R3, SSC		M	M	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Rare	No	R3, SSC		M	M	
Cape May Warbler	<i>Dendroica tigrina</i>	Uncommon	No	R3			M	
Louisiana Waterthrush	<i>Seiurus motacilla</i>	Rare	No	R3, SSC	M		M	
Connecticut Warbler	<i>Oporornis agilis</i>	Rare	No	R3, SSC		M	M	
Canada Warbler	<i>Wilsonia canadensis</i>	Uncommon	No	R3, SSC			M	
Yellow-throated Warbler	<i>Dendroica dominica</i>	Rare	No	SE			M	
*Field Sparrow	<i>Spizella pusilla</i>	Uncommon	Yes	R3, SSC		M, P		M, P
*Vesper Sparrow	<i>Poocetes gramineus</i>	Uncommon	Yes	SSC		M, P		M, P
*Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Uncommon	Yes	R3, SSC				M, P
*Henslow's Sparrow	<i>Ammodramus henslowii</i>	Uncommon	Yes	R3, ST				M, P
*Dickcissel	<i>Spiza americana</i>	Uncommon	Yes	R3, SSC				M, P

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*Bobolink	<i>Dolichonyx oryzivorus</i>	Common	Yes	R3, SSC				M, P
*Eastern Meadowlark	<i>Sturnella magna</i>	Uncommon	Yes	R3, SSC				M, P
*Western Meadowlark	<i>Sturnella neglecta</i>	Rare	Yes	R3, SSC				M, P
Rusty Blackbird	<i>Euphagus carolinus</i>	Common	No	R3, SSC			M	
Amphibians								
*Wood Frog	<i>Rana sylvatica</i>	Common	Yes		P			
*Western Chorus Frog	<i>Pseudacris triseriata</i>	Abundant	Yes		P			P
*Spring Peeper	<i>Pseudacris crucifer</i>	Uncommon	Yes		P			
*Northern Leopard Frog	<i>Rana pipiens</i>	Abundant	Yes		P			
*American Toad	<i>Bufo americanus</i>	Abundant	Yes		P	P	P	P
*Eastern Gray Treefrog	<i>Hyla versicolor</i>	Common	Yes		P	P	P	
*Bullfrog	<i>Rana catesbeiana</i>	Common	Yes		P	P	P	
*Green Frog	<i>Rana clamitans melanota</i>	Abundant	Yes		P			
*Tiger salamander	<i>Ambystoma tigrinum</i>	Uncommon	Yes	R3	P	P		

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Reptiles								
*Painted Turtle	<i>Chrysemys picta</i>	Abundant	Yes		P			
*Snapping Turtle	<i>Chelydra serpentina</i>	Common	Yes		P			
*Spiny Softshell Turtle	<i>Apalone spinifera</i>	Rare	Yes		P			
Northern Red-Bellied Snake	<i>Storeria occipitomaculata</i>	Common	Yes			P		
Eastern Garter Snake	<i>Thamnophis sirtalis</i>	Common	Yes		P	P	P	
Fishes								
Walleye	<i>Stizostedion vitreum</i>	Recreation/ economic Uncommon	Yes	R3	P,M			
*Common Carp	<i>Ctenopharyngodon idella</i>	Nuisance Abundant	Yes	R3 (nuisance)	P,M			
Mussels								
Three Ridge	<i>Amblema plicata</i>	Recreation/ economic Common	Yes		P			

# Appendix H: Mailing List



## Appendix H: Mailing List

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**



## Appendix I: List of Preparers

*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 Dobrowolny, Regional Historic Preservation Officer, Region 3, USFWS

Jane Hodgins, Technical Writer/Editor, Region 3, USFWS

*Mangi Environmental Group:*

Leon Kolankiewicz, Biologist/Environmental Planner/Consultant



# **Appendix J: Bibliography and References Cited**



## Appendix J: Bibliography and References Cited

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# **Appendix K: Response to Comments on the Draft CCP**



## Appendix K: Response to Comments on the Draft CCP

The following is a summary of the comments received on the Draft CCP and how the issues are addressed in the CCP.

### Horicon National Wildlife Refuge

- 1 *Three organizations and several individuals endorsed the CCP as written and commended the Refuge and planning staff for their work on the plan.*

Comments acknowledged. The Service appreciates this endorsement of its proposed plan.

