

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.

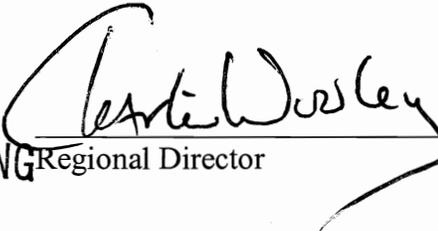
The preferred alternative for Fox River would include more hunting opportunities, the initiation of a fishing program, new wildlife observation and photography opportunities, and the beginning of an environmental education and interpretation program. Habitat restoration and management would continue 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

Horicon and Fox River

National Wildlife Refuges

Environmental Assessment

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

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

Responsible Agency and Official:

Robyn Thorson, Regional Director
U.S. Fish & Wildlife Service
Bishop Henry Whipple Building
1 Federal Drive
Ft. Snelling, MN 55111

Contacts for additional information about this project:

Patti Meyers, Refuge Manager
Horicon National Wildlife Refuge
W4279 Headquarters Road
Mayville, WI 53050
Office Phone: (920) 387-2658
Fax: (920) 387-2973

Gary Muehlenhardt
U.S. Fish & Wildlife Service
NWRs/Conservation Planning
Bishop Henry Whipple Building
1 Federal Drive
Ft. Snelling, MN 55111
Office Phone: (612) 713-5477

Chapter 1: Purpose and Need

1.1 Background

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

1.1.1 Horicon National Wildlife Refuge

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

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

The southern third (11,000 acres) of Horicon Marsh is managed by the Wisconsin Department of Natural Resources as a wildlife area and fur farm for

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

1.1.2 Fox River National Wildlife Refuge

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

The uniqueness of the Refuge is not only because of its importance to nesting Sandhill Cranes, but for the diversity of wildlife within this wetland/upland complex. The Refuge has 10 distinct plant communities ranging from upland coniferous and deciduous

Figure 1: Horicon NWR Location

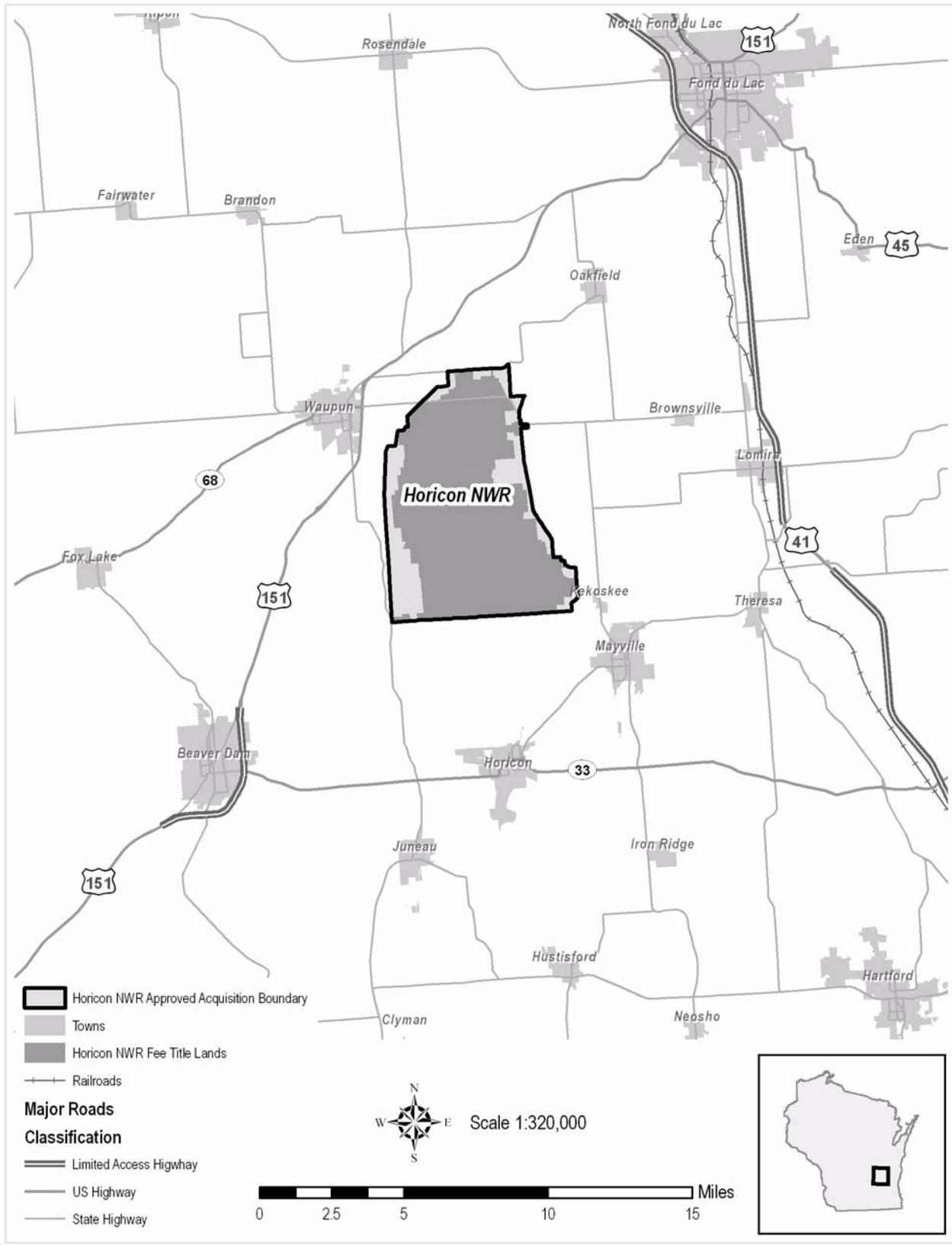
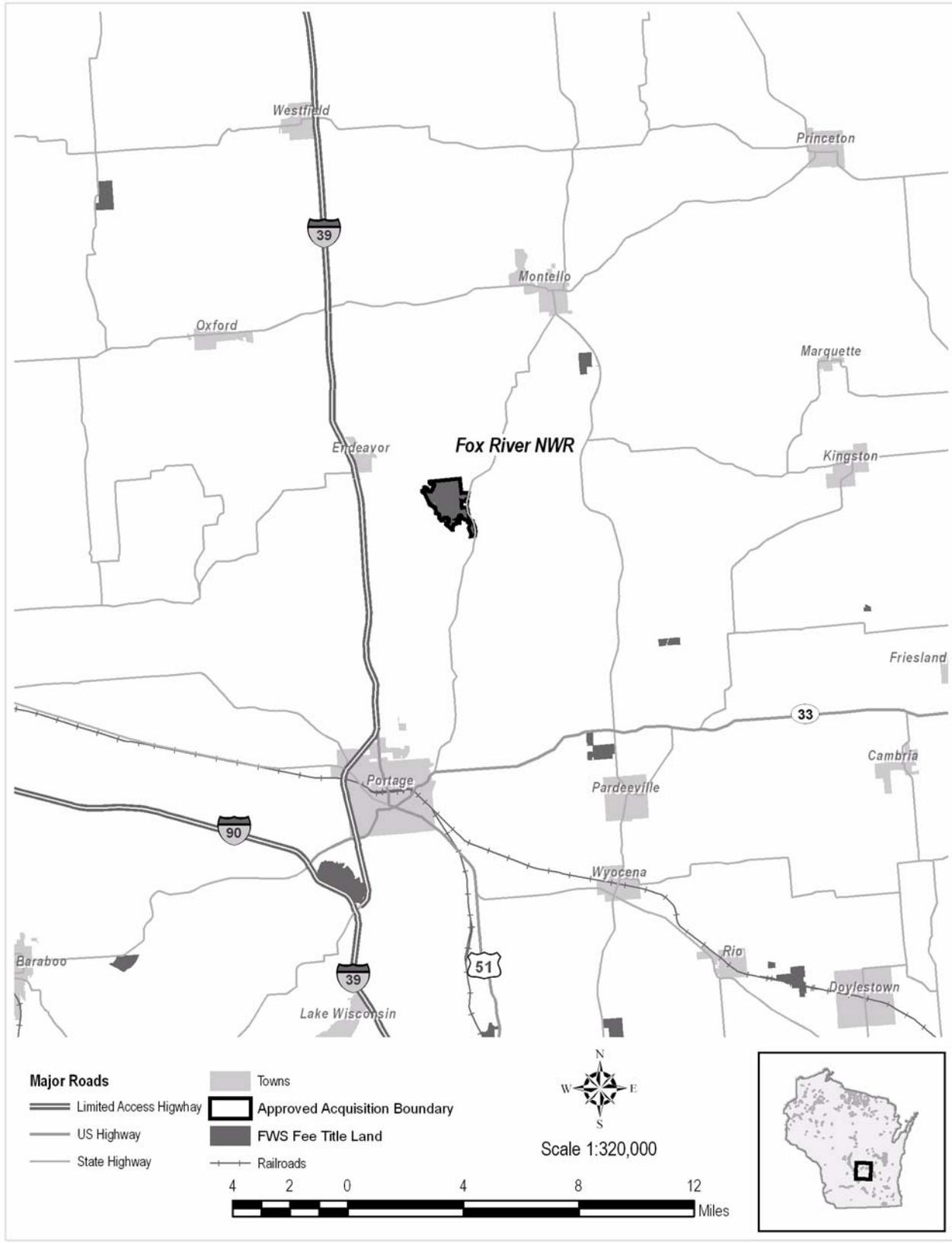


Figure 2: Fox River NWR Location



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

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

1.2 Purpose

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

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

1.3 Need for Action

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

This EA will present three management alternatives for the future of Horicon NWR and two alternatives for Fox River NWR. For each refuge, the preferred alternative will be selected based on its ability to meet identified goals. These goals may also be considered as the primary need for action. Goals for the refuges were developed by the planning team and encompass all aspects of refuge management,

including wildlife management, habitat management, and public use. Each of the management alternatives for the refuges described in this EA will be able to at least minimally achieve these goals.

1.3.1 Horicon National Wildlife Refuge Goals

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

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

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

1.3.2 Fox River National Wildlife Refuge Goals

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

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

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

1.4 Decision Framework

The Regional Director for the Great Lakes-Big Rivers Region (Region 3 of the U.S Fish and Wildlife Service) will need to make two decisions based on this

EA: (1) select an alternative for each refuge, and (2) determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS). For Horicon NWR, the planning team has recommended Alternative 2 (“Restoring Natural Watercourses”) to the Regional Director. Coincidentally, for Fox River NWR, the team also recommends Alternative 2 (“Historic Habitat Conditions and Enhanced Visitor Services”) to the Regional Director. The Draft CCP was developed for implementation based on these recommendations.

1.5 Authority, Legal Compliance, and Compatibility

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

1.6 Scoping of the Issues

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

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

tentative schedule for completion of the CCP. A Public Involvement Plan was drafted and distributed to participants immediately after the meeting.

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

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

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

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

1.6.1 Horicon NWR Issues, Concerns and Opportunities

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

1.6.1.1 Habitat Management

- Upland habitat restoration and management
- Invasive plant species
- Prescribed burning
- Land acquisition (authorized boundary and adjustments)
- Off-refuge involvement and external threats (i.e. watershed protection)

1.6.1.2 Water Management

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

1.6.1.3 Wildlife Management

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

1.6.1.4 Public Use

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

1.6.1.5 Cultural Resources

- Protection of cultural resources

1.6.2 Fox River NWR Issues, Concerns and Opportunities

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

1.6.2.1 Wildlife Management

- Management for nesting and staging Sandhill Cranes

1.6.2.2 Habitat Management

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

1.6.2.3 People

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

1.6.2.4 Administration and Logistics

- Refuge staffing and location
- Volunteers

1.6.2.5 Cultural Resources

- Protection of cultural resources

Chapter 2: Description of the Alternatives

2.1 Formulation of Alternatives

The CCP planning team developed management alternatives for both of the refuges based on the issues, concerns and opportunities raised during the CCP scoping process. The issues that are discussed came from individuals, local citizens and officials, cooperating agencies, conservation organizations and Refuge staff. Summaries of the three alternatives are provided in Table 1 on page 18 and Table 2 on page 32. The following management alternatives were developed to generally fit within the current Refuges' budget. In other words, the alternatives were formulated under the assumption that a large budget increase for Refuge operations is unlikely during the life of the plan. If an alternative calls for one program to increase in size or scope other Refuge programs may need to be reduced. However, the alternatives do consider the possibility of new private resources (volunteers, grant funds, etc.) and a modest refuge program and/or staff funding increase.

2.2 Horicon National Wildlife Refuge

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

Refuge Habitat: What is an appropriate mix of habitats – upland, wetland, open water, mudflats, forest, brush, grassland, etc. – within this ecological zone in the 21st century, and what level of habitat restora-

tion and maintenance is feasible given the constraints of funding and ecological succession?

