Appendix A: Environmental Assessment

ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR TAMARAC NATIONAL WILDLIFE REFUGE AND WETLAND MANAGEMENT DISTRICT

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for Tamarac National Wildlife Refuge (NWR) and Wetland Management District (Tamarac WMD) located in northwest Minnesota. This Environmental Assessment (EA) considers the biological, environmental and socioeconomic effects that implementing the CCP (which is the preferred alternative in this EA), or one of three alternatives, would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the Refuge for the next 15 years. The management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in the CCP.

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Environmental Assessment

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Chapter 1: Purpose and Need

1.1. Background

The purpose of the proposed action is to specify a management direction for Tamarac National Wildlife Refuge (NWR) and Tamarac Wetland Management District (WMD) for the next 15 years. This management direction will be described in detail through a set of goals, objectives, and strategies in a Comprehensive Conservation Plan (CCP).

Tamarac NWR lies in the glacial lake country of northwestern Minnesota in Becker County, 18 miles northeast of Detroit Lakes (pop. 7,400) and 60 miles east of Fargo, North Dakota (Figure 1 on page 102). The Refuge covers 42,738 acres. It was established in 1938 as a Refuge and breeding ground for migratory birds and other wildlife.

In 1987, the Tamarac WMD was established and it encompasses nearly 9,500 square miles of Beltrami, Cass, Clearwater, Hubbard and Koochiching Counties (Figure 2 on page 103). The Tamarac WMD is responsible for administering 8,577 acres of wetland and conservation easements distributed throughout these five northwestern Minnesota counties, Tamarac WMD personnel also manage conservation easements previously administered by the Farmers Home Administration, consult on wetland determinations and restore wetlands to enhance wildlife habitat on private lands.

We prepared this Environmental Assessment (EA) using guidelines established under the National Environmental Policy Act (NEPA) of 1969. NEPA requires us to examine the effects of proposed actions on the natural and human environment. In the following sections we describe three alternatives for future Refuge management, the environmental consequences of each alternative, and our preferred management direction. We designed each alternative as a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities, and then we selected our preferred alternative based on their environmental consequences and their ability to achieve the Refuge purposes.

1.2. Purpose

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

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

1.3. Need for Action

The CCP ultimately derived from this EA will establish the overall management directions for Tamarac NWR and Tamarac WMD over the next 15 years. Both areas currently lack long-term management plans. Instead, management is broadly guided at present by general Service policies, by interpreting the official purposes for which the area was created, and by short-term, step-down management plans.

The action is needed because adequate, long-term management direction does not currently exist for the Refuge and Tamarac WMD. Management is now guided by a dated Master Plan that was published in 1978 and by various general policies and short-term plans. Also, the action is needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

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

Figure 1: Location of Tamarac NWR

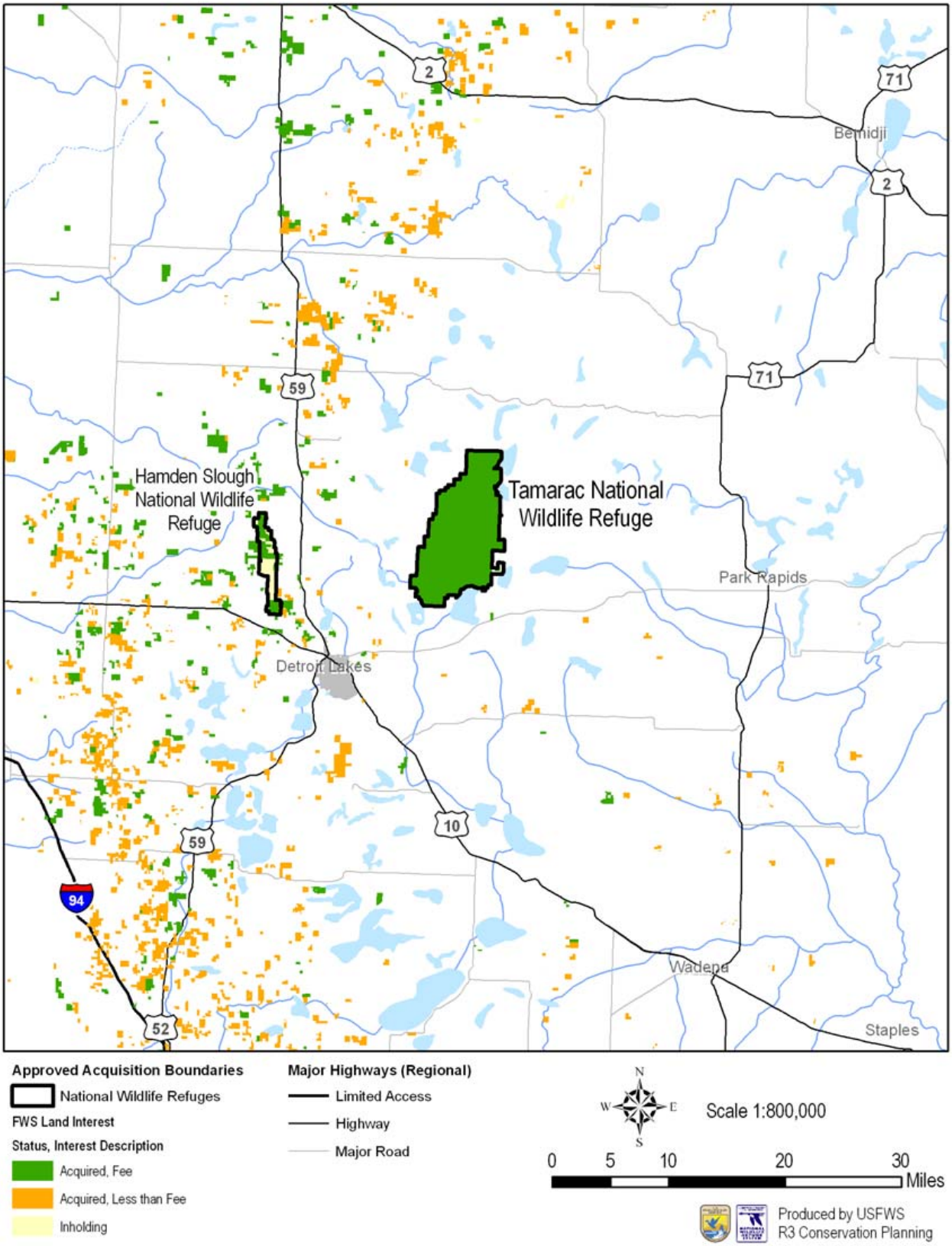
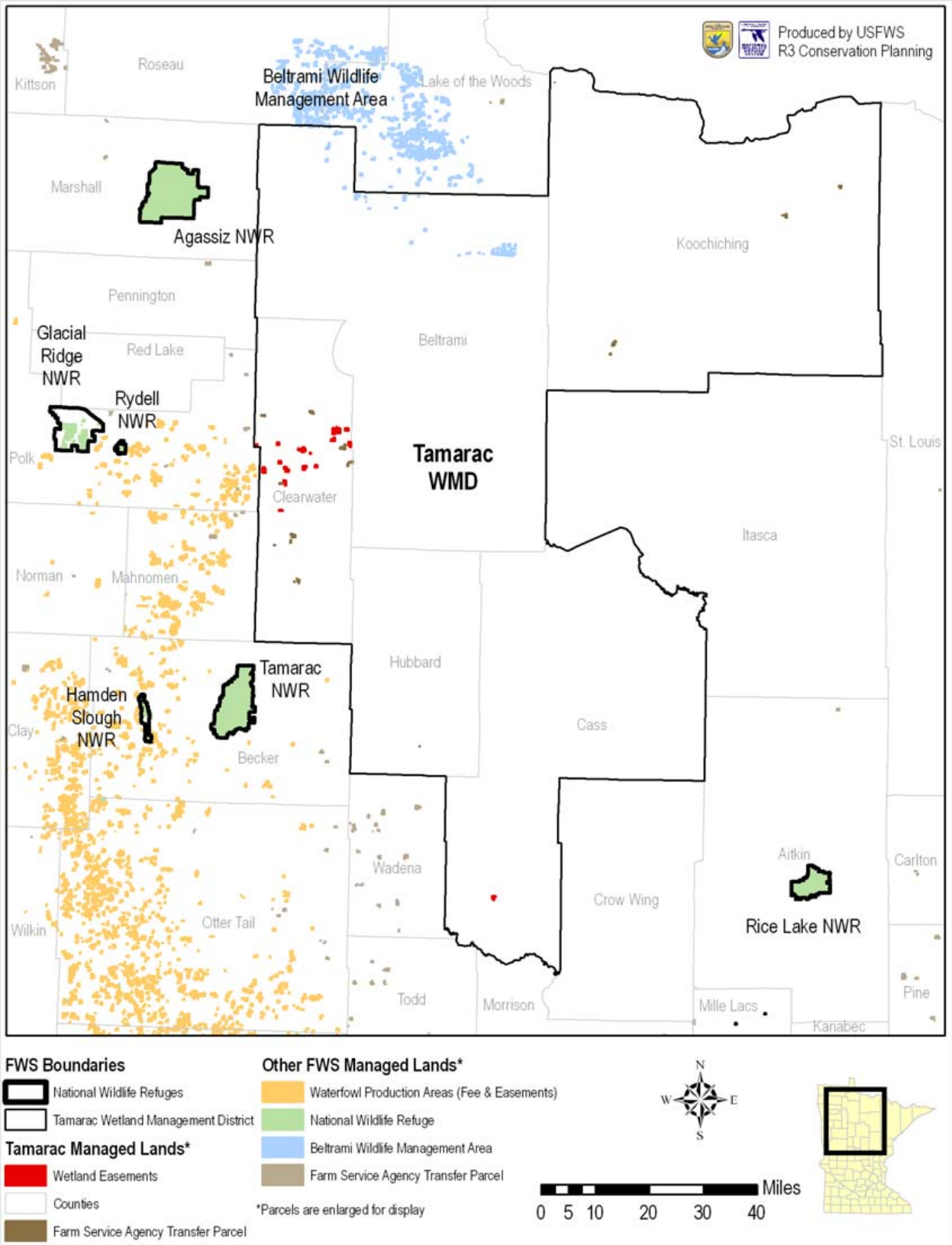


Figure 2: Location of Tamarac WMD



1.3.1. Tamarac National Wildlife Refuge 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.

1.3.2. Tamarac Wetland Management District Goals

Goal 1: Wildlife

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

Goal 2: Habitat

To protect, restore, and enhance wetland and upland habitats, mimicking natural ecological processes where possible, within the Tamarac WMD for the benefit of federal trust species

Goal 3: People

Provide people with opportunities to experience quality wildlife-dependent recreation and promote ecologically sound land stewardship.

1.4. Decision Framework

The Regional Director for the Midwest Region (Region 3 of the U.S Fish and Wildlife Service) will need to make two decisions based on this EA: (1) select an alternative for the Refuge and District, and (2) determine if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS). The planning team has recommended Alternative 1 to the Regional Director. The Draft CCP was developed for implementation based on this recommendation.

1.5. Authority, Legal Compliance, and Compatibility

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

1.6. Scoping of the Issues

The CCP process began in late February 2007 with a kickoff meeting between Refuge staff and regional planners from the Service's office in the Twin Cities, Minnesota. The participants in this "internal scoping" exercise discussed a vision statement, goals, existing baseline resource data, planning documents and other pertinent information. In addition, the group identified a preliminary list of issues, concerns and opportunities facing the Refuge and Tamarac WMD that would need to be addressed in the CCP.

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

Public input was encouraged and obtained using several methods, including open house events, written comments during a public scoping period and personal contacts.

Initial public scoping for the Tamarac NWR and WMD CCP began in July 2007 with a series of open house events held in Detroit Lakes and at the Refuge Headquarters (Tamarac NWR) and in Bagley, Minnesota (WMD). Turn-out was light at all events despite widespread notification in area newspapers and local television. Comment forms were available at the events and made available at the Refuge Headquarters and Visitor Center during the following weeks.

Those interested in making written comments had until September 2007 to submit them. Comments could be sent by U.S. mail, e-mail, or via the Tamarac NWR planning website on the Internet. The Planning Team received 8 written comment forms and several e-mail messages during public scoping and took numerous pages of notes from internal group discussions and conversations with individuals representing government agencies, NGOs and Refuge users.

On April 25-26 and November 14-16, 2006, a Biological Program Review was held to obtain detailed input on the issues and opportunities concerning the habitat and biological monitoring program at the Refuge. Thirty people, representing Minnesota DNR, U.S. Geological Survey – Biological Resource Division, universities, non-governmental organizations, Refuge staff, conservation organizations, and others attended these discussions. This program review was scheduled to coincide with the CCP scoping process and to help formulate objectives and strategies in the plan.

Summary of Issues, Concerns and Opportunities

The following list of issue topics was generated by internal Refuge scoping, the public open house sessions and program reviews. Each topic will be described in more detail in the following chapters of this plan.

