

Chapter 4: Refuge Management

Horicon National Wildlife Refuge

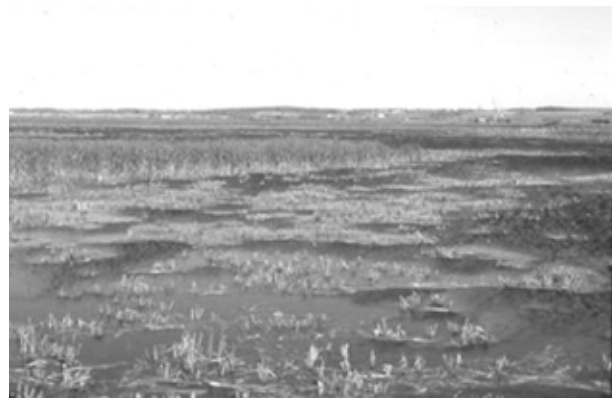
Future Management Direction: Tomorrow's Vision

Refuge Vision

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

Goals, Objectives and Strategies

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



Horicon NWR

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

Goal 1: Wildlife

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

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

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

Objective 1.1: Deer Population

Annually, maintain Refuge deer population consistent with State Management Unit 68A and 68B at a density of 15-20 deer per square mile based on annual winter surveys. The allowable deer density can be modified based on the health of the herd and/or changes in state regulations.

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

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

Strategies:

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

Objective 1.2: Wildlife-Vehicle Collisions

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

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

Strategies:

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

Objective 1.3: Over-abundant Fish and Wildlife Species

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

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

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

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

Strategies:

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

Objective 1.4: Regional Conservation Priority (RCP) Species

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

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

Strategies:

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

Goal 2: Habitat

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

Discussion: The Refuge has both inherited and contributed to an altered landscape with vegetation communities different from those that existed during the pre-settlement era (Figure 3 on page 8). The habitat goal seeks to restore natural landscapes and processes, to the extent feasible, within the constraints imposed by the



Wetland tour, Horicon NWR

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

Objective 2.1: Restoration of Natural Watercourses

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

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

A larger radial gate, a water control structure, and several spillways along Dike Road will be installed. Refuge staff will remove or breach the spoil piles and plug lateral ditches. As a result of these management actions, water from springs and surface flow will move evenly across the marsh. This sheet flow should reduce cattail growth and flush excess nutrients, such as phos-

phorus, from the marsh. Daily inflow from the Rock River will also be passed through the new radial gate instead of holding water as in the past. The result will be a more open, healthy Horicon Marsh with better-quality wildlife habitat. However, the area may not change for many years since the monotypic stand of cattail could continue to act similarly to how the lateral ditches are presently acting. Benefits will be evident in the long term, although fire control will be more difficult with the loss of the lateral ditches.

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

Strategies:

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

Objective 2.2: Managing Water Impoundments

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

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

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

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

Strategies:

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

Objective 2.3: Exotic and Invasive Species Control

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

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

Strategies:

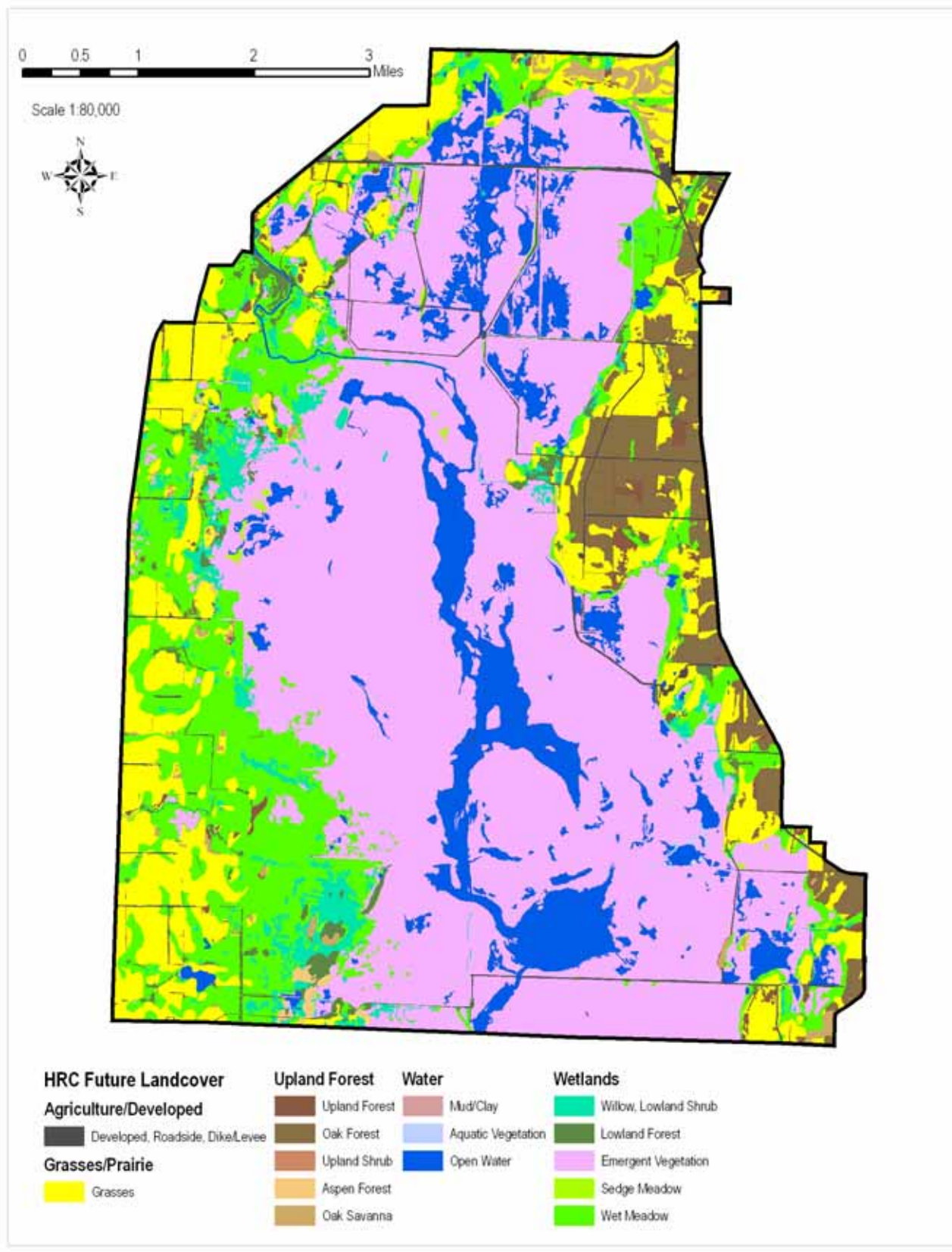
1. Document the location and size of invasive populations on the Refuge with GIS mapping.
2. Use biological control when available as a preferred strategy.
3. Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed.
4. Use fire and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

Objective 2.4: Oak Savanna

By 2012, restore and maintain 100 acres of oak savanna in the uplands on the west side of the Refuge to benefit regional habitat diversity and grassland-dependent wildlife species. Restoration efforts will target mature habitats that within 75-100 years will have 10-50 percent tree canopy closure, 5-35 percent relative cover of shrubs, and at least 50 percent relative cover of diverse native grasses and native forbs (Figure 12).

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

Figure 12: Future Habitat Conditions of Horicon NWR



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

Strategies:

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

Objective 2.5: Grasslands

By 2020, restore and manage 500 to 1,000 acres of upland grasslands, primarily native dry tallgrass prairie, to benefit declining wildlife species that depend on this habitat type including Bobolinks, Grasshopper Sparrow and Eastern Meadowlark. Grasslands are characterized by less than 10 per-



Aquatic buttercup, Horicon NWR

cent canopy closure, less than 5 percent shrub cover, and a diverse native grass and forb species mix.

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

Strategies:

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

Objective 2.6: Sedimentation of Horicon Marsh

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

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

Excessive sedimentation and the accumulation of pollutant chemicals, primarily the nutrient phosphorous, is a major challenge to the management of Refuge wetlands and moist soil units. The Horicon Marsh is literally filling up with soil and dense vegetation stimulated by excessive nutrient levels.

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

Strategies:

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



Deer hunter on Horicon NWR.

6. Work with water experts, such as hydrologists, groundwater specialists, and other water specialists, on the problems and solutions for the Rock River basin.
7. Cooperate with local government land use planning efforts to ensure that water quality impacts to the Refuge are considered.
8. Continue to stress the importance of water quality in public information and interpretation, and environmental education programs.

