

## Chapter 4: Future Management Direction: Tomorrow's Vision

Future management on Tamarac NWR will focus on conserving and restoring the ecological integrity, particularly the structure, composition, and natural processes of native biotic communities and physical environments within the historical range of natural variability. At the landscape scale, management will conserve and restore nationally, regionally, or locally imperiled ecosystems and a diversity of habitat types (ie: native plant communities and cover types) while providing ecosystems, habitats, or seral stages important for wildlife species of national, regional, state, or local conservation concern (broad-based or coarse filter approach applied within this CCP). Management will strive to increase patch size and connectivity between similar ecosystems, thereby reducing fragmentation. At the patch scale, management will focus on conserving and restoring historic compositional and structural patterns to forests that were degraded by past human activities, while providing wildlife species benefits (fine filter approach which will be applied in the step-down Habitat Management Plan). Public use activities on the refuge will continue to be considered as long as they are compatible with wildlife and habitat goals and objectives.

### Tamarac NWR Goals, Objectives and Strategies

The planning team developed goals and objectives for four management alternatives at Tamarac NWR. These alternatives include:

- Alternative 1: Management of Habitat in Context of Providing Migratory Bird Benefits while Emphasizing Restoration of Historic Vegetation Patterns and Ecological Processes (Preferred Alternative)
- Alternative 2: Management Emphasizing Restoration of Historic Vegetation Patterns and Ecological (natural) Processes
- Alternative 3: Focused Management for Priority Migratory Birds



*A tranquil Tamarac NWR setting. Photo Credit: Gale Kaas Frazee*

#### ■ Alternative 4: Current Management Direction of Conservation, Restoration, and Preservation (No Action)

The Environmental Assessment in Appendix A describes and analyzes four management alternatives for Tamarac NWR. The Service identifies one as its preferred alternative and it is described in this chapter as the proposed future management direction that would guide activities on the Refuge for the next 15 years.

Goals, objectives, and strategies comprise the proposed future management direction. Goals are descriptive broad statements of desired future conditions that convey a purpose. Goals are followed by objectives, which are specific statements describing management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help clarify how the objective was formulated.

Finally, beneath each objective there is a list of strategies, the specific actions, tools, and techniques required to fulfill the objective. The strategies may be refined or amended as specific tasks are com-

pleted or new research and information come to light. Some strategies are linked to the duties of an employee position, which indicates that the strategy will be accomplished with the help of a new staff position. When a time in number of years is noted in an objective or strategy, it refers to the number of years from approval of this CCP. If no time is given, the objective is to be accomplished within the 15 years of the life of the CCP.

## Tamarac NWR Goals

### *Goal 1: Wildlife*

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

### *Goal 2: Habitat*

Protect, restore and enhance the wetland and upland habitat on the Refuge to emulate naturally functioning, dynamic ecosystems emphasizing a variety of habitat conditions that were present prior to European settlement.

### *Goal 3: People*

Provide people with opportunities to experience quality wildlife-dependent activities and make a connection with a natural, functioning landscape.

### Goal 1: Wildlife

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

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. Tamarac NWR can most effectively do its share as part of the national conservation strategy by focusing on those migratory species indigenous to the particular habitat types found in north-central Minnesota. In addition to migratory species, resident species will be considered in management efforts, but will not take precedence over migratory species, unless the resident species is threatened, endangered or of special concern. In emphasizing Conservation Priority Species in Region 3 of the Refuge System, Tamarac NWR is contributing to wildlife conservation at an appropriate regional scale by trying to assist those species in greatest need of attention. Note: Not all species associated with the conservation priority species for Region 3 are indigenous to Tamarac NWR, nor will the Refuge manage for all the species on the list. A subset of the regional priority species has been selected for



*There are more than 20 lakes on Tamarac NWR. Photo Credit: D. Mudderman*

Tamarac NWR (Appendix D). The goal expands the Refuge's original focus on waterfowl and symbolizes its commitment to a more holistic view of wildlife. We recognize that most direct wildlife outcomes result through habitat management and these are considered under the Habitat Goal.

### **Objective 1.1 Trust Resources: Waterfowl**

Maintain a minimum annual population of 2,000 breeding pairs of dabbler ducks (ie: mallards, blue-winged teal and wood ducks), 300 breeding pairs of diving ducks (primarily ring-necked ducks), 250 breeding pairs of Canada Geese and 25 breeding pairs of Trumpeter Swans on the Refuge by providing optimal breeding habitats. *Note: This is considered a threshold objective such that if the breeding pair estimate falls below the minimum specified objective for five consecutive years it will trigger further investigation and management action.*

### Rationale

The establishing authority explicitly states Tamarac NWR was established to serve as a "breeding ground and sanctuary for migratory birds and other wildlife". The Refuge was originally known as the Tamarac Migratory Waterfowl Refuge, thus emphasizing the importance of the area to waterfowl. The Refuge was one of the areas which the initial acquisition action was the result of the reinvigorated national waterfowl restoration program which began in 1934 to restore the nesting grounds of the waterfowl resource. Studies during the summers of 1934 and 1935 indicated that Becker and Mahnomen Counties had the highest waterfowl nesting indices in the state of Minnesota.

Management emphasis throughout Refuge history has focused on furthering the purposes for which Tamarac NWR was established, primarily

production and maintenance of migratory waterfowl, with only endangered species having a higher priority than waterfowl.

Through this CCP, it might appear that waterfowl management is being de-emphasized; however, the Refuge staff plan on focused approach of forest waterfowl resources by redirecting efforts to make quality habitat for ring-necked ducks, wood ducks, mallards and trumpeter swans with less emphasis on grassland nesting waterfowl. Large blocks of grassland habitat adjacent to wetland habitats will be enhanced under this CCP; however, smaller parcels (<20 acre) of grassland will be converted to forest for other species benefits. Considering Tamarac NWR's place in the landscape and that outside the Refuge boundaries extensive fragmentation from agriculture, development and timber harvest, the Refuge should play a powerful role in maintaining an extensive, un-fragmented landscape where possible.

#### Strategies

1. Management of Refuge resources of concern will be directed through habitat management as identified in this plan as well as the subsequent Habitat Management Plan.
2. Extend the timber harvest rotational ages of certain tree species and promote the retention of cavity trees for wood ducks
3. With the remaining grassland units develop an aggressive management strategy, which should be subsequently incorporated in the Habitat Management Plan, that enhances the value to nesting waterfowl and grassland passerines.
4. In the central portion of the Refuge maintain and/or restore Jack Pine barrens (which were historically present) adjacent to wetland habitats which provide a natural, open habitat that could be just as beneficial to ground nesting waterfowl as the current grasslands.
5. Maintain vernal pools or temporary wetlands within a forested landscape for the benefit of forest waterfowl species (breeding)
6. Restore natural processes (as much as possible) such as hydrology and fire in the appropriate wetland ecosystem, particularly sedge meadows along lake perimeters for the benefit of nesting Ring-necked Ducks

#### **Objective 1.2 Other Trust Resources – Non- waterfowl**

Implement a monitoring and research program to track the presence, abundance, population trends, and/or habitat associations of Trust Resources, including but not limited to Region 3 Conservation Priority Species, habitats, com-

munities and ecosystems. Priority for monitoring will be given to those species identified as Refuge resources of concern.

#### Rationale

The diversity of habitats on Tamarac NWR, its position in the landscape, and its size all contribute to its role as a place for many USFWS Trust Resources, including Region 3 Conservation Priority Species. Priority Species, other than waterfowl, that currently inhabit Tamarac NWR including but are not limited to the following species:

- Bald Eagle
- Red-shouldered Hawk
- American Woodcock
- Common Loon
- American Bittern
- Yellow Rail
- Forster's Tern
- Black Tern
- Yellow-bellied Sapsucker
- Northern Flicker
- Eastern Wood-Pewee
- Least Flycatcher
- Sedge Wren
- Veery
- Wood Thrush
- Golden-winged Warbler
- Black-throated Green Warbler



*White pines tower over a Refuge lake. Photo Credit: D. Braud*



Gray wolf on Tamarac NWR. Photo Credit: Donna Dustin

- Blackburnian Warbler
- Ovenbird
- Mourning Warbler
- Swamp Sparrow
- Rose-breasted Grosbeak
- Purple Finch

Fish and Wildlife Service Trust Resources also include unique habitat types, communities and ecosystems which are discussed in the Habitat Objectives section later in this chapter.

### Strategies

1. Management of Refuge resources of concern will be directed through habitat management which will be driven by objectives derived from the CCP and HMP. The goal of the inventory and monitoring program is to improve management actions and decisions through the adaptive management process.
2. Revise current wildlife and inventory monitoring plan to address the monitoring needs for the Refuge resources of concern
3. Conduct annual review of monitoring plan to assess trends of trust resources and determine if there are any priorities for research
4. If a Trust Resource research issue has been identified, initiate research at the station level.

### **Objective 1.3: Gray Wolves**

Maintain adequate habitat and prey base to support at least two packs of gray wolves on the Refuge.

### Rationale

Recent survey trends have indicated a stable wolf population in Minnesota which was well above recovery goals eastern established in the eastern gray wolf recovery plan. The U.S. Fish and Wildlife Service delisted the gray wolf in Minnesota, Wisconsin and Michigan in April 2009 and was subsequently mandated to reinstate protection through the Endangered Species Act due to pending litigation. The current status of the eastern gray wolf in Minnesota is listed as threatened.

In the near future, the Service will likely attempt to delist gray wolf in Minnesota again, upon which the state of Minnesota will take over management authority. The Minnesota DNR has already completed a management plan in advance of the first delisting attempt. Under the state plan, gray wolves will have two levels of protection. Tamarac NWR falls just outside the more protective zone; however, all wolves will continue to be protected on all public lands throughout the state. Under the state plan, wolves can be removed from private land and in some cases, small areas of immediately adjacent public land. Hence, it is imperative that Tamarac NWR maintain healthy wolf populations with the Refuge.

In recent years, two gray wolf packs have produced young on the Refuge. This wolf density is considered viable and sustainable. Gray wolves prey on both large and small mammals, including deer, muskrat, beaver, rabbit, and snowshoe hare. Tamarac NWR can manage for wolves only indirectly, by fostering habitat conditions that are favorable to prey populations, and by maintaining populations of the wolves' preferred prey.