Tamarac NWR

Wildlife Management

- *Waterfowl Focus Shift to Natural Diversity with Emphasis on Service Resource Conservation Priority Species*

  When Tamarac NWR was established in 1938, the tail end of the Dirty Thirties, much of the land had been cleared, prairies were dry, forests were less dense, and lakes were shallower. The Refuge's original master plan emphasized getting water on the land and focusing on the production of Wood Ducks, Ring-necked Ducks, Blue-winged Teal, Mallards, and Canada Geese. The landscape has changed since the 1930s, both in terms of the environment and Service policy. By expanding Tamarac NWR's original specific focus on waterfowl to natural diversity of wildlife native to Minnesota, with an emphasis on Conservation Priority Species in Region 3, Tamarac NWR demonstrates a more holistic view of wildlife. This view continues to implement the broad mission of the National Wildlife Refuge System to conserve America's wildlife and enhance biodiversity, as well contribute to wildlife conservation at an appropriate regional scale by trying to assist those species in greatest need of attention. Identifying the direction of waterfowl management will dictate some habitat management decisions.

- *Establish Population Objectives For Eastern Gray Wolves, Bald Eagles and Trumpeter Swans*

  Eastern gray wolves are federally listed as threatened in Minnesota under the Endangered Species Act. The Bald Eagle has been delisted from the Endangered Species Act but is protected by the Bald and Golden Eagle Protection Act and revisions (1994). The Trumpeter Swan is a Conservation Priority Species in Region 3 and considered by the state of Minnesota to be endangered. The Refuge has a legal responsibility to monitor the status of these species. Additionally, given the history of reintroduction of the Trumpeter Swans at Tamarac NWR and recovery from the brink of extinct of the Bald Eagle, there is tremendous visitor interest in these majestic bird species.

- *Stocking Fish Where Appropriate and Not in Conflict with Refuge Purposes*

  Tamarac NWR is managed primarily for waterfowl, which means that lake levels are managed with the goal of producing aquatic vegetation and invertebrates for ducks. There is interest in to developing more fishing opportunities by stocking fish in Refuge lakes. Some of these include lakes where certain fish species did not naturally occur.

- *High White-tailed Deer Population is Damaging Refuge Habitats*

  The recent high Refuge deer population has limited conifer regeneration by over browsing. Insects, amphibians, mammals and some migratory songbird populations can also be negatively impacted. The Refuge needs to establish a sustainable deer population objective that balances habitat concerns, hunting opportunities and eastern gray wolf population objectives. Deer are a major prey species for the resident wolf packs. Utilize state and tribal deer hunting framework/strategies to achieve this goal

- *Managing Invasive Wildlife Species*

  Earth worms are an invasive species present on the Refuge. Carp have not yet entered Refuge waters, but are only held in check by a water control structure. Zebra mussels have recently infested a lake within the Refuge's watershed. The Refuge needs to better understand what impacts exotic earth worms are having on habitat and explore ways to ensure that carp, zebra

mussels, and other invasive species do not infiltrate the Refuge.

- *Managing Beaver to Minimize Infrastructure Damage*

  Beaver are very effective in blocking water flows, including through Refuge water control infrastructure. Beaver activity increases the costs of maintaining Refuge water control structures and road culverts. To date, beaver control has been primarily addressed by tribal recreational trapping, and to a lesser degree, removal by contract, permit, and Refuge staff. These efforts have been ineffectual in controlling the growth of Refuge beaver populations. An expansion of the Refuge's trapping program may help reduce the beaver population, however, fluctuating` fur markets dictate interest and other alternatives need exploration.

- *Invertebrate Numbers and Health*

  Invertebrates are a critical food resource for waterfowl, particularly during migration, egg laying, and brood rearing. An initial investigative survey on Pine Lake suggested a general lack of aquatic invertebrates in the lake. The study underscores the need for more information regarding the abundance and diversity of Refuge invertebrate populations. Water quality monitoring may provide some answers to this concern.

Habitat Management

- *Manage Water Levels to Promote Wild Rice Production, Enhance Tribal Harvest Opportunities and Minimize Downstream Impacts*

  Refuge waters have a long history of wild rice production and use by wildlife, particularly waterfowl, and Native American people. The basic purpose of water level management has been to enhance the area's natural ability to grow wild rice, and the other vegetation and associated invertebrates established within the aquatic ecosystem.

  The Refuge has added stoplogs in August to enhance tribal rice harvesting opportunities in the past. This action was thought to have benign consequences for all parties involved, however the downstream lake shore owners complained of lowered water levels on Height of Land Lake. The resulting low water caused boat launching and docking problems and posed safety concerns for boaters and skiers that could potentially hit submerged dead head logs, now closer to the surface. The water management program needs to address this issue.

  Additionally, there has been a request to maximize rice production on a yearly basis. However, recent research indicates that stable water levels will, over time, jeopardize the long-term viability of a wild rice-dominated lake. Wild rice systems require water level fluctuations from year to year to insure a sustainable system.

- *Water Quality Monitoring Needs*

  A 2005 lake assessment by the Minnesota Pollution Control Agency indicated that North Tamarac Lake could possibly be listed as an Impaired Water due to high levels of phosphorus.

  The Refuge needs to develop a comprehensive water quality monitoring program to establish a baseline for Refuge waters (not just North Tamarac Lake). Work with MPCA to determine the parameters, sites, timing, laboratory use, long-term objectives, etc., for this effort.

- *Managing Invasive Plant Species*

  Exotic and invasive plant species pose a threat to the maintenance and restoration of the Refuge's diverse habitats. Canada thistle, plumeless thistle, purple loosestrife, leafy spurge and spotted knapweed and several other invasive terrestrial plants are known to occur on the Refuge. The Refuge currently uses chemical, mechanical and biological methods of controlling invasive plant species.

  Although Tamarac NWR believes, from general observation, the water bodies of the Refuge are fairly clear of aquatic invasive plants, the potential for infestation is high due to the large number of boating visitors.

  More invasive plant species, both terrestrial and aquatic, are predicted to spread to the area. The Refuge needs to establish an invasive species monitoring program. Closer coordination with county weed task forces would help with the early detection monitoring, preventative measures development and removal strategies. Outreach with neighboring lake associations has been requested.

- *Forest Management*

  Forest habitat within the transitional zone was once characterized by upland conifer, upland deciduous, mixed upland, lowland conifer, mixed lowland forest, and lowland deciduous communities. These communities have been altered over the past 200 years by logging, agriculture and development. This has created grassland and forest openings that are costly to maintain and do not fully emulate a natural system of succession.

- *Establishing Habitat Corridors With Other Conservation Lands*

  Tamarac NWR is located near federal, state, tribal and county lands. Connectivity between the Refuge and other conservation units could benefit wildlife and habitats.

Visitor Services

- *Inadequate Parking Facilities*

  Inadequate parking areas raises safety concerns and does not invite use.

- *Hunters with Disabilities Limited by Lack of Accessible Facilities*

  Hunters with disabilities are limited to hunting on roads that are already open to vehicles. There is interest in the Refuge providing more access.

- *Tribal and State Hunting Season Conflicts*

  On the north half of the Refuge, the tribal seasons overlap with state seasons. The season for tribal primitive deer hunting overlaps with the state small game season, creating quality hunt conflicts for tribal members and safety issues for small game hunters. The tribal rifle season overlaps with state archery season, creating quality hunt conflicts for hunters and possible safety concerns. Additionally, many non-tribal hunters scout out locations for deer hunting during the state grouse season and are not wearing the required blaze orange, which creates safety concerns. All hunters should be aware of the different hunting seasons on the Refuge and use safe hunting practices. The Refuge needs to insure visitors are informed.

- *Native American Cultural Practices*

  The site of Tamarac NWR has a long, rich history of Native American Indian cultural traditions. The Refuge remains an important site for traditional practices of the local Ojibwe tribe. Wild rice is harvested by tribal members in concert with the rice abundance. Access to ricing lakes is balanced with wildlife management activities. Other activities such as plant collection and harvesting leeches have potential conflicts with wildlife management objectives. There are opportunities for incorporating traditional Ojibwe practices into the Refuge's interpretive programs, events and signage.

- *Lake Access Regulations are Confusing*

  The regulations related to lake access are confusing. One Refuge lake is open only for the winter, some are open only during the summer, some are open both winter and summer. Some lakes are open to fishing but not to other uses. In some instances, roads provide vehicle access to a boat landing, but walking on that road is prohibited. This complexity makes it difficult for the visiting public to follow the Refuge's regulations.

- *Bank Fishing Access Regulations Are Unclear*

  Bank fishing restrictions are unclear for the visiting public.

- *Expanded Hunting Opportunities*

  The Minnesota Department of Natural Resources has asked Tamarac NWR to consider opening bear and turkey hunting seasons.

- *Additional Public Use Activities Requested*

  Visitors have expressed interest in uses not currently allowed or expanding some that are limited.

  - Leaving ice houses overnight is currently prohibited in accordance with federal regulations.
  - Motorized vehicles are not allowed on frozen lakes. This activity has been requested to access ice fishing locations.
  - Horseback riding is currently allowed on county and township roads, auto tour route and Bruce Blvd. Increased spread of invasive plants through horseback riding activities on the Refuge is a threat to the maintenance and restoration of the Refuge's diverse habitats.
  - The North Country National Scenic Trail is a footpath proposed to route through the Refuge in the public use area south of County Hwy 26.
  - Canoeing and tubing on the Ottertail River is currently not allowed through the Refuge due to its location within the sanctuary area and disturbance to wildlife.

- *Fishing with Motorboats*

  In some cases, motorboat 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.

- *More Demand for Environmental Education Programming*

  Tamarac NWR's environmental education program is growing and lacks the facilities and staffing to meet demand for environmental education programming. School groups, home school groups, colleges and others have expressed interest in Refuge-based environmental education opportunities.

- *Division of Outreach Workload Among FWS Offices*

  Agassiz NWR, Glacial Ridge NWR, Rydell NWR, Hamden Slough NWR, Detroit Lakes Wetland Management District and Fergus Falls Wetland Management District are all less than a 2 hour drive of Tamarac NWR. There are many benefits to having other stations nearby, however this proximity also makes it confusing for Refuge staff to divide up the outreach workload and articulate the differing Refuge purposes to the public. Because the Refuges are so close and there is potential for audiences to overlap, there are opportunities for outreach efforts to have a broader perspective and impact.

Facilities/Roads

- *Volunteer/Intern Housing Needed*

  The Refuge needs to provide housing for volunteers and interns who come to do extended projects. The nearest community with available housing is a long drive away from the Refuge, making it unfeasible to house people off-site. A bunkhouse would be suitable for students; Recreation Vehicle pads would be useful for volunteer Refuge hosts working on the Refuge.

- *Potential to Demonstrate Green Facilities*

Federal buildings, particularly U.S. Fish and Wildlife Service facilities, can play an important role in demonstrating practical and efficient "green" building technologies. There are opportunities on Tamarac NWR to demonstrate these technologies.

- *Speeding Creates Safety, Wildlife Mortality and Maintenance Problems*

Vehicle speed on all public roads needs to be kept to a minimum to improve visitor safety and to reduce dust, wildlife mortality, and long-term maintenance costs. Many of these public roads are administered by the county and townships. Tamarac NWR needs to continue to work with these local governmental agencies responsible for speed limits to insure safety and to maintain the character of a National Wildlife Refuge.

- *ATV and Snowmobile Uses*

  County ordinances allow the operation of an ATV or snowmobile in the right-of-way of county roads. Local ATV and snowmobile enthusiasts have respected Tamarac's interest in prohibiting this activity, particularly in light of the numerous trails available around the Refuge. Additionally, most road right-of-ways within the Refuge include either steep or undeveloped ditches which are unsafe to operators, thus limiting the potential activity. Tamarac NWR plans to coordinate with the County to restrict this activity within the boundary of the Refuge in order to maintain the character of a National Wildlife Refuge, prevent habitat destruction and avoid law enforcement issues, such as trespass or illegal operation.

Tamarac WMD

- *Land Acquisition*

  Thousands of wetlands dot the District landscape, yet as of 2010, no fee-title lands have been acquired or additional easements procured within the five-county Wetland Management District. Private lands work is a valuable component of habitat restoration and protection, however, perpetual protection, whether through the Service or other agency programs, assures long-term conservation benefits for wildlife and wildlife-dependent recreational opportunities.

- *Partnerships*

  Partnerships are an essential part of accomplishing the goals of the Tamarac WMD. Partnerships allow the Service to reach beyond social and political boundaries to achieve specific objectives and, through involvement of individuals and organizations, inspire future generations to care about conservation. Developing partnerships requires a commitment of people and funding.

- *Direction of the WMD*

  District activities have been primarily restricted to private land wetland restoration and easement enforcement. Many opportunities exist to broaden habitat restoration efforts. The role the District can play at addressing the needs of migratory birds, Conservations Priority Species and critical habitats across the landscape needs to be determined. A commitment of staff and funding is critical to achieving this goal.