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

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

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

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

2.2.1 Alternative A: Current Management Direction (No Action)

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

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

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

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

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

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

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

Landscape and watershed involvement by staff and partners would be increased to reduce sedimentation rate and water quality in the Horicon Marsh.

Strategies would include personal contact with the agricultural community and other landowners by non-government personnel, increased Partners for Fish and Wildlife projects in the watershed, and participation on inter-agency teams, and other partnership efforts.

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

2.2.3 Alternative C: The Big Pool

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

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

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

2.2.4 Alternatives Considered But Not Developed

2.2.4.1 Pre-settlement Conditions

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

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

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

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

2.2.4.2 New Dikes and Water Control Structures

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

2.2.5 Comparison of Management Alternatives

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

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p>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.</p>		
<p><i>Objective 1.1: Deer Population.</i> Same as Alternative B.</p>	<p><i>Objective 1.1: Deer Population.</i> Annually, maintain Refuge deer population consistent with State Management Units 68A and 68B at a density of 15-20 deer per square mile based on annual winter surveys.</p>	<p><i>Objective 1.1: Deer Population.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B except #2. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Change deer hunting opportunities by expanding the current Refuge deer season to include a later archery and muzzleloader hunt to commensurate with the state seasons, with a delayed opening of December 1 on designated dikes north of Ledge Road. ■ Conduct informal survey /interact with hunters and listen to feedback on ways to improve hunt. ■ Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed. ■ Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.
<p><i>Objective 1.2: Wildlife-Vehicle Collisions.</i> For the 15-year duration of the CCP, do not allow wildlife mortality from wildlife-vehicle collisions to exceed 2006 levels.</p>	<p><i>Objective 1.2: Wildlife-Vehicle Collisions.</i> By 2012, reduce wildlife losses as the result of auto collisions by 50% on Highway 49.</p>	<p><i>Objective 1.2: Wildlife-Vehicle Collisions.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B except #1. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Support a reroute of State Highway 49 leaving the existing road for bird watching and recreation. ■ Promote lowering the speed limit along State Highway 49 or at a minimum, promote compliance of the existing speed limit through increased law enforcement patrol. <p><i>Continued next page</i></p>	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
	<p><u>Strategies (Continued)</u></p> <ul style="list-style-type: none"> ■ Provide mitigation measures along State Highway 49 to reduce the number of roadkill. These measures may include providing simple barriers or fences along the road where appropriate, constructing coffer dams at strategic locations that allow animals to cross under the road through existing culverts, placing poles or other similar tall barriers along the highway to discourage birds from flying into the path of vehicles. ■ Pursue funding sources to implement the above mitigation measures and/or to participate in research to determine the best measure. 	
<p><i>Objective 1.3: Over-abundant Fish and Wildlife Species</i> Same as Alternative B.</p>	<p><i>Objective 1.3: Over-abundant Fish and Wildlife Species.</i> 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.</p>	<p><i>Objective 1.3: Over-abundant Fish and Wildlife Species</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ strategies #2, #3, and #4 from Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Implement new research techniques such as using pheromones for carp control. ■ Use chemical pesticides periodically (i.e. rotenone) to control carp. ■ Continue use of carp trap and look for improved ways of disposing of the carp such as commercial fisherman, mink farms, etc. ■ Conduct Refuge trapping program as necessary and as water conditions allow. ■ Explore other options, along with trapping, to reduce the number of predators (such as hunting of predators, providing incentives for taking a predator, expanding the trapping season, making upland Refuge trapping regulations less restrictive). ■ Remove woody vegetation, old fencerows, and other structures in order to decrease predator habitat. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p><i>Objective 1.4: Regional Conservation Priority (RCP) Species.</i> RCP species will receive no special consideration in Refuge management decisions.</p>	<p><i>Objective 1.4: Regional Conservation Priority (RCP) Species.</i> 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.</p>	<p><i>Objective 1.4: Regional Conservation Priority (RCP) Species.</i> Same as Alternative B.</p>
<p>Strategies:</p> <ul style="list-style-type: none"> ■ Monitor population according to the wildlife inventory plan but with no emphasis on RCP species. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Monitor population trends according to the wildlife inventory plan. ■ Support research activities that are directed toward these species. ■ Continue water level management to provide a mosaic of water level depths for migrating waterfowl to utilize during spring and fall. ■ Provide mudflats for migrating shorebirds in Early May. ■ Once nesting has been initiated, keep stable water levels to prevent flooding nests. ■ Remove trees and brush that are encroaching on grassland fields. ■ Conduct rotational burning as outlined in the Fire Management and Habitat Management Plans to provide a mosaic of burned and unburned habitat. ■ Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches. ■ Restore Oak Savanna areas. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.
<p>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.</p>		
<p><i>Objective 2.1: Maintenance of current water and marsh management regime.</i> For duration of CCP, maintain existing water management regime and water control infrastructure, including dikes and water control structures.</p>	<p><i>Objective 2.1: Restoration of Natural Watercourses.</i> 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.</p>	<p><i>Objective 2.1: Creation of a “Big Pool.”</i> By 2015, manage the majority of Horicon Marsh as one large waterbody by removing the Main Dike to encourage the natural sinuosity of the Rock River.</p>

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Maintain existing radial gate on Main Dike and continue present operation of the gate. ■ Continue drawdowns of Main Pool every 5-6 years to control cattails and sediment accumulation. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Replace the damaged radial gate on the Main Dike just east of the present location. The water control structure would be kept open most of the time to allow the removal of the daily influx of phosphorus and sediments and allow a braided river channel throughout the Main Pool. ■ Add a spillway, with a water control structure, at the historic river channel site. The purpose of the spillway would be to release water during heavy rain events. The highest water level achievable in the Main Pool would be dictated by the level of the spillway. ■ Remove or breach spoil banks and plug the lateral drainage ditches to increase water level, reduce side drainage, and increase sheet flow. ■ Evaluate the Wildfire Urban Interface levee on the west side of the Refuge for possible reconstruction or rehabilitation to improve hydrology, but without negatively effecting fire control. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Explore removal of the southern Horicon Marsh dam operated by WIDNR. ■ Continue to practice water management control on 16 sub-impoundments or approximately 5,000 acres of wetland habitat. ■ Solve the problem of marsh sedimentation by dredging the main channel. ■ Nutrient-rich dredge spoil could be sold to farmers within the watershed to enhance depleted cropland soils. ■ Work with farming community to implement new soil erosion prevention measures where spoil is distributed in order to slow the rate of future sedimentation in the Horicon Marsh.
<p><i>Objective 2.2: Managing Water Impoundments. Same as Alternative B.</i></p>	<p><i>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.</i></p>	<p><i>Objective 2.2: Managing Water Impoundments. Same as Alternative B.</i></p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Draw down Main Pool when the opportunity exists and when weather conditions permit. The emphasis is on maintaining a diverse aquatic plant community while reducing sedimentation and pollutants. ■ Draw down selective sub-impoundments in a cycle of 4 to 6 years, based on the annual water management plan. Burning may be prescribed to occur if feasible during the drawdown phase. ■ Provide stable water levels from May 1 to July 15 in a variety of cover types for over-water nesting birds. <p><i>Continued next page</i></p>	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
	<p><i>Objective 2.2: Managing Water Impoundments.</i> <u>Strategies (Continued)</u></p> <ul style="list-style-type: none"> ■ Lower water levels 6 to 12 inches in some impoundments during the fall to provide shallow foraging sites for migrating waterfowl. ■ Draw down selective sub-impoundments each year to expose mudflats for migrating shorebirds. 	
<p><i>Objective 2.3: Invasive Species Control.</i> For duration of CCP, prevent infestations of invasive plant species from spreading beyond 2006 levels.</p>	<p><i>Objective 2.3: Invasive Species Control.</i> By 2020, reduce invasive plant species locations by 50 percent from 2006 levels and make every attempt to eliminate new infestations as they occur.</p>	<p><i>Objective 2.3: Invasive Species Control.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B except #6. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Document the location and size of invasive populations with GIS mapping. ■ Use biological control when available as a preferred strategy. ■ Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed. ■ Use fire and grazing in controlling some invasive plant species. ■ Monitor the infestations and effectiveness of control measures. ■ Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge program. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.
<p><i>Objective 2.4: Oak Savanna.</i> For duration of CCP, maintain current area of oak savanna in the uplands to benefit regional habitat diversity.</p>	<p><i>Objective 2.4: Oak Savanna.</i> By 2007, restore and maintain 100 acres of oak savanna in the uplands to benefit regional habitat diversity and grassland-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50% tree canopy closure, 5-35% relative cover of shrubs, and at least 50 percent relative cover of diverse native grasses and native forbs.</p>	<p><i>Objective 2.4: Oak Savanna.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps. ■ Plant native grasses and forbs (flowers) if needed. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
	<p><i>Objective 2.4: Oak Savanna.</i> <u>Strategies (Continued):</u></p> <ul style="list-style-type: none"> ■ Plant oak seedlings in native grasslands in the designated oak savanna areas. ■ Control invasive and exotic plants. ■ Conduct rotational burning (prescribed fire) as outlined in the Fire Management Plan and Habitat Management Plan. 	
<p><i>Objective 2.5: Grasslands.</i> For duration of CCP, maintain and manage existing area of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than five percent shrub cover, and a diverse native grass and forb species mix.</p>	<p><i>Objective 2.5: Grasslands.</i> By 2008, restore and manage 500 to 1000 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than five percent shrub cover, and a diverse native grass and forb species mix.</p>	<p><i>Objective 2.5: Grasslands.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Conduct rotational burning (prescribed fire) as outlined in the Fire Management Plan and Habitat Management Plan. ■ Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower; or in combination with other techniques. ■ Use chemical treatments exclusively or in combination with other techniques. ■ Use grazing, when appropriate, exclusively or in combination with other techniques. ■ Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p><i>Objective 2.6: Sedimentation of Horicon Marsh.</i> For duration of CCP, ensure that levels of sediments and non-point source pollutants entering the Horicon Marsh from drainages of the Rock River are no greater than 2006 levels.</p>	<p><i>Objective 2.6: Sedimentation of Horicon Marsh.</i> By 2020, reduce sediments and non-point source pollutants entering the Horicon Marsh from drainages of the Rock River watershed by 50% from 2000 levels.</p>	<p><i>Objective 2.6: Sedimentation of Horicon Marsh.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Increase the enrollment in cost-sharing wetland restorations and agricultural practices that improve water quality and to reduce peak flows entering Horicon Marsh by working with the Service’s Partners for Fish and Wildlife program and partnerships with the Dodge County Land Conservation Department, Fond du Lac County Land and Water Conservation Department, Green Lake and Washington Counties, and NRCS. ■ Continue to provide financial and non-financial incentives to private landowners through the above partners to implement conservation measures within the south and west branches of the Rock River watershed. Non-financial incentives can include landowner recognition at public functions, news articles, and voluntary land heritage registries. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Increase the enrollment in cost-sharing wetland restorations and agricultural practices that improve water quality and to reduce peak flows entering Horicon Marsh by working with the Service’s Partners for Fish and Wildlife program and partnerships with the Dodge County Land Conservation Department, Fond du Lac County Land and Water Conservation Department, Green Lake and Washington Counties, and NRCS. ■ Continue to provide financial and non-financial incentives to private landowners through the above partners to implement conservation measures within the south and west branches of the Rock River watershed. Non-financial incentives can include landowner recognition at public functions, news articles, and voluntary land heritage registries. ■ Conduct door-to-door landowner education using non-government employees and involving local industry and businesses. ■ Monitor water quality and quantity entering the Marsh in cooperation with the U.S. Geological Survey. ■ Purchase land or obtain easements from willing sellers as it becomes available within the authorized Refuge boundaries. ■ Work with water experts, such as hydrologists, groundwater specialists, and other water specialists, on the problems and solutions for the Rock River basin. ■ Cooperate with local government land use planning efforts to ensure that water quality impacts to the Refuge are considered. ■ Continue to stress the importance of water quality in public information and interpretation, and environmental education programs. 	<p><u>Strategies:</u></p> <p>Employ same strategies as Alternative B.</p>