### Strategies

1. Manage for a Refuge deer herd (pre-fawn density) at a density of 13-17 per square mile.
2. Conduct appropriate surveys to determine pack size, distribution, territory size, movements and productivity.
3. Regulate trapping to maintain beaver and muskrat populations as a wolf prey base.
4. Maintain trapping restrictions for land-based trap sets to prevent accidental captures of wolves.
5. Maintain a mix of wetland, brush, forest, and grassland habitats that is conducive to healthy wolf and deer populations.
6. Minimize disturbance from public use and Refuge activities at known denning locations.

#### **Objective 1.4: Deer Management**

Annually, maintain the Refuge deer population (Minnesota Deer Management Unit 251) at a density of 13-17 deer per square mile (pre-fawning density) based on annual winter surveys.

##### Rationale

Recently, there has been an over-abundance of white-tailed deer state-wide, with relatively high densities of deer (26 to 28 deer/mi<sup>2</sup> pre-fawn survey) occurring on the Refuge within the last decade. Literature reviews indicate that about 11-13 ungulates/mi<sup>2</sup> historically existed in this area, of which 2-3 ungulates/mi<sup>2</sup> were actually white-tailed deer. As previously mentioned, adverse effects of browsing in forest understory by white-tailed deer could lead to significant ecological ramifications. Data from Pennsylvania says that a population above 20 deer/mi<sup>2</sup> (pre-fawn densities) will impact vegetative regeneration. The impacts of deer over browse on plants can cascade to affect wildlife species diversity, from insects to amphibians to migratory song birds.

Unlike most of the other deer management units surrounding the Refuge that include a lot of private land, Tamarac NWR has a sole statutory responsibility for migratory birds and current policy dictates that we maintain the biological integrity, diversity and environmental of the ecosystem within the Refuge boundaries. In order to attain the future habitat goals on the Refuge there is an inherent need to maintain deer populations between 13 and 17 deer/mi<sup>2</sup>. Although hunting opportunities are considered in the population objective, the emphasis is placed on habitat needs for migratory birds.

##### Strategies

1. Continue the annual aerial deer surveys conducted by the Refuge staff but explore opportunities for improving survey methodology and population estimates
2. Conduct periodic habitat assessments, such as browse surveys and deer exclosure evaluations to document the impact of various deer densities on the habitat
3. Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Minnesota DNR.
4. Work with the White Earth Natural Resources Department to examine methods to adequately address tribal deer harvest statistics for the Refuge.

#### **Objective 1.5: Fish**

Maintain diverse, balanced and natural fish populations where compatible with Refuge goals and objectives, while maintaining all Refuge water-bodies free of invasive aquatic animal and plant species.

##### Rationale

The goal of the Refuge fisheries program is to provide and maintain a diverse, yet balanced and natural fish population capable of supporting a quality sport fishery. Lakes currently supporting catchable sizes of game fish (and open to public fishing) in most years include: Lost, Two Island, Wauboose, Blackbird, North Tamarac and Pine. Some of the issues that threaten the Refuge's fishery are undesirable nuisance fish species (bullheads, common carp and fathead minnows), poor survival of naturally produced walleye, and winterkills.

Invasive animals such as common carp and zebra mussels pose a current and looming threat to native fish and mussel species and have the potential to disrupt the aquatic ecosystem. They can also have a direct link to the quality of fishing by displacing various game fish, or destroying important habitat for fish and wetland-dependent birds which people observe or hunt. 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 wetlands is reduced, including the production of wild rice. Carp are present within Ottetail River system, but so far restricted in distribution by a box culvert structure in the Hubbel Pond WMA, which is just south of the Refuge.

All the Refuge water areas, with the exception of Lost and Wauboose Lakes have an average depth of 8 feet or less; therefore, they are subject to frequent winterkills (death of fish due to lack of oxygen caused by natural environmental conditions). The Minnesota DNR currently stocks Wauboose and North Tamarac Lakes with walleye fry on an every-other year cycle. Likewise, the White Earth Natural Resources Department stocks walleye fry in Lost and Teacracker Lakes on a similar cycle. The Minnesota DNR and White Earth Natural Resources Department routinely conduct fish surveys on these lakes that are stocked to monitor populations. The LaCrosse Fisheries Resource Office (USFWS) has conducted fish survey assessments on some of the other priority lakes on a 5-year rotation.

##### Strategies

1. Continue monitoring fish populations and their impacts to the aquatic resources through

cooperation with the Minnesota DNR, White Earth Natural Resources Department and LaCrosse Fisheries Resource Office.

2. Include small non-game fish species, such as fat-head minnows, darters, etc. in future surveys.
3. Continue to stock naturally occurring fish species (walleye, northern pike, bluegills and bass) as necessary following winterkills in North Tamarac, Wauboose, Lost and Teac-reacker Lakes.
4. Update the Fisheries Management Plan upon completion of CCP and HMP.
5. Assess fish barriers within the Refuge boundaries and explore opportunities for removal of these barriers and restoration of fish populations (ie: reconstruction of perched culverts, flowages, dams, etc.).
6. Maintain water control structure at the South Chippewa outlet as an effective barrier to carp for the upper portion of the Refuge within the Ottertail River watershed.
7. Keep abreast of the distribution and status of aquatic invasive animal and plant species and initiate preventative measures where feasible.
8. Work cooperatively with the White Earth Natural Resources Department, the Minnesota DNR and the LaCrosse Fisheries Resources Office to develop guidelines to effectively manage the fishery resource within the Refuge.
9. Restrict introduction of fish species in lakes or other wetlands that were not naturally fish basins (i.e., Pine Lake).

## Goal 2: Habitat

Protect, restore and enhance the wetland and upland habitat on the Refuge to emulate naturally functioning, dynamic ecosystems emphasizing a variety of habitat conditions that were present prior to European settlement.

### **Objective 2.1. Upland Grass**

Reduce anthropogenic grassland habitat from 2009 levels (1,362 acres) by 953 acres (minus 70 percent) and manage the remaining 409 acres for the diversity of species present, including Region 3 Conservation Priority Species (Table 5 on page 62 and Figure 14 on page 63).

### Rationale

The Refuge currently manages about 2,800 acres (6.5 percent) as upland grass/brush habitat. These areas are mostly remnants of the pre-Refuge farming era and have been maintained by mowing and prescribed burning. Many of these areas are small and scattered throughout the Refuge and as such,



*Blue flag iris. Photo Credit: J. Tabaka*

are too small to be a value to most area-sensitive grassland bird species due to their juxtaposition in a forested landscape. These grasslands were originally intended to provide upland nesting habitat for dabbling ducks; however surveys in the late 1980's and early 1990's indicated limited use by mallards and blue-winged teal (primarily due to the condition of the habitat). Many of the smaller grassland units may be biological "sinks" due to high predation rates.

Currently, there are 83 designated grassland units on the Refuge with an average size of 17 acres (median of 7.6 acres). Sixty-eight percent (57 of 83) of these grassland units are less than 20 acres in size. Only ten of these grasslands are greater than 40 acres in size with the largest tract consisting of 88 acres. Historically, there probably was not any upland grassland habitat at the Refuge during the era immediately prior to European settlement (John Almendinger, pers. comm.). In addition, many of these small grassland units are "economic sinks" due to the funding resources needed to maintain grassland communities and combat threatening invasive plant species, which are occurring in many of the units.

Due to limited benefits to nesting dabbling ducks the Refuge staff recommended converting many of the smaller isolated grassland units to forest habitats. Larger openings adjacent to lakes or large wetland complexes will be managed as grassland habitat for the benefits of upland nesting waterfowl, and to some extent, grassland passerines. The Refuge staff is committed to enhancing these larger blocks of grassland habitat; however, the focus of

**Table 5: Proposed Changes in Vegetation Cover Types, Tamarac NWR**

Habitat Type	Current Management Direction (Acres)	Future Goal		Change	
		Acres	Percent of Total	Acres	Percent by Type
Developed	374	374	1	0	0
Lowland Coniferous Forest	1,863	1,863	4	0	0
Lowland Deciduous Forest	755	755	1	0	0
Lowland Mixed Forest	463	463	1	0	0
Lowland Shrub	2,657	1,814	4	-843	-32
Marsh/Wetland	6,251	6,967	16	716	11
Open Water	7,117	7,117	16	0	0
Upland Coniferous Forest	713	1,328	3	615	87
Upland Deciduous Forest	16,167	16,486	38	319	2
Upland Grass	1,362	409	1	-953	-70
Upland Mixed Forest	4,348	4,995	12	647	15
Upland Shrub	1,519	1,018	3	-501	-33
Total	43,589	43,589			

waterfowl management on the Refuge will be redirected toward forest waterfowl species by providing quality habitat for Ring-necked Ducks, Wood Ducks, Trumpeter Swans with less emphasis on grassland nesting waterfowl.

#### Strategies

1. Convert targeted small isolated grasslands and openings within the forest through reforestation or natural succession based upon site characteristics such as soil type, drainage, surrounding habitat types, etc.
2. Use soil maps and other references such as the Minnesota's Native Plant Communities guide and Kotar's habitat typing manual to determine the most suitable forest habitat type and associated successional pathways and natural disturbances
3. With the remaining grassland units develop an aggressive management strategy, which should be subsequently incorporated in the HMP that enhances the value to nesting waterfowl and grassland passerines.