- *Easement Management Planning and Implementation*

  Over 35 FmHA inventory property tracts were transferred to the District in the mid-1990s. Many of these tracts possess undeveloped, outdated, or unfulfilled management plans, but could yield significant ecological benefits to the landscape. Service resources need to be allocated to develop and carry out up-to-date habitat management plans on these Refuge System lands.

- *Invasive Plants*

  Invasive plants are considered one of the greatest threats to natural ecosystems. Within the District, the Service is working with private

landowners and partners to control existing and prevent additional spread of invasive species.

- *Education and Outreach*

  Opportunities exist for the Service to develop education and outreach tools for the Tamarac WMD that will promote private lands conservation and demonstrate wildlife conservation techniques.

Chapter 2: Description of the Alternatives

2.1. Formulation of Alternatives

Based on the issues, concerns and opportunities we heard during the scoping process, the Planning Team developed four alternative management scenarios that could be used at Tamarac NWR and three for Tamarac WMD. These alternatives and the consequences of adopting each are presented in the Environmental Assessment. Each of the alternatives is designed to fit within the scope of operations of similar-sized Refuge programs in the Midwest. The alternatives were formulated under the assumption that staffing and budgets would remain constant or grow slowly throughout the life of the Plan.

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

2.1.1. Tamarac NWR

Wildlife Management: Waterfowl production, carrying capacity for trust species, carp and beaver management, and endangered species.

Habitat Management: Water management on select lakes, invasive plant species impacts and management, value of maintaining forest openings, wild rice harvest, wilderness management, establishing habitat corridors with other state and federal conservation lands.

Visitor Services: Hunting, fishing, visitor capacity, and outreach.

Access: Equity of access by user groups, horseback riding, snowmobiles in highway rights-of-way, etc.

2.1.2. Tamarac WMD

Land Acquisition: Potential growth of the WMD.

Partners for Fish and Wildlife Program: Resource focus, size of program and work priorities.

Habitat Restoration Direction: Wetland or grassland emphasis.

Invasive Plants: Identification of sites and responsibility for control efforts.

Grazing and Haying: Impacts to existing and restored grasslands.

2.2. Tamarac NWR Management Alternatives

2.2.1. Alternative 1: Management of Habitat in Context of Providing Migratory Bird Benefits and Complemented with Priority Public Use

This alternative combines many of the habitat changes proposed in alternatives 2 and 3. However, priority public use activities will be enhanced in nearly all aspects of Refuge management. Management of upland habitats will focus on maintaining and using ecological processes that shaped these communities prior to European settlement. Forest management will promote the range of natural variation but will allow for some emphasis of priority bird habitat. Water control structures will be removed at locations where natural hydrologic flow is feasible.

Environmental interpretation and education programs on and off Refuge will compare the biology of managed systems to that of natural landscapes and the cultural history of pre-European settlement to European settlement. Opportunities for hunting, fishing, wildlife observation, and wildlife photography will give visitors a personal experience with wildlife and native habitats. New hunting experiences would be considered including black bear (without baiting and use of dogs), Wild Turkey, and Mourning Dove. Refuge outreach and partnership activity will emphasize natural processes, and native habitat restoration and protection to form ecologically functioning connections to and from the Refuge.

2.2.2. Alternative 2: Pre-settlement Ecological Processes

Under Alternative 2, Refuge management actions will approximate ecological processes that promoted the native communities present prior to European settlement, emphasizing the use of natural hydrological and fire regimes. Vegetative communities and wildlife diversity will then be expected to resemble pre-settlement conditions. This alternative would probably result in significant change in habitats from the present condition. Grassland rem-

nants and forest openings will no longer be artificially maintained. Forest management will promote the range of natural variation. Water control structures will be removed at locations where natural hydrologic flow is feasible.

Opportunities for hunting, fishing, wildlife observation, and wildlife photography will give visitors a personal experience with wildlife and native habitats. New hunting experiences would be considered including black bear (without baiting and use of dogs), Wild Turkey, and Mourning Dove. Environmental interpretation and education programs will emphasize the role of ecological processes in creating natural pre-European settlement habitats and cultural history. Off-Refuge outreach and partnership activity will emphasize natural processes, corridors, and restoration.

2.2.3. Alternative 3: Focused Management for Priority Migratory Birds

The focus of this alternative will be management for U.S. Fish and Wildlife Service (Region 3) priority wetland and grassland birds. Wetland management for priority bird species will include a mixture of high water for emergent vegetation control and drawdowns that vary spatially and temporally to favor the seasonal occurrence of various bird groups.

Where possible, water management will mimic natural processes to provide for a diverse wetland bird community. Some grassland remnants and forest openings will continue to be maintained to promote diversity. Forest management, including active timber harvests, will be oriented toward priority migratory birds.

Environmental interpretation and education programs on and off the Refuge will focus on the importance of managing for Service priority wetland and forest birds and their habitats. Opportunities for hunting, fishing, wildlife observation, and wildlife photography give visitors a personal experience with wildlife and native habitats. Outreach activities will focus on habitat restoration and protection with an emphasis on on-site conservation actions.

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

The Council of Environmental Quality's regulations for implementing the National Environmental Policy Act require that all environmental assessments include the alternative of taking no action. In the case of a CCP, no action means that the Refuge will continue on the same path of management.

Current management is focused on providing a variety of upland and wetland habitats to benefit an array of migratory and resident species. Forest lands are harvested to maintain early and mid-successional stages. Wetlands are actively managed to benefit migratory birds, especially waterfowl.

Sixty percent of the Refuge is forested. Forested uplands currently include a mix of aspen stands, jack pine, red pine, balsam fir, paper birch, red and white oak, sugar maple and basswood. Thirty-five percent of the Refuge is comprised of large and small wetland complexes. About 1,500 acres, or five percent, of Tamarac NWR are grassland, mostly remnants of early settler clearings or small farms.

Public use under the Alternative 4 is served by a variety of on-Refuge environmental education, an auto-tour route, annual open houses, foot trails, a visitor contact station, and observation platforms. The hunting program consists of a firearms and archery deer season and small game hunting. Fishing is a popular activity on several Refuge lakes. Off-Refuge outreach by Refuge staff includes school talks, radio programs, informational kits, displays at fairs, etc. All six wildlife-dependent public uses encouraged on the National Wildlife Refuge System take place at Tamarac NWR.

2.2.5. Alternative(s) Considered But Not Developed

The CCP planning team also considered the alternative of returning the Refuge to its original, presettlement condition. Attempting to restore Tamarac NWR's pre-settlement condition would mean restoring it to the state it was in prior to large-scale logging, settlement and draining by Euro-American homesteaders beginning in the late 1800's and continuing into the early 20th century. At that time, according to historical accounts, the lands that now comprise the Refuge were primarily covered by mixed pine stands, natural lakes, and scattered deciduous forests. To implement this alternative and meet its goals, all impoundments and dikes would have to be removed and ditches filled in.

The planning team dismissed this alternative on the grounds that it would be contrary to the established purposes of Tamarac NWR "…as a refuge and breeding ground for migratory birds and other wildlife" (Executive Order 7902, dated May 31, 1938) and "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act). While reverting to pre-settlement conditions would undoubtedly benefit some wildlife, probably those species that favor forest and shrub/scrub, it would not allow the Refuge to meet its pri-

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
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			
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.	*Objective 1.1 Trust Resources: Waterfowl* Maintain a minimum annual population of 1,500 breeding pairs of dabbler ducks (ie: mallards, blue-winged teal and wood ducks), 200 breeding pairs of diving ducks (primarily ring-necked ducks), 200 breeding pairs of Canada Geese and 20 breeding pairs of Trumpeter Swans on the Refuge by providing optimal breeding habitats.	*Objective 1.1 Trust Resources: Waterfowl* Maintain a minimum annual population of 2,500 breeding pairs of dabbler ducks (ie: mallards, blue-winged teal and wood ducks), 400 breeding pairs of diving ducks (primarily ring-necked ducks), 300 breeding pairs of Canada Geese and 30 breeding pairs of trumpeter swans on the Refuge by providing optimal breeding habitats.	*Objective 1.1 Trust Resources: Waterfowl* Same as Alternative 2.
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, communities and ecosystems. Priority for monitoring will be given to those species identified as Refuge resources of concern.	*Objective 1.2 Other Trust Resources – Non-waterfowl* Same as Alternate 1	*Objective 1.2 Other Trust Resources – Non-waterfowl* Same as Alternate 1	*Objective 1.2 Other Trust Resources – Non-waterfowl* Same as Alternate 1
Objective 1.3: Gray Wolves Maintain adequate habitat and prey base to support at least two packs of gray wolves on the Refuge.	*Objective 1.3: Gray Wolves* Maintain adequate habitat and prey base to support at least one pack of gray wolves on the Refuge.	*Objective 1.3: Gray Wolves* Maintain adequate habitat and prey base to support at least three packs of gray wolves on the Refuge.	*Objective 1.3: Gray Wolves* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
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.	*Objective 1.4: Deer Management* Annually, maintain the Refuge deer population (Minnesota Deer Management Unit 251) at a density of 10-13 deer per square mile (pre-fawning density) based on annual winter survey	*Objective 1.4: Deer Management* Annually, maintain the Refuge deer population (Minnesota Deer Management Unit 251) at a density of 15-18 deer per square mile (pre-fawning density) based on annual winter survey	*Objective 1.4: Deer Management* Same as Alternate 1
Objective 1.5: Fish Maintain diverse, balanced and natural fish populations where compatible with Refuge goals & objectives, while maintaining all Refuge water-bodies free of invasive aquatic animal and plant species.	*Objective 1.5: Fish* Same as Alternate 1	*Objective 1.5: Fish* Same as Alternate 1	*Objective 1.5: Fish* Same as Alternate 1
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 947 acres (-70 percent) and manage the remaining 415 acres for the diversity of species present, including Region 3 Conservation Priority Species.	*Objective 2.1. Upland Grass:* Eliminate anthropogenic grassland habitat by 1,362 acres (100 percent) for the diversity of native species.	*Objective 2.1. Upland Grass:* Same as Alternate 1	*Objective 2.1. Upland Grass:* Same as Alternate 1
Objective 2.2. Upland Brush (1000 Acre Tract): Decrease the dominance of upland brush 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.	*Objective 2.2. Upland Brush (1000 Acre Tract):* Same as Alternate 1	*Objective 2.2. Upland Brush (1000 Acre Tract):* Same as Alternate 1	*Objective 2.2. Upland Brush (1000 Acre Tract):* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
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.	*Objective 2.3. Forest Openings:* Same as Alternate 1	*Objective 2.3. Forest Openings:* Same as Alternate 1	*Objective 2.3. Forest Openings:* Same as Alternate 1
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.	*Objective 2.4. Food Plots:* Same as Alternate 1	*Objective 2.4. Food Plots:* Same as Alternate 1	*Objective 2.4. Food Plots:* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
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 616 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.	*Objective 2.5. Upland Conifer (Red,White and Jack Pine):* Same as Alternate 1	*Objective 2.5. Upland Conifer (Red,White and Jack Pine):* Same as Alternate 1	*Objective 2.5. Upland Conifer (Red,White and Jack Pine):* Same as Alternate 1
Objective 2.6. Upland Deciduous Forest: Over the next 15 years, increase upland deciduous forest by 319 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 Towhees, etc as well as other forest interior species such as Red-eyed Vireo, Ovenbird, etc.	*Objective 2.6. Upland Deciduous Forest:* Same as Alternate 1, with the exception that upland deciduous forest increases by 1,362 acres with the conversion of former grassland.	*Objective 2.6. Upland Deciduous Forest:* Same as Alternate 1	*Objective 2.6. Upland Deciduous Forest:* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 2.7. Mixed Upland Forest: Increase acreage (+ 195 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.	*Objective 2.7. Mixed Upland Forest:* Same as Alternate 1	*Objective 2.7. Mixed Upland Forest:* Same as Alternate 1	*Objective 2.7. Mixed Upland Forest:* Same as Alternate 1
Objective 2.8. Lowland Conifer: Maintain acreage of lowland conifer (1863 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.	*Objective 2.8. Lowland Conifer:* Same as Alternate 1	*Objective 2.8. Lowland Conifer:* Same as Alternate 1	*Objective 2.8. Lowland Conifer:* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 2.9. Lowland Deciduous: Maintain acreage of lowland deciduous (756 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.	*Objective 2.9. Lowland Deciduous:* Same as Alternate 1	*Objective 2.9. Lowland Deciduous:* Same as Alternate 1	*Objective 2.9. Lowland Deciduous:* Same as Alternate 1
Objective 2.10. Mixed Lowland Forest: Maintain acreage of mixed lowland forest (462 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.	*Objective 2.10. Mixed Lowland Forest:* Same as Alternate 1	*Objective 2.10. Mixed Lowland Forest:* Same as Alternate 1	*Objective 2.10. Mixed Lowland Forest:* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 2.11. Lowland Brush: Reduce the lowland brush 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 (1815 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.	*Objective 2.11. Lowland Brush:* Same as Alternate 1	*Objective 2.11. Lowland Brush:* Same as Alternate 1	*Objective 2.11. Lowland Brush:* Same as Alternate 1
Objective 2.12. Marsh/Wetland: Increase this habitat type by 716 acres (11 percent) from 2009 levels (6248 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.	*Objective 2.12. Marsh/Wetland:* Same as Alternate 1	*Objective 2.12. Marsh/Wetland:* Same as Alternate 1	*Objective 2.12. Marsh/Wetland:* Same as Alternate 1