Goal 3: People

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

Objective 3.1: Hunting

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

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

Strategies:

1. Small game: Upon revision of the Refuge Hunt Plan, Pheasant, Gray Partridge, rabbit

and squirrel hunting will be expanded to include the entire state season and state bag limits. In order to avoid migratory bird disturbance, the season will have a delayed opening of December 1 on designated dikes north of Ledge Road.

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

Objective 3.2: Fishing

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

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

Strategies:

1. Open all three fishing sites to ice fishing (Figure 13).

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

Objective 3.3: Wildlife Observation and Photography

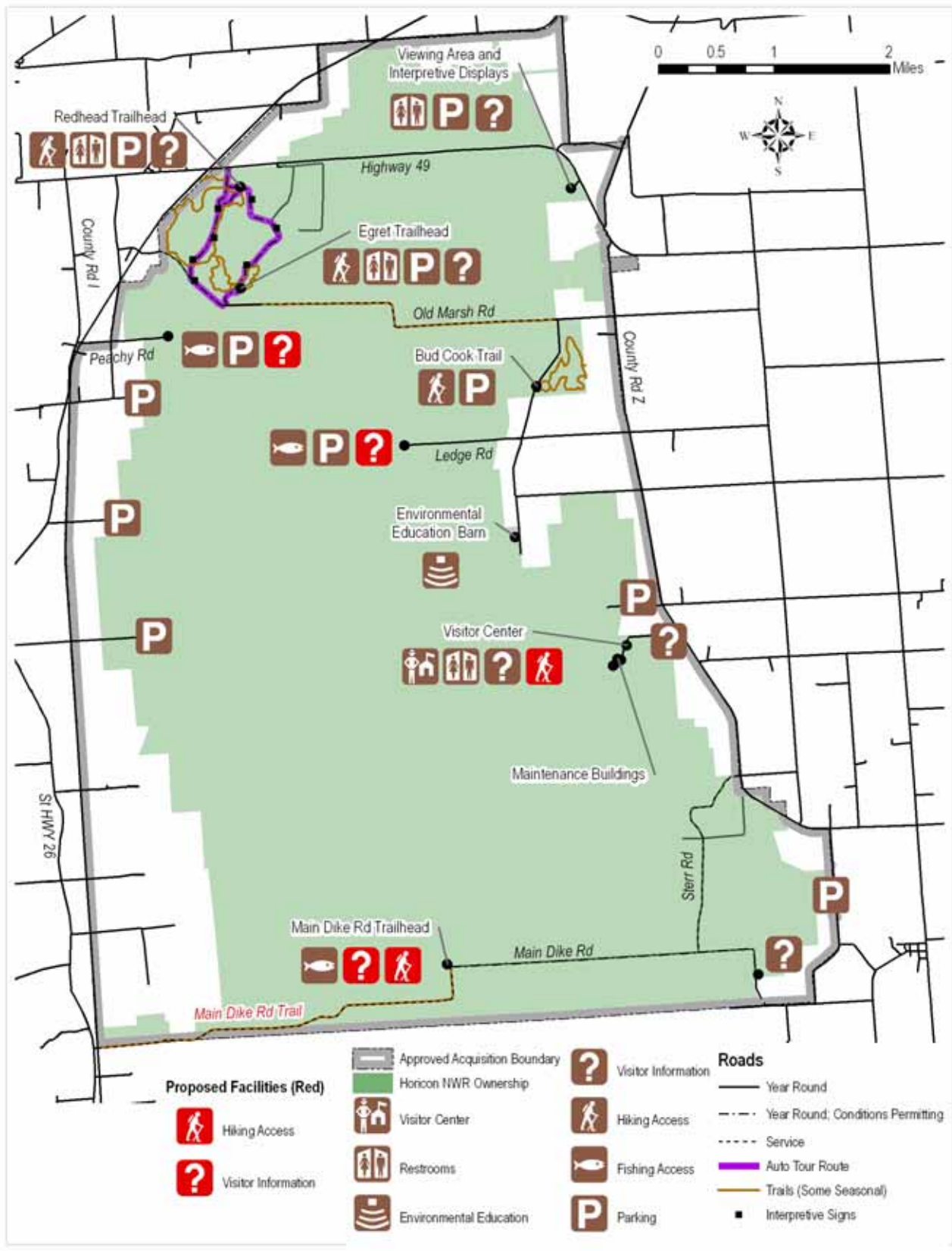
Provide year-round opportunities for up to 400,000 visitors annually to observe and photograph wildlife and habitat.