#### **Objective 2.2. Upland Shrub (1,000 Acre Tract):**

Decrease the dominance of upland shrub habitats within the 1,000 Acre Tract by 75 percent by conversion to forest cover types initially dominated by early successional forest structure for the benefit of Region 3 Conservation Priority Species such as American Woodcock

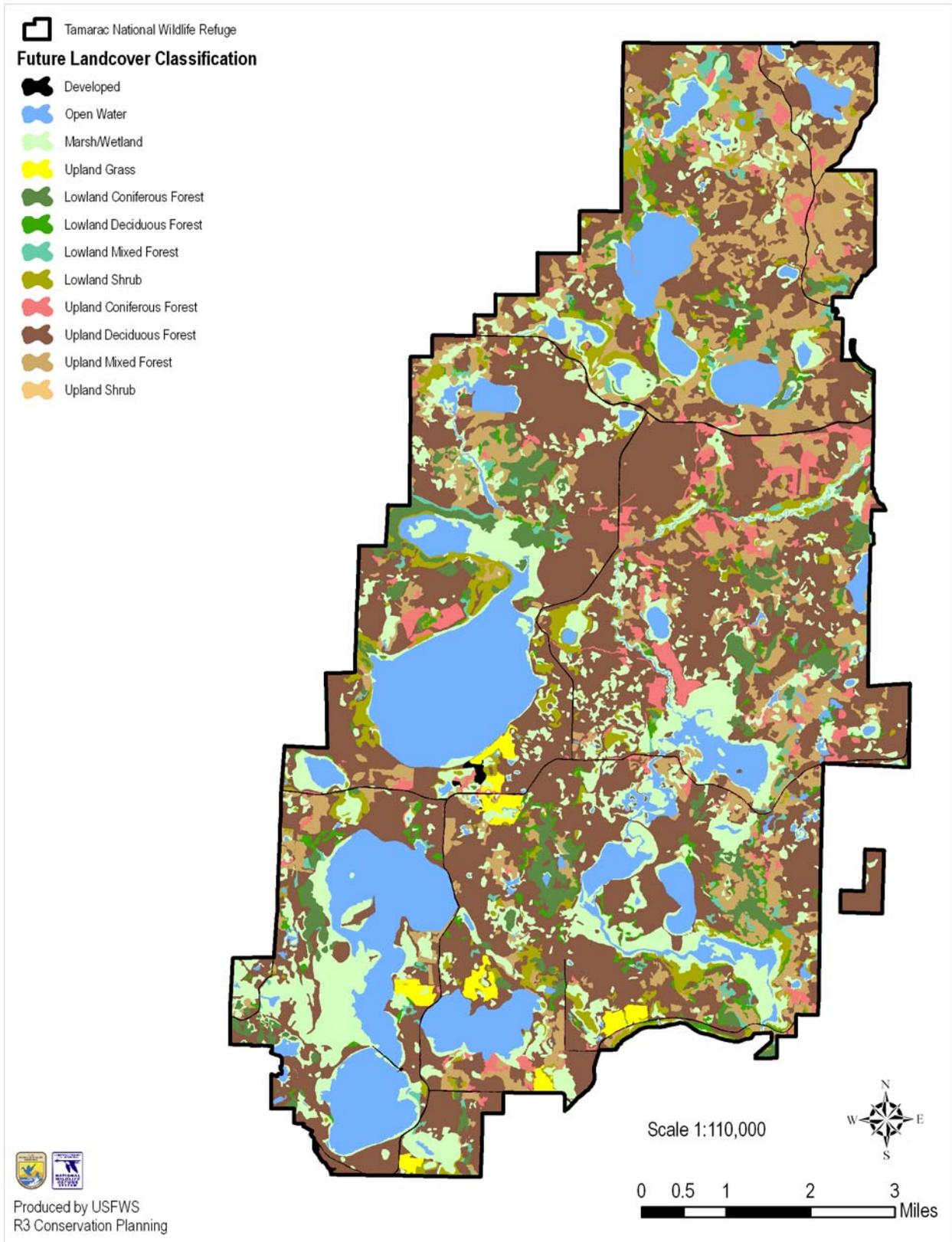
and Golden-winged Warblers, with long-term benefits to forest interior songbirds.

#### Rationale

In 1990, this forested/wetland area in the central portion of the Refuge was cleared of trees to create a brushy grassland area of 1,000 acres for the benefits of upland nesting waterfowl, Sharp-tailed Grouse and Greater Prairie Chicken. Prior the creation of the 1,000 Acre Tract, the area consisted of extant grassland (52 acres), and the remainder was a 50/50 mix of commercial forest (aspen, oak, pine) and wetlands. Although the intent was to clear cut the tract, many red pines and oaks were spared along the ridgelines that traverse the unit. Essentially, this management adopted a "cookie-cutter" approach where a chunk of forest habitat was fragmented within an interior forested landscape. Currently, this tract is not contributing significantly to regional or even local waterfowl or prairie grouse populations.

Because of Tamarac NWR's position in a forested landscape and the juxtaposition of the tract, coupled with the fact that Sharp-tailed Grouse and Greater Prairie Chickens have not pioneered or re-established into the area, the area should be restored back to a forested habitat type either through natural succession or active restoration. Even a slight successional shift would greatly increase the value of this tract to RCP species such as Golden-winged Warblers and American Woodcock.

**Figure 14: Future Land Cover Goals, Tamarac NWR**



### Strategies

1. Re-forest the 1,000 Acre Tract in small patches and allow some open areas to regenerate naturally. Work with the regeneration (oaks) and seed sources (red pine) that is currently present there to restore the area back to jack pine, red pine, white pine, and red and bur oak with aspen pockets.
2. Use soil maps and other references such as the Minnesota's Native Plant Communities guide and Kotar's habitat typing manual to determine the most suitable forest habitat type and associated successional pathways and natural disturbances
3. Plant jack pine seedlings (bud capping for deer) in natural spacing patterns on sandy ridges and south-facing slopes.
4. The intensive use of prescribed on this unit should be halted until detailed habitat objectives and strategies are developed. A combination of mechanical treatments (ie: patch mowing) and prescribed burning three years in a row may be necessary to minimize hazel (and other brush species) and prepare seed bed for additional plantings.
5. Once the forest cover types have been restored, maintain a fire return interval appropriate for those plant communities as identified in the Native Plant Communities Handbook.
6. The unit could be used as a long-term research site to monitor the changes in forest composition along with potential climatic changes introduced through climate change

### **Objective 2.3. Forest Openings**

Convert 32 anthropogenic forest openings (totaling 63 acres) to forest cover types through natural regeneration or tree planting by 2025 based upon site characteristics such as soil type, drainage, or surrounding habitat types. By conversion to forest cover types these areas will be initially dominated by early successional forest structure benefiting Region 3 Conservation Priority Species such as American woodcock and golden-winged warblers, with long-term benefits to forest interior songbirds once fully restored.

### Rationale

From 1990 to 1991, 32 forest openings totaling 63 acres were established in the northern portion of the Refuge with funding provided by the DNR and local chapters of the Minnesota Deer Hunters Association. These openings were created out of a need to provide early successional stages and edge habi-

tat within a continuous forest habitat primarily for the benefit of Ruffed Grouse, American Woodcock, black bear and white-tailed deer. These openings are very similar to the smaller grassland units mentioned above and are slightly smaller in size. The openings were typically placed in a variety of forest types and generally centered on recently abandoned logging decks and ranged in size from 1 to 3 acres with an irregular shape. In most cases, these openings represent a "hard edge" or transition from grass to forest without much woody vegetation within the opening itself.

Intense maintenance of these openings has included prescribed fire, herbicide, tillage, grading, mowing and seeding to stop woody invasion. Prescribed fire, herbicide and mowing have been the primary treatments in recent years, although invasive species, particularly thistle species, have invaded many of these openings thus requiring additional mechanical or chemical treatment. With limited budgets, these openings can be very costly to maintain.

Based on recommendations (Green 1995) that "there are enough natural openings on the landscape, we don't need to maintain anthropogenic openings", these types of opening will not be maintained on the Refuge in the future. The natural openings on the landscape, along with temporary openings created through routine silvicultural practices, provide adequate habitat on the landscape for the species that are currently using the openings, therefore, the Refuge will focus on maintaining unbroken or non-fragmented forest habitat. Temporary openings created through on-going silvicultural practices on the Refuge provide the same amount of habitat if not more at no additional cost to the Refuge and require no maintenance.



*Enhancing habitat through a prescribed burn. Photo Credit: FWS*

Strategies

1. Convert small forest openings within the forest through reforestation or natural succession based upon site characteristics such as soil type, drainage, surrounding habitat types, etc.
2. If tree planting is implemented, use soil maps and other references such as the Minnesota's Native Plant Communities guide and Kotar's habitat typing manual to determine the most suitable forest habitat type and associated successional pathways and natural disturbances

**Objective 2.4. Food Plots**

Convert remaining food plots (35 acres), with the exception of the plot adjacent the autotour trailhead, to forest cover types for the benefit of interior forest passerines.

Rationale

Food plots were initially planted in the 1950's throughout the southern half of the Refuge to provide green browse for Canada Geese and supplemental foods for ducks, migratory passerines and resident species. This was during the era of Canada goose restoration in the Midwest. The original goal was to annually rotate about 100 acres of crop and green browse (alfalfa) in various locations throughout the Refuge within failed native grassland restoration sites. Due to successful restoration of Canada geese and poor crop production, the number of food plots has continued to dwindle to only a few in recent years (North Chippewa fields and Auto-tour site) and the emphasis has changed to "watchable wildlife" sites. Presently, these areas account for only about 35 acres of open landscape.

The Refuge intends to abandon the Chippewa food plots in favor of natural cover. Alternatives for this site include planting native prairie seed or other cover crop that can eventually be converted to forest or directly plant with trees. A food plot along the Blackbird Auto-tour trailhead will continue to be maintained as a watchable wildlife site for the viewing public. However, this watchable wildlife site will not be promoted as a management practice through the Refuge's environmental education or interpretation program.

Strategies

1. Restore the North Chippewa fields to forest cover types utilizing the Native Plant Communities handbook for guidance
2. Maintain the Blackbird Auto-tour site as a watchable wildlife area (food plot)

**Objective 2.5. Upland Conifer (Red, White and Jack Pine)**

Increase dominance of upland conifer (particularly red, white and jack pine but also white spruce and balsam fir to some extent), by increasing both acreage (plus 615 acres) of dominance at the Refuge scale and basal area at the stand level, to provide a diversity of seral stages while restoring historic composition and structure for the benefit of Region 3 Conservation Priority Species such as Bald Eagle, Cape May Warbler, Northern Flicker, Olive-sided Flycatcher, Whip-poor-will, and gray wolf along with a plethora of other more-common forest passerines such as Blackburnian Warbler, Black-throated Green Warbler, Pine Warbler, Red Crossbill, etc. Note: Overall changes of major habitat types will be reflected as an increase in acres for upland conifer (red, white, and jack pine) and mixed upland forest (ie: aspen/pine, forested broadleaf/coniferous mix, aspen/birch/fir/spruce, etc.) and a decrease in acres for upland deciduous (aspen, northern hardwoods, basswood, oak, forested broadleaf mix, etc.).