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 2.13. Open Water: Maintain the open water (lacustrine) habitat type (7116 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.	*Objective 2.13. Open Water:* Same as Alternate 1	*Objective 2.13. Open Water:* Same as Alternate 1	*Objective 2.13. Open Water:* Same as Alternate 1
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 and where possible control new infestations of these and other highly invasive species as they occur.	*Objective 2.14. Invasive Species:* By 2025, reduce the area infested with target invasive plant species (e.g., purple loosestrife, leafy spurge, spotted knapweed, thistle species, etc.) by 70 percent from the documented 2005 level and eliminate new infestations of these and other highly invasive species as they occur.	*Objective 2.14. Invasive Species:* By 2025, reduce the area infested with target invasive plant species (e.g., purple loosestrife, leafy spurge, spotted knapweed, thistle species, etc.) by 30 percent from the documented 2005 level and eliminate new infestations of these and other highly invasive species as they occur.	*Objective 2.14. Invasive Species:* Same as Alternate 3
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. Hunting: Annually, provide no fewer 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.	*Objective 3.1. Hunting:* Annually, provide no fewer than 5,000 quality hunting experiences on the Refuge. Fifty percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.	*Objective 3.1. Hunting:* Same as Alternate 1	*Objective 3.1. Hunting:* Same as Alternate 2

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 3.2. 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.	*Objective 3.2. Fishing:* Same as Alternate 1 Annually, provide for 3,000 quality fishing visits to the Refuge. Fifty percent of anglers will report no conflicts with other users and will know that they were fishing on a national wildlife Refuge.	*Objective 3.2. Fishing:* Same as Alternate 1	*Objective 3.2. Fishing:* Same as Alternate 2
Objective 3.3: Wildlife Observation and Photography: Provide year-round opportunities for at least 60,000 visits annually to observe and photograph wildlife and habitat.	*Objective 3.3: Wildlife Observation and Photography:* Provide year-round opportunities for at least 40,000 visits annually to observe and photograph wildlife and habitat.	*Objective 3.3: Wildlife Observation and Photography:* Same as Alternate 1	*Objective 3.3: Wildlife Observation and Photography:* Same as Alternate 2
Objective 3.4. Interpretation: Annually provide no less than 2,000 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.	*Objective 3.4. Interpretation:* Same as Alternate 1	*Objective 3.4. Interpretation:* Annually provide no less than 1,500 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.	*Objective 3.4. Interpretation:* Same as Alternate 3
Objective 3.5. Environmental Education: Annually provide no fewer 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.	*Objective 3.5. Environmental Education:* Same as Alternative 1, but annually provide no fewer than 4,000 environmental education experiences per year.	*Objective 3.5. Environmental Education:* Same as Alternate 1	*Objective 3.5. Environmental Education:* Same as Alternate 2

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative

Alternative 1 Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred Alternative)	**Alternative 2** Pre-settlement Ecological Processes	**Alternative 3** Focused Management for Priority Migratory Birds	**Alternative 4** Current Management Direction of Conservation, Restoration, and Preservation (No Action)
Objective 3.6. 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.	*Objective 3.6. Refuge Access and Secondary Uses:* Same as Alternate 1	*Objective 3.6. Refuge Access and Secondary Uses:* Same as Alternate 1	*Objective 3.6. Refuge Access and Secondary Uses:* Same as Alternate 1
Objective 3.7. 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.	*Objective 3.7. Outreach:* Same as Alternate 1	*Objective 3.7. Outreach:* Same as Alternate 1	*Objective 3.7. Outreach:* Same as Alternate 1
Objective 3.8. 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.	*Objective 3.8. Archeological, Cultural, and Historic Protection:* Same as Alternate 1	*Objective 3.8. Archeological, Cultural, and Historic Protection:* Same as Alternate 1	*Objective 3.8. Archeological, Cultural, and Historic Protection:* Same as Alternate 1
Objective 3.9. American Indian Cultural Practices: Opportunities to engage in American Indian cultural practices will be available at the level offered in 2009.	*Objective 3.9. American Indian Cultural Practices:* Same as Alternate 1	*Objective 3.9. American Indian Cultural Practices:* Same as Alternate 1	*Objective 3.9. American Indian Cultural Practices:* Same as Alternate 1

mary obligation to serve as a breeding ground for migratory birds. This alternative would be very costly, at least at first, and would severely disrupt long-established management institutions and infrastructure in the area.

Note: habitat acreages are "GIS acres" (rounded to the nearest whole number) based on the USGS-created Refuge cover type data layer.

2.3. Tamarac WMD Management Alternatives

In 2010, the Tamarac WMD does not contain any lands that are owned by the Service in fee. Habitat management actions on easement lands are limited to the terms of each easement and the nature of surrounding lands. Recreational uses on the land remain solely controlled by the principle landowner. If fee lands are acquired in the future they will be managed according to the themes of the preferred alternative.

Table 2 compares management objectives by the three alternatives.

2.3.1. Alternative 1: Restoration and Management of Habitat by Facilitating Natural Ecological Processes but also Providing for Migratory Bird Benefits.

This alternative will result in a more active and growing WMD. Wildlife resources of concern will be identified and targeted for protection and enhancement. Management of upland habitats will focus on maintaining and using ecological processes that shaped these communities prior to European settlement including fire and grazing. Growth of the WMD will include fee and easement acquisitions as funding is available. Priority will be given to core areas, corridors and critical sites.

2.3.2. Alternative 2: Pre-settlement Ecological Processes

Under Alternative 2, WMD actions will approximate ecological processes that promoted the native communities present prior to European settlement, emphasizing the use of natural hydrological and fire regimes. Vegetative communities and wildlife diversity will then be expected to resemble pre-settlement conditions. Actions on private lands, such as the use of prescribed fire and grazing, will be used if possible. The WMD will not grow as much as under Alternative 1 but landowner interaction will be similar.

2.3.3. Alternative 3: Current Management Direction (No Action)

Current management is focused on providing habitats to benefit migratory birds, especially nesting waterfowl. Landowners are primarily responsible for maintaining habitat and controlling invasive plant species. No growth in easement land holdings has occurred since the mid-1990s. Emphasis will be on maintaining relationships with existing landowners and enforcement issues. New acquisitions and partnerships will continue on an opportunistic basis.

Table 3 on page 125 provides a brief overview of how each alternative would address the issues and opportunities for future management of Tamarac WMD lands.

Table 2: Comparison of Tamarac Wetland Management District Objectives by Management Alternative

Alternate 1 Restoration and Management of Habitat by Facilitating Natural Ecological Processes, but also Providing for Migratory Bird Benefits (Preferred Alternative)	**Alternate 2** Pre-settlement Ecological Processes	**Alternate 3** Current Direction
Goal 1: Wildlife: Protect, restore and maintain a diversity of wildlife species native to habitats naturally occurring within the Tamarac WMD with special emphasis on Service Regional Conservation Priority Species		
Within 3 years of plan approval, assimilate available information on avian presence and abundance within Tamarac WMD and identify focal areas and strategies for habitat improvement projects and land and easement acquisition that delivers maximum benefits for waterfowl and other Resource Conservation Priority (RCP) species.	*Objective 1.1: Migratory Bird Baseline Information:* N/A	*Objective 1.1: Migratory Bird Baseline Information:* Same as Alternate 1
Goal 2: Habitat *To protect, restore, and enhance wetland and upland habitats, mimicking natural ecological processes where possible, within the Tamarac WMD for the benefit of RCP species*		
Objective 2.1: Wetland Restoration: Restore or enhance on average at least 60 acres of degraded wetlands on private lands per year to benefit waterfowl and other wetland dependent wildlife.	*Objective 2.1: Wetland Restoration:* Restore or enhance on average at least 20 acres of degraded wetlands on private lands per year to benefit waterfowl and other wetland dependent wildlife.	*Objective 2.1: Wetland Restoration:* Restore or enhance on average at least 80 acres of degraded wetlands on private lands per year to benefit waterfowl and other wetland dependent wildlife.
Objective 2.2 : Wetland Management: Maintain hydrological function of wetlands, currently totaling more than 4,100 acres, under easement or PFW agreements. Acreage maintenance will increase annually as additional lands are restored and preserved.	*Objective 2.2 : Wetland Management:* Enhance hydrological function of new restored wetlands to more closely mimic natural function.	*Objective 2.2 : Wetland Management:* Same as Alternative 1.
Objective 2.3: Grassland Establishment and Management: Judiciously select sites sustaining dynamic wetland complexes for potential establishment of grassland communities. Strive to compose a grassland unit with a large patch size and diverse assembly of native grasses and forbs.	*Objective 2.3: Grassland Establishment and Management:* Same as Alternative 1.	*Objective 2.3: Grassland Establishment and Management:* N/A
Objective 2.4: Forest Management: Identify, prioritize, and implement forest conservation projects based on land capabilities that yield the highest benefits for Regional and Tamarac WMD priority species.	*Objective 2.4: Forest Management:* Identify, prioritize, and implement forest conservation projects based on land capabilities that yield the highest benefits for existing native species.	*Objective 2.4: Forest Management:* Same as Alternative 1.

Table 2: Comparison of Tamarac Wetland Management District Objectives by Management Alternative

Alternate 1 Restoration and Management of Habitat by Facilitating Natural Ecological Processes, but also Providing for Migratory Bird Benefits (Preferred Alternative)	**Alternate 2** Pre-settlement Ecological Processes	**Alternate 3** Current Direction
Objective 2.5: FmHA Conservation Easement Planning and Management: Within 5 years of approval of this plan, develop or update and implement habitat management plans on 16 FmHA conservation easements to benefit RCP species of Regional and District priority.	*Objective 2.5: FmHA Conservation Easement Planning and Management:* N/A	*Objective 2.5: FmHA Conservation Easement Planning and Management:* Within 5 years of approval of this plan, develop or update and implement habitat management plans on 8 FmHA conservation easements to benefit RCP species of Regional and District priority.
Objective 2.6: Exotic Plant and Animal Control: Promote the eradication or control of invasive plants and animals impacting native habitats on easement lands by using a variety of methods including biological agents, chemical controls, burning, mowing, grazing, and re-establishing native vegetative communities. Target species include spotted knapweed, leafy spurge, purple loosestrife, Canada thistle, common tansy, wild parsnip, and common buckthorn.	*Objective 2.6: Exotic Plant and Animal Control:* Same as Alternative 1.	*Objective 2.6: Exotic Plant and Animal Control:* Same as Alternative 1.
Objective 2.7: Acquisition: Pursue opportunities to acquire critical habitat for Service trust resources through fee title or easement purchase, where PFW program agreements and other natural resource agency programs are insufficient to fulfill perpetual protection needs.	*Objective 2.7: Acquisition:* Same as Alternative 1.	*Objective 2.7: Acquisition:* Same as Alternative 1.
Goal 3: People *Build relationships and partnerships with people and organizations to promote ecologically sound land stewardship.*		
Objective 3.1: Environmental Education, Interpretation and Outreach: The majority of rural landowners and partners within the Tamarac WMD will be aware of the opportunities for habitat restoration and management offered by the Service.	*Objective 3.1: Environmental Education, Interpretation and Outreach:* Same as Alternative 1.	*Objective 3.1: Environmental Education, Interpretation and Outreach:* Same as Alternative 1.
Objective 3.2: Enforcement The majority of rural landowners and partners within the Tamarac WMD will be aware of the opportunities for habitat restoration and management offered by the Service.	*Objective 3.2: Enforcement* Same as Alternative 1.	*Objective 3.2: Enforcement* Same as Alternative 1.
Objective 3.3: Partnerships The Tamarac WMD will cooperate and partner with USDA, Minnesota DNR, tribal government, and conservation organization on initiatives that further Service goals for migratory birds and other Regional RCP Species.	*Objective 3.3: Partnerships* Same as Alternative 1.	*Objective 3.3: Partnerships* Same as Alternative 1.