- 2 *Two organizations and two individuals oppose the inclusion of hunting and trapping in each of the management alternatives presented in the CCP/EA.*

Hunting is one of the six wildlife-dependent public uses of national wildlife refuges specifically encouraged by the National Wildlife Refuge System Management Act of 1997 (the “Organic Act” of the Refuge System). Whenever a particular type of hunting is compatible with the Refuge’s purposes, goals and objectives, and can be conducted in a sustainable manner, it may be permitted. Wildlife populations are monitored and whenever a population is below the population objective, hunting is suspended or reduced until the population recovers.

Limited trapping is conducted at Horicon of furbearers that damage infrastructure, like muskrat and beavers, and other mammalian predators and carnivores. Trapping does not occur every year as marsh conditions may be unfavorable. When it occurs, trapping is conducted by several permittees on a sustainable, relatively small scale. Trapping data indicate that there is no adverse direct effect on the long-term populations of target species or indirect effect on related prey species. As with hunting, trapping is suspended when the populations of target species appear to be low.

- 3 *Two organizations assert that the Draft CCP for Horicon does not meet the requirements of the National Wildlife Refuge System Improvement Act of 1997 because insufficient*

*investigation of biological integrity, diversity and environmental health were undertaken prior to plan preparation. They state that rigorous biological analyses, with conclusions published in a NEPA document subject to public review, need to be conducted of wildlife populations to ensure that there is a surplus, before making any compatibility determinations about the killing of wildlife.*

The Draft CCP listed a number of wildlife surveys and censuses that are conducted at Horicon which in sum provide an adequate basis for making informed decisions on the compatibility of hunting and trapping. In addition, the year-to-year trapping records themselves, and long-term trends in these numbers, furnish valuable information that can be used in opening or closing seasons. Recognizing that it does not have limitless budgetary and personnel resources to conduct ideal surveys that would yield perfect information on wildlife population sizes, the Refuge and Service use adaptive resource management, several features of which are monitoring, feedback, flexibility, and making adjustments in midcourse whenever the data point in that direction.

- 4 *One organization states that the Service cannot continue to endorse hunting on any National Wildlife Refuge without analyzing its impact as required by the NWRSA of 1997 and NEPA through an Environmental Impact Statement.*

This comment letter makes reference to a legal complaint filed in Federal court, [The Fund et al. v. Williams et al., Civ. No. 03-677](#). The complaint is under evaluation by the court as of this writing and does not specifically discuss the hunting program on Horicon or Fox River Refuges. See the previous response, and Chapter 3 of the CCP, for the Service’s current approach toward hunting on the Horicon and Fox River Refuges.

- 5 *5. One regional organization endorsed the plan based on the increase in recreational opportunities for local tourism and businesses. The group also suggested that we send electronic copies of the final CCP to all*

*municipal governments near the refuges to assist with their comprehensive planning efforts.*

Comments acknowledged. We tried to include all local governments on our mailing list for notice of the draft and final plans. In addition, the entire final plan will be posted on the Service's planning website.

*6 Three individuals and two statewide organizations suggested closing or re-routing State Highway 49 as the best solution to the high number of road-killed wildlife and the potential safety risk for wildlife observers.*

We agree that the best permanent way to reduce wildlife-auto collisions may be to remove this high-speed roadway from the Horicon Marsh. However, the closure or re-alignment of a state-owned and operated highway is outside the jurisdiction of the U.S. Fish and Wildlife Service. As presented in Chapter 4 of the CCP, we will advocate for the best solution possible to reduce or eliminate wildlife deaths along State Highway 49.

*7 One organization claimed that members observed the refuge staff using prescribed fire for habitat improvement this past summer during the nesting season. Members of the organization encourage us to use fire only during the pre-nesting season times.*

A prescribed burn was conducted during the summer by Refuge staff and Wisconsin Department of Natural Resources staff. The objectives of the burn were 1) to remove as much of the organic layer as possible to prepare the site for a herbicide treatment that was scheduled in August and 2) to improve the habitat, which was a dense stand of cattail, for nesting birds. A fire research study is also ongoing on the Refuge, which designates several areas on the Refuge for summer burning. Burning during the summer is not necessarily going to be a regular occurrence. Refuge staff consider the impacts of the fire to a variety of factors, including nesting birds. Due to the fire study, one area is planned for burning in 2007.