Rationale

Conifers are important at all spatial scales for a variety of wildlife species. With the exception of non-forested wetland habitat, upland conifer (both red/white and jack pine) ranks the highest in regard to species richness or total number of species using this habitat (CWCS 2006). Pre-settlement cover types throughout much of the northern and central portions of the Refuge were largely comprised of mature stands of red pine, white pine, mixed red & white pine and jack pine barrens. Red and white pine was also intermixed with other dominant hardwood cover types such as aspen, basswood, northern hardwoods and oak throughout the southern portion of the Refuge. Dry pine woodlands have been identified as imperiled native plant communities through Minnesota DNR's subsection planning (CP-PMOP SFRMP 2009).

Since upland conifer communities have decreased substantially since the pre-settlement era, the Refuge intends to restore native plant communities dominated by red, white and jack pine through natural succession, silvicultural practices including tree planting and natural processes such as fire. Dominance at the Refuge scale is intended to increase between-habitat diversity, whereas the dominance at stand level is intended to increase within-in stand diversity.

Opportunities exist to allow some of the other habitat (cover) types to convert to red, white or jack pine dominated communities either naturally or



American Woodcock. Photo Credit: FWS

through silvicultural practices. Additional opportunities exist for planting pine, such as abandoned agriculture fields and upland grassland slated for conversion to forest. Since upland conifer historically occurred as a component within other habitat types (hardwood-dominated stands), opportunities also exist for enhancing the structural diversity within these hardwood stands by increasing the white pine, red pine, white spruce and balsam fir component (basal area) through creation of canopy gaps and understory planting (particularly where seed trees exist). Many of the remaining jack pine forests on the Refuge have become closed jack pine systems versus the jack pine barrens that once existed. In the case of the jack pine barrens, infrequent fire occurrences have altered this community type and succession has been allowed to occur. Therefore, the Refuge staff intends to restore the jack pine barren community and its associated disturbance regime where feasible. In any of these situations, landscape juxtaposition, soil type, moisture, and the nutrient regime should be conducive to these conifers prior to any management effort or treatment. Red, white and jack pine compete best on outwash or glacial moraines where soils are sandy and gravely, moisture regimes are dry to dry mesic and the nutrient regime is poor to medium.

Although red pine and white pine have largely been preserved or protected throughout recent Refuge history, there is concern that red, white and jack pine are not adequately regenerating within the Refuge largely due to high deer populations in recent years and a lack of natural disturbances (ie: fire due to fire suppression activities). Based on the cover type size distribution for the upland conifer stands on the Refuge, the majority of the stands are within later age classes, therefore an increase in early and mid age classes is desired.

#### Strategies:

1. Hire a full-time Forest Ecologist to develop a forestry program that is ecologically, economically, and socially responsible as a means of sustaining the integrity of Tamarac NWR's forest ecosystems and the human communities dependent upon them.
2. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
3. Evaluate potential sites for red and white pine restoration within the Refuge based on suitability of site characteristics and native plant community mapping/modeling.
4. Convert some of upland grass fields that are slated for conversion to forest to red, white and jack pine cover types through natural regeneration or restoration based site characteristics
5. Evaluate current mixed stands (mostly northern pine and bur oak) of closed jack pine/oak forest for conversion to jack pine barren habitat type (ie: decrease cover of oaks) followed by appropriate disturbance regime (ie: fire)
6. Evaluate other cover types for potential white pine and red pine planting in canopy gaps (1-2 acre) in hardwoods to increase structural diversity or within-stand diversity
7. Restore fire to the pine ecosystems through development of a detailed HMP.

#### **Objective 2.6. Upland Deciduous Forest**

Over the next 15 years, increase upland deciduous forest by 317 acres while managing the remaining acreage (16,167) to maintain a diversity of seral stages and restore historic composition and structure for the benefit of Region 3 Conservation Priority Species using this habitat type on the Refuge such as American Woodcock, Golden-winged Warbler, Eastern Towhee, etc., as well as other forest interior species such as Red-eyed Vireo, Ovenbird, etc.

#### Rationale

The hardwood cover types of upland deciduous forest are much more abundant on the Refuge and throughout the Pine Moraines and Outwash Plains of northern Minnesota, than was historically present. The aspen cover type is approximately 40 percent more abundant on the Refuge (plus 40 percent) compared to pre-settlement times, whereas the pro-

portion of hardwoods (basswood, maple, oak, etc.) has dramatically increased (plus 244 percent) from pre-settlement times. In terms of the dominant cover type, the northern hardwood cover type may not have changed as significantly in acreage estimates as the dry oak forests (which are located in the central portion of the Refuge) has. However, the structural diversity has changed significantly within the northern hardwood cover type through previous silvicultural practices.

Also noted previously, the Refuge intends to convert some aspen (particularly those in later age classes) to conifer-dominated cover types through natural succession and silvicultural practices. Approximately 30 percent of the remaining aspen cover type will be managed as early successional habitat (<20 years age class) for the benefit of Region 3 Conservation Priority Species such as American Woodcock and Golden-winged Warbler. The current age-class distribution of aspen does not reflect a balanced age-class structure, therefore efforts will be made to move toward a more balanced age structure managed through rotational silvicultural practices so that the ideal habitats are provided on a continual basis, long-term basis. Aspen cover types will range from pure aspen stands to mixed forests dominated by aspen including conifers and other hardwoods, although efforts will be made to increase within stand structure and composition where feasible.

The Northern hardwood cover type consists of a mixture of basswood, sugar maple, red maple, northern red oak, bur oak, paper birch and aspen in which no one species comprises greater than 40 percent dominance in relation to basal area. Under certain conditions, the northern hardwood cover type will be converted to other cover types based primarily on site conditions, but for the most part northern hardwoods will be managed as late successional plant communities. However, the northern hardwood cover type will be managed to promote structural and compositional diversity and to increase dominance of rare species. The use of prescribed fire will be limited in these systems primarily due to the infrequency of natural disturbance in these systems; however silvicultural treatments will be used to increase the structural and compositional diversity where feasible.

Species comprising the oak cover type include burr oak, red oak, and northern pin oak. Most of these stands (with the exception of red oak) occur on dry sandy soils that historically supported jack and red pine and due to fire suppression have slowly succeeded to mixed oak/jack pine or oak dominated forest. Therefore, some mixed oak-jack pine sites will be converted to jack pine barrens by removing the oak component and thinning the jack pine to low

stocking densities. These habitat types were historically fire dependent systems with a rotation of mild surface fires of about 22-30 years. Under this strategy, prescribed fire would be re-introduced into the system to manage early successional jack pine barrens which could provide nesting habitat for upland nesting waterfowl and passerines. Since red oak is an under-represented species throughout the Refuge, red oak stands will be maintained where they exist and the red oak component will be increased within the northern hardwood cover types.

### Strategies

1. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
2. Convert some later age-classes of aspen to conifer-dominated cover types through natural succession and silvicultural practices.
3. Manage approximately 30 percent of the aspen cover type as early successional habitat (<20 years age class).
4. Within the aspen cover type, manage for a more balanced age structure managed through rotational silvicultural practices.
5. Manage the northern hardwood cover type to promote structural and compositional diversity, including coarse woody debris and snags and to increase dominance of rare species, with continued emphasis on late successional plant communities.
6. Within northern hardwood cover types, use silvicultural treatments to create single to multi-tree gaps to enhance structural & compositional diversity, including coarse woody debris and snags, and increase dominance of rare (such as conifers) overstory species.
7. Manage northern hardwood cover type as late successional plant communities.
8. Convert some mixed dry oak-jack pine sites to jack pine barrens by removing the oak component and thinning the jack pine to low stocking densities.
9. Maintain red oak stands where they exist while promoting structural and compositional diversity (ie: white pine) and increase the red oak component within the northern hardwood cover types.

10. Use prescribed fire where and when appropriate (primarily in dry oak and aspen cover types).
11. Retain snags to insure a continuous supply of natural cavities wood ducks, hooded mergansers, and other cavity nesting birds.

#### **Objective 2.7. Mixed Upland Forest**

Increase acreage (plus 647 acres) of mixed upland forest by increasing the dominance of upland conifer (particularly red pine, white pine, balsam fir and white spruce) within deciduous forest stands to provide a diversity of seral stages while restoring historic composition and structure for the benefit of Region 3 Conservation Priority Species such as Bald Eagle, Cape May Warbler, Northern Flicker, Olive-sided Flycatcher, Whip-poor-will, and gray wolf along with a plethora of other more-common forest passerines such as Blackburnian Warbler, Black-throated Green Warbler, Pine Warbler, Red Crossbill, etc.

#### Rationale

Historic benchmark conditions indicate high structural and compositional diversity within the mixed upland forest habitat type. Red pine, white pine, balsam fir and white spruce were often intermixed with other dominant hardwood cover types such as aspen, basswood, northern hardwoods and oak throughout the Refuge. Since the era of the "great cut-over," this "with-in" stand diversity has shifted to more homogenous habitat types such as pure aspen or oak stands, primarily due to altered disturbance regimes through timber harvest practices. Future management will focus on transitioning homogenous habitat types (ie: pure aspen cover types) with the upland deciduous forest toward mixed upland forests with higher structural and compositional diversity, primarily the conifer component. The mixed upland forest habitat type will serve as a transitional stage between homogenous deciduous forest and long-term conversion to coniferous forest.

#### Strategies

1. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
2. Maintain and promote structural and compositional diversity where it currently exists in mixed upland forests, including coarse woody debris and snags.

3. Transition some later age-classes of aspen stands to mixed upland forest habitat types through silvicultural practices and understory tree planting.
4. Use prescribed fire where and when appropriate.
5. Retain snags and cavity trees to insure a continuous supply of natural cavities wood ducks, hooded mergansers, and other cavity nesting birds.

#### **Objective 2.8. Lowland Conifer**

Maintain acreage of lowland conifer (1,863 acres) and restore historic composition and structure when and where possible, while providing a diversity of seral stages. Region 3 Conservation Priority Species using this habitat type on the Refuge include Long-eared Owl, Olive-sided Flycatcher, Cape May Warbler, Connecticut Warbler and gray wolf and numerous species in greatest concern need of Minnesota.