Table 3: Overview of Issues By Alternative

Issue	Alternatives		
	Alternate 1 Current Direction	Alternate 2 Pre-settlement Ecological Processes	Alternate 3 Restoration and Management of Habitat by Facilitating Natural Ecological Processes, but also Providing for Migratory Bird Benefits
Acquisition			
	Idle – no growth since mid-1990s	Some growth with fee and easement acquisition.	More growth than 2. Resources of concern identified. More critical areas protected.
Partners for Fish and Wildlife (restoration)			
	Active, but opportunistic. Limited partnerships.	Active, but targeted towards core areas, corridors, critical sites, etc., with growth in partnerships	Same as 2, but more flexibility to work outside of focus areas to benefit trust resources and expand partnerships.
Habitat Management			
Fee-title lands	None	Mimic natural processes	Manage natural processes, but also provide for resources of concern
Easement lands	Waterfowl habitat based	Same – no special landowner uses retained	Same, but blend with compatible landowner uses
Non-federal land	Waterfowl habitat based	Same – no special landowner uses retained	Same, but blend with compatible landowner uses
Invasive Species Control			
Fee-title lands	None	More FWS involvement	Same as 2
Easement lands	Landowner responsibility Some FWS restoration	Same	
Non-federal land	Landowner responsibility	Same	
Grazing and Haying Impacts (FSA)			
	Fencing and grazing plans not initiated	Purchase hazing and grazing rights	Work with landowners and implement contemporary grazing systems to benefit resources of concern.

Chapter 3: Affected Environment

This chapter includes an overview of the affected environments of Tamarac NWR and Tamarac WMD. More detail is contained in Chapter 3 and Chapter 6 of the CCP itself.

3.1. Tamarac National Wildlife Refuge

3.1.1. Introduction

Tamarac NWR covers 42,738 acres in the glacial lake area of northwestern Minnesota. The Refuge is located in Becker County, 18 miles northeast of Detroit Lakes, in the heart of one of the most diverse ecological transition zones in North America, where northern hardwood forests, coniferous forest and tall grass prairie converge. Between 10,000 and 10,500 years ago, receding glaciers left behind the rolling ridges and deep depressions that became a woodland area complemented by lakes, rivers, bogs and marshes which is now Tamarac NWR. The primary ecological drivers influencing the plant and wildlife populations of the Refuge are the climate, hydrology and fire.

Situated along the backbone of Minnesota, the Refuge lies within a mile of the continental divide, which separates the Mississippi and Hudson Bay watersheds. Lake Itasca, headwaters of the Mississippi River, lies approximately 25 miles northeast of the Refuge. Many Refuge lakes and rivers contain large wild rice or "manoomin" beds which produce abundant waterfowl food in most years. Upland vegetation is diverse due to the Refuge's location in the transition zone between northern hardwood and coniferous forests, which levels off into tallgrass prairie, or the Red River Valley, a mere 10 miles west of Tamarac NWR. Hence, many species of plants and animals are at the extreme western edge of their range.

3.1.2. Climate

The climate at Tamarac NWR is characterized by warm summers and long cold winters. Temperatures range from minus 50 degrees Fahrenheit to 107 degrees Fahrenheit. Annual average precipitation is 25 inches with an average annual snowfall of 46 inches. Frost can occur in almost any month although June, July and August are usually frost-free. The annual average growing season is 115 days. Incidentally, most climatic models predict this area with warm by 4 degrees to 5 degrees Celsius within the next 50 years.

3.1.3. Geology and Glaciation

Formation of the regional terrain is the result of glaciation, specifically and most recent, the retreat of the Wadena lobe of the Wisconsin ice sheet toward the northwest, leaving a complex series of marginal and terminal moraines. The Itasca moraine, which covers most of the Refuge, and associated outwash plains are a direct result of this glaciation. Moraines are formed by the deposition of soil and rock at the edges of a glacier as it moves. Terminal moraines are associated with the tip of a glacier, whereas, marginal moraines are along sides of the glacier. Water from the melting ice formed lakes and rivers, while glacial till which was deposited formed the moraines. Within Tamarac NWR, a "chain of lakes" was formed along these marginal moraines primarily due to the settling and slumping of wet sediments. The outwash plains were created when "meltwater" carried away fine sediment from the retreating glacier. The outwash plains on the Refuge are characterized by numerous depressions such as kettles, shallow pits, and potholes, hence known as "pitted" outwash plains.

Initially the Wadena lobe moved southeastward into Northern Minnesota from the limestone belt of the Winnipeg lowland, depositing calcareous sandy loam and gray till that contains Paleozoic limestone from southern Manitoba. This deposition left behind rich, calcareous fens that are interspersed amongst the marginal moraines. The Wadena lobe retreated northward and re-advanced to form the Itasca Moraine approximately 20,000 years ago. The deposits of sand and gravel drift found throughout the Refuge, supported dense coniferous stands, ultimately resulting in accumulation of organic material in depressions underlain with clay, thus poor drainage is a problem in lower areas.

3.1.4. Soils

A heavy mantle of glacial drift covers all of Becker County. In general, Refuge soils run on the sandy side, from coarse sand to sandy loams that are well to excessively drained. Soils on the northern half of the Refuge are generally lighter than those in the south where all extant grasslands occur.

Subsoils are mostly limy clay loams. All areas soil tested to date produced neutral to slightly basic pH readings.

3.1.5. Surface Hydrology

Tamarac NWR is located near or at the top of two major watersheds (see Figure 3 on page 128). The Ottertail River Watershed originates just north of the Refuge in Elbow Lake. It flows southerly through a chain of lakes along the eastern half of the Refuge eventually exiting the Refuge via Height of Land Lake in a south-westerly direction. The Egg River, which is a tributary to the Ottertail River, is primarily contained within Refuge boundaries and flows southerly through a chain of lakes along the northwestern half of the Refuge and merges into Ottertail River in the central portion of the Refuge. The Buffalo River Watershed originates in Pine Lake and exits the Refuge in an east-west fashion via Tamarac Lake along the western boundary of the Refuge. Drainage of these watersheds is eventually into Hudson Bay through the Red River of the North. The Continental Divide, which is located a couple of miles just east of Refuge, divides the Red River and Mississippi River Watersheds. There are 31 palustrine wetlands (shallow lakes), 14 miles of riverine habitats and approximately 1500 small wetlands within the Refuge.

Formation of the regional terrain is the result of glaciation, specifically the retreat of the Wisconsin ice sheet toward the northwest, leaving a complex series of marginal and terminal moraines. The deposits of sand and gravel drift found on the Refuge, supported dense coniferous stands, ultimately resulting in accumulation of organic material in depressions underlain with clay, thus poor drainage is a problem in lower areas. Elevation ranges from 1,400 to 1,650 feet above mean sea level (MSL). Generally, the higher elevations are in the north –northeast and eastern portions of the Refuge. Broad areas through the central portion of the Refuge are between 1,450 and 1,500 feet above MSL, and the lowest portions are in the extreme southwest corner of the Refuge. Total relief of the Refuge is in excess of 250 feet. The steeper slopes typically exist in the northern one-third of the Refuge, whereas the southern two-thirds is indicative of an outwash plain, containing fewer areas with slopes in excess of 24 percent.

3.1.6. Archeological and Cultural Values

Historically, the Refuge was, and remains a prized hunting, fishing and ricing territory for a succession of Native American people. The Dakota controlled the area until the 18th century when they were displaced by the Annishanabe (Chippewa). These native people knew the value of the lush beds of manomin (wild rice), stands of sugar maple and abundance of wild foods, fish and game the land provided for their people. Historical sites throughout the Refuge chronicle their use and numerous battles fought over these precious resources.

Between 1890 and 1930, the Refuge's original stands of red and white pine were logged, beginning in the south half of the Refuge and transcending north. Settlers followed the loggers, but farming never achieved much prominence due to the thick forest, marginal soils and numerous wetlands.

The northern one-half of the Refuge lies within the original boundary of the White Earth Reservation, which was established in 1867. An agreement between the Bureau of Biological Survey (U.S. Fish and Wildlife Service) and the Bureau of Indian Affairs called the "Collier Agreement" was signed during Refuge establishment and provided Native Americans with certain hunting, fishing and gathering privileges within the Refuge.

3.1.7. Social and Economic Context

Tamarac NWR is located in Becker County, Minnesota. The City of Detroit Lakes is the largest town, 22 miles south of the Refuge headquarters with 7,348 people listed in the 2000 census. The racial makeup of the county is 89 percent white, 7 percent Native American, 0.3 percent African American with Asians, Hispanic and other races contributing 3 percent.

In 2004, the median household income for Becker County was $40,182 compared to $51,202 for the state of Minnesota. Nearly 11 percent of the population lived on income below the poverty line.

Please see Chapter 3 of the CCP for more socioeconomic information.

3.1.8. Natural Resources

3.1.8.1. Historic Habitat Conditions

Pre-settlement cover types were comprised of mature stands of red and white pine, jack pine barrens, aspen, birch, mixed hardwoods, conifer bogs, swamps and numerous lakes. Extensive logging of red and white pine took place on the south half of the Refuge during 1880-1910. Similar logging occurred on the north half of the Refuge from 1918-1922. Generally timbered lands were burned two to three times in as many years immediately following the logging operations. This practice resulted in appreciable re-growth of aspen, birch, and hardwoods, but not conifers.

The current cover types are significantly altered from pre-settlement times (Figure 4 on page 129). Red and white pine has been reduced by 92 percent

Figure 3: Watersheds Affecting Tamarac NWR

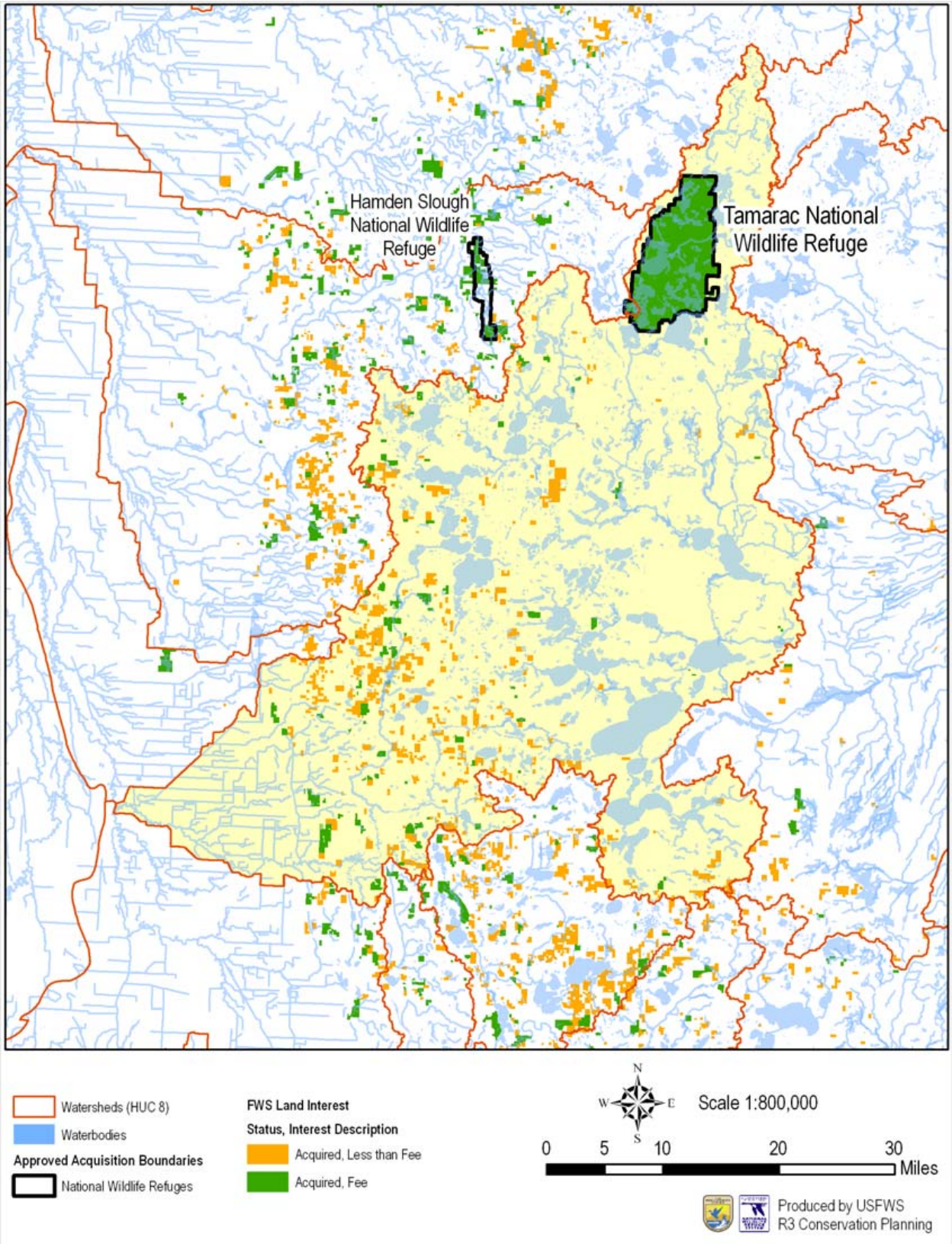
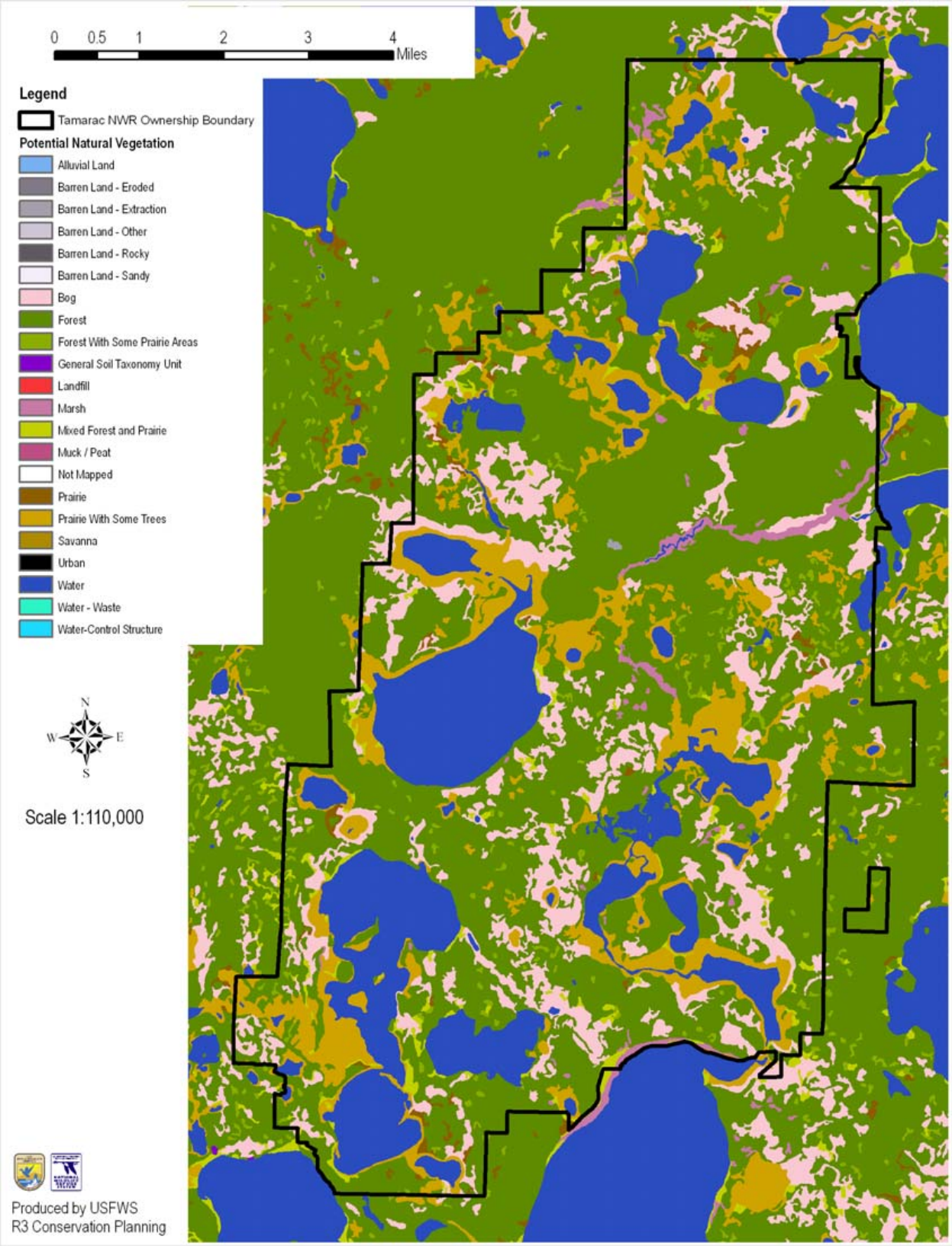