*8 One individual wrote to say that current hunting opportunities are adequate and extended seasons and opening dike roads to year-round foot and bike traffic is excessive and may impact the needs of wildlife. The*

*commenter states that the interior of the marsh should be left to Refuge personnel and the wildlife.*

Comments acknowledged. The extension of the hunting seasons to coordinate with the State seasons is to lessen hunter confusion and is a recommendation in the Chronic Wasting Disease Management Plan for the Refuge. Increasing deer hunting opportunities is strongly encouraged by the State due to Chronic Wasting Disease in the deer within certain areas of the state.

Allowing wildlife observation and photography via hiking, cross country skiing, and bicycling year-round on the Refuge between December 1 and March 15 and on Main Dike Road west of the fishing site year-round is a compatible use. Currently wildlife observation and photography are only allowed on the two trail systems where as hunting is allowed on most of the Refuge. Refuge staff wanted to provide an additional opportunity for people who wanted to observe or photograph wildlife that was compatible with the Refuge purpose.

*9 One individual requested that the Horicon NWR consider special hunts for Canada Geese, deer and turkey for persons with disabilities. The comment note acknowledged that access assistance for wheel chairs and persons with limited walking ability may be required to designated blinds. The blinds could be used for bird watchers during the non-hunting season.*

The Refuge currently offers an 800-acre area to deer hunters with disabilities during the traditional nine day deer gun season at the end of November and during a special gun hunt designated by the State in October. Six accessible hunting blinds are available for hunters to use during the hunt. Hunters are required to have a special Refuge permit, as well as a Class A, B, or C disabled permit from the State. Currently no other opportunities exist for hunters with disabilities, for example for Canada geese or turkey. A Refuge Hunting Plan, which will discuss all aspects of hunting on the Refuge, will be completed in 2007.

*10 One individual suggested that the Refuge should manage a limited archery, permit-only spring wild turkey hunt. Archers would need to demonstrate competence in shooting to receive a permit.*

Refuge staff discussed turkey hunting during the CCP process. In the end, Refuge staff agreed that

turkey hunting in the spring is not compatible because of disturbance to nesting birds. The first couple of periods would probably be compatible, but Refuge staff felt it was too much of an administrative workload to only offer turkey hunting for such a small part of the season.

*11 One statewide organization stated that sharpshooters are a more appropriate deer management tool for a Refuge than hunting. They cite problems of trespassing, littering, vandalism, and shortage of law enforcement as reasons for not conducting public hunts.*

Hunting is one of the six wildlife-dependent public uses of national wildlife refuges specifically encouraged by the National Wildlife Refuge System Management Act of 1997 (the “Organic Act” of the Refuge System). Whenever a particular type of hunting is compatible with the Refuge’s purposes, goals and objectives, and can be conducted in a sustainable manner, it may be permitted. Wildlife populations are monitored and whenever a population is below the population objective, hunting is suspended or reduced until the population recovers.

Using sharpshooters instead of offering deer hunting as a deer management tool would not be economical or administratively efficient. The Refuge has adequate staffing to deal with any problems that may arise from the current public hunts.

*12 One statewide organization urged the Service to eliminate the use of Rotenone for carp management. Total marsh poisoning and deposition of dead and decaying carp are given as reasons to eliminate this chemical control measure.*

Rotenone has proven to be an effective method of control for invasive fish species. However, Refuge staff use an integrated fish management approach, which involves a variety of techniques including rotenone. Other techniques used include water level draw downs, carp gates, carp traps, and stocking of game fish.

Rotenone is a naturally occurring compound derived from the roots of certain tropical and subtropical legume plants. Rotenone kills by interfering with cellular use of oxygen. It affects all gill-breathing animals such as fish, amphibians, and insects. At normal application rates, mammals, birds, and reptiles are not affected because their skins inhibit absorption and enzymes in their

digestive systems break down small amounts of rotenone into harmless products.

*13 One individual suggested that the Refuge restore spawning areas for northern pike and stock fish (rock bass, pike, perch, panfish) in the spring-fed areas of the marsh.*

Fish stocking efforts continue each year on the Refuge as part of the carp control program and to improve marsh health after the carp treatments. Predator game fish are being restocked at every opportunity. Restocking with game fish in 2005 consisted of 400,000 northern pike fry, 10,660 bluegill fingerlings, 9,782 yellow perch fingerlings, and 13,600 black crappie fingerlings. Due to the drought in 2005, these fish were released upstream of the Refuge in Waupun’s Mill Pond. However, during normal water years, the fish are released directly into the Refuge.