#### Rationale

Lowland conifer species include tamarack, balsam fir and black spruce. Due to structurally weak peat soils and shallow root systems, wind-throw was a natural process historically in these habitat types. These plant communities are considered relatively intact ecosystems relative to historic benchmark conditions, as very little harvest has occurred in these habitat types. Undoubtedly, some of these roads constructed on the Refuge may have altered the hydrology associated with some of these lowland conifer communities. Restoring the natural hydrology associated with these communities will be promoted. Timber harvest or salvage operations will be very limited in these communities in order to prevent a loss of single trees or small groups of trees. Preservation and promotion of ecological integrity of these habitat types will be the primary strategy for these communities in the future.

#### Strategies

1. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
2. Restoring the natural hydrology associated with these communities, where and when feasible
3. Management techniques should emulate natural disturbance regimes and patterns

- Promote research or investigation to determine the hydrological impacts of Refuge roads and other facilities (ie: water control structures) on lowland conifer habitats

#### **Objective 2.9. Lowland Deciduous**

Maintain acreage of lowland deciduous (755 acres) and restore historic composition and structure when and where possible, while providing a diversity of seral stages. Region 3 Conservation Priority Species using this habitat type on the Refuge include Wood Duck, Mallard, Red-shouldered Hawk, American Woodcock, Wood Thrush, Golden-winged Warbler and numerous species in greatest concern need of Minnesota.

##### *Rationale*

Lowland hardwood species primarily include green ash, black ash and American elm. Since timber harvest in these systems has been essentially non-existent in recent Refuge history, the Refuge proposes to continue with a “preservation” approach to these habitat types as well. Very little data is available on regeneration and age classes within these cover types, but cover size data indicates these stands are comprised of older aged trees. With the threat of emerald ash-borer on the horizon, it seems prudent to monitor these stands in the near future rather than manipulate them.

##### *Strategies*

- Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
- Restore the natural hydrology associated with these communities, where and when feasible
- Management techniques should emulate natural disturbance regimes and patterns
- Monitor ash stands for any emerald ash-borer activity

#### **Objective 2.10. Mixed Lowland Forest**

Maintain acreage of mixed lowland forest (463 acres) and restore historic composition and structure when and where possible, while providing a diversity of seral stages. Region 3 Conservation Priority Species using this habitat type on the Refuge include Wood Duck, Mallard, Red-shouldered Hawk, American Woodcock, Wood Thrush, Golden-winged Warbler

and numerous species in greatest concern need of Minnesota.

##### *Rationale*

Timber harvest in these systems has been essentially non-existent in recent Refuge history, therefore the Refuge intends to continue with a “preservation” approach to these habitat types while promoting ecological integrity within the habitat type. Very little data is available on regeneration and age classes within these cover types, but cover size data indicates these stands are comprised of older aged trees.

##### *Strategies*

- Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
- Maintain and promote structural and compositional “with-in” stand diversity where and when feasible.
- Restore the natural hydrology associated with these communities, where and when feasible.
- Management techniques should emulate natural disturbance regimes and patterns.
- Assess and monitor the ecological condition of this habitat type.



*Drake Wood Duck. Photo Credit: FWS*

### **Objective 2.11. Lowland Shrub**

Reduce the lowland shrub habitat type by 843 acres (32 percent) from 2009 levels through conversion to marsh/wetland habitat type (primarily open sedge meadows) and manage the resulting acreage (1,815 acres) for the benefit of shrub/shrub wetland dependent species, including Region 3 Conservation Priority Species such as the American Bittern, American Woodcock, Golden-winged Warbler and Black-billed Cuckoo as well as numerous species in greatest conservation need.

#### Rationale

This dominant habitat type has been increasing in recent years due to the lack of an ecological disturbance and natural succession of the marsh/wetland habitat type (see marsh/wetland section below). Many of the Refuge's low-lying sites (primarily former sedge fens) are transitioning or succeeding to lowland shrub, which although has value to wildlife, is not a habitat that is regionally scarce like sedge meadows. Much of this transition can be attributed to fire suppression. Open sedge fens are important habitat for American Bittern, Yellow Rail, LeConte's Sparrow and Sedge Wren, which are considered regional conservation priority species. There have been documented positive responses by rails to prescribed burning to reduce woody vegetation in the open fens from studies at Seney NWR (Burkman 1993).

#### Strategies

1. Restore and emulate natural ecological processes through the use of prescribed fire and natural hydrological regimes where possible.
2. Document ECS native plant community for these habitat types and their current condition.

### **Objective 2.12. Marsh/Wetland**

Increase this habitat type by 716 acres (11 percent) from 2009 levels (6,251 acres) by converting the lowland brush habitat type for the benefit of wetland dependent species, including Region 3 Conservation Priority Species such as the American Bittern, Northern Harrier, Forster's Tern, Black Tern Sedge Wren, Yellow Rail, Le Conte's Sparrow and Nelson's Sharp-tailed Sparrow.

#### Rationale

Many of the Refuge's low-lying sites (primarily former sedge fens dominated by Carex and other graminoid species) have transitioned or succeeded to lowland shrub, which although has value to wildlife, is not a habitat that is regionally scarce like

sedge meadows. Much of this transition can be attributed to fire suppression within these wetland habitat types that are characterized by emergent vegetation. Sedge meadows constituted more than three-quarters of Minnesota's original wetlands and were indispensable habitat for plants like lilies, irises and native orchids. Furthermore, non-forested wetland habitat ranks the highest in regard to species richness or total number of species using this habitat within the Pine Moraines and Outwash Plains subsection (CWCS 2006).

#### Strategies

1. The management of water levels on the Refuge will follow one of three management strategies: 1) no water level manipulation, 2) removal of problem beaver dams as necessary and 3) active water level manipulation.
2. Actively managed water levels via water control structures at Dry, Lost, Ogemash and Chippewa Lakes.
3. Establish a benchmark (where not previously identified) for all identified lakes so that water levels can be referenced from year-to-year.
4. Complete a comprehensive hydrological assessment to assess water flow, water quality and water capability of all major wetland areas (lakes and rivers).
5. Complete a comprehensive survey of Refuge wetlands by mapping all aquatic resources, including wooded potholes, drainage systems and other hydrologic features.
6. Use prescribed fire to maintain open sedge meadows for benefit of wetland dependent birds such as yellow rails and American bitterns.



*Tamarac NWR provides a diversity of habitats. Photo Credit: D. Mudderman*

7. Explore opportunities for controlling cattail in specified wetlands through physical removal and/or minimal chemical treatments.
8. Examine any potential sedimentation build-up at water control structures and explore opportunities for removal.
9. Document ECS native plant community habitat types for all aquatic habitats.
10. Restore wetlands and emulate natural hydrologic regimes where possible.
11. Use the water level management database which is being developed by the USFWS Biological Monitoring Team.

**Objective 2.13. Open Water**

Maintain the open water (lacustrine) habitat type (7,117 acres) based on 2009 levels for the long-term sustainability of wild rice and other native aquatic plants by emulating natural hydrological regimes and maintaining and/or restoring water quality where feasible for the benefit Region 3 Conservation Priority Species such as the Bald Eagle, Common Loon, Trumpeter Swan, Mallard, Blue-winged Teal, Wood Duck and Lesser Scaup.

Note: Although open water is used to characterize by this habitat type, wild rice is a naturally fluctuating emergent cover type that is recognized under this habitat type and varies from year to year in acreage, as well as density and seed production.

*Rationale*

The basic purpose of water level management on the Refuge has been to enhance the area's natural ability to grow wild rice and other aquatic vegetation for the benefit of migrating waterfowl. Submerged aquatic vegetation and associated invertebrates provide essential food for waterbirds as well. Since 1959, management tactics have tried to stabilize water levels so that the growth of wild rice would benefit waterfowl by providing brood cover and food for migrants. Water management for wild rice production generally involved moving high spring runoff through Refuge lakes as rapidly as possible and maintaining stable water levels throughout the growing season. Throughout Refuge history, water control structures have been used to manipulate water levels to "maximize" wild rice production. However, wild rice evolved through a cyclic process of water level fluctuations depending upon precipitation (and runoff) and evaporation in any given year. Recent research (Carson 2002) indicates stable water levels over time or drawdown without re-flooding capability (Deede pers. obs. 1989) jeopardize the long-term viability of a wild rice domi-

nated lake by allowing undesirable species, such as pickerelweed and cattail, to outcompete wild rice.

Sustained long-term viability of wild rice and other wetland ecosystems has been recognized as the water management philosophy for the future on the Refuge. Similar to the forested areas of the Refuge, wetland management will focus on restoring ecosystem function, primarily natural hydrological regimes. For the most part, the Refuge staff intends to manage the lakes, rivers and wetlands through natural fluctuations of water levels where possible. Essentially, the stop-logs will be removed from some of the control structures and water will flow through freely. There are a few lakes that will still be managed via water control structures for the benefit of wild rice and other aquatic vegetation where it is recognized that these structures can have a positive impact. Water level prescription will not be rigid, but rather targets that provide the flexibility for wetland enhancement. Wetland systems are dynamic and since wild rice evolved through these natural fluctuations it is critical to work with these fluctuations in order to sustain wild rice production in the future.

*Strategies*

1. The management of water levels on the Refuge will follow one of three management strategies: 1) no water level manipulation, 2) removal of problem beaver dams as necessary and 3) active water level manipulation.
2. Actively managed water levels via water control structures at Dry, Lost, Ogemash and Chippewa lakes.
3. Complete a comprehensive hydrological assessment to assess water flow, water quality and water capability of all major wetland areas (lakes and rivers).
4. Develop detailed wetland/lake management strategies in subsequent HMP
5. Establish a benchmark (where not previously identified) for all identified lakes so that water levels can be referenced from year to year.
6. Develop bathymetric maps of prioritized lakes.
7. Examine any potential sedimentation build-up at water control structures and explore opportunities for removal.
8. Initiate a shallow lakes survey on prioritized lakes to assess habitat condition.
9. Document ECS native plant community habitat types for all aquatic habitats.
10. Restore and emulate natural hydrologic regimes where possible.



Balsam Lake, Tamarac NWR. Photo Credit: J. Tabaka

11. Document water quality and develop a protection and/or restoration plan for improving water quality if necessary.
12. Use the water level management database which is being developed by the USFWS Biological Monitoring Team.

#### **Objective 2.14. Invasive Species**

By 2025, reduce the area infested with target invasive plants (e.g., purple loosestrife, leafy spurge, spotted knapweed, thistle species, etc.) and animals by 50 percent from the documented 2005 level and rapidly respond where possible control new infestations of these and other highly invasive species as they occur.