Figure 4: Potential Natural Vegetation, Tamarac NWR



and jack pine has been reduced by 89 percent, most of which have become closed jack pine systems mixed with scrub oak versus the jack pine barrens that once existed. Significant increases have occurred in mixed hardwood and the aspen-birch cover types (plus 244 percent and 40 percent respectively). The upland grass cover type has also increased due to remnant openings that were created for farming at the time of settlement.

3.1.8.2. Current Habitat Conditions

Vegetation on the Refuge is diverse due to its location in the transition zone between northern hardwood and coniferous forests. Sixty percent of the Refuge is forested, dominated by second-growth timber such as aspen (*Populus* spp.), jack pine (*Pinus banksiana*), red pine (*Pinus resinosa*), white pine (*Pinus strobus*) balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), tamarack (*Larix laricina*) paper birch (*Betula papyrifera*), red and white oak (*Quercus* spp.), sugar maple (*Acer saccharum*) and American basswood (*Tilia americana*) cover types. Thirty-five percent of the Refuge is comprised of large and small wetland complexes dominated by wild rice, sedges and cattail. About 1,500 acres (5 percent) of grassland are managed on the Refuge, mostly remnants of early settler clearings or small farms. The tallgrass prairie (Prairie Pothole region in the Red River Valley) begins about 10 miles west of Tamarac NWR.

Upland deciduous forest (16,167 acres): This habitat type includes aspen, paper birch, oak, red & sugar maple, basswood, northern hardwoods and forest broadleaf mix cover types. This habitat type comprises approximately 37 percent of the Refuge land base. Aspen, particularly in the young to mid age classes dominates this habitat type within the Refuge.

Mixed upland forest (4,346 acres): This habitat type contains a mixture of hardwoods and softwoods, and includes an aspen/birch/spruce/fir mix, aspen/pine, forest upland broadleaf/coniferous mix and forest coniferous mix cover types. This habitat type comprises approximately 10 percent of the Refuge land base. Red and white pines are prevalent in the overstory along with a mix of hardwood, such as aspen and birch. Jack pines are often mixed with pin oak and burr oak on drier sandy soils.

Lowland deciduous forest (756 acres): This habitat types primarily consists of black ash and lowland forest broadleaf mix cover types. These communities are often referred to as black ash swamps. Species composition includes green ash , black ash, and occasionally American elm. The lowland hardwoods are located mostly on medium quality sites which are found along sluggish streams, swamp edges and in depressions within the upland hardwoods.

Mixed lowland forest (462 acres): This habitat type consists of a mix of lowland conifers and hardwoods, primarily black ash and includes the lowland forested broadleaf/coniferous mix as well as the lowland forested coniferous mix. The mixed lowland forested broadleaf/coniferous is heavily dominated by hardwoods in the overstory;, whereas the lowland forested coniferous mix is dominated by lowland conifers such as tamarack, black spruce and balsam fir.

Upland conifer forest (711 acres): This habitat type consists of jack pine, red pine, white pine, red cedar (non-native) and white spruce/balsam fir dominated cover types. As species that once dominated the landscape as pure stands, red pine and white pine comprises only 1 percent (482 acres) of the Refuge, including plantations. Jack pine barrens, which were quite prevalent prior to European settlement, only make up about one-quarter of a percent of the Refuge. Jack pine is located in pure stands on dry sandy soils. In heavier soils it is mixed with oak red pine and aspen.

Lowland conifer forest (1,863 acres): This habitat type consists of pure stands of tamarack and a mixture of black spruce/balsam fir stands.

Upland shrub (1,519 acres): This habitat type is dominated by upland shrub species such as hazel, willow, dogwoods and other upland shrubs. Typically few to no trees are present in the overstory and very little herbaceous cover exists where the shrub layer is dense.

Lowland shrub (2,658 acres): This habitat type consists of lowland areas typically within a wetland where the dominant vegetation is shrubs. These areas include bog birch, tag alder, willow and scrub/shrub lowland types. Generally, there is a thick herbaceous cover beneath the shrubs consisting of a variety of sedge species. Large expanses of these areas typically surround the shallow lakes within the Refuge as well as closed wetland systems. Many of these areas have typically been invade by brush species due to a lack of fire within these habitats, thus allowing the sites to become dominated by brush species.

Upland grass (1,362 acres): This habitat type consists of cool season grasses, other grasses and forbs, and warm season grasses. All of these sites were anthropogenic habitats created as a result of logging and early settler clearings which were planted into agriculture crops in the early days of the Refuge. In recent years, most of these sites have been converted primarily to warm season grasses. Many non-native species of grass and other herbaceous plants are quite prevalent throughout many of these areas.

Marsh/Wetland (6,248 acres): This habitat type consists of cattail, giant reed grass (Phragmites), mixed emergent aquatics, rooted-floating vegetation, sedge meadow/bluejoint grass, sedge meadow/cattail mix, reed canary grass and wet meadow cover types. This is the third most abundant habitat type and comprises approximately 14 percent of the Refuge land base.

Open Water (7,116 acres): This habitat type consists of open water, submergent vegetation and wild rice cover types. Although open water is not a plant community, it is classified as such because throughout a majority of the year, the surface consists of open water but vegetation can occur within these areas. Most of these open water habitat types are natural, but some have been enhanced through the construction of water control structures and dikes. Wild rice is an important staple food for waterfowl migrating through the Refuge in the fall, as well as subsistence for Native Americans. This habitat type is the second most abundant habitat type and comprises approximately 16 percent of the Refuge land base.

Development (374 acres): This is classification is not a true habitat type but merely depicts areas on the Refuge that have been developed such as buildings, maintenance facilities and roads.

3.1.8.3. Fish and Wildlife Communities

The highly diverse plant communities of the Tamarac NWR provide habitats for an abundance of wildlife species. Twenty-five species of butterflies, 11 species of amphibians, 5 species of reptiles, 60 species of mammals, and 257 species of birds have either been recorded or can reasonably be expected to be present on the Refuge for a portion of the year.

Birds

Tamarac NWR is especially important for migratory birds, both during the migrating and nesting seasons. Fifty-three species of birds that are USFWS Region 3 Regional Conservation Priority species reside on the Refuge or migrate through, although only 21 of these species breed within the Refuge. The remaining 32 species have been documented in migration. Many of these species as well as other species are listed species of greatest conservation concern by the Minnesota DNR. Of the 257 species of birds that have been observed on the Refuge, 113 species are reported to have nested here. A list of bird species known to occur on Tamarac NWR is listed in Appendix C.

Waterfowl have been an important bird group throughout the history of the Refuge. Primary nesters include Mallard, Wood Duck, Blue-winged Teal, Ring-necked Duck, Canada Goose and Trumpeter Swan. Duck nesting densities are among the highest reported for the woodland transition zone in Minnesota. Spring surveys indicate slightly higher than 40 breeding pairs of ducks per square mile. In addition to the breeding population, approximately 50,000 ducks also migrate through the Refuge each fall stopping to feed on the abundant annual wild rice crops. The Refuge was the focal point for the 1987 Minnesota DNR Trumpeter Swan reintroduction program. The Trumpeter Swan was extirpated from Minnesota in the early 1900s. The population within the Refuge has grown to over 30 breeding pairs and an annual production of around 100 cygnets per year. Average brood size is nearly twice the national average.

The wetland ecosystems are particularly important to other waterbirds. These wetlands are ideal nesting sites for Common Loons, Great Blue Herons, Forster's Terns, Black Terns, American Bitterns, Least Bitterns, Yellow Rails, Sora Rails and Virginia Rails, Sedge Wrens and Swamp Sparrows. Annual surveys of Common Loons indicate nearly 70 adults, but production is less than 10 loon chicks per year.

The diverse forests of Tamarac NWR are well suited for providing habitat for migrating and nesting passerines. Red-eyed Vireos, Ovenbirds, Veery's, Scarlet Tanagers, Rose-breasted Grosbeaks, Golden-winged Warblers and Chestnut-sided Warblers are common breeders throughout the Refuge. Although not abundant on the Refuge, various species of shorebirds can be seen throughout the Refuge. The Refuge contains very little mud flat habitats or shallow water (<10 cm) that most shorebirds prefer. Despite low shorebird densities, the American Woodcock breeds in significant numbers throughout the Refuge, again primarily due to the abundance of young forest habitats.

Resident bird or year-round species include Ruffed Grouse, Wild Turkey, Great-horned and Barred Owls, Downy, Hairy and Pileated Woodpeckers, Blue Jay, Black-capped Chickadee and White-breasted Nuthatch.

Mammals

The Refuge supports 53 species of resident mammals and seven species of bats which migrate off-Refuge to overwinter. Some of the mammal species found on the Refuge are listed as RCP's for Region 3 (ie: gray wolf) and numerous other species are listed species of greatest conservation concern by the Minnesota DNR (ie: Franklin's ground squirrel). Two packs of gray wolves have successfully produced young on the Refuge; whereas, a third pack's territory overlaps into Tamarac NWR.

White-tailed deer, beaver, striped skunk, raccoon, muskrat, mink and red squirrels are abundant. White-tailed deer and beaver can severely impact the Refuge's ability to restore or manage habitats. Currently there is overabundance of white-tailed deer state-wide. Furbearers, including red fox, coyote, bobcat, fisher, otter, long and short-tailed weasels, are locally common and seen in the area on a regular basis. Based on state-wide surveys conducted by the Minnesota DNR, most of the mammals which are considered "predatory" are well above long-term trends and historical records (ie: fox, skunk and raccoon), which have devastating effects on ground nesting birds. A list of species known to occur within the Refuge is listed in Appendix C.