*14 One statewide organization would like the plan to address protection of the Horicon marsh periphery by including recommendations for neighboring municipalities and the state pertaining to wind farms, incompatible land uses, phosphorous bans, etc.*

Comments acknowledged. Refuge staff recognizes the impact of outside threats to the marsh. However, many state, county and local governments have specific regulatory jurisdiction over industry and residential and agricultural developments. The Refuge will always need to work with these partners to accomplish tasks outside of U.S Fish and Wildlife Service jurisdiction. The plan specifically addresses two threats, sedimentation and phosphorus loading, in the plan with Objective 2.6. Eight strategies are listed, many which involve partners and public education which are important aspects to these challenging problems.

*15 The WDNR is concerned that the proposed increase in open flowage on the Refuge’s main dike water control structure will increase sediment load in the State portion of the marsh and impact water recreation.*

The movement of water and sediments through the marsh does indeed impact the State and Federal portions and downstream waters. The Refuge will continue to work closely with DNR marsh managers every time it is necessary to open the radial gate. Overall, the Service agrees with the DNR in that a “unified approach to address all issues pertinent to the management of the entire marsh will increase

protection of the marsh both in the Federal and State areas.”

16 *The WDNR is in favor of establishing an allowable deer density that can be modified as conditions change instead of the fixed 15-20 per square mile cited in the plan.*

We retained the population density figures in order to have a quantifiable objective target as required in refuge CCPs. However, we added a sentence stating these figures could be modified based on the future health of the herd and/or changes in state regulation.

17 *The WDNR and several individuals suggested that we evaluate whether to leave the auto tour route open during the winter; citing little visitor use and increased costs for snow plowing.*

Strategy 3.3.3 calls for extending the auto tour route season to be open year-round, *conditions permitting*. The Refuge does not intend to plow the road after moderate or heavy snowfalls and the “conditions permitting” clause was meant to convey this thought. We have added the phrase “weather conditions permitting” and added a statement about snowplowing in the text.

## Fox River National Wildlife Refuge

1. *A short petition with 8 signatures was received in support of Alternative B, the preferred alternative. Specifically, the petition endorsed habitat restoration to historic conditions, increased visitor use, and designation of Fox River NWR as a State Natural Area by the Wisconsin DNR.*

Comment acknowledged. The Service appreciates this endorsement of its proposed plan.

2. *The DNR proposes to designate a State Natural Area on the Fox River NWR.*

The Service does not endorse the nomination of Fox River NWR as a State Natural Area (SNA). We acknowledge the program as a valuable way to provide protection and public recognition for endangered species habitat and rare natural features on county, state and some Federal and private lands. However, we feel that an SNA designation is redundant with the National Wildlife Refuge status of Fox River NWR. The Refuge is already protected and managed in way that

promotes the goals of the SNA program. Further, an SNA designation may actually create an unnecessary layer of governmental oversight in future management of the Refuge. For instance, SNA regulations require all scientific researchers to obtain a separate research and collections permit from the State.

3. *One individual wrote to dispute specific numbers of Sandhill Cranes (50 pairs) present on the Refuge during the summer and the existence of a rookery (or nesting colony) of wading birds.*

The Environmental Assessment prepared for establishment of the Refuge in 1979 cited the figure of 50-60 non-breeding cranes present during the summer. Between refuge establishment and 2004, surveys of nesting and summer resident cranes have been sporadic. We do know that use by nesting pairs and non-breeders changes from year to year. We removed the specific mention of 50 summer residents in the Final CCP to acknowledge this flexibility.

In addition, the 1979 EA described a small heron and egret rookery on a wooded island in the center of the marsh. In 1977, 14 pairs of great blue herons, five pairs of great egrets and several pairs of black-crowned night herons were observed nesting at the site. A literature citation for the 1979 EA was added to the text in the Final CCP.

4. *Three individuals commented that fishing may not be a compatible use on the Refuge. They mentioned litter, bird-fishing line entanglements, lead sinkers and law enforcement as reasons to not allow walk-in fishing as proposed in the CCP.*

Fishing is a priority public use on National Wildlife Refuge System Lands as identified in the Refuge Improvement Act of 1997. For years, people have expressed interest in fishing on Long Lake. The lake supports a diverse population of gamefish. The 1-mile hike from the parking lot to the potential fishing spot on Long Lake is expected to naturally limit the number of anglers.