#### **Rationale**

Invasive species are considered one of the greatest threats to the National Wildlife Refuge System. Executive Order 13112 – Invasive Species, dated February 3, 1999, directs federal agencies to use relevant programs and authorities to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, monitor invasive species infestations accurately and reliably, and promote public education on these species and methods to address them. Numerous exotic plants, invertebrates, and pathogens have been identified at the Refuge, with many being invasive. The zebra mussel, a prolific aquatic invasive, has been documented in lakes within 40 miles of the Refuge. More invasive species are predicted to arrive in the area in the future.

Invasive species management on the Refuge in the future will focus on early detection and rapid response, essentially meaning complete control and eradication of new infestations or satellite areas followed by control of large, central infestations. Subsequent to complete eradication of invasive species,

the goal for invasive species management on the Refuge is to promote biological control agents as primary treatment and reduce the dependency of chemical applications.

#### **Strategies**

1. Complete invasive species inventory in wetlands and forest habitats and establish a regular monitoring program to measure changes in invasive plant infestations.
2. Define priorities for controlling these invasive species within the Refuge boundaries.
3. Develop an integrated pest management plan (invasive species) with a range of alternatives for control of individual species.
4. Focus on early detection and rapid response to new infestations.
5. Use chemical, mechanical, prescribed fire to manage and control infestations.
6. Promote biological control agents as primary treatment and reduce the dependency of chemical applications.
7. Monitor infestations and effectiveness of management efforts.
8. Maintain information on distribution, abundance, density, treatments, etc. in RLGIS database.
9. Promote research of invasive species treatment effects and impacts on biological-control agents as well as the effectiveness of the agents.
10. Keep aware of distribution and new control methods for invasive animals such as zebra mussels and earthworms.

#### **Goal 3: People**

Provide people with opportunities to experience quality wildlife-dependent activities and make a connection with a natural, functioning landscape.

#### **Objective 3.1. Welcome and Orient Visitors**

Annually provide no fewer than 100,000 quality visits to the Refuge. Ninety percent of visitors will report a satisfactory overall experience on the Refuge.

#### **Rationale**

The Refuge mission and the National Wildlife Refuge System Improvement Act of 1997 encourage visitation to refuges where compatible. Tamarac NWR has been inviting visitors since its establishment. The Refuge staff will assure that the Refuge is welcoming, safe and accessible. The Refuge will provide clear information so visitors can easily determine where they can go, what they can do and

how to safely and ethically engage in recreational and educational activities.

### Strategies

1. Improve the website to provide clear and dynamic information about the Refuge's importance, location, natural history and activities.
2. Ensure that entrance and directional signs are well-maintained and meet Fish and Wildlife Service standards.
3. Provide kiosks at key locations that welcome and orient visitors to the Refuge.
4. Provide and maintain publications that are clear, accurate and meet U.S. Fish and Wildlife Service graphic standards.

### **Objective 3.2. Hunting**

Annually, provide no less than 7,000 quality hunting experiences on the Refuge. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.

### Rationale

Providing opportunities for hunting is consistent with the Refuge mission 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, and where biologically feasible. When necessary, Refuge staff will seek ways to ensure that hunters have the opportunity for high quality experiences with both primitive and improved access opportunities.

All hunting will be conducted within the framework of Refuge, Minnesota DNR, and where appropriate, White Earth Tribal regulations. (See Figure 15)

### Strategies

1. Continue annual small game hunting opportunities (grouse, woodcock, snipe, rabbit, hare, squirrel).
2. Continue waterfowl hunting opportunities.
3. Continue annual firearms, muzzleloader and archery white-tailed deer hunting opportunities.
4. Explore assisted/contracted accessible hunts during regular seasons in open hunting areas.
5. Consider wild turkey accessible hunts on southern portion of the Refuge.
6. Designate Rice, Johnson and as open to hunting, but only primitive boat access will be



*Hunters track down that trophy deer. Photo Credit: FWS*

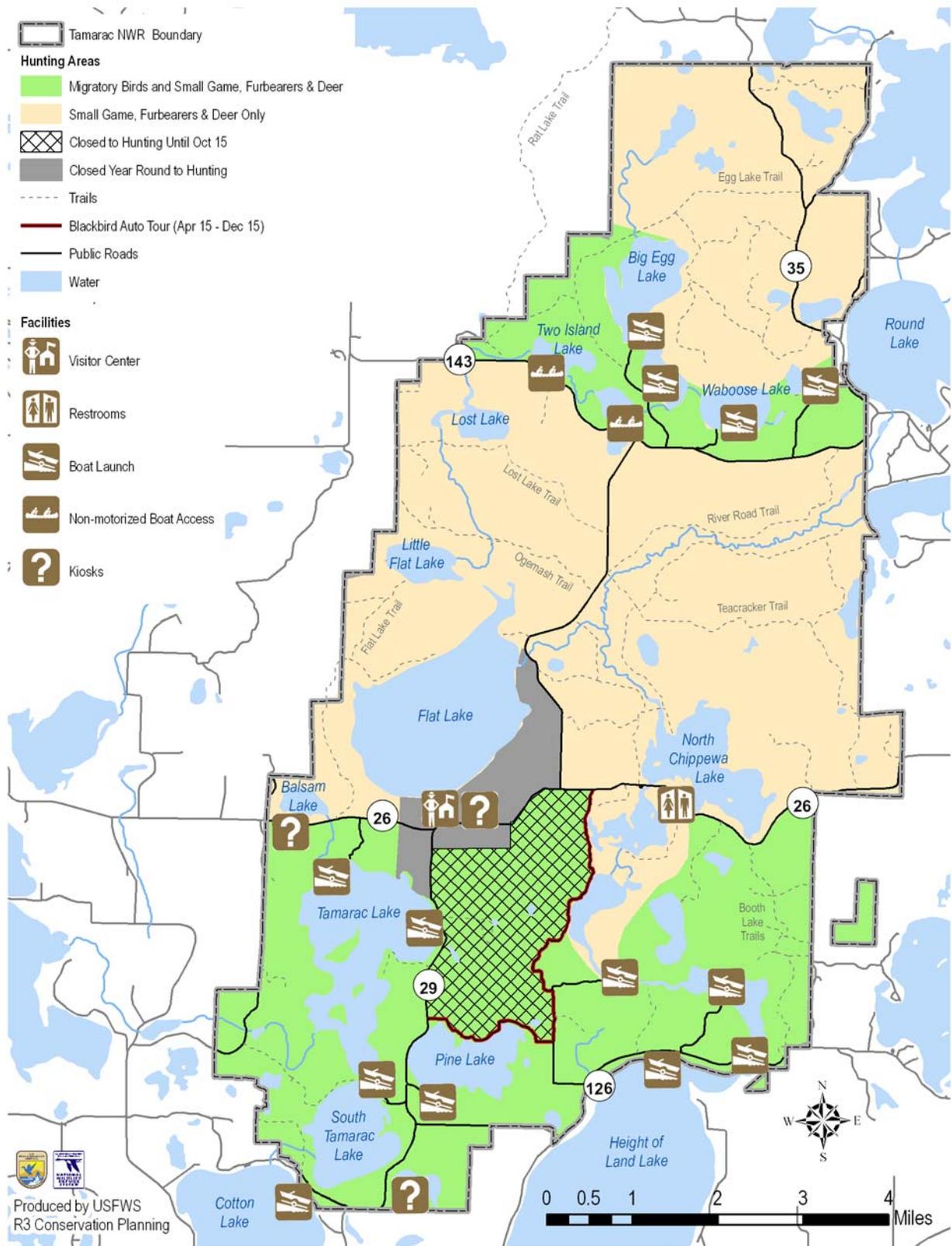
maintained. This will protect the wild rice resource and minimize resources impacted by improved access.

7. Maintain Two Island Lake as open to hunting with a primitive access.
8. Improve hunter safety including deer drive safety, and the perception of safety of non-hunters, by providing new educational materials and events (brochures, signage, programs).
9. Develop operational definition of success and measures for hunting through a survey of hunter satisfaction.
10. Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs and wording within brochures and on the Refuge web page.
11. Hire a full-time law enforcement office to share duties on the Refuge and District.
12. 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 3.3. Fishing**

Annually, provide for 5,000 quality fishing visits to the Refuge. Ninety percent of anglers will report no conflicts with other users and will know that they were fishing on a national wildlife Refuge.

**Figure 15: Hunting Areas on Tamarac NWR**



### Rationale

Providing opportunities for fishing is consistent with the Refuge mission and the National Wildlife Refuge System Improvement Act of 1997. Select waterbodies will be open to fishing, subject to state and tribal regulations, and where biologically feasible. When necessary, Refuge staff will seek ways to ensure that anglers have the opportunity for high quality experiences both primitive and improved access opportunities.

Outboard motor use and lake access were identified as issues during the planning process. In some cases, motorboats and intense use interferes with Refuge visitors engaged in wildlife observation. There is concern that boat trailering and motorized fishing activity is not compatible with other uses along the Refuge's auto tour route.

### Strategies

1. Promote ethical fishing practices, including proper disposal of fish lines and use of non-toxic sinkers.
2. Implement educational program that promotes no-wake on wild rice lakes.
3. Use traffic counters to estimate number of anglers.
4. Develop operational definition of success and measures for fishing through a survey of angler satisfaction.
5. Consider a no-wake zone on the south end of Tamarac Lake for protection of wild rice resource.
6. Designate Blackbird Lake as a non-motorized lake for quality wildlife observation.
7. Improve Cotton and Height of Land Lakes accesses.
8. Improve Mitchell Bridge/Otter Tail River fishing opportunities, including accessible fishing platform.

### **Objective 3.4: Wildlife Observation and Photography**

Provide year-round opportunities for at least 60,000 visits annually to observe and photograph wildlife and habitat.

### Rationale

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 Tamarac NWR.

Tamarac NWR lakes have some of the last "unbroken" or undisturbed shorelines in the area.

Throughout north-central Minnesota, extensive shoreline development for residential and recreational purposes has fragmented the lakes with manicured lawns, swimming beaches, docks, and other structures. Many of these practices detract from a natural viewshed and are detrimental both to wildlife and to lake water quality. The Refuge is trying to balance wildlife observation opportunities with protection of this critical resource.