Fish

Fish surveys have been conducted on select lakes and streams by the Minnesota DNR , the LaCrosse Fishery Resource Office (USFWS), the White Earth Natural Resources Department and various universities in cooperation with the Refuge staff on a periodic basis. Sampling by various methods has documented 37 species of fish including walleye, yellow perch, black crappie, large-mouth bass, bluegill, pumpkinseed, rock bass, brown, yellow and black bullhead, white sucker, northern pike, and bowfin. Numerous other fish species were also documented including shiners, dace, chubs, darters and other minnow species (Appendix C).

Reptiles and Amphibians

Eleven species of amphibians and five species of reptiles have been recorded. Lakes, streams, ditches and other wetland basins provide aquatic habitat required for a variety of turtles, frogs, toads and salamanders. Spring peeper, American toad, wood, chorus, northern leopard, gray tree, Cope's gray tree and mink frogs are common. Snapping and painted turtles and garter snakes are also common. The snapping turtle is listed a species of special concern by the Minnesota DNR.

Invertebrates

Twenty-five species of butterflies have been documented to date although formalized surveys have not occurred. Refuge wetlands are presumed to contain typical freshwater invertebrates found in the area but only limited sampling has been done as well. There is speculation that some freshwater invertebrate species have been negatively impacted by fish species that were not historically present within several wetland basins (ie: fathead minnows). Freshwater invertebrates are an extremely important food source for waterfowl, during spring migration, egg laying and brood rearing.

Threatened, Endangered, and Candidate Species

There are no federally listed endangered, threatened, proposed or candidate species in Becker County. However, the Canada lynx is listed as threatened in 14 Minnesota counties, including adjacent Clearwater County. Two unverified Canada lynx sightings have been reported in northeastern Becker County.

The state of Minnesota lists 22 endangered, threatened or special concern species, which have been sighted or reproduce on the Refuge. The six species with confirmed reproduction are gray wolf, Trumpeter Swan, Red-shouldered Hawk, Bald Eagle, Forster's Tern and snapping turtle. The Henslow's Sparrow is listed as state endangered. The Peregrine Falcon, Wilson's Phalarope, Loggerhead Shrike, Horned Grebe and Common Tern are listed as threatened.

3.1.9. Refuge Recreation

3.1.9.1. Hunting

Hunting on the Refuge is very popular with local residents and many visiting hunters. All hunting is done in accordance with Refuge, Minnesota DNR and White Earth tribal regulations. A 1,350-acre area surrounding the Refuge Headquarters and Visitor Center is closed to hunting.

White-tailed deer are hunted during the state firearms and archery seasons. The Refuge is managed as a separate harvest unit by the Minnesota Department of Natural Resources. The White Earth Reservation firearms deer season, open to tribal members, runs from October through December.

The most popular small game is Ruffed Grouse, with gray and fox squirrels, cottontail rabbit and snowshoe hare also pursued by hunters. Migratory birds including ducks, Canada Geese, American Woodcock and Common Snipe are hunted during the established fall seasons. A special youth waterfowl hunt is held every year.

3.1.9.2. Fishing

Fishing is a popular activity in this region of Minnesota and on Tamarac NWR as well. Anglers pursue northern pike, walleye, largemouth bass, bluegill, pumpkinseed, black crappie, yellow perch, black, brown, and yellow bullhead and white sucker.

Several lakes are open for fishing throughout the year. Two sites along the Otter Tail River are also open for bank fishing. The following sites are open to fishing on the Tamarac NWR:

- North Tamarac, Wauboose and Two Island Lakes are open year-round under state and reservation regulations.
- Blackbird and Lost Lakes are open only during the state season- mid-May through Labor Day
- Pine Lake is open to ice fishing from December 1 to March 31.
- Regulations of the Minnesota Department of Natural Resources and, where applicable, the White Earth Reservation are in effect regarding licensing, creel limits, tackle restrictions and season. Site-specific conditions described in the Refuge fishing brochure include:
- Bank fishing 50 yards either side of Otter Tail River bridges on County Roads 26 and 126 is permitted. No additional river areas are open to fishing.
- Fishing is restricted to those areas designated above.
- Vehicles are permitted only on designated roads and trails where gates are open.
- Vehicles are not permitted on the ice.
- Camping and overnight parking are not permitted on the Refuge. All public use, including fishing, is limited to the hours of 5:00 a.m. to 10:00 p.m.
- Fires are permitted only in the fireplace at the Chippewa Picnic area.
- Possession of firearms and fireworks is prohibited.

3.1.9.3. Wildlife Observation

Tamarac NWR is known as a great place to watch wildlife and it is recognized internationally for its importance as a migratory bird stopover. Each year, visitors from around the world come to the Refuge to observe wildlife. The road network and waters provide excellent opportunities for people, of all ages with various abilities, to observe wildlife. Others prefer to walk the nature trail or hike and bike the backcountry roads in search of wildlife. If they are lucky they may get a glimpse of a black bear or gray wolf. During the winter, visitors can get into cross-country skis or snowshoes to track wildlife.

Staff and volunteers working at the Visitor Center maintain a wildlife observation log and share that information with visitors. Binoculars are available for loan to visitors and help them locate observation decks with viewing scopes. Tours are given periodically that provide viewing opportunities into the back country.

3.1.9.4. Wildlife Photography

The network of roads and public use structures along the lakes and rivers affords photographers, of all skill levels, excellent opportunities to photograph wildlife. Many beginners focus their lens on the ever charismatic Trumpeter Swan or state flower, the showy lady-slipper, as is evident by entries to the annual Tamarac NWR Photo Contest. The more seasoned photographers often venture beyond the auto tour route to capture images of plants, insects, and landscapes bathed in a wide spectrum of light conditions.

3.1.9.5. Environmental Interpretation

The Refuge Visitor Center, open year-round, contains a variety of displays to interpret the natural resources of Tamarac NWR as well as the biological work conducted on the Refuge. It contains permanent exhibits including a forest and wetland wildlife diorama that features wolf, beaver and eagle's nest. Exhibits also include vernal ponds, ruffed grouse, and wildlife sounds of the Refuge. Creative temporary displays and video monitors are used to inform the visitors of what's blooming, who is migrating, the use of fire management, the threats of invasive species and other Refuge management activities.

Refuge kiosks provide interpretive information on the Fish and Wildlife Service and specifically Tamarac NWR. The Blackbird Auto Tour Drive has an interpretive brochure for stops along the route and an observation platform was built with a focus on eagles and wild rice. Fact sheets and posters also provide additional interpretive information.

Interpretive events, held throughout the season, provide interpretive information on a variety of topics such as hunting and fishing, endangered species backyard wildlife, migratory birds, fire ecology, invasive species management, wildflowers and wildlife films.

The Refuge's interpretive program reaches beyond the Refuge boundaries. Special events in the community, presentations to civic groups, and are all part of the special outreach efforts. Some of the special events sponsored in recent years include:

- National Wildlife Refuge Week which includes a Fall Festival event and a variety of interpretive programs
- Detroit Lakes Festival of Birds
- Winter Open House

The Refuge's interpretive program is subsidized by funds from Tamarac Interpretive Association. The Tamarac Interpretive Association has also paid for the publication of brochures and signs as well as

the construction of observation decks. A majority of their funds are derived from the sale of books, Refuge-specific clothing and interpretive material sold in a small store located in the Visitor Center.

3.1.9.6. Environmental Education

The Refuge welcomes school groups and others interested in environmental education. On average, 2,000-3,000 students visit the Refuge each year, with many returning several times over the seasons. School field trips are accommodated through guided activities including data collection of habitats, weather, and nature observations. In recent years, home-schooled students are frequent visitors. The Refuge has a variety of lessons that address state graduation standards and the Fish and Wildlife Service mission. There is a growing demand for environmental education both on and off Refuge.

3.1.9.7. Outreach

The Refuge is an integral part of the surrounding communities. It plays a role in the communities' tourism through recreation, is an outdoor classroom for local school districts, and is at the headwaters of two major watershed districts. The Refuge is part of the Pine to Prairie Birding Trail, North Country National Scenic Trail and the Lake Country Scenic Byway. All of these connections and more have created extensive partnership opportunities to enhance the biology and interpretive efforts on a landscape scale beyond the boundaries of the Refuge. Refuge staff regularly work with local officials, civic groups, agencies and organizations that have similar goals.

Interpretive efforts to connect local residents with biological activities and wildlife management practices extend to regular newspaper articles, radio and tv broadcasts. Off-site presentations to civic groups and others are also an important means to strive for local communities to recognize Refuges as national treasures, understanding the System's tremendous contribution toward wildlife conservation and actively participating in their stewardship.

3.1.9.8. Volunteer and Friends Contributions

The Refuge friends group, Tamarac Interpretive Association, is heavily involved in the operation of the Refuge's visitor services program. The group runs the gift shop in the visitor center and a variety of wildlife books, tapes, cards, clothing, crafts, bird feeders and gifts are part of the inventory. The group also provides funding for educational supplies and services and recruits volunteers for many environmental education and interpretive programs, events, and outreach activities for the Refuge. In addition to the friends group there are also approximately one hundred other volunteers, both individual and group, that donate time to the Refuge to assist with: providing information to the public at the Visitor Center and public use areas during peak visitation, habitat restoration, environmental education, interpretive and outreach programs, and administrative and maintenance tasks.

3.1.9.9. Archaeological and Cultural Resources Management

Evidence found on the Tamarac NWR has revealed a rich history of human use by many cultures. Refuge staff strive to protect and to preserve archeological and historic sites against degradation, looting, and other adverse impacts.

Tamarac NWR has never been intensely surveyed for archeological resources and does not have a formal preservation program. However, several site and project specific investigations have occurred on the Refuge. In addition, known archeological and historic sites were summarized and mapped in 1977 by two archeologists working under contract for the Service (USFWS 1977). This "Phase 1 Reconnaissance" survey identified 119 historic and prehistoric sites on Refuge lands. These sites included historic roads and trails, pioneer and Ojibwa homesites, temporary camps, and burial mounds.

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

3.2. Tamarac Wetland Management District

3.2.1. Geology, Topography, Hydrology, and Land Use

The Tamarac WMD stretches across five north central Minnesota counties, over 170 miles north to south, and 115 miles east to west, totaling roughly 9500 square miles. Each county bears unique characteristics. Koochiching County abuts the Canadian border and represents the second largest county in the state. The land surface is predominately flat with swampy peat based soils where glacial Lake Agassiz was at its deepest point. The northern por-

tions of the county are broken in places by Precambrian bedrock. The land is mostly forested, divided by a number of major rivers, but few lakes. Agricultural use and development is minimal.

Beltrami County is similar in that it is generally level and primarily forested, but possesses an abundance of lakes, including Upper and Lower Red Lake which cover about 280,000 acres. There a two basic physiographic regions: the lake plain of glacial Lake Agassiz over the north half, consisting of broad and flat lacustrine soils and beach ridges; and the moraine-outwash complex overlaying the south half, a level to hilly region bearing sandy to loaming glacial till. The county economic industries of tourism, timber, and farming have considerably altered the natural landscape.

To the South, Clearwater County is comprised of a great variety of landforms and soil types. Forestry is the dominant land use, despite significant agricultural fragmentation. High wetland densities abound across the county. Hubbard County to the east is likewise heavily forested and replete with lakes in the northern two thirds of the county. The southern portion is founded in a mostly sandy loam glacial till and supports a long agricultural tradition. Cass County shores up the south end of the Tamarac WMD. Its topography ranges from flat to rolling. The landscape is pockmarked by over 500 interconnected lakes and waterways. The county is composed of a variety of landforms and soil types. Agriculture is less prevalent and favors pasture and hay production.

The Tamarac WMD landscape conforms to three major watershed basins: most of Clearwater and Beltrami Counties drain into the Red River basin; Koochiching flows into the Rainy River basin; and Hubbard and Cass Counties run-off into the Upper Mississippi River basin. The Tamarac WMD feeds 16 of Minnesota's 81 major surface watersheds.

3.2.2. Climate

Northern Minnesota is a true four season environment with warm summers and cold, often frigid winters. The thirty year average lows and highs have ranged from minus 10 Fahrenheit in International Falls to 81 Fahrenheit near Motley, Minnesota. Overall snow fall averages 44-48 inches per year and average annual precipitation is approximately 26 inches.

3.2.3. Natural Resources

3.2.3.1. Plant Communities

The Tamarac WMD falls within the Laurentian Mixed Forest Province according to the Field Guide to Native Plant Communities of Minnesota, an ecological classification system used by the Minnesota Department of Natural Resources. This province is distinguished by expanses of coniferous and mixed hardwood forests, lakes, swamps, and bogs. The Tamarac WMD landscape typifies the province ranging broadly from exposed bedrock to rolling hills to flatten glacial drift plains and peatlands. Koochiching County and the northern half of Beltrami County lie within the Northern Minnesota and Ontario Peatland ecological section. The remainder of the Tamarac WMD falls into the ecological section of the Northern Minnesota Drift and Lake Plains. The Eastern Broadleaf Forest Province, specifically the Hardwood Hills Section, and the Aspen Parklands Section of the Tallgrass Aspen Parkland Province extend into the northern third of Clearwater County.