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

People walking and riding bicycles along Refuge trails and dike roads cause some disturbance to wildlife. Resting waterfowl may flush and move to other areas and birds sitting on a nest may temporarily leave. Overall, disturbance is limited to a small portion of the entire Refuge. The following strategies to increase wildlife observation and photography would cause only minor disturbance to wildlife because the open areas and designated times were determined on the basis of wildlife needs. However, entry on all or portions of designated routes may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Chapter 5 of this CCP lists a proposal to conduct an in-depth evaluation of the Refuge's visitor services programs and the effects of visitor use on wildlife. This work would be completed through a contract with a local university. This study would provide staff with information on the impacts of activities on closed and open areas of the Refuge and may lead to adjustments in specific strategies.

Figure 13: Proposed Visitor Facilities, Horicon NWR



Strategies:

1. Develop the Highway 49 overlook/comfort station for better wildlife observation and promote the use of the site.
2. Open most of the Refuge roads and trails to wildlife observation and photography via cross country skiing, hiking, and bicycling from December 1 through March 15.
3. Extend the auto tour route season to be open year-round, weather conditions permitting. The Refuge does not intend to plow the route after significant snowfall.
4. Open Main Dike Road east of the water control structure year-round, conditions permitting, to automobiles, foot, and bike traffic.
5. Open Main Dike Road west of the fishing site year-round to foot and bike traffic for wildlife observation and photography.
6. Open Old Marsh Road every weekend in June, July, and August to foot and bike traffic for wildlife observation and photography.
7. Open a specific area on the west side and east side of the Refuge to foot traffic for year-round wildlife observation and photography.
8. Install two permanent or temporary photo blinds on the Refuge.
9. Develop an interpretive loop trail from the visitor center.
10. Due to maintenance concerns and low visitor use, reduce the length of the Bud Cook Trail.
11. As part of the Visitor Services Plan, the trail system will be evaluated to ensure that trails meet resource goals and are accessible to all visitors.
12. Document current use of the Environmental Education Barn and determine if use justifies the future cost of maintenance.

Objective 3.4: Environmental Education and Interpretation

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

Discussion: Horicon NWR has a long history of providing environmental education and interpretation opportunities for thousands of visitors each year. In 2005, 100 on-site environmental education programs by school groups occurred on the Horicon NWR. However, school budgetary prob-

lems have made maintaining even the existing level a serious challenge. The Refuge currently has only one person to handle all responsibilities of the visitor service program, including promoting and conducting environmental education and interpretation.

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

Strategies:

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

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

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

Objective 3.5: Community Outreach

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

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

Strategies:

1. Offer training programs for teachers centered on the Refuge's place in the ecological landscape, the importance of habitat management, and the objectives in this plan.
2. Support an active volunteer program which includes recruitment and training of volunteers for assistance in Refuge programs.
3. Participate in off-site community events.
4. Issue regular news releases and improve the Information Dissemination System for distributing news releases.
5. Maintain and update a Refuge website with current information about Refuge management and events.
6. Increase community partnerships.
7. Work closely with the Friends of Horicon NWR to foster understanding and mutual priorities.
8. Develop outreach plans for important resource issues.

Objective 3.6: Protection of Cultural Resources

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

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

Strategies:

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

Objective 3.7: Cultural Resources Appreciation

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

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

Strategies:

1. Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time.
2. Seek to form a partnership among the Service, the Wisconsin DNR, and the Rock River Archaeological Society to promote the story of the Horicon Marsh.