### Strategies

1. Maintain the 5-mile Blackbird Auto Tour Route with quality wildlife watching opportunities.
2. Make the complete Blackbird Auto Tour Route one-way traffic. The road is too narrow for safe passage of two vehicles. The current two-way section creates a confusing route.
3. Continue annual amateur photo contest in cooperation with the Refuge friends group, Tamarac Interpretive Association.
4. Improve South Tamarac Lake area for wildlife observation.
5. Open the closed area south of County Road 26 (keep it closed to hunting) and create a primitive hiking trail that merges with the North Country Trail.
6. Develop an all-season hiking trail from the Tamarac Lake ski trail.
7. Develop accessible trail and observation area at Chippewa site.
8. Promote birding on the Refuge in coordination with the Pine to Prairie Birding Trail which includes wildlife observation on the Refuge, birding festival and publications.
9. Modify the Refuge web site to include current and accurate information about wildlife observations and opportunities available to the pub-



*Scoping out wildlife at Tamarac NWR. Photo Credit: L. Kramer*

- lic. Link the Refuge web site to other important wildlife observation web sites.
10. Maintain 5 miles of hiking trails.
11. Maintain 8 miles of groomed ski trails.
12. Maintain viewing platforms with scopes and interpretive panels.
13. Provide guided photo opportunities and/or workshops.
14. Develop operational definition of success and measures for wildlife observation. and photography through a survey of visitor satisfaction.
15. Work with local units of government on the development of regional trails that link to the Refuge.
16. Promote undisturbed and undeveloped shorelines.
17. Add a restroom facility at Pine Lakes ski trail parking lot.

### **Objective 3.5. Interpretation**

Annually provide no fewer than 2,000 personal interpretive experiences per year to create connections between people and the rich mosaic of wildlife and habitats found within the forest-prairie transition zone of western Minnesota and an understanding of wildlife management activities on the Refuge.

#### **Rationale**

Tamarac NWR has a long history of providing interpretation opportunities for thousands of visitors each year. Through the use of brochures, kiosks, articles, web sites, and interpretive programs, the Refuge interprets the value of wildlife and their habitats to current and potential visitors. Interpretive products will be dynamic, of quality, and will articulate the importance of Service lands to local and national conservation efforts.

The Refuge staff will strive to provide opportunities focused on the objectives in this plan, so that the public will understand future management activities and provide support.

#### **Strategies**

1. Identify three to five interpretive themes for the Refuge that will guide development of interpretive programs and products.
2. Continue to provide interpretive programs, events, festivals, tours for Refuge visitors, with a message that emphasizes habitat diversity, natural patterns and processes, and wildlife management.
3. Conduct at least two special events, 8-12 Refuge tours, and 12-24 programs on-site to inter-



*Wildlife observation deck along the Blackbird Auto Tour. Photo Credit: J. Ditmar*

pret the Refuge, its habitat diversity, natural patterns and processes, and wildlife management.

4. Add interpretive panels to the Old Indian Trail.
5. Maintain and update interpretive signs/panels on nature trail and viewing platforms.
6. Provide and maintain kiosks that orient visitors and help interpret habitats, wildlife, management, and regulations (Figure 16 on page 78).
7. Replace dated Refuge orientation slide show to new video format and offer a variety of wildlife-related videos for the visiting public.
8. Update Visitor Center Exhibits to enhance the overall message to reflect the importance of the Refuge including dynamic media that highlight the latest research activities.
9. Develop operational definition of success and measures for interpretation through a survey of visitor satisfaction.

### **Objective 3.6. Environmental Education**

Annually provide no less than 6,000 environmental education experiences per year to create connections between students and the natural resources of the Refuge. The experiences will also promote an understanding of habitat diversity, natural processes and wildlife management.

#### **Rationale**

Few opportunities for guided outdoor experiences for children exist within a 60-mile radius of the Refuge. Tamarac NWR plays an important role in several area communities in providing experiences to connect children and nature. Tamarac NWR has an expanding environmental education

program. Since 2005 the environmental education contacts on the Refuge have tripled. In 2009, 5,605 on-site environmental education visits by school groups occurred on the Refuge. The Refuge routinely turns away school groups due to the lack of staff available to conduct environmental education activities. The Refuge currently has two staff to handle all responsibilities of the visitor services program, including promoting and conducting environmental education, interpretation and volunteer management. Along with local partners, Tamarac NWR has surveyed local communities to determine a niche for educational programming for grade levels and communities that have the least amount of environmental education support available. This focus of target grades allows Refuge staff to provide the most effective educational program with the resources available.

All school curriculum directly relates to Refuge management activities and it will meet the state of Minnesota environmental education graduation requirements while addressing the Minnesota environmental literacy scope and sequence. In order to keep it fresh and dynamic, the curriculum will be continually evaluated and improved in concert with area teachers.

See Figure 16 and Figure 17 on page 79 for an overview of future visitor facilities.

#### Strategies

1. Encourage programming and use of facilities for environmental education activities for area schools, universities, community groups, and other Refuge visitors, with a message that emphasizes habitat diversity, natural processes, and wildlife management.
2. Regularly evaluate programs to ensure they are meeting the needs of the community as well as addressing Refuge management activities.
3. Train volunteers to assist or lead educational activities for classrooms.
4. Develop operational definition of success and measures for environmental education.
5. Encourage partnerships with local schools, community groups and surrounding agencies.
6. Provide teacher workshops.
7. Create an educational shelter/classroom on the Refuge.
8. Secure funding through partnerships for bus-ing for those schools that do not have the ability to assume those costs on their own with an emphasis on determined target grades.

#### **Objective 3.7. Refuge Access and Secondary Uses**

Throughout the life of the plan, evaluate opportunities for new access to the Refuge and recreational uses not defined by the NWRS Improvement Act of 1997. All public access and secondary uses must be compatible with the mission of the Refuge.

#### Rationale

The NWRS Improvement Act of 1997 identifies six priority public uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation that receive enhanced consideration over other general public uses in planning and management of the Refuge System. Other uses can occur but must support a priority public use or not conflict with priority public uses. No use of a national wildlife Refuge can detract from accomplishing the purposes of the Refuge or the mission of the System. Tamarac NWR supports various forms of nature-based outdoor recreation that, while not exactly wildlife-dependent, may well be compatible with the purposes of the Refuge and contributes to public appreciation and enjoyment of it.

Issues identified during development of this CCP included a proposed North Country Natural Scenic Trail to run through the Refuge, desire for access to the Ottertail River for canoeing, firewood cutting, horseback riding on Refuge roads, and snowmobile and all-terrain vehicle use in county road right-of-ways.

#### Strategies

1. Coordinate with Becker County through the recreational plan process to eliminate Snowmobiles and ATVs on County Roads within or immediately adjacent to Refuge boundary.
2. Prohibit horse-back riding on the Refuge.
3. Continue to permit firewood cutting but modify program to allow cutting only in areas that complement Refuge management objectives. Priority cutting areas will be identified and guidelines and special conditions for permits will be established.
4. Picnicking – convert the Chippewa site to an interpretive site.

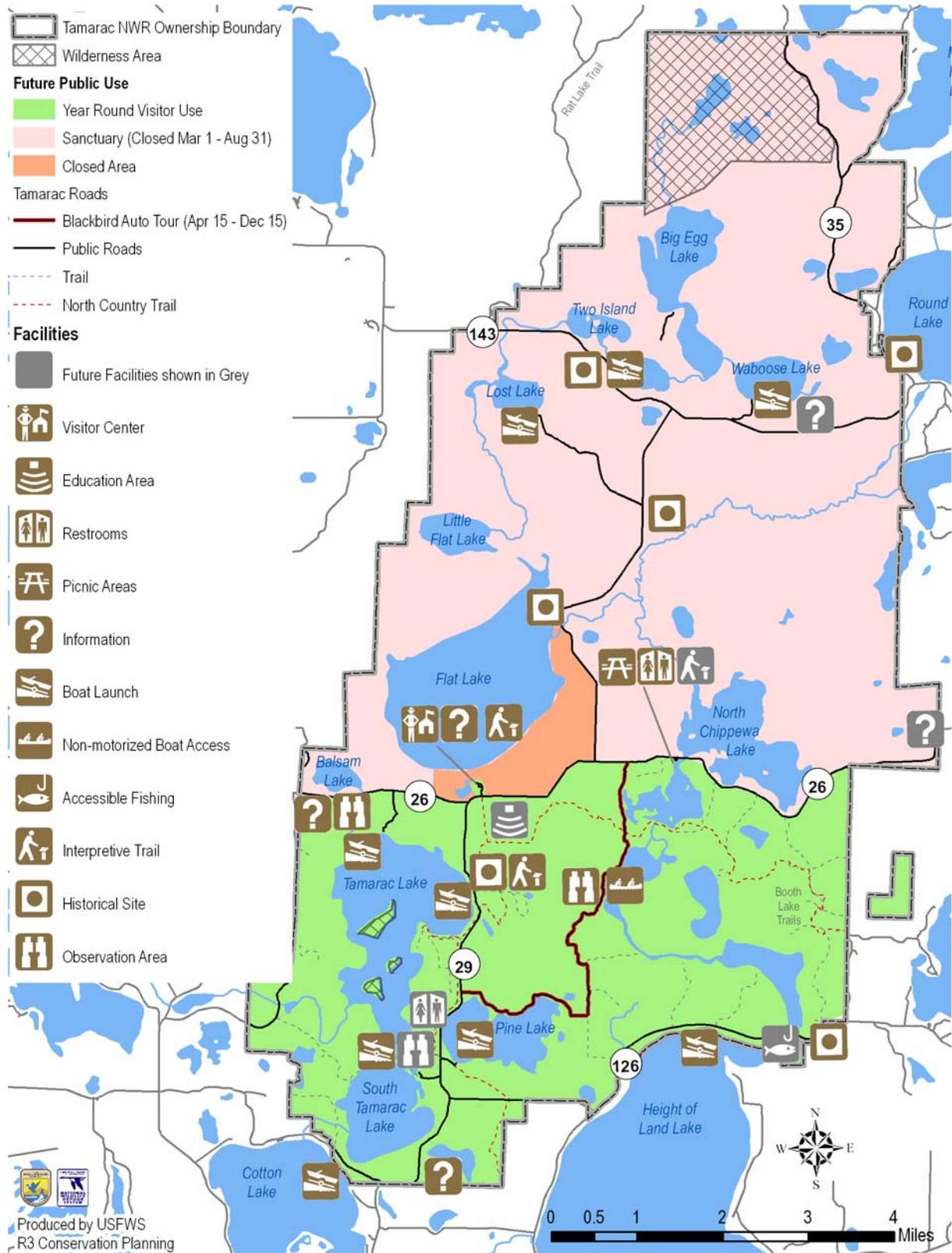
#### **Objective 3.8 Outreach**

Throughout the life of the plan, increase local community support and appreciation for fish and wildlife conservation and endorse the Refuge's role in conservation.