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p>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.</p>		
<p><i>Objective 3.1: Hunting.</i> Annually, provide no less than 75 quality upland hunting experiences per year.</p>	<p><i>Objective 3.1: Hunting.</i> 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.</p>	<p><i>Objective 3.1: Hunting.</i> Same as Alternative B.</p>
<p>Strategies:</p> <ul style="list-style-type: none"> ■ Small game: After revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit and squirrel hunting will be maintained as they are at present. ■ White-tailed deer: Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal. ■ Continue to collect hunting data through volunteers. ■ Develop a revised and current Refuge hunting plan based on the CCP. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Small game: After revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit and squirrel hunting will be expanded to include the entire state season and following state bag limits. The season will have a delayed opening of December 1st on designated dikes north of Ledge Road. ■ White-tailed deer: Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal. ■ Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs and wording within brochures and on the Refuge web page. ■ Evaluate the restricted use hunting areas (areas D, E, and F on the Refuge hunting brochure map) for possible amendments. Changes will be reflected in the Refuge Hunt Plan. ■ Increase the visibility of Refuge law enforcement and hunter adherence to Federal and state regulations to ensure quality, ethical hunting. ■ Establish hunter and vehicle counts, through staff and volunteers, at all hunting access points to gain an index on hunting pressure and collect additional hunting data. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p><i>Objective 3.2: Fishing.</i> For the duration of the CCP, maintain bank fishing on the Refuge in accordance with Wisconsin State fishing regulations at three locations: Main Dike Road, Ledge Road and Peachy Road.</p>	<p><i>Objective 3.2: Fishing.</i> By 2008, provide for 250 quality fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will know they were fishing on a national wildlife refuge.</p>	<p><i>Objective 3.2: Fishing.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Maintain accessible fishing piers at Main Dike Road and Ledge Road. ■ Complete planning process for new access to Peachy Road bank fishing site and implement reconstruction. ■ Continue to stock game fish annually at various locations throughout the Refuge. ■ Hold one youth fishing event on the Refuge every summer in celebration of National Fishing Week. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Open all three fishing sites to ice fishing. ■ Continue to provide the annual fishing expedition for area schools, coordinated with volunteers. ■ Maintain accessible bank fishing platforms at all fishing sites. ■ Improve the parking lot at Peachy Road. Develop a site plan for placement of a kiosk; wayfinding, interpretive and regulatory signage; accessible routes; possible rest rooms; and accessible bank fishing facilities. ■ Improve access for fishing at Ledge Road and add signs at Ledge Road and Dike Road. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.
<p><i>Objective 3.3: Wildlife Observation and Photography.</i> Provide year-round opportunities for up to 350,000 visitors annually to observe and photograph wildlife and habitat.</p>	<p><i>Objective 3.3: Wildlife Observation and Photography.</i> Provide year-round opportunities for up to 400,000 visitors annually to observe and photograph wildlife and habitat.</p>	<p><i>Objective 3.3: Wildlife Observation and Photography.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Continue to monitor wildlife mortality problem along Highway 49 and consider means of reducing mortality. ■ Maintain the Ternpike auto tour route season. ■ Conditions permitting, keep the Main Dike Road open year-round to vehicles, foot, and bike traffic. ■ Install two permanent or temporary photo blinds near hiking trails. ■ Provide volunteer-led programs such as the goose watches at the Highway 49 viewing area and volunteer-led bird watching tours. ■ Develop an interpretive loop trail from the visitor center. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Determine whether to develop the Highway 49 overlook/comfort station for better wildlife observation or to restore the site to upland habitat, including removal of the buildings and parking lot. This area receives little visitor use in its present state. ■ Open other specific areas of the Refuge during the March 15 to December 1 time period for wildlife observation and photography via hiking and bicycling. ■ Extend the auto tour route season to be open year round, conditions permitting. ■ Open Main Dike Road year-round, conditions permitting, to automobiles, foot, and bike traffic. ■ Open Main Dike Road west of the fishing site year-round to foot and bike traffic for wildlife observation and photography. <p><i>Continued next page</i></p>	<p><u>Strategies:</u></p> <p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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

Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<p><i>Objective 3.3: Wildlife Observation and Photography.</i> <u>Strategies (Continued):</u></p> <ul style="list-style-type: none"> ■ Continue to participate in and promote public events and interpretive programs on the Refuge that focus on wildlife observation, mainly bird-watching, such as the Horicon Marsh Bird Festival, guided birding tours, and Marsh Melodies. 	<p><i>Objective 3.3: Wildlife Observation and Photography.</i> <u>Strategies (Continued):</u></p> <ul style="list-style-type: none"> ■ Continue Old Marsh Road being open on weekends in June, July, and August to foot and bike traffic for wildlife observation and photography. ■ Open a specific area on the west side and east side of the Refuge for year-round wildlife observation and photography. ■ Install two permanent or temporary photo blinds on the Refuge. ■ As part of the Visitor Services Plan, the trail system will be evaluated to ensure that trails meet resource goals and are accessible to all visitors. ■ Consider developing an interpretive loop trail from the visitor center. 	
<p><i>Objective 3.4: Environmental Education and Interpretation. Same as Alternative B.</i></p>	<p><i>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.</i></p>	<p><i>Objective 3.4: Environmental Education and Interpretation. Same as Alternative B.</i></p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Continue to conduct numerous interpretive programs on and off the Refuge for ages ranging from pre-school children to adults. Primary topics will include the history of Horicon Marsh, habitat management and resource issues. ■ Continue to implement Rhythms of the Refuge program for school groups, Scouts, and civic groups. ■ Utilize trained volunteers to conduct EE on and off Refuge. ■ Continue participation in the Rolling Readers literacy program, using volunteers. ■ Continue to offer a variety of educational trunks and materials available for check-out, such as the Wildlife Discovery trunk, prairie trunk, aquatic exotics, songbird trunk and wetland trunk. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Hire an additional park ranger to serve as environmental education specialist and volunteer coordinator. ■ Train volunteers to provide tours or lessons for classrooms. ■ Construct a portable building at the Auto Tour/Hiking Trail Complex for volunteers to use during the busy season as an outpost for providing visitors information. ■ Contact schools annually notifying them of the Refuge’s facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Hold teacher workshops to train educators to conduct their own programs. ■ Consider building an amphitheater to be used for environmental education and interpretive presentations. <p><i>Continued next page</i></p>	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
	<p><i>Objective 3.4: Environmental Education and Interpretation.</i> <u>Strategies (Continued):</u></p> <ul style="list-style-type: none"> ■ Purchase state-of-the-art audio visual equipment for the new visitor center auditorium where thousands of people are provided programs each year. ■ Update the exhibits and signs in the visitor center and on all kiosks. ■ Update and print new brochures. 	
<p><i>Objective 3.5: Community Outreach.</i> Increase awareness of Refuge management within surrounding areas by annually providing opportunities for at least 1,000 people to participate in off-site programs and exhibits; 20 teachers to participate in training programs, 250 people to volunteer at the Refuge, and 100 people to be members of a supporting friends group.</p>	<p><i>Objective 3.5: Community Outreach.</i> 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.</p>	<p><i>Objective 3.5: Community Outreach.</i> Same as Alternative B.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Offer training programs for teachers centered on the Refuge’s place in the ecological landscape and the importance of habitat management. ■ Continue to send out monthly new releases pertaining to recreational opportunities and resource issues and maintains a website with links to: the Rhythms of the Refuge environmental education curriculum and teacher resources; news releases; current habitat conditions; historical information about the marsh; maps; regulations; and a calendar of events listing public interpretive programs. ■ Maintain a Traveler Information System (TIS) with monthly updates and also a weekly waterfowl numbers phone recording. ■ Refuge staff and volunteers will reach a wider audience by partnering with other natural resource agencies and local community service groups to offer regional educational and recreational events such as the Horicon Marsh Bird Festival, Marsh Melodies, Ducks Unlimited Outdoor Show, and many other events. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Offer training programs for teachers centered on the Refuge’s place in the ecological landscape and the importance of habitat management ■ Offer training programs for teachers centered on the Refuge’s place in the ecological landscape, the importance of habitat management, and the objectives in this plan. ■ Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs. ■ Participate in off-site community events. ■ Issue regular news releases and improve the Information Dissemination System for distributing news releases. ■ Maintain and update a Refuge website with current information about Refuge management and events. ■ Increase community partnerships. ■ Work closely with the Friends of Horicon NWR to foster understanding and mutual priorities. ■ Develop outreach plans for important resource issues. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

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Alternative A: Current Management (No Action)	Alternative B: A Free-flowing Rock River (Preferred Alternative)	Alternative C: The Big Pool
<i>Objective 3.6: Protection of Cultural Resources.</i> Same as Alternative B.	<i>Objective 3.6: Protection of Cultural Resources.</i> 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.)	<i>Objective 3.6: Protection of Cultural Resources.</i> Same as Alternative B.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Initiate a Cultural Resources Management Plan within 5 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.) ■ Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.) ■ Develop an oral cultural history to preserve the “community memory” about the area. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.
<i>Objective 3.7: Cultural Resources Appreciation.</i> Same as Alternative B.	<i>Objective 3.7: Cultural Resources Appreciation.</i> Seventy percent of visitors will understand and appreciate the cultural history of the Refuge.	<i>Objective 3.7: Cultural Resources Appreciation.</i> Same as Alternative B.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative B.

2.3 Fox River National Wildlife Refuge

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

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

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

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

2.3.1 Alternative A: Current Management Direction (No Action)

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

The primary Refuge habitat consists of 779 acres of wetlands along the Fox River. The wetlands are composed primarily of sedge meadow, although fens, shallow marsh, and wet prairie are present as well. Approximately 375 acres of the wetland has never been drained; the remainder was drained in 1978 before the Service purchased the land. The 375 acres of undrained wetlands would continue to be protected

under the Current Direction Alternative. The hydrologic regime and other historic habitat conditions within the 404 acres of drained wetlands would be restored and maintained through ditch plugging and filling, prescribed fire and subsequent monitoring.

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

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

2.3.2 Alternative B: Historic Habitat Conditions and Enhanced Visitor Services

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

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

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

2.3.3 Alternatives Considered but not Developed

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

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

2.3.4 Comparison of Management Alternatives

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

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Goal 1: Wildlife – Protect, restore, and maintain a diversity of wildlife species native to habitats historically found in the Upper Fox River Watershed, with special emphasis on Service priority species, through habitat preservation, restoration, and management.	
<i>Objective 1.1: Deer Population.</i> 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.	<i>Objective 1.1: Deer Population.</i> Same as Alternative A.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Continue to use regulated hunting every fall during all regular state seasons, including archery, gun, muzzleloader, and special hunts. ■ Monitor for signs of habitat damage such as browse lines on the Refuge that would indicate that carrying capacity has been surpassed. ■ Conduct informal survey/interact with hunters and listen to feedback on ways to improve the hunt. ■ Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Wisconsin DNR. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<i>Objective 1.2: Sandhill Cranes.</i> Annually, maintain habitat to support 8 pairs of nesting Sandhill Cranes and more than 400 migratory cranes daily during spring and fall.	<i>Objective 1.2: Sandhill Cranes</i> Same as Alternative A.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Monitor Sandhill Crane use of the Refuge. ■ Maintain the open structural component in prairies and oak savannas on the Refuge as Sandhill Cranes forage in these habitats. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<i>Objective 1.3: Regional Conservation Priority (RCP) Species.</i> RCP species will receive no special consideration in Refuge management decisions.	<i>Objective 1.3: Regional Conservation Priority (RCP) Species.</i> 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.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Monitor population trends through point counts, waterfowl surveys, breeding bird surveys, etc. according to the wildlife inventory plan but with no emphasis on RCP species. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Monitor population trends according to the Wildlife Inventory Plan. ■ Support research activities that are directed toward these species. Continue restoring natural hydrology to benefit waterfowl and other birds by filling/plugging remaining ditches. ■ Monitor effects of ditch plugging on vegetation and bird use. ■ Remove trees and brush that are encroaching on grassland fields. ■ Continue burn program rotation of every 4-8 years to provide a mosaic of burned and unburned habitat. ■ Continue seeding tall-grass or mixed-grass prairie with a forb component to provide cover and singing perches. ■ Restore oak-savanna areas.

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
Goal 2: Habitat – Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands.	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.
<i>Objective 2.1: Oak Savanna.</i> 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.	<i>Objective 2.1: Oak Savanna.</i> Same as Alternative A.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Remove the understory in existing oak forest by thinning the trees with cutting and then treating the stumps. ■ Plant native grasses and forbs (flowers) if needed. ■ Plant oak seedlings in native grasslands in the designated oak savanna areas. ■ Control invasive and exotic plants. ■ Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<i>Objective 2.2: Grasslands.</i> By 2008, restore and manage 115 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit wildlife species that depend on this habitat type, including Henslow’s sparrow, Bobolink, Grasshopper sparrow, and Eastern meadowlark. Grasslands are characterized by less than 10 percent canopy closure, less than 5 percent shrub cover, and a diverse native grass forb species mix.	<i>Objective 2.2: Grasslands.</i> Same as Alternative A.
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Conduct rotational burning (prescribed fire), as outlined in the Fire Management Plan and the Habitat Management Plan. ■ Use mechanical treatments exclusively, such as brush cutting and mowing with a fecon mower, or in combination with other techniques. ■ Use chemical treatments exclusively or in combination with other techniques. ■ Monitor plant species composition and structure in plantings and compare to other native prairies; try to achieve historical conditions. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<i>Objective 2.3: Fen and Wet Prairie.</i> 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.	<i>Objective 2.3: Fen and Wet Prairie.</i> Same as Alternative A.