Fox River National Wildlife Refuge

Future Management Direction: Tomorrow's Vision

A Vision for Fox River National Wildlife Refuge

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

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

Goals, Objectives and Strategies

Goal 1: Wildlife

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

Objective 1.1: Deer Population

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

Discussion: The following notes support a continued high level of deer hunting opportunities on the Refuge. During the summer months of 2003 and 2004, the Refuge biologist regularly saw herds of deer (three to 12) all across the Refuge; deer trails were plentiful, well-developed (wide), and regularly used. Deer damage native plant populations (such as remnant patches of prairie forbs, e.g., spiderwort) and there is the high pos-



Columbine, Horicon NWR

sibility of high deer populations on the Refuge impacting local farmers and motorists. In addition, the Refuge has been part of a T-Zone unit, which allows additional antlerless deer hunting opportunities, and is just north of the Chronic Wasting Disease zone (increased harvest zones).

Strategies:

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

Objective 1.2: Sandhill Cranes

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

Discussion: The Refuge was established for nesting Sandhill Cranes during a time when the species was declining throughout the Midwest. Crane numbers have increased significantly during the last 20 years. The reintroduction of Whooping Cranes to Wisconsin has created the likelihood that a nesting pair may utilize Refuge habitats in the future. In fact, an individual Whooping Crane used the area in 2004 and six Whooping Cranes were present within 3 miles of the Refuge boundary in 2005.

Strategies:

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

Objective 1.3: Regional Conservation Priority (RCP) Species

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

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

Strategies:

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



Mallard drake, USFWS

Goal 2: Habitat

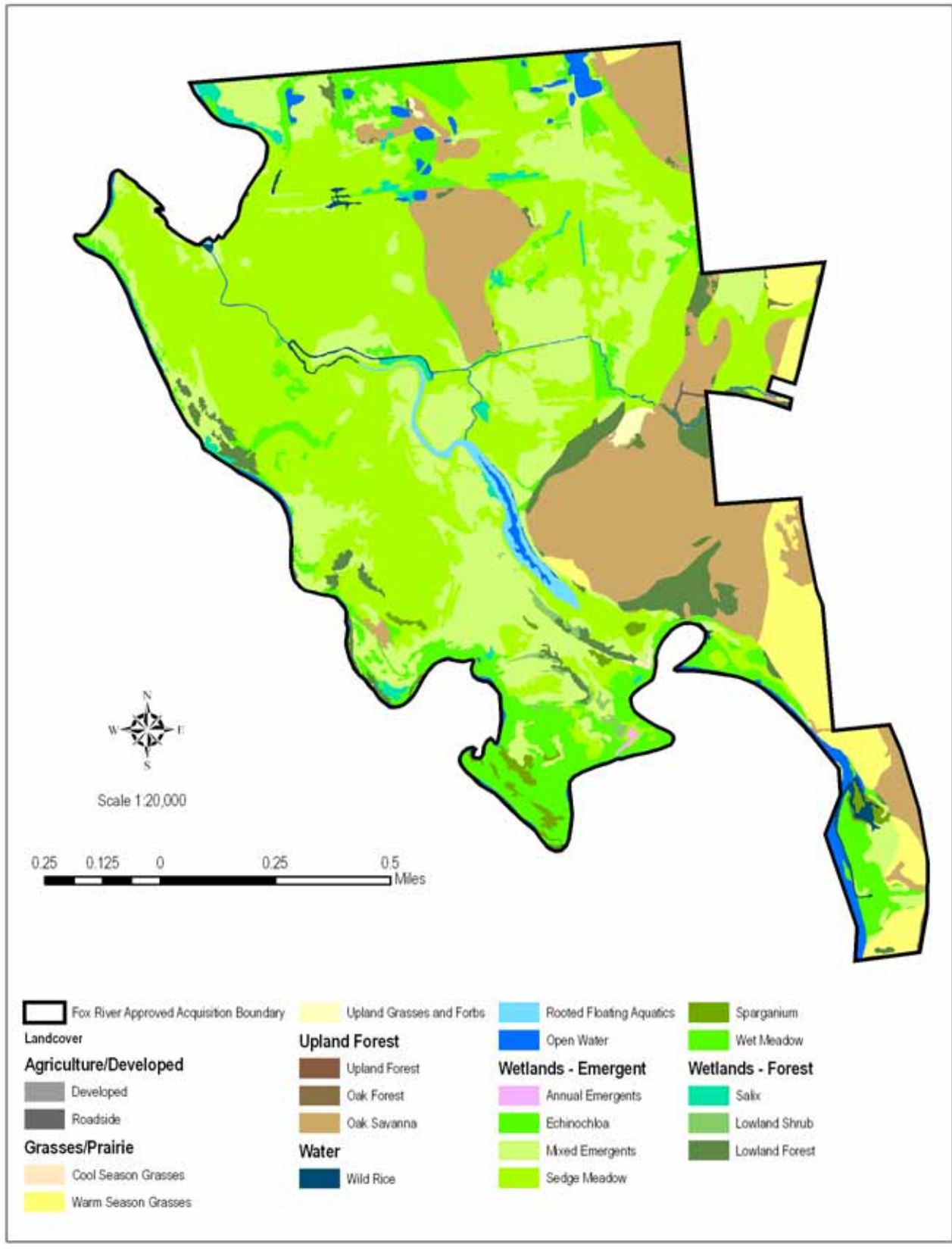
Protect, restore, and enhance the wetland and adjacent upland habitat on the Refuge to emulate a naturally functioning, dynamic ecosystem containing a variety of habitat conditions that were present prior to European settlement, namely dry tallgrass prairie, oak savanna, fens, sedge meadow, and shallow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