We intend to monitor litter and habitat disturbance and provide signs to educate anglers to always carry out trash. Patrol by law enforcement staff will be necessary. The Service will need to revisit the fishing program on the Refuge if trash becomes an excessive problem. In the meantime, the Refuge Manager has determined that sport fishing on the

Fox River NWR, with proper stipulations, will not diminish the primary purpose of the Refuge.

5. *One individual suggested that we eliminate the firearms deer hunt in favor of an archery-only hunt. The commenter felt that an archery hunt is more compatible with the Refuge habitat restoration, adds to a tranquil environment and increases safety for hikers.*

As stated in the Draft CCP and EA, the deer population in Unit 67A, and in many places throughout Wisconsin, is considered too high to be supported by the habitat and may be contributing to the transmission of catastrophic diseases, such as Chronic Wasting Disease. Archery hunting has a much lower harvest rate than hunts using firearms. For this reason alone, the Service or the Wisconsin DNR cannot support a reduction in the harvest for this vicinity.

6. *A petition with 78 signatures was submitted as part of the planning record. The text of the 3-page petition contained commentary on past habitat restoration projects and made several specific requests for "local" involvement in future management of the refuge. The following is a summary of the statements and requests in the petition and the Service's response.*

6-a. The petition begins with an incomplete and misleading summary of the public scoping effort conducted for the CCP.

Please see Chapter 2 of the CCP for a full account of the public outreach efforts for the Fox River NWR CCP including a local open house event in March 2005. The open house was lightly attended. So, to ensure more widespread notice, the refuge biologist sent CCP comment forms and a packet of refuge information to approximately 100 neighbors and deer hunters later that month. The packet including a CCP process summary leaflet, comment form, Refuge fact sheet, summary of the oak savanna restoration project, and an invitation to take free firewood.

6-b. A statement that the oak savanna restoration project initiated by the Refuge in 2004 destroyed unique features and "natural gems" including three wild apple trees, a small red pine plantation, and a small natural spring.

The goal of habitat restoration on the Refuge is to more closely emulate the historic, pre-settlement conditions of the area. Oak savanna is a rare habitat type throughout its former range due to conversion

to agriculture, residential developments, invasive plants, and the need for periodic fire or grazing to maintain it. All non-oak species, including non-native planted trees such as red pine and "wild" apple are removed in favor of thinned native oak.

A small natural spring, one of many in the area, was indeed damaged by heavy equipment. However, water flow throughout the property is being restored by plugging and filling the extensive ditch system created by a former landowner. Natural water seeps and springs will be re-established in the process and protected to the extent possible in the Refuge.

6-c. A request that at least one local citizen representative, with full voting rights, be on the decision making team with the Service. The petition further requests that this person would be compensated "as are other consultants brought in by the F&WS." The petition also contained a request that any financial opportunities that become available at Fox River NWR be offered to the local community first.

See the following section for an alternative approach to local citizen involvement in Refuge management.

7. *The Service received a Resolution from the Town of Buffalo requesting that a Service representative attend their regular Township Board meeting on September 11, 2006 to "discuss the impact of the Fox River NWR CCP on the Town of Buffalo." Refuge Manager Patti Meyers attended the meeting and answered questions from the Board and local citizens (approximately 18 people were in attendance).*

Refuge Manager Meyers learned that the Town Chairperson had requested the meeting with a Service representative for two reasons. First, the Board was interested in the monetary aspects of the CCP, wanting to ensure that local businesses could participate in getting some of the bids for future projects. Ms. Meyers explained the Federal contracting process that requires multiple bids and the present budget situation for refuges. The habitat restoration work on the Refuge is nearly complete and funding for special projects will be difficult to obtain in the near future. However, any local contractors that can meet Federal contracting standards are welcome to bid on any future projects, should any funding materialize.

Secondly, Board members wanted to be part of a Committee making decisions for the Refuge. Ms. Meyers explained that such a committee would be very difficult to form as several Federal laws governed the amount of special interest involvement in Federal agency decisions. However, the request was resolved to mutual satisfaction when the Refuge Manager agreed to attend the spring annual township meeting and a fall Board meeting to notify them of what was happening on the refuge. In addition, several Board members stated their support for Alternative B (the preferred alternative), agreeing that they would like to see some usage of the refuge without major developments like roads or a visitor center.