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Attempt to burn each unit in early fall as outlined in the Fire Management Plan to control brush. ■ Use mechanical treatments such as hand cutting or mowing over the ice when burning is not effective for controlling brush. ■ Use localized chemical treatments on the stumps in conjunction with the mechanical treatments. ■ Control other invasive and exotic plants. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<ul style="list-style-type: none"> ■ <i>Objective 2.4: Sedge Meadow and Shallow Emergent Marsh.</i> Annually, maintain 600 – 650 acres of sedge meadow and shallow emergent marsh to benefit Regional Conservation Priority species dependent on this habitat type such as the Yellow Rail, American Bittern, Sedge Wren, Mallard, Canada Goose, and Sandhill Crane, among others. 	<p><i>Objective 2.3: Fen and Wet Prairie.</i> Same as Alternative A.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Monitor the hydrological and plant species composition and structure changes associated with restoration activities. ■ Practice adaptive management in restored areas via maintaining restored conditions if habitat goals are achieved or modifying techniques if goals are not achieved. The ultimate goal would be to achieve historical site conditions. ■ Conduct rotational burning (prescribed fire) as outlined in the <i>Fire Management Plan</i> and the <i>Habitat Management Plan</i>. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<p><i>Objective 2.5: Exotic and Invasive Species Control.</i> 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.</p>	<p><i>Objective 2.5: Exotic and Invasive Species Control.</i> Same as Alternative A.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Document the location and size of invasive populations on the Refuge with GIS mapping. ■ Use biological control when available as a preferred strategy. ■ Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed. ■ Use fire in controlling some invasive species. ■ Monitor the infestations and effectiveness of control measures. ■ Support and work with the Service’s Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
<i>Objective 2.6: Land Conservation.</i> By 2020, conserve sufficient lands adjacent to the Refuge to ensure the restoration and protection of Refuge wetlands.	<i>Objective 2.6: Land Conservation.</i> Same as Alternative A.
<p>Strategies:</p> <ul style="list-style-type: none"> ■ Acquire in fee title or in easement from willing sellers 200 acres of land surrounding the Refuge. ■ Improve cooperative work with adjacent landowners, who have similar habitats and wildlife via sharing technical advice and referring them to the FWS's Partners for Fish and Wildlife program, USDA's programs, or other NGO's for assistance in performing conservation practices on their lands. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.
<p>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.</p>	
<i>Objective 3.1: Hunting.</i> Maintain current deer hunting opportunities on the Refuge for area residents.	<i>Objective 3.1: Hunting.</i> 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.
<p>Strategies:</p> <ul style="list-style-type: none"> ■ Maintain current public awareness of Refuge hunting opportunities through existing maps, signs, and wording within brochures and on the Refuge web page. ■ Maintain current Refuge law enforcement and hunter adherence to federal and state regulations. ■ Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs, and wording within brochures and on the Refuge web page. ■ Increase the visibility of Refuge law enforcement and hunter adherence to federal and state regulations to ensure quality, ethical hunting. ■ Deer hunting is both a recreational opportunity and a population management strategy to protect Refuge habitats. See Objective 1.1 under the Wildlife Goal.
<i>Objective 3.2: Fishing.</i> Maintain current closure of Refuge to fishing.	<i>Objective 3.2: Fishing.</i> By 2008, provide for 75 fishing visits per year to the Refuge. Seventy-five percent of anglers will report no conflicts with other users and will be aware that they were fishing on a national wildlife refuge.
No strategies required; Fox River NWR closed to all fishing.	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Provide fishing on designated areas of the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan. ■ Monitor litter and provide signage to educate anglers to always carryout trash.
<i>Objective 3.3: Wildlife Observation and Photography.</i> Unsupervised wildlife observation and photography continue to be prohibited at Fox River NWR.	<i>Objective 3.3: Wildlife Observation and Photography.</i> Provide limited opportunities for 200 visitors annually to observe and photograph wildlife and habitat.
<ul style="list-style-type: none"> ■ No strategies required; Fox River NWR closed to all wildlife observation and photography. 	<p>Strategies:</p> <ul style="list-style-type: none"> ■ Provide wildlife observation and photography on designated areas of the Refuge during given times of the year where it does not interfere with wildlife. ■ Consider establishment of a segment of the Wisconsin Ice Age State and National Trail through the Refuge.

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
<p><i>Objective 3.4: Environmental Education and Interpretation.</i> Provide for annual onsite visitation of 100 students and 2-4 group visits.</p>	<p><i>Objective 3.4: Environmental Education and Interpretation.</i> Same as Alternative A</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Contact schools annually notifying them of the Refuge’s facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes. ■ Train educators to conduct their own programs (via teacher workshops). 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Provide educational opportunities based on the objectives in this plan, so that the public will understand future management activities and provide support. For example, a person who understands the benefits of controlling invasive species will be more likely to support Refuge decisions. ■ If feasible, train volunteers to provide tours or lessons for classrooms. ■ Contact schools annually notifying them of the Refuge’s facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted. ■ Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes. ■ Train educators to conduct their own programs (via teacher workshops). ■ If necessary, redesign or enlarge both Refuge parking lots to accommodate school buses.
<p><i>Objective 3.5: Community Outreach.</i> Maintain existing awareness of Refuge management within surrounding areas by continuing outreach efforts to two local charter schools.</p>	<p><i>Objective 3.5: Community Outreach.</i> 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.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Continue to provide environmental education to two nearby charter schools. ■ Continue to provide tours of Refuge habitats to groups from these two schools. ■ Continue to use students from two charter schools in habitat restoration projects on the Refuge. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Improve outreach to Refuge neighbors about the benefits of habitat prescriptions such as tree cutting, invasive species control, and prescribed fire. ■ Offer training programs for teachers centered on the Refuge’s place in the ecological landscape, the importance of habitat management, and the objectives in this plan. ■ Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs. ■ Participate in off-site community events. ■ Issue regular news releases and improve the Information Dissemination System for distributing news releases. ■ Maintain and update a Refuge website with current information about Refuge management and events. ■ Increase community partnerships. ■ Develop outreach plans for important resource issues and improve the outreach to the Refuge neighbors about habitat management (i.e., tree cutting, invasive species control, prescribed fire).

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

Alternative A: Current Management Direction (No Action)	Alternative B: Historic Habitat Conditions and Enhanced Visitor Services (Preferred Alternative)
<p><i>Objective 3.6: Protection of Cultural Resources.</i> 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.)</p>	<p><i>Objective 3.6: Protection of Cultural Resources.</i> Same as Alternative A.</p>
<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Initiate a Cultural Resources Management Plan within 3 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.) ■ Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.) ■ Develop an oral cultural history to preserve the “community memory” about the area. 	<p><u>Strategies:</u></p> <ul style="list-style-type: none"> ■ Employ same strategies as Alternative A.

Chapter 3: Affected Environment

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

3.1 Horicon National Wildlife Refuge

3.1.1 Introduction

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

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

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

grass. Uplands include 1,878 acres of woodlands and 3,598 acres of grasslands.

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

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

3.1.2 Geographic/Ecosystem Setting

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

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

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

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

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

3.1.3 Climate

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

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

3.1.4 Geology

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

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

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

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

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

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

3.1.5 Soils

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

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

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

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

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

3.1.6 Surface Hydrology

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

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

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

3.1.7 Archeological and Cultural Resources and Historical Preservation

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

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

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

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

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

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

The historic period tribes encountered by Europeans in Wisconsin generally and in the Horicon Refuge area specifically included the Winnebago (some of which are known as the Ho-Chunk) as well as the 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 Refuge.

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

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

3.1.7.1 Horicon National Wildlife Refuge

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

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

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

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

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

3.1.7.2 Fox River National Wildlife Refuge

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

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

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

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

3.1.7.3 Museums and Repositories

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

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

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

Table 3: Population Characteristics, Dodge and Fond du Lac Counties, Wisconsin¹

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

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

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

3.1.8 Social and Economic Context

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

3.1.8.1 Socioeconomic Characteristics

Dodge and Fond du Lac counties, Wisconsin

Both Dodge and Fond du Lac counties are characterized by a mixture of rural and urban areas, that is, small towns and villages surrounded by predominantly agricultural countryside. The population densities of both counties roughly mirror that of

Wisconsin as a whole (98 and 135 vs. 99 persons per square mile, respectively), while the state of Wisconsin has slightly less population density than the USA as a whole (99 vs. 80). However, the USA's figure is somewhat distorted by large, thinly populated Alaska.

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

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

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

Activity	Resident	Non-resident	Total
Non-consumptive	\$70.8	\$1,772.9	\$1,843.7
Hunting	\$11.9	\$37.3	\$49.2
Fishing	\$1.5	---	\$1.5
Total	\$84.2	\$1,810.2	\$1,894.4

1. Source: Laughland and Caudill, 1997

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

Educational attainment is lower in both Dodge and Fond du Lac counties than in Wisconsin overall, with much lower percentages of college graduates in the two counties than in the state. However, this is very representative of rural areas around the country and is a reflection of the labor market and kinds of jobs available in rural vs. urban areas. In spite of having fewer college graduates in their midst, the median household incomes of both counties exceed the state's median household income, which is unusual for areas without large towns or cities.

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

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

Horicon National Wildlife Refuge was one of the sample Refuges investigated in a national study of the

economic benefits to local communities of national wildlife refuge visitation (Laughland and Caudill, 1997). This study found that that in 1995, resident and non-resident visitors to Horicon NWR spent about \$1.9 million in the Refuge (Table 4). When this spending had cycled through the economy, the Refuge had generated \$1.53 million in final demand, \$616,000 in employee compensation, and 44 jobs.

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

3.1.9 Natural Resources

3.1.9.1 Habitats

Horicon National Wildlife Refuge includes 15,573 acres of marsh and 5,476 acres of associated upland habitat. Marsh habitat is seasonally to permanently flooded and dominated by cattail, river bulrush, common reed grass, sedges, and reed canary grass. Uplands include 2,598 acres of grasslands and 1,878 acres of woodlands.

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

Of the 2,598 acres of grasslands, fully 1,468 acres (57 percent) are introduced grasslands, 626 acres (24 percent) are forbes, 423 acres (17 percent) are native grasslands, and 81 acres (3 percent) are wet meadows.

Of the 1,878 acres of woodlands, 1,027 acres (55 percent) are willow-dominated, 415 acres (22 percent) are mixed hardwoods, 225 acres (12 percent) are aspen-dominated, 151 acres (8 percent) are willow-cattail, and 58 acres (3 percent) are oak savanna. From these figures, it is evident that almost two-thirds (63 percent) of the Refuge's woodlands are lowland or bottomland and a little more than one-third (37 percent) are upland woodlands.

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

3.1.9.2 Wildlife

Birds – Horicon Marsh is a major migratory 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 per year.

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

Up to one million Canada Geese migrate through the Refuge each fall. On a peak fall day, there may be as many as 300,000 geese in the area. Most of the Canada Geese that stop at Horicon Marsh fly to their winter range in the area where the Ohio River joins the Mississippi River, about 450 miles away. The rest

of the Mississippi Valley population of Canada Geese that migrate through Michigan, Ohio, and Indiana join these birds on the wintering grounds located in southern Illinois, Western Kentucky, Tennessee, and Missouri. From about the middle of March until the end of April the birds pass through Horicon Marsh once more to rest and fatten up for the flight to the nesting grounds near Hudson Bay in Canada.

Mallards are the principle species of ducks using the area, but Green-winged and Blue-winged Teal, Wigeon, Redheads, Pintails, Gadwalls, Wood Ducks, Scaup, and Ruddy Ducks are also abundant, with peak numbers traditionally reaching 60,000. The marsh is especially important to Redhead ducks, which have experienced a population decline nationwide. The marsh is the largest nesting area for red-head ducks east of the Mississippi River, with an estimated 2,000 to 3,000 birds utilizing the marsh for this purpose. Historically, a majority of the continent's canvasback population used the region.

For centuries, marsh birds have stopped at food-rich wetlands during their annual migration between Central and South America and their northern U.S., Canadian and Arctic breeding grounds. Horicon Marsh provides an important link in their journey. Four mile island, the Marsh's largest island at 15 acres, harbors Wisconsin's largest rookery with up to 1,000 nesting pairs of Great Blue Herons, Double-crested Cormorants, Black-crowned Night Herons, and Great Egrets. Common marsh and water birds on the Refuge include the Pied-billed Grebe, American Bittern, Common Gallinule, Sora and Virginia Rails, and Sandhill Cranes. Tremendous numbers of shorebirds utilize low water pools with counts of a single species typically numbering over 5,000.