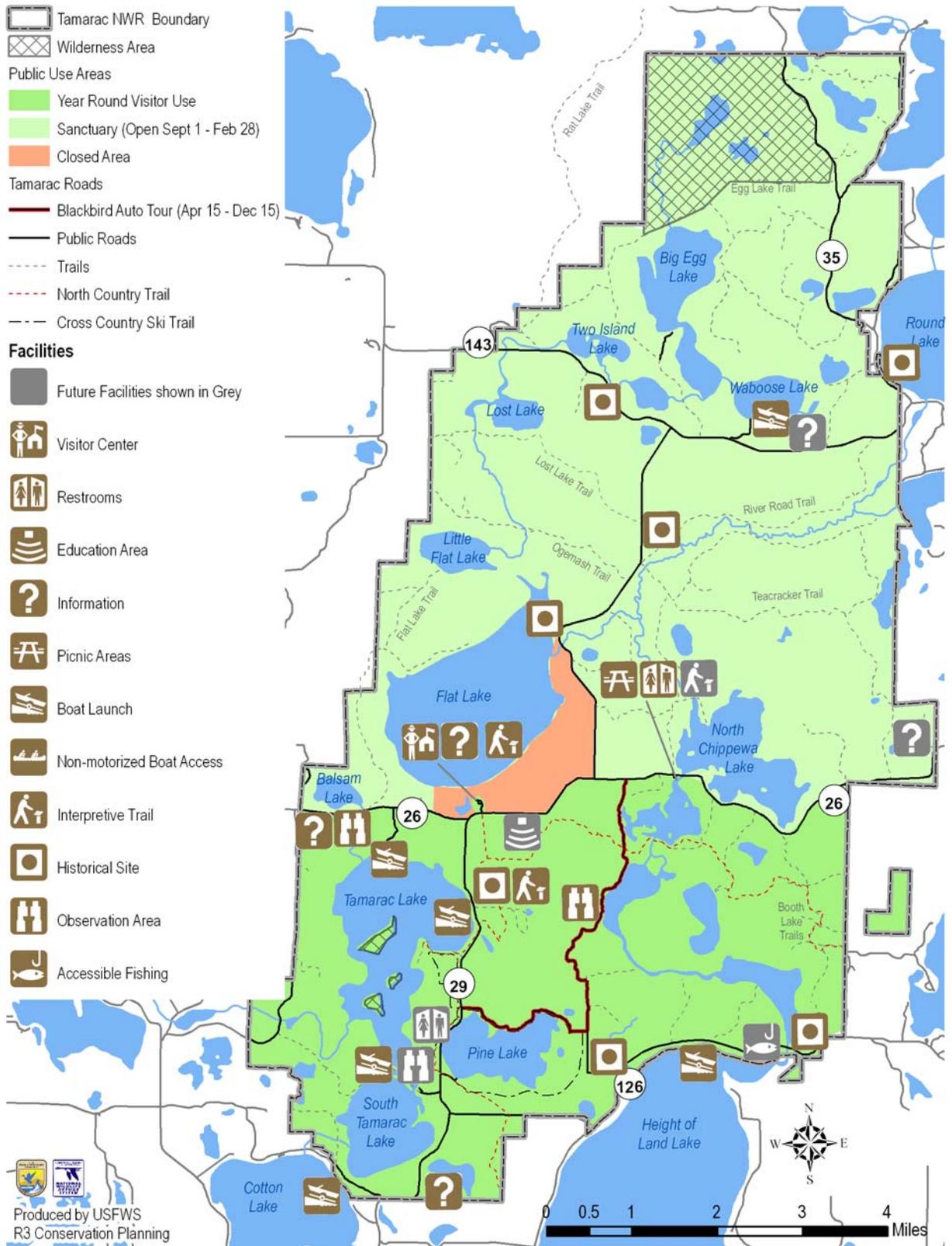
#### Rationale

The Refuge considers its neighbors and visitors to be very important. The Refuge is an asset to the

**Figure 16: Future Visitor Services Facilities –Spring and Summer, Tamarac NWR**



**Figure 17: Future Visitor Services Facilities – Fall and Winter, Tamarac NWR**



community and the continued support of the community is essential. It is important that the Refuge continues efforts to build and maintain open communications with neighbors to let them know the successes, challenges, and opportunities in conservation and wildlife-dependent recreation. In an ideal setting, the objective would be to achieve an appreciation of the value and need for fish and wildlife conservation among a larger percentage of the population living around the Refuge.

The success in achieving the objective would be determined through a survey of the general population. However, for an objective to be useful it must be measurable in both a conceptual and practical sense. It is not practical to propose that the Refuge will conduct a survey of the general population anytime in the next few years, because the approvals and costs are beyond the likely resources of the Refuge. As an alternative, the objective reflects the assumption that community leaders reflect and help form the attitude within the community. By evaluating the opinions of community leaders, there will be a surrogate measure of our desired outcome within the guidelines of the Office of Management and Budget.

#### Strategies

1. Upgrade and maintain the Refuge's website.
2. Write and distribute no fewer than 20 news releases each year that increase the public's understanding and knowledge of the Refuge management activities, key natural resources and its programs.
3. Maintain regular contact with community leaders through presentations and conversations.
4. Continue participation in community networks including the Pine to Prairie Birding Trail, Lake Country Scenic Byway and local community chambers, etc.
5. Explore new outreach efforts with local communities.

#### **Objective 3.9 Volunteer Programs and Partnerships**

Annually recruit no fewer than 5,000 donated volunteer hours on the Refuge.

#### Rationale

The Fish and Wildlife Act of 1956, as amended by the Fish and Wildlife Improvement Act of 1978 and the National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1988, authorized the Service to accept volunteer services. Congress reauthorized the Volunteer and Community Partnership Enhancement Act in 2004, affirming its desire to involve Americans as stewards of

our nation's natural resources and wildlife. Whether through volunteers, refuge support groups, or other important partnerships in the community, refuge personnel seek to make the refuge an integral part of the community. Volunteers and partners of Tamarac NWR become advocates for Refuge management activities and provide vital assistance in fulfilling the Refuge mission.

#### Strategies

1. Recruit, orient and train volunteers to assist with a variety of Refuge projects including visitor services programs, habitat restoration, biological programs and maintenance tasks.
2. Train volunteers to provide Refuge tours, lead environmental education activities, and assist with interpretive and outreach programs.
3. Initiate and nurture relationships with volunteer and Refuge support groups including the Tamarac Interpretive Association. Monitor, support and evaluate these groups with the goal of enhancing Refuge activities.
4. In cooperation with the Tamarac Interpretive Association, maintain quality interpretive and educational material offered for sale in the Tamarac Wildlife gifts and Bookshop that enhance wildlife watching.

#### **Objective 3.10. Archeological, Cultural, and Historic Protection**

Over the life of the plan, avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.

#### Rationale

Cultural resources are an important facet of the country's heritage. Tamarac NWR, like all national wildlife refuges, remains committed to preserving archeological and historic sites against degradation, looting, and other adverse impacts. The guiding principle for management derives from the National Historic Preservation Act of 1966 as amended, 16 U.S.C. 470 et seq. and the Archeological Resources Protection Act of 1979 as amended, 16 U.S.C. 47011-mm, which establish legal mandates and protection against identifying sites for the public, etc. The Refuge must ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. It is also essential that new site discoveries are documented. In order to meet these responsibilities, the Refuge intends to maintain an open dialogue with the Regional Historic Preservation Officer (RHPO) and to provide the RHPO with information about new archeological site discoveries. The Refuge will also cooperate with federal, state, and local agencies,

American Indian tribes, and the public in managing cultural resources on the Refuge.

#### Strategies

1. Conduct site-specific surveys prior to ground disturbing projects and protect known archeological, cultural and historic sites.
2. Explore partnership opportunities with White Earth Band for cultural interpretation projects.
3. Within 10 years of CCP approval and with the assistance of the RHPO, develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.
4. Identify and nominate to the National Register of Historic Places all historic properties including those of religious and cultural significance to Indian tribes.
5. Contract with cultural resources firms specializing in Minnesota to conduct Phase I surveys prior to undertakings that could adversely affect historic resources.
6. In the event of inadvertent discoveries of ancient human remains, follow instructions and procedures indicated by the RHPO.
7. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
8. Inspect the condition of known cultural resources on the Refuge and report to the RHPO changes in the conditions.
9. Integrate historic preservation with planning and management of other resources and activities.
10. Continue accessioning, cataloging, inventorying, and preserving the museum collection at the Refuge.

#### **Objective 3.11. American Indian Cultural Practices**

Opportunities to engage in American Indian cultural practices will be available at the level offered in 2009.

#### Rationale

The Refuge is rich in both historic and pre-historic American Indian cultural traditions. Both the Dakota (Sioux) and Ojibwe (Chippewa) Indians used the resources of the current Tamarac NWR and surrounding lands during historic times. Today, members of the White Earth Band travel to the Ref-

uge to practice rice harvesting, hunt deer and gather natural products.

#### Strategies

1. Continue cooperating with the White Earth Band for the harvest of wild rice and furtrapping as per the Collier Agreement.
2. Follow habitat objectives to ensure long-term wild rice production is sufficient to allow for a successful harvest during most years.
3. Consult with the White Earth Band and other tribes with a historic interest in the area for interpretation and environmental education of American Indian history.
4. Work with the White Earth Band to reduce or eliminate leech harvest on specific water bodies to curb negative impacts.
5. Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time.
6. Develop an oral cultural history to preserve the "community memory" about the area.
7. Provide education and training opportunities, such as internships, for local youth, including tribal youth, in natural resource management.