Objective 2.1: Oak Savanna

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

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

Figure 14: Future Vegetation Cover, Fox River NWR



Strategies:

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

Objective 2.2: Grasslands

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

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

Strategies:

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

Objective 2.3: Fen and Wet Prairie

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

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

Strategies:

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

Objective 2.4: Sedge Meadow and Shallow Emergent Marsh

Annually, maintain 600 to 650 acres of sedge meadow and shallow emergent marsh to benefit Regional Conservation Priority species depen-



Spider, Horicon NWR

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

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

Strategies:

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

Objective 2.5: Exotic and Invasive Species Control

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

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

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

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

Strategies:

1. Document the location and size of invasive populations on the Refuge with GIS mapping.
2. Use biological control when available as a preferred strategy.
3. Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed.
4. Use fire in controlling some invasive plant species.
5. Monitor the infestations and effectiveness of control measures.

6. Support and work with the Service's Partners for Fish and Wildlife program, other partners, and landowners to provide education, identification, location, and a control program for invasive species within a 15-mile radius of the Refuge.

Objective 2.6: Land Conservation

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

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

Strategies:

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

Goal 3: People

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

Objective 3.1: Hunting

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

Discussion: Providing opportunities for hunting is consistent with the Refuge purposes and the National Wildlife Refuge System Improvement Act of 1997. Refuge uplands will be open to hunting, subject to state regulations and public safety concerns, where conflicts with other users will

not occur, and where biologically feasible. When necessary, Refuge staff will seek ways to ensure that hunters have the opportunity for high quality experiences.

Strategies:

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

Objective 3.2: Fishing

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

Discussion: Boat access for fishing is available along the Fox River. Many people have expressed interest in fishing on Long Lake. The 1-mile hike from the parking lot to the potential fishing spot is expected to limit the number of anglers (Figure 15). Boating will continue to be restricted on Refuge-interior waterways other than the Fox River to reduce disturbance of migratory birds, especially nesting Sandhill Cranes.

Strategies:

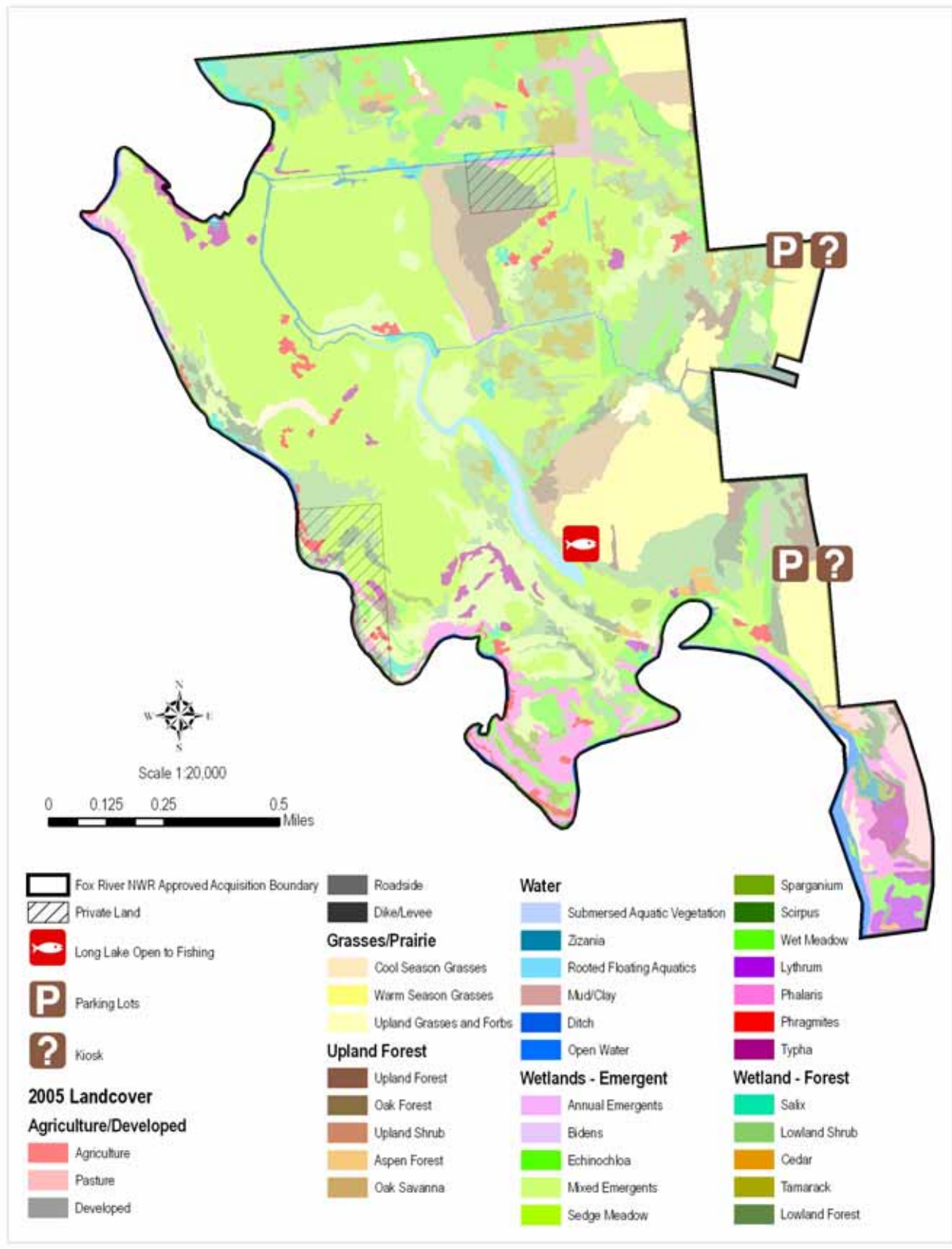
1. Provide fishing on designated areas of the Refuge at given times of the year where it does not interfere with wildlife and upon completion of the Fishing Plan.
2. Monitor litter and provide signs to educate anglers to always carry out trash.

Objective 3.3: Wildlife Observation and Photography

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

Discussion: No trails should be built solely on the Refuge as the likely low number of visits from the public would likely not warrant the impact to habitat and disturbance to wildlife associated with trail maintenance. A segment of the Wisconsin

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



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

Strategies:

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

Objective 3.4: Environmental Education and Interpretation

Provide for annual on-site visitation of 100 students and two to four group visits.

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

The Refuge staff will strive to provide educational opportunities that highlight the objectives in this plan, so that the public will understand future management activities and provide support. For example, a person who understands the benefits of controlling invasive species will be more likely to support Refuge decisions.

Strategies:

1. Work with local teachers to develop grade-specific curricula that meet local, state and national education standards and that keep focus on the Refuge.
2. If feasible, train volunteers to provide tours or lessons for classrooms.
3. Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted.
4. Devise and encourage additional opportunities for research, wildlife surveys, or bird



Birding, Horicon NWR

banding within the ability of high school science or biology classes.

5. Train educators to conduct their own programs (via teacher workshops).
6. If necessary, redesign or enlarge both Refuge parking lots to accommodate school buses.

Objective 3.5: Community Outreach

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

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

Strategies:

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

6. Increase community partnerships.
7. Develop outreach plans for important resource issues and improve the outreach to the Refuge neighbors about habitat management (i.e., tree cutting, invasive species control, prescribed fire).

Objective 3.6: Protection of Cultural Resources

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

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

Strategies:

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