Horicon NWR has documented 267 species of birds on the Refuge, including resident, migratory, and accidental species. Of the 267 species recorded on the Refuge, 223 are expected to be present while 44 birds are listed as "accidental," meaning they are not normally expected to be present. Many birds are present for less than all four seasons, and they may be abundant, common, uncommon, or rare.

Mammals – Horicon Marsh also supports an array of resident mammals – approximately 20 species have been documented – including white-tailed deer, woodchucks, red fox, squirrels, raccoons, muskrat, skunk, mink, otter, opossum, and coyote. Mammals tend to be most abundant in and around the wetland habitat due to the abundant food and cover available. Muskrats play an important role in striking

a balance between the stands of cattails and the open water zones.

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

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

Amphibians and Reptiles – Amphibians and reptiles are two natural and distinct classes of vertebrates common to the area. Several species of turtles and snakes are found in the area. Salamanders, newts, toads, and frogs depend on quality wetland habitat for their survival. Nine species of amphibians and five species of reptiles have been recorded at Horicon NWR.

Threatened and Endangered Species – At present, the only Federally-listed threatened or endangered wildlife species that uses the marsh is the Bald Eagle. State-listed endangered species at Horicon NWR include the Osprey, Forster's tern, Common Tern, and Barn Owl.

3.1.10 Fire Management

This section contains detail about the prescribed fire and wildfire suppression procedures used on the Horicon and Fox River Refuges. We have included more detail on this subject here and in Chapter 4 of the EA in order to fully document each Refuge's Fire Management Plan (FMP) in compliance with the National Environmental Policy Act.

3.1.10.1 Prescribed Fire

Prescribed fire is used regularly on the Refuges as a habitat management tool. Periodic burning of grasslands and wet meadows reduces encroaching woody vegetation. Fire also encourages the growth of desirable species such as native, warm-season grasses, sedges and forbs. Trained and qualified

personnel perform all prescribed burns under precise plans. The Refuges have an approved FMP that describes in detail how prescribed burning will be conducted. A burn is conducted only if it meets specified criteria for air temperature, fuel moisture, wind direction and velocity, soil moisture, relative humidity, and several other environmental factors. The specified criteria (prescription) minimize the chance that the fire will escape and increase the likelihood that the fire will have the desired effect on the plant community.

There are two burning seasons on the Refuges. The first burning season starts as soon as spring thawing conditions will allow burning. This is usually in late March or April and extends until May. The second season (fall) starts in late September and continues until fall rains, snow or low temperatures eliminate burning conditions. Refuge staff is currently trying burns in late June to early July on cattail fuels to stress them at their weakest period of the year. How often established units are burned depends on management objectives, historic fire frequency, and funding. The interval between burns may be 2 to 5 years or longer. As part of the prescribed fire program, we will conduct a literature search to determine the effects of fire on various plant and animal species, and we will begin a monitoring program to verify that objectives are being achieved.

Prescribed fires will not be started without the approval of the Regional Fire Management Coordinator when the area is at an extreme fire danger level or the National Preparedness level is V. In addition, we will not start a prescribed fire without first getting applicable concurrence when local fire protection districts or the State of Wisconsin have instituted burning bans. Spot fires and escapes may occur on any prescribed fire. The spot fires and escapes may result from factors that cannot be anticipated during planning. A few small spot fires and escapes on a prescribed burn can usually be controlled by the burn crew. If so, they do not constitute a wildland fire. The burn boss is responsible for evaluating the frequency and severity of spot fires and escapes and, if necessary, slowing down or stopping the burn operation, getting additional help from the Refuge staff, or extinguishing the prescribed burn. If the existing crew cannot control an escaped fire and it is necessary to get help from the Wisconsin DNR or other local fire units, the escape will be classified as a wildland fire and controlled accordingly. Once controlled, we will stop the prescribed burning for the burning period.

3.1.10.2 Fire Prevention and Detection

In any fire management activity, firefighter and public safety will always take precedence over property and resource protection. Historically, fire influenced the vegetation on the Refuges. Now, fires burning without a prescription are likely to cause unwanted damage. In order to minimize this damage, we will seek to prevent and quickly detect fires by discussing fire prevention at safety meetings prior to the fire season and during periods of high fire danger and periodically training staff in fire prevention. The Refuge will also posting warnings at visitor information stations, and notify the public via press releases and personal contacts, during periods of extreme fire danger. Trained staff will investigate all fires suspected of having been set illegally and taking appropriate action. We will also depend upon neighbors, visitors, cooperators, and staff to detect and report fires.

3.1.10.3 Wildfire History

Wildfires were known in this area prior to the establishment of the Refuge in 1941. From 1942 to 2005, 51 wildfires consumed approximately 7990 acres. This is an average of 157 acres per wildfire. Most fires are less than 2 acres or more than 250 acres. The most acres burned was in 1964 when 1900 acres were consumed in three fires. Over this 63 year period, zero to three fires were reported each year except in 1994 when six fires were documented. In addition to the documented fires we know that fires occurred on the refuges that were extinguished by local fire units that did not get documented. From 1970 to 1999, 26 wildfires were documented with lightning causing only two fires while 24 were human caused. Human caused fires include campfire, smoking, debris burning, incendiary, equipment use, railroads and children. The above list of wildfires does not include fires that threatened refuge properties, many of these occur every spring.

The period of highest fire danger occurs from 1 April to 15 May and 1 September to 15 November. Generally, spring rains and vegetative green up have occurred by Memorial Day; in the fall, precipitation and colder temperatures reduce the fire hazard by early November. Horicon NWR contains 17 water impoundments, most of which are surrounded by firebreaks such as a road, trail, dike, ditch or large bay of open water. These firebreaks have reduced widespread wildfires in recent history. However, weather still has the greatest influence on wildfires in this area. A combination of prolonged

drought conditions, lack of winter snow fall or delayed early spring rains can result in wildfire potential.

3.1.10.4 Fire Suppression

We are required by Service Policy to use the Incident Command System (ICS) and have firefighters who meet National Wildfire Coordinating Group (NWCG) qualifications for fires occurring on Refuge property. Our suppression efforts will be directed towards safeguarding life while protecting Refuge resources and property from harm. Mutual aid resources responding from Cooperating Agencies will not be required to meet NWCG standards, but must meet the standards of their Agency. All wildland fires occurring on the Refuges and staffed with Service employees will be supervised by a qualified Incident Commander (IC). The IC will be responsible for all management aspects of the fire. The IC will obtain the general suppression strategy from the Fire Management Plan, but it will be up to the IC to implement the appropriate tactics. Minimum impact suppression tactics will be used whenever possible. As a guide, on low intensity fires (generally flame lengths less than 4 feet) the primary suppression strategy will be direct attack with hand crews and engines. On higher intensity fires (those with flame lengths greater than 4 feet) we may use indirect strategies of back fires or burning out from natural and human-made fire barriers. The barriers will be selected based on their ability to safely suppress the fire, minimize resource degradation, and be cost effective.

3.1.10.5 Wildland Urban Interface

Wildland Urban Interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires, habitat fragmentation, invasive species, and biodiversity decline. FIREWISE is a community safety program developed to educate the public to the wildland urban interface and corrective measures needed. Additional examples include working toward a comprehensive social awareness and support system to inform the public concerning the benefits of management ignition in fire adapted ecosystems.

The size of Horicon NWR, and agricultural uses on adjoining lands, somewhat diminishes the WUI presence but still creates the need to reduce wildland and urban intermix fire threats. The fire management program will mitigate any interface risks

by a combination of mechanical fuels treatments near any buildings and prescribed fire to reduce and eliminate hazard fuel loadings while creating wide buffers around developed areas and adjacent to private property.

3.1.10.6 Mechanical Fuel Treatments

Mechanical fuel reduction is the use of mechanical equipment (i.e. weed whackers, chainsaws, dozers, rubber tired skidders, chippers, mowers, etc.) to cut and remove, or prepare for burning, woody fuels. Mechanical treatments are intended to help in achieving resource management goals and objectives, most often a combination of ecosystem restoration and reduction of high hazard fuel loadings. Mechanical fuel treatments must be described in a fuels project plan. The plan will contain a prescription defining goals, objectives, and treatment methods employed to achieve the objectives.

Mechanical fuel treatment is often used in concert with prescribed fire treatment. High hazard fuel conditions can be reduced while meeting structural objectives in areas immediately adjacent to buildings or on boundary areas through a mix of mechanical treatment and prescribed fire. Mechanical treatment can be used as the primary method of reaching structural goals while prescribed fire actually removes and eliminates the hazardous fuels.

3.1.11 Refuge Recreation

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

3.1.11.1 Hunting

Hunting opportunities on the Refuge include ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer. Closed areas include the viewing area and interpretive displays on Highway 49, the Bud Cook Hiking Area, and a small area around the office/visitor center. The auto tour route/hiking trail complex is closed to all hunting except during the deer gun season; a 600-acre area around the office/visitor center is closed to all hunting except for special hunts for hunters with disabilities; and the former Stensaas unit is closed to all hunting except for youth and novice pheasant hunters. The Refuge is closed to migratory bird hunting, other than a controlled Youth Waterfowl Hunt. State regulations apply to all Refuge hunters, except that currently all seasons close at the end of the deer gun season on the Refuge.

3.1.11.2 Fishing

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

3.1.11.3 Wildlife Observation

Wildlife observation is popular at the Refuge. At least 267 different species of birds have been documented on the Refuge over the years. The Refuge is recognized as both a state and globally important bird area. Between mid-September and mid-November, visitation is at its peak due to the fall migration of over 200,000 geese that use the Refuge as a stopping point in their nearly 850-mile migration to southern wintering areas. The 3-mile paved Horicon Ternpike Auto Tour Route is an excellent place for wildlife observation and receives the highest annual visitation of any sites throughout the Refuge. Many public events and interpretive programs occur on the Refuge that focus on wildlife observation, mainly bird-watching, such as the Horicon Marsh Bird Festival, guided birding tours, and Marsh Melodies.

3.1.11.4 Wildlife Photography

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

3.1.11.5 Wildlife Interpretation

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

adults. Primary topics include the history of Horicon Marsh, habitat management and resource issues.

3.1.11.6 Environmental Education

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

3.2 Fox River National Wildlife Refuge

3.2.1 Introduction

Fox River National Wildlife Refuge consists of 1,004 acres of wetland and upland habitat astride the Fox River in Marquette County, approximately 35 miles west of Horicon National Wildlife Refuge. Fox River NWR was established in 1979 under the U.S. Fish and Wildlife Service's Unique Wildlife Ecosystem Program to protect an area known as the Fox River Sandhill Crane Marsh from further drainage and to preserve associated upland habitat. The Refuge protects an important breeding and staging area for the Sandhill Crane. The majority of the Refuge contains sedge meadow, wet prairie, and shallow marsh wetlands.

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

3.2.2 Climate

As would be expected, given its proximity to Horicon NWR, Fox River NWR's continental climate,

characterized by cold winters and warm summers, is very similar to Horicon's. In the nearby county seat of Montello, July is the warmest month with average highs of 78 degrees Fahrenheit and January the coldest month with average lows of 4 degrees Fahrenheit. Annual precipitation is about 32 inches, with April through September the wettest months. Average snowfall is approximately 40 inches. The median growing season is 144 days.

3.2.3 Topography and Soils

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

3.2.4 Surface Hydrology

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

3.2.5 Archeological and Cultural Resources and Historical Preservation

See the discussion in Chapter 3, "Archeological and Cultural Resources and Historical Preservation" on page 40.

3.2.6 Social and Economic Context

Marquette County, where Fox River NWR is located, is a more rural county than either Dodge or Fond du Lac counties, where Horicon NWR is situated. Table 5 presents data on socioeconomic features of the county in comparison with Wisconsin as a whole.

Marquette County has a substantially smaller population as well as a lower population density than either Dodge or Fond du Lac counties. Its population has declined slightly since 2000, although it grew very

Table 5: Socioeconomic Characteristics Marquette County, Wisconsin¹

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

1. Sources: USCB, 2005c; USCB, 2005d

rapidly in the 1990s, three times as quickly as the state did. Still, the county population density is only one-third of Wisconsin's average density.

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

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

Marquette County are substantially below the state figures (18 percent and 20 percent, respectively).

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

Marquette County ranks consistently among Wisconsin's top five producers of mint oil and Christmas trees and also has significant potato and sweet corn production. The county has a rich history of dairy as well as cash grain crops. It also has several large nursery producers and sod farms. Production of landscape trees and plants as well as landscape and grounds maintenance is rapidly growing segments of

Marquette County's agricultural industry. Greenhouses, tree farms, nurseries, sod farms and other horticultural businesses contribute to the diversity of agriculture in the county.

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

3.2.7 Natural Resources

3.2.7.1 Habitats

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

Another habitat feature which contributes to diversity is a 40-acre upland island in the center of the marsh. This island is generally inaccessible to humans or cattle during the summer and represents an excellent example of an undisturbed climax oak-hickory woodlot.

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

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

Fens are a very rare wetland type in Wisconsin and harbor many state threatened and endangered plants. Shrub-carr thickets are a wetland community

dominated by tall shrubs such as red-osier dogwood, meadow-sweet, and various willows. Canada bluejoint grass is often very common.

Upland habitats consist of closed canopy upland deciduous forest dominated by white, black, and bur oak, upland dry prairie, and oak savanna. Three spring-fed creeks flow through the Refuge, adding to the diversity of the area.

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

3.2.8 Wildlife

3.2.8.1 Birds

The Fox River Marsh is important to nesting Sandhill Cranes and has some of the most productive crane habitat in southern Wisconsin. The marsh supports at least five breeding pairs each year. It is also one of four major staging areas for Sandhill Cranes in southern Wisconsin and is utilized by 300-400 migrating cranes each autumn.

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

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

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

3.2.8.2 Mammals

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

3.2.8.3 Amphibians and Reptiles

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

3.2.8.4 Aquatic Life

Fox River and nearby Buffalo Lake contain an abundance and diversity of fresh water aquatic plant and animal life. Portions of the river and the lake have been chemically treated at times to remove undesirable non-game fish and excessive aquatic vegetation. Game fish included perch, bass and northern pike. Six species of freshwater clams have been reported at the Refuge, providing food for many wildlife species (USFWS, 1979).

3.2.8.5 Threatened and Endangered Species

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

3.2.9 Refuge Recreation

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

The Refuge biologist has given tours of Refuge fens, shallow marshes, oak savannas, and prairies to school groups. Flora and fauna were identified and natural processes such as fire and flooding were discussed. Not only did these school groups learn a lot about the Refuge and the environment, but they had the chance to get their hands dirty and provide wonderful help on the Refuge's 85-acre prairie restoration project (cedar cutting/piling, prairie seed collection, and prairie planting).

Currently, the only staff-unaccompanied public use permitted on the Refuge is deer hunting. The Refuge is open to deer hunting during all state deer seasons in Unit 67A. No Refuge permits are required.

Chapter 4: Environmental Consequences

4.1 Effects Common to All Alternatives at Both Refuges

Specific environmental and social impacts of implementing each alternative are examined according to the five broad issue categories: habitat management, water management, wildlife management, landscape and watershed, and visitor services. However, several potential effects will be very similar under each alternative and are summarized below:

4.1.1 Air Quality

Air quality in much of southern Wisconsin is not particularly good. Graded on a scale from A (Best/Cleanest in the U.S.) to F (Worst/Dirtiest in U.S.) in one evaluation, Dodge, Fond du Lac, and Marquette counties received a “D”. The U.S. Environmental Protection Agency (EPA) has designated a number of counties along the eastern edge of Wisconsin as “non-attainment areas” for ozone. While Dodge, Fond du Lac and Marquette counties are in attainment for ozone, they are close to these non-attainment areas. Ozone (O₃), a primary chemical constituent of smog, forms when volatile organic compounds (VOCs) and oxides of nitrogen (NOx) react in the presence of sunlight. Elevated ozone levels can produce distinctive stippling and chlorosis in sensitive plant species in addition to causing adverse effects on human health.

None of the management alternatives at either refuge would have appreciable, long-term impacts on ambient air quality conditions in the area. At both refuges, habitat management involving prescribed fire would occur under each alternative, but prescribed fire would be used only under ideal weather conditions. Approved smoke management practices developed by state and federal land management agencies would be implemented in all burning events. The gen-

erally low population densities of the farmlands bordering the refuges would help to minimize temporary smoke-related, air quality impacts by reducing the number of potential “sensitive receptors” that could be affected by excessive smoke. Nevertheless, under each alternative at both refuges there would be some potential for temporary air quality impacts from smoke in areas beside the refuges.

Tailpipe emissions from operation of refuge equipment and from visitation to the refuges by the motorist public are negligible in comparison with overall regional emissions.

4.1.2 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives for either refuge described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income popula-

tions. The percentage of minorities in the three counties in which the two refuges are located is lower than in Wisconsin (and much lower than the United States) as a whole. Average incomes and poverty rates within these counties are comparable to other rural counties in the state. Public use activities that would be offered under each of the alternatives at both Horicon and Fox River NWRs would be available to any visitor regardless of race, ethnicity or income level.

4.1.3 Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies, under its direction, that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The increase of carbon dioxide (CO₂) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's "Carbon Sequestration Research and Development" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric CO₂. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. One Service activity in particular – prescribed burning – releases CO₂ directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air. Overall, there should be little or no net change in the amount of carbon sequestered at Horicon or Fox River NWRs from any of the proposed management alternatives. Conversion of closed forest to more open savanna would entail the reduction of standing biomass at Fox River NWR, but this would occur under both alternatives and would not be significant.

Preserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this CCP would preserve or restore land and habitat, and would thus retain existing carbon sequestration on both refuges. This in turn contributes positively to efforts to mitigate human-induced global climate change.

4.1.4 Cultural Resources

The USFWS is responsible for managing archeological and historic sites found on national wildlife refuges. The consequences for cultural resources for each management alternative in this Draft EA are the same.

Undertakings accomplished on the Refuges have the potential to impact cultural resources. Although the presence of cultural resources including historic properties cannot stop a Federal undertaking, the undertakings are subject to Section 106 of the National Historic Preservation Act and sometimes other laws.

Thus the Refuge Manager will, during early planning, provide the Regional Historic Preservation Officer a description and location of all projects, activities, routine maintenance and operations that affect ground and structures, and requests for permitted uses; and of alternatives being considered. The RHPO will analyze these undertakings for potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. The Refuge Manager will notify the public and local government officials to identify concerns about impacts by the undertaking; this notification will be at least equal to, preferably with, public notification accomplished for NEPA and compatibility.

Archeological investigations and collecting are performed only in the public interest by qualified archeologists or by persons recommended by the Governor of Wisconsin working under an Archaeological Resources Protection Act permit issued by the Regional Director. Refuge personnel take steps to prevent unauthorized collecting by the public, contractors, and Refuge personnel; violators are cited or other appropriate action taken. Violations are reported to the Regional Historic Preservation Officer.

4.1.5 Prescribed Fire

Social Implications – A prescribed burn on the Refuges will benefit the public in creating recreational opportunities through increased wildlife

populations for hunting and observation. If a wildland fire occurs on or near the Refuges, the areas that were prescribed burned and the firebreaks intended for prescribed burning will help in controlling the fire. Smoke from a Refuge fire could impair visibility on roads and become a hazard. All efforts will be taken to assure that smoke does not impact smoke sensitive areas such as roads and local residences. The impact of smoke can be reduced through management actions, which include: use of traffic control, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement officers to assist with control traffic. Burning will be done only when the smoke will not be blown across the community or when the wind is sufficient to prevent heavy concentrations.

Combustion of fuels during prescribed fire operations may temporarily impact air quality, but the impacts are mitigated by small burn unit size, direction of wind, and distance from population centers. In the event of wind direction change, mitigation measures will be taken to assure public safety and comfort. Refuge staff will work with neighboring agencies and State air quality personnel to address smoke issues that require additional mitigation. The Prescribed Fire Plan describes specific measures to deal with smoke management problems for each unit. Any smoke from a Refuge may cause some public concern. This concern will be reduced through a concerted effort by Refuge personnel to inform the local citizens about the prescribed burning program, emphasizing the benefits to wildlife and the safety precautions that are taken. Interpretive programs, explaining the prescribed burning program, may also be conducted on and off the Refuges.

Cultural and Archaeological Resources – There may be archaeological sites within prescribed burn units. When these units are burned, it is doubtful that the fire will have any adverse impact on the sites. The fire will be only a temporary disturbance to the vegetation in the area and in no way destroy or reduce the archaeological value, since artifacts are buried beneath the surface. No known sites will be impacted by prescribed burning operations. Constructing firebreaks usually involves some shallow ground disturbance that could damage or destroy these resources. If a firebreak is needed on undisturbed ground, the area will be surveyed prior to construction to protect any cultural or archaeological resources.

Flora – The prescribed burning program will have a visible impact on vegetation and the land. Immediately after a fire much of the land will be blackened. There will be few grasses or ground forbs remaining and most of the brush will be scorched. Trees may be scorched. Because of wet ground conditions or discontinuous fuel, there may be areas within the burn unit that are untouched by the fire. In spring, grasses and forbs will begin to grow within a few days of the burn. The enriched soil will promote rapid growth such that after two or three weeks the ground will be covered. In some cases, young trees will re-sprout. Some of the less fire resistant trees will show signs of wilting and may succumb. After one season of regrowth, most signs of the prescribed burn will be difficult to detect without close examination.

Other signs of the burn will remain for longer periods. The firebreaks will be maintained for use in containing wildland fires and future prescribed burns. Vehicle tracks through the burn are visible on the freshly burned ash and may be longer lived if the vehicle created ruts in the ground. Travel across the burn area will be kept to a minimum. Vehicle travel is necessary in some instances, such as lighting the fire lines or quickly getting water to an escape point. A fire plow will be used only in the event that an escape occurs and cannot be controlled by any other method. The trench of the plow would be repaired by filling, which would eliminate it from view after several years.

Listed Species – Precautions will be taken to protect threatened and endangered species during prescribed burning. Nesting trees for Bald Eagles will be protected and burning will not be conducted at a time or in a way to negatively impact any nesting eagles. If any of the known populations of listed plant species are in or near a burn unit, precautions will be taken to avoid the plants.

Soils – The effect of fire on soil is dependent largely on the fire intensity and duration. On areas with high fuel loads, a slow backing fire is usually required for containment and desirable results. The intense heats generated by a slow backing fire will have a greater effect on the soils than fast, cooler head-fires. The cool, moist soils of wetter areas in the burn units or areas with little fuel will be minimally affected by the fire. The degree of impact to the soil is a function of the thickness and composition of the organic mantle. In cases where only the top layer of the mantle is scorched or burned, there will be no effect on the soil. This usually occurs in

the forested areas of the burn units. On open grassland sites, the blackening of the relatively thin mantle will cause greater heat absorption and retention from the sun. This will encourage earlier germination during the spring growing season. Nutrient release occurs as a result of the normal decomposition process. Fire will speed up the nutrient release process. The rate and amount of nutrients released will be dependent on the fire duration and intensity as well as the amount of humus, duff and other organic materials present in the mantle. The increase, immediately after a burn, of calcium, potash, phosphoric acid and other minerals will give the residual and emergent vegetation a short-term boost. There is no evidence to show that the direct heating of soil by a fire of low intensity above it has any significant adverse affect. Fire of this type has little total effect on the soil, and in most cases would be beneficial.

Peat Fires – An ecological impact that can result from wildfire is ignition of peat soils. Most of the Refuge's wetland soils contain peat varying in depth from a few inches to 6 feet or more. Once started, peat is often difficult to extinguish and can burn down to mineral soils. This can change the vegetation composition in an area. Peat fire suppression efforts can also have an adverse effect on the vegetation through the use of heavy equipment (dozers, fire trucks, etc). Examination of some previously burned areas with prolonged peat fires has shown that the resulting habitat has become exceptional for waterfowl. The burned-out areas created potholes in what were otherwise temporary or cattail-choked wetlands. The damages versus benefits of burning peat will need to be addressed on a case by case basis.

Escaped Fire – The possibility exists that prescribed fire may escape to the surrounding area. An escape can be caused by factors that may, or may not, be preventable. Inadequate firebreaks, too few personnel, unpredicted changes in weather conditions, peculiar fuel type, and insufficient knowledge of fire behavior are factors that can lead to a loss of control. An escaped fire can turn into a very serious situation. On the Refuge's wildlands, an escaped fire would cause less severe damage than on land where buildings, equipment, and land improvements could be damaged. Many of the prescribed burn areas are well within the Refuges and of minimal threat to private or other improved lands. We will exercise extreme care, careful planning, and adherence to the unit prescription when we conduct all prescribed burns. We will place an extra emphasis on control

when burning areas that are near developed areas or the Refuge boundary.

In the event that a prescribed fire does jump a firebreak and burn into unplanned areas, there is a high probability of rapid control with minimal adverse impact. In general, prescribed burns will have light fuel loads (0.25 to 3 tons of fuel per acre), will be burned under low fuel moisture conditions, and will be burned under specific wind direction and atmosphere stability conditions. The network of firebreaks and roads will greatly assist in rapid containment. In most cases all of the Refuge fire fighting equipment will be immediately available at the scene with all nearby water sources previously located. The applicable WIDNR fire suppression crews and local fire departments will always be notified of a prescribed burn. Thus, maximum numbers of experienced personnel and equipment are immediately available for wildfire suppression activities.

4.1.6 Other Common Effects

None of the alternatives at either Refuge would have more than negligible or at most minor effects on soils, topography, noise levels, land use patterns in and around the Refuges, transportation and traffic, waste management, human health and safety, or visual resources.

4.2 Horicon National Wildlife Refuge

4.2.1 Alternative A – Current Management Direction (No Action)

Under the No Action Alternative – Alternative A – nearly all of the Refuge's uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. This restoration of a habitat that has been in regional decline is a positive effect in and of itself and it would also represent a beneficial impact for nesting grassland birds and waterfowl. The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of preventing the spread of these species, which tend to supplant native flora and reduce habitat value for wildlife. The pro-

posed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

This alternative would continue to manage water impoundments to provide a variety of water conditions for waterbirds including ducks, geese, shorebirds, and wading birds during spring, summer, and fall. Water management is conducted on 17 impoundments or approximately 17,000 acres of wetland habitat. It is expected that habitat benefits to these birds would continue under Alternative A.

Landscape and watershed involvement by Service employees would continue to be limited due to staffing constraints. This alternative would not rigorously address the serious, long-term threat Horicon Marsh faces from sedimentation. Thus, it is reasonable to assume that for the duration of the CCP, sedimentation rates would continue unabated and the Marsh would continue to fill in, to its detriment and the detriment of the water-associated birds that depend on it. Excessive nutrient and sediment inflow would continue to aggravate the ongoing spread of thick cattail stands of limited utility to wildlife. In essence, pursuing the Current Management Direction Alternative would not affect the inevitable “day of reckoning” with regard to sedimentation’s long-term impacts on wetland habitat quality in the marsh.

This alternative would not advance the Region’s interest in promoting Regional Conservation Priority Species. If any of these species were to become established and thrive on the Refuge, it would not be from any proactive measures on the Refuge’s part.

Horicon NWR’s deer population may increase somewhat under Alternative A, due to the proposed increase in grasslands and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Wildlife/auto collisions along Highway 49 in the northern part of Horicon Marsh would continue at approximately current levels under this alternative, which would not propose or implement any new mea-

asures to reduce mortality along that corridor. This mortality would represent a continuing source of downward pressure on populations of various species, though whether this would be to a decisive extent is unknown.

The Current Management Direction Alternative would maintain existing hunting opportunities on the Refuge, including hunts for ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer. Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge’s boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Existing fishing facilities and opportunities would also be maintained. These are limited to Main Dike Road, Ledge Road and Peachy Road. Main Dike Road and Ledge Road would continue to have accessible fishing piers on location but lack welcome kiosks. Game fish would continue to be stocked each year at various locations throughout the Refuge. One youth fishing event would be held on the Refuge in celebration of National Fishing Week. The impact of this alternative on fishing would be neither beneficial nor adverse.

The Refuge’s active environmental education, interpretation, and outreach programs would all continue as they are at present under Alternative A.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under this alternative, meeting the Service’s obligation to protect these irreplaceable assets.

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

Under Alternative B – A Free-Flowing Rock River – which is the preferred alternative and the basis for the CCP, nearly all of the Refuge’s uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. Upland habitat management objectives and strategies proposed under Alternative B are essentially identical to those of Alternative A. Restoration of native grasslands and oak savanna, which have been in regional decline, are positive outcomes in and of themselves. This restoration, if fully implemented, would also represent a beneficial impact for nesting grassland birds and waterfowl.

The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed, intensified control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of reducing the size of current infestations of these species, which tend to supplant native flora and reduce habitat value for wildlife. Reducing 50% of current invasive plant infestations and preventing new ones during the life of the CCP would open niches for native flora and benefit the wildlife that depend on it. The proposed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

This alternative would seek to re-establish a braided river system flowing into the north end of the Horicon Marsh. The radial gate would remain open so that the marsh is managed as an open system. In theory, this should facilitate flushing nutrients and sediments out of the Marsh, which in turn would help reduce the accretion of sediments and the spread of dense cattail stands that now threaten to eliminate open water areas and patchy hemi-marsh. By practicing adaptive resource management, Service and Refuge staff can monitor changes in water and sediment levels and cattail distribution, density and abundance. Depending on the behavior of the system, management strategies could be experimented with or adjusted to continue aiming for an expansion in acreage of open water and hemi-marsh.

Under Alternative B, water management would continue on the 16 sub-impoundments as in Alternative A. These sub-impoundments would continue to produce seasonal habitats and food sources for waterfowl, shorebirds, and wading birds.

The proposed increase in landscape and watershed involvement by staff and partners to pursue the dual objectives of reducing sedimentation and improving water quality in the Horicon Marsh may succeed, but it is impossible to predict how successful this will be. The technical approaches needed to succeed are generally well-known, but developing the trust and positive working relationship with the agricultural community – as well as the financial or other incen-

tives for farmers – needed to reduce erosion, sedimentation and nutrient loss will require patience and dedication extending over decades.

This alternative would actively advance the Region's interest in promoting Regional Conservation Priority Species. Horicon NWR would explicitly seek to introduce or assist priority species that historically occurred in the area. Over a 15-year period, these efforts would likely improve the status of various priority species in the state and region.

Horicon NWR's deer population may increase somewhat under Alternative B, due to the proposed increase in grasslands and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Under Alternative B, a number of strategies are proposed to address the problem of wildlife/auto collisions along State Highway 49. Several of these can be pursued concurrently. The most costly and politically challenging solution – relocation of Hwy. 49 – would be the most effective one in reducing collisions and mortality, but also the one least likely to occur within the 15-year life of the CCP. Other strategies are more feasible but would probably be less successful in cutting down on the number of collisions.

The Preferred Alternative would maintain existing hunts for ring-necked pheasant, gray partridge, cottontail rabbit, squirrel, and deer as well as modestly increase hunting opportunities on the Refuge. The addition of a spring wild turkey hunt would benefit hunters. As in Alternative A, Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge's boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Under Alternative B, fishing would continue not to be a main public use emphasis at Horicon NWR. Existing, fairly small fishing facilities and opportunities would be maintained and slightly increased under this alternative. The impact of this alternative on sport fishing would be modestly beneficial.

The Refuge already has active environmental education, interpretation, and outreach programs. Under the Preferred Alternative, each would continue

approximately as they are at present, so that this alternative would not have any impacts, positive or negative, on these programs.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under this alternative, meeting the Service's obligation to protect these irreplaceable assets.

4.2.3 Alternative C: The Big Pool

Alternative C would seek to manage the majority of Horicon Marsh, approximately 10,845 acres, as one large waterbody. The main dike would be removed and the natural sinuosity of the Rock River would be encouraged. The removal of the southern dam, operated by the WIDNR, would also be explored. The problem of marsh sedimentation would be solved under this alternative by dredging the main channel. The nutrient-rich dredge spoil could be sold to farmers within the watershed to enhance depleted cropland soils. Water management control would still exist on 16 sub-impoundments or approximately 5,000 acres of wetland habitat.

Under Alternative C, as with Alternatives A and B, nearly all of the Refuge's uplands, or 5,000 acres, would continue to be restored and maintained as the open grasslands and oak savanna that were prevalent prior to Euro-American settlement. Upland habitat management objectives and strategies proposed under Alternative C are essentially identical to those of Alternatives A and B. Restoration of native grasslands and oak savanna, which have been in regional decline, are positive outcomes in and of themselves. This restoration, if fully implemented, would also represent a beneficial impact for nesting grassland birds and waterfowl.

The projected increase in grassland parcel sizes from the removal of trees along old fencerow and lanes would also be beneficial, because it would reduce the adverse effects of habitat fragmentation. The proposed, intensified control of invasive plant species using a variety of chemical, mechanical and biological methods would have the beneficial result of reducing the size of current infestations of these species, which tend to supplant native flora and reduce habitat value for wildlife. Reducing 50 percent of current invasive plant infestations and preventing new ones during the life of the CCP would open niches for native flora and benefit the wildlife that depend on it. The proposed thinning of woodlands and/or removal of invasive species would help maintain stand health and the resulting increased amount of light penetrating to lower levels in the forest would trigger greater

growth in the sub-stories below the canopy; this in turn would benefit terrestrial wildlife that feed on shoots, leaves, flowers, fruits, nuts, grass and forbs, all of which are in short supply in the understory and ground levels of closed canopy forests.

As stated above, under the Big Pool Alternative, the main dike would be removed and the natural sinuosity of the Rock River would be encouraged. In theory, both these steps should facilitate flushing nutrients and sediments out of the Marsh, which in turn would help reduce the accretion of sediments and the spread of dense cattail stands that now threaten to eliminate open water areas and patchy hemi-marsh. An additional step, dredging the Marsh as necessary to remove accumulated sediments, would be highly beneficial – perhaps even indispensable – to restoring habitat values and maintaining the marsh over the long term. However, dredging would be expensive and the measure proposed to offset this cost – sale of dredge spoil to farmers – must be regarded as speculative, though it certainly holds promise.

Under Alternative C, water management would continue on the 16 sub-impoundments as in Alternatives A and B. These sub-impoundments would continue to produce seasonal habitats and food sources for the benefit of waterfowl, shorebirds, and wading birds.

Under this alternative, as in Alternative B, the proposed increase in landscape and watershed involvement by staff and partners to pursue the dual objectives of reducing sedimentation and improving water quality in the Horicon Marsh may succeed, but it is impossible to predict how successful this will be. The technical approaches needed to succeed are generally well-known, but developing the trust and positive working relationship with the agricultural community – as well as the financial or other incentives for farmers – needed to reduce erosion, sedimentation and nutrient loss will require patience and dedication extending over decades.

Like Alternative B, Alternative C would also actively advance the Region's interest in promoting Regional Conservation Priority Species. Horicon NWR would explicitly seek to introduce or assist priority species that historically occurred in the area. Over a 15-year period, these efforts would likely improve the status of various priority species in the state and region.

As in the first two alternatives, Horicon NWR's deer population may increase somewhat under Alternative C, due to the proposed increase in grasslands

and oak savanna habitat, which are more favorable to their food needs than closed woodland. However, through hunting, the population density of the deer herd would be controlled to approximately current levels of 15-20 per square mile. Deer numbers would not be allowed either to decrease substantially or to increase to such an extent that they are damaging habitat.

Under Alternative C, as in Alternative B, a number of strategies are proposed to address the problem of wildlife/auto collisions along State Highway 49. Several of these can be pursued concurrently. The most costly and politically challenging solution – relocating Hwy. 49 outside the Refuge – would be the most effective one in reducing collisions and mortality, but also the one least likely to occur within the 15-year life of the CCP. Other strategies are more feasible but would probably be less successful in cutting down on the number of collisions.

Alternative C would maintain existing hunts for Ring-necked Pheasant, Gray Partridge, cottontail rabbit, squirrel, and deer as well as modestly increase hunting opportunities on the Refuge. The proposed addition of a spring wild turkey hunt would benefit hunters. As in Alternative A, under Alternative C Horicon NWR would continue as a migratory bird sanctuary, with no hunting of ducks or geese permitted, although these may be hunted just outside the Refuge's boundaries. The one exception to this sanctuary would be a supervised youth waterfowl hunt to be held on three weekend days during the season.

Under Alternative C, fishing would continue not to be a main public use emphasis at Horicon NWR. Existing, fairly small fishing facilities and opportunities would be maintained and slightly increased under this alternative. The impact of this alternative on sport fishing would be modestly beneficial.

The Refuge already has active environmental education, interpretation, and outreach programs. Under Alternative C, each would continue approximately as they are at present, so that this alternative would not have any impacts, positive or negative, on these programs.

Standard procedures now used to ensure that cultural resources are protected would continue to be used under Alternative C, meeting the Service's obligation to protect these irreplaceable assets.

Table 6 summarizes and compares the impacts of each of the Horicon NWR management alternatives evaluated in this EA.

4.2.4 Cumulative Impacts Analysis

“Cumulative environmental impacts” refer to effects that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impact of each alternative is discussed in terms of Horicon Marsh sedimentation and environmental education.

Horicon Marsh began filling in with sediments the moment farmers dragged plows across virgin prairie and converted oak savanna to cultivated fields in the drainage area of the Rock River upstream of the Refuge. Conducted on tens of thousands of acres, these soil and sod disturbing agricultural activities inevitably exposed soils to wind, rainfall, erosion and subsequent sedimentation in water courses down-slope. Because it is a basin with little or no gradient, Horicon Marsh is filling in with the materials deposited by the Rock River, which loses kinetic energy when flowing across the Marsh's flat surface and can no longer transport its sediment load, thus depositing it in the Marsh. This deposition and gradual filling in is a natural process, one that is repeated across the planet and one that has occurred for millions of years. The problem is that human activities in the watershed have accelerated this natural process by at least an order of magnitude.

Alternative A, the No Action or Current Management Direction Alternative, would continue to not actively intervene in the processes by which sediment is generated from the agricultural activities of the watershed. These are gradually resulting in the Marsh's disappearance and its succession from a marsh that includes open water and hemi-marsh through a dense cattail phase with less and less open water, and ultimately, to a wet and then a semi-wet meadow. The loss of marshland over the long term under this alternative would represent a long-term, cumulative adverse impact to waterfowl, shorebirds, wading birds and other water-dependent avifauna.

Alternative B – a free-flowing Rock River and the preferred alternative – aims to interrupt the historic pattern of erosion and sedimentation that threaten the Marsh's values. Whether this alternative actually enables the river to flush out the nutrients and sediments now being deposited will await the results of long-term monitoring of water levels and volumes in the Marsh and the relative areas of open water and

Table 6: Summary of Environmental Consequences for Management Alternatives for Horicon National Wildlife Refuge

Issue	Alternative A Current Direction (No Action)	Alternative B A Free-flowing Rock River (Preferred Alt.)	Alternative C The Big Pool
Oak Savanna Habitat	Increase over current acreage	Same as Alt. A	Same as Alt. A
Marsh /Open Water Habitat	Continues to degrade at current rate from sedimentation and cattail growth	More natural water flow regime established; encroachment of cattails curtailed	Similar to Alt. B but likely on larger scale
Mudflats for Shorebirds	Maintains current acreage and mgmt.	Same as Alt. A	Same as Alt. A
Sedimentation of Marsh	Continues or accelerates	Likely to continue but at reduced rate from Alt. A	Sedimentation would continue as in Alt. B, but periodic dredging would hold in check
Invasive Plant Species	Would continue to be controlled but not eradicated	Infestations reduced from current levels	Same as Alt. B
Regional Conservation Priority Species	Occurrence on Refuge incidental	Would be assisted by greater Refuge efforts	Same as Alt. B
Deer Population	Hunting continues to control at density of 15-20 per square mile; oak savanna restoration may increase carrying capacity	Same as Alt. A	Same as Alt. A
Wildlife/Auto Collisions	High mortality continues along Hwy. 49	Reduced collisions and mortality along Hwy. 49	Same as Alt. B
Hunting	Existing hunting opportunities maintained	Hunting opportunities expanded slightly	Same as Alt. B
Fishing	Limited fishing opportunities continue	Modestly expanded fishing facilities and opportunities	Same as Alt. B
Wildlife Observation and Photography	Current emphasis and high level of public participation continue	Slight increase in current high emphasis and public participation	Same as Alt. B
Environmental Education and Interpretation	Current high levels of both EE and interpretation are maintained	Same as Alt. A	Same as Alt. A
Cultural Resources	Current levels of protection maintained	Same as Alt. A	Same as Alt. A

hemi-marsh. If successful in achieving its aims, Alternative B would lessen and perhaps reverse cumulative impacts on the Marsh.

Alternative C – The Big Pool – also aims to interrupt the historic pattern of erosion and sedimentation that threaten the Marsh’s values. As with Alternative B, if successful in achieving its aims, Alternative C

would reduce and maybe reverse cumulative impacts of excessive sedimentation in Horicon Marsh. Whether it actually succeeds will depend both on wetland and riverine functioning as well as whether funds can be obtained to dredge the Marsh and the agricultural community can be convinced to buy or at least receive dredged materials.

Environmental education (EE) is provided by a variety of institutions inside and outside of the formal classroom. In addition to K-12 public schools, in which environmental education is generally included under the life and physical sciences, especially biology, but also within chemistry, geography, civics, and history, museums, zoos, parks, libraries, television and the news media (e.g., newspapers, magazines, the Internet) all contribute to improving environmental education for American students and citizens. As a result of the cumulative impact of these combined efforts, in recent decades the average American's level of environmental knowledge and awareness appear to have gradually increased.

At present, Horicon NWR provides a substantial amount of environmental education on and off the Refuge. The Refuge has one full-time staff person – the Visitor Services Specialist – who is responsible for environmental education, interpretation, and outreach, as well as promoting and managing other compatible public uses on the Refuge. These efforts are focused primarily on wildlife, habitat, and water management, which is appropriate for a national wildlife refuge. Efforts and results are somewhat constrained by staffing and budgetary limitations; Horicon NWR is not able to dedicate one entire staff person's efforts to environmental education; rather it is a collateral duty of the Visitor Services Specialist. Efforts include both on and off-Refuge educational activities. Under all three alternatives, this would continue to be the case. All three alternatives, then, would equally continue to make a contribution to overall environmental education efforts in the region for the public at large, and especially for the school-aged population. The ongoing EE program would likely lead to a concomitant cumulative, beneficial impact on the level of environmental knowledge and awareness in the citizens of south-central Wisconsin.

4.3 Fox River National Wildlife Refuge

4.3.1 Alternative A – Current Management Direction

The Current Direction Alternative would continue with ongoing restoration and management activities on Refuge wetlands and uplands. These activities aim to create a mosaic of habitat conditions that were present prior to European settlement, in particular dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow emergent marsh wetlands. Once

reestablished, these habitats would then be managed to perpetuate a variety of native plant and wildlife species, especially those of priority to the Service. If successful, these restoration and management efforts would represent a benefit for biodiversity in Wisconsin, in that each one of the habitats in question has suffered declines since Euro-American settlement and conversion of natural habitats into agricultural lands in the region began in earnest more than a century ago.

However, restoring these habitats would render much larger ecological benefits – especially to wildlife – if the areas involved were larger. The small size of Fox River NWR limits the likely extent of benefits that would actually occur. Advances in the field of island biogeography in the last 20-30 years have demonstrated that intact ecosystems and self-sustaining populations of the species that comprise them, especially wider-ranging, larger animals with larger spatial requirements, simply cannot endure over the long run without sufficient area. Nevertheless, over the long run, the Fox River NWR habitat restoration efforts may serve to instigate other efforts on state and private-owned tracts in the area, and thus have a positive cumulative effect.

The above discussion assumes that funding, expertise and personnel would be available to continue to implement habitat restoration and hold encroachment by other habitat types or even natural succession in check.

Proposed invasive species control efforts would also help to preserve the integrity of native habitats.

The only visitor services provided by the Current Direction Alternative would be an annual deer hunt. The Refuge would continue to be closed to unsupervised visitors the remainder of the year, although there would continue to be a small number of Service-led educational excursions for students. Thus, this alternative would not allow for any increase in the six priority public uses of national wildlife refuges, or any other forms of consumptive or non-consumptive outdoor recreation.

With regard to facilities and administration, there would continue to be no facilities on the Refuge, and it would continue to be administered entirely from Horicon NWR. Thus, there would be no additional Service presence on the Refuge to serve as a deterrent to would-be law breakers, deal with enforcement issues, or to assist and work with visitors and Refuge neighbors. There would continue to be limited participation in pursuing the Refuge's goals, objectives and strategies by partners and volunteers.

4.3.2 Alternative B: Historic Habitat Conditions and Enhanced Visitor Services

The impacts of Alternative B on habitat and wildlife populations would be very similar to those of the Current Management Direction (Alternative A), because the objectives and strategies are almost identical. The one area in which there may be differences concerns Regional Conservation Priority (RCP) Species. More of an emphasis on restoring those wildlife species that originally occurred in this area and that were extirpated sometime over the last century or that have become regionally scarce would be made under Alternative B than in Alternative A. This greater emphasis could further the Service's mission to serve as a steward of the nation's living resources.

Alternative B would include more opportunities for wildlife-dependent recreation on the Refuge than Alternative A, including additional hunting opportunities, the initiation of a fishing program, new wildlife observation and photography opportunities, and the beginning of an environmental education and interpretation program. All of these would represent benefits for the public.

Specifically, initiating a spring season for wild turkeys and ice fishing on Refuge water bodies would benefit local hunters and anglers. If the proposed Wisconsin Ice Age State and National Trail segment were to be built across Refuge lands, it could serve Refuge visitors by providing access for wildlife observation and photography, hunting, and environmental education and interpretation.

Refuge staffing would likely remain limited and insufficient under Alternative B, although the possible addition of a part-time position dedicated to the Refuge would help management. Overall, however, Refuge facilities and administration would change little under Alternative B. Table 7 summarizes the impacts of the two proposed management alternatives by issue.

4.3.3 Cumulative Impacts Analysis

"Cumulative environmental impacts" refer to those that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impact of each alternative

is discussed in terms of two rare wetland habitats: fens and sedge meadow.

Fens are an open wetland type found in southern Wisconsin; they are often underlain by a calcareous substrate, through which carbonate-rich groundwater percolates. Some fens have significant prairie or sedge meadow components, and intergrade with those communities. Calcareous fens are the rarest wetland plant community in Minnesota and Wisconsin, and perhaps one of the rarest in North America. Only a select group of calcium-tolerant plants, known as calciphiles, can tolerate the extreme conditions found in fens. Characteristic species include shrubby cinquefoil, sterile sedge, wild timothy, beaked spike-rush, Ohio goldenrod, common valerian and lesser fringed gentian. Fen communities in general have a disproportionate number of rare, threatened, and endangered plant species compared to other plant communities in the Great Lakes Region. Over the past century, fens have declined in area not only in the Great Lakes Region of North America, but throughout much of the continent and indeed, over in Europe as well.

Although they have declined generally, sedge meadows are still widespread in southern Wisconsin. This open wetland community is dominated by sedges and grasses, most typically tussock sedge and Canada bluejoint grass. Common associates are water-horehound, panicled aster, blue flag, Canada goldenrod, spotted joe-pye-weed, broad-leaved cat-tail, and swamp milkweed. Reed canary grass may be dominant in grazed and/or ditched stands. Ditched stands can succeed quickly to Shrub-Carr.

Both Alternative A and Alternative B, by providing 100 acres and 600-650 acres of fen and sedge meadow habitats, respectively, would contribute incrementally in a beneficial way toward efforts to reverse the historic loss of these two wetland habitats.

Table 7: Summary of Environmental Consequences for Management Alternatives for Fox River NWR

Issue	Alternative A Current Direction (No Action)	Alternative B Historic Habitat Conditions & Enhanced Visitor Services (Preferred Alt.)
Oak savanna habitat	Increase over current acreage	Same as Alternative A
Grasslands	Increase over current acreage	Same as Alternative A
Fen and wet prairie	Increase over current acreage	Same as Alternative A
Sedge meadow and shallow emergent marsh	Increase over current acreage	Same as Alternative A
Invasive plant species	Would continue to be controlled but not eradicated	Same as Alternative A
Regional Conservation Priority Species	Occurrence on Refuge incidental	Would be assisted by greater Refuge efforts
Deer population	Hunting continues to control at density of 15-20 per square mile; oak savanna restoration may increase carrying capacity	Same as Alternative A
Land conservation	Additional lands conserved within and near Refuge	Same as Alternative A
Hunting	Existing deer hunting opportunities maintained	Hunting opportunities expanded by adding spring wild turkey hunt
Fishing	Fishing continues to be prohibited	Modestly expanded fishing opportunities (ice fishing on Long Lake)
Wildlife Observation and Photography	Refuge continues to be closed to wildlife observation and photography	Observation and photography opportunities would increase
Environmental Education and Interpretation	Current low levels of EE and interpretation would be maintained	Same as Alternative A
Administration and Logistics	Continued management from Horicon NWR signifies low Service profile on Refuge	Similar to Alternative A but possible increase in volunteers, partners, and part-time staff
Cultural Resources	Current levels of protection maintained	Same as Alternative A

Chapter 5: List of Preparers

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, former Wildlife Biologist, Fox
River National Wildlife Refuge

Regional Office Staff:

Gary Muehlenhardt, Wildlife Biologist/Refuge
Planner, Region 3, USFWS

Gabriel DeAlessio, Biologist-GIS, Region 3,
USFWS

H. John Dobrovolny, Regional Historical
Preservation Officer, Region 3, USFWS

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

Mangi Environmental Group:

Leon Kolankiewicz, Biologist/Environmental
Planner/Consultant

Chapter 6: Consultation and Coordination With Stakeholders

The Service and Refuges have conducted extensive consultation and coordination over several years with stakeholders in developing the CCP and EA for Horicon and Fox River national wildlife refuges. In the course of scoping and focus group meetings for the two refuges, the Service consulted with more than two dozen individuals representing Wisconsin DNR, conservation organizations, neighboring communities, Refuge users, and other stakeholders. See Chapter 2 of the CCP for a more detailed description of the process and Appendix H for a listing of contacts.