Extensive logging of white and red pine in the late 1800s through the early decades of the 19th century has substantially influenced present day forest composition. Where coniferous forests once reigned, hardwood species now predominate in many areas of the Tamarac WMD. Significant land subdivision for recreational use is increasingly common place. The mixture of ecological environments, converted forests, and man made disturbances has resulted in a diverse assembly of plant communities.

Wetlands

Federal easement lands and private land project sites center upon diverse complexes of temporary, seasonal, and semi-permanent wetlands. The majority of these wetlands were drained and converted for agricultural production, but have since been restored. Adjacent uplands support both managed and unmanaged forest and tame grasslands. These forested or grass buffered wetland communities represent a critical oasis for migratory birds. They also yield habitat for myriad species of reptiles, amphibians, and mammals in a region fragmented by crop fields, pasture, and recreational development. Numerous shallow lakes also perforate the Tamarac WMD providing key habitat, particularly those supporting wild rice beds, for resting and feeding migratory waterfowl.

Forests

For the most part, forests govern the Tamarac WMD landscape. The southern portion of the Tamarac WMD is characterized by mesic hardwood forest supporting sugar maple, basswood, paper birch, aspen, and red oak, and expansive peatland typified by black spruce, white cedar, tamarac, and black ash. Fire dependent woodlands, historically widespread, are now appreciably reduced to smaller scattered stands of jack, white, and red pine, The northern half of the Tamarac WMD is a combination of poorly drained peatland sustaining species such

as tamarac and black spruce, and glacial till based mesic forests of aspen, paper birch, spruce, balsam fir, and black ash. Less extensive low sandy uplands that support jack or red pine are also present.

Grasslands

A few tiny scattered tracts of unbroken tallgrass prairie persist within the Tamarac WMD. Grasslands, particularly large patches, are rare. Significant deforestation by early settlers for purposes of farming has created high densities of grassland tracts still used today for hay production and pasture throughout Clearwater County, and the southern portions of Hubbard and Cass Counties. These grassland communities are dominated by cool season non-native grasses and forbs, primarily smooth brome grass, Kentucky bluegrass, quack grass, timothy, common yarrow, and spotted knapweed. Many former agricultural fields now under Tamarac WMD easement management have been reseeded with a blend of native tall grass warm season and exotic grass and broadleaf species. Overall, biological diversity and domination of native vegetation is low, represented chiefly by big bluestem, switch grass, and goldenrod and aster species.

3.2.3.2. Fish and Wildlife Communities

The diverse blend of coniferous and hardwood forests, open fields, lakes, rivers, and wetlands sustain a large assembly of wildlife species within the Tamarac WMD.

Birds

Over 165 (167) species annually nest within Tamarac WMD boundaries. Including seasonal use, more than 300 bird species are attracted to Tamarac WMD habitats each year. Resource Conservation Priority (RCP) waterfowl species such as Mallards, Blue-winged Teal, Wood Ducks, resident Canada Geese, and Trumpeter Swans are commonly observed using restored and easement wetlands. Other priority Tamarac WMD birds include American Bitterns, Yellow Rails, Red-shouldered Hawks, Bald Eagles, American Woodcock, Sedge Wrens, Wood Thrushes, and Connecticut and Golden-winged Warblers.

Mammals

Of the 74 mammals native to the state, 62 species potentially occur in the Tamarac WMD. Federally-listed threatened Canada lynx and eastern gray wolves have been documented in Beltrami, Cass, Clearwater, and Koochiching Counties. Gray wolves are also present in Hubbard County. Critical habitat for lynx has been designated in northeastern Koochiching County.

Reptiles and Amphibians

Twenty-four species of amphibians and reptiles inhabit the Tamarac WMD. The abundance of wetlands provide homes for common species such as grey tree frogs, spring peepers, wood frogs, snapping turtles, and painted turtles, but also rare ones such as the state-threatened Blanding's turtle. The rich mesic forests yield ideal habitat for red belly and eastern garter snakes and red back and blue spotted salamanders. Reptiles such as smooth green and eastern hognose snakes and prairie skinks thrive in the sandy soiled grasslands and pine barrens found across the Tamarac WMD.

Fish

Muskellunge, northern pike, largemouth bass, walleye, brook trout, black crappies, and various sunfish species are commonly found in Tamarac WMD lakes and rivers. Interconnected streams and wetlands present critical spawning and nursery havens for many of these popular recreational species.

Chapter 4: Environmental Consequences

4.1. Effects Common to All Alternatives

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

4.1.1. Air Quality

None of the management alternatives would have appreciable, long-term impacts on ambient air quality conditions in the area. Habitat management involving prescribed fire would occur under each alternative, but prescribed fire would be used only under ideal weather conditions. Approved smoke management practices developed by state and federal land management agencies would be implemented in all burning events. The generally low population density of forested lands bordering the Refuge would help to minimize temporary smoke-related, air quality impacts by reducing the number of potential "sensitive receptors" that could be affected by excessive smoke. Nevertheless, under each alternative there would be some potential for temporary air quality impacts from smoke in areas beside the Refuges.

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

4.1.2. Environmental Justice

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

None of the management alternatives for the Refuge or District described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The percentage of minorities in north-central Minnesota counties is lower than greater Minnesota (and much lower than the United States) as a whole. Average incomes and poverty rates within the counties is comparable to other rural counties in the state. Public use activities that would be offered under each of the alternatives would be available to any visitor regardless of race, ethnicity or income level.

4.1.3. Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies, under its direction, that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The managers and resource specialists on the Tamarac NWR and District need to be aware of the possibility of change due to global warming. When feasible, documenting long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the Refuge. Adjustments in Refuge management direction may be necessary over the course of time to adapt to a changing climate.

More discussion of climate change impacts can be found in Chapter 3 of the CCP.

4.1.4. Cultural Resources

The USFWS is responsible for managing archeological and historic sites found on national wildlife refuges or fee lands of wetland management districts. Cultural resources on private lands (easement lands of the Tamarac WMD) are not the responsibility of the Service but may be protected by state statutes. Known cultural resources occur at Tamarac NWR and there may be undiscovered cultural resources awaiting discovery. Under each of the alternatives evaluated in this EA, Refuge management would ensure compliance with relevant

federal laws and regulations, particularly Section 106 of the National Historic Preservation Act. Prior to all habitat and facility projects, appropriate efforts will be made to identify cultural resources within the area of potential impact by contacting the Regional Historic Preservation Officer.

4.1.5. Other Common Effects

None of the alternatives would have more than negligible, or at most minor effects on soils, topography, noise levels, land use patterns in and around the Refuge, transportation and traffic, waste management, human health and safety, or visual resources. See Table 4 on page 139 for a summary of effects.

4.1.5.1. Cumulative Impacts Analysis

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

Vegetative Changes: Prior to Refuge establishment, the forests and soils of the Tamarac NWR area and surrounding Becker County were exploited to a considerable degree. Early timber cutting favored the best stands of white pine, followed by "high-grading" in the red pine and hardwood stands. After the logging era, an attempt was made to settle cut-over lands and develop farming communities. Imperfect drainage of peat soils, poor soil fertility, and the short growing season made the farming venture a disaster. But the scars remained on the land.

Current management is focused on providing a variety of upland and wetland habitats to benefit an array of migratory and resident species. Forest lands are harvested to maintain early and mid-successional stages. Nearly 1,400 acres, or 3 percent, are grassland, mostly remnants of early settler clearings or small farms. Wetlands are actively managed to benefit migratory birds, especially waterfowl.

Under each of the action alternative, management of upland habitats will focus on maintaining and using ecological processes that shaped these communities prior to European settlement. Forest management will promote the range of natural variation but will allow for some emphasis of priority bird habitat. The amount of grassland and lowland shrub habitats will gradually be reduced in favor of the historic upland coniferous forest.

Environmental Education: Environmental education is provided by a variety of institutions inside and outside of the formal class-room. In addition to K-12 public schools, in which environmental education is generally included under the life and physical sciences, especially biology, but also within chemistry, geography, civics, and history, museums, zoos, parks, libraries, television and the news media (e.g., newspapers, magazines, the Internet) all contribute to improving environmental education for American students and citizens. As a result of the cumulative impact of these combined efforts, in recent decades the average American's level of environmental knowledge and awareness appear to have gradually increased. At present, Tamarac NWR provides a small amount of environmental education on and off the Refuge. These efforts are focused primarily on wildlife and habitat. Efforts and results are constrained in part by staffing and budgetary limitations.

Under Alternative 4, this would remain the same, and there would be a continuing modest contribution to overall environmental education efforts in the region. Under Alternative 1, 2 and 3, environmental education would receive an increased emphasis. This enhanced effort would likely lead to an associated cumulative, beneficial impact on environmental knowledge and awareness in the citizens of north-central Minnesota.

Table 4: Summary of Environmental Consequences for Management Alternatives for Tamarac National Wildlife Refuge

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred)	Presettlement Ecological Processes	Focused Management for Priority Migratory Birds	Current Direction
Wildlife				
Invasive Fauna	Carp: Maintain control structure at Chippewa and a carp-free Refuge.	Remove control structures with possible invasion by carp.	Same as Alternative 1	Same as Alternative 1
Gray Wolves	Stable population	Possible lower population due to habitat change.	Increased population due to higher habitat diversity.	Same as Alternative 1
Deer Management	Lower to 15-18/sq mi, pre-fawn	Lower target than Alternative 1	Same as or higher than Alternative 1	Same as Alternative 1
Fisheries	Current stocking promotes unsustainable populations.	More limited fishing opportunities due to shallow lake management.	Same as Alternative 2	Same as Alternative 1
Beaver	Deal with nuisance beavers; remove to maintain wild rice water levels, and tribal take. There is a need for increased removal.	Same as 1 except beaver activity could enhance natural processes.	Same as Alternative 1	Same as Alternative 1
Waterfowl	Follow existing plan and populations. Old goals are unrealistic for some species.	Decreased emphasis on waterfowl and reduced breeding population.	Increased emphasis for identified priority species, ring-neck ducks, wood ducks and mallards. Strategy: increase aquatic invertebrates as a food source.	Same as 3, except fewer species.
Wildlife disturbance due to commercial leeching	Reduce or eliminate harvest on specific waterbodies to curb impacts.	Eliminate harvest to curb impacts.	Same as Alternative 2.	Tribal use with unknown impacts.
Swans	Population managed to carrying capacity of habitat.	Management may limit populations due to loss of impoundments.	Population managed to carrying capacity of habitat.	No population objectives
RCP Species	Use Biological Review list	Smaller RCP list due to lower diversity of habitats.	Emphasize select migratory bird species.	Maximum species diversity (current plan).
Woodcock	Increased population matched to habitat capacity.	Decreased population due to less desirable habitats.	Same as Alternative 1	Active habitat management to increase population.

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	Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred)	Presettlement Ecological Processes	Focused Management for Priority Migratory Birds	Current Direction
Wild Turkeys	No emphasis	No emphasis	No emphasis	No current management
Habitat				
Invasive Plants	Same as 2, may need to limit public access to vulnerable areas.	Inventory, Monitor, use biological, mechanical and any available means.	Same as Alternative 2	Not in current management plan; Inventory plan is being written.
Wild Rice Harvest	Potential for increased wild rice coverage.	Reduced water management capability will likely impact annual rice production and harvest.	Potential for increased wild rice coverage.	Follow water management plan and allow harvest by tribal members
Grasslands	Conversion to natural habitat based on biological review.	No long-term maintenance	Conversion of some to natural habitat.	Active management
Forest Openings (<1.5 acres)	Conversion to natural habitat based on biological review.	No long-term maintenance	Conversion of some to natural habitat.	Active management
Wildlife Corridors	Pursue outreach and partnerships with neighboring landowners, state, county and DLWMD.	Same as Alternative 1	Same as Alternative 1	No pro-active outreach. Need to increase and promote concept.
Forest Management	Promote range of natural variation to include management for focused priority migratory birds.	Promote range of natural variation.	Active timber program oriented toward focused priority migratory birds.	Active timber program oriented toward early succession forests to benefit resident wildlife
South Tamarac Dike	Same as 2, and improve public use.	Removal of dike and restoration of original shoreline peninsulas.	Resume pumping after rehabilitation.	No management due to lack of funding.
Height of Land	Rebuilt WCS should provide a barrier to carp	Rebuilt WCS should provide a barrier to carp	Same as Alternative 2	Continue ongoing discussions
Pine Lake	Lower water level to promote shallow water habitat (need to study feasibility)	Natural water level variation (need to study hydrology)	Same as Alternative 1	Managed as a fishing lake with elevated water level.

Table 4: Summary of Environmental Consequences for Management Alternatives for Tamarac National Wildlife Refuge

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred)	Presettlement Ecological Processes	Focused Management for Priority Migratory Birds	Current Direction
Tamarack Trees	Hydrologic and disease/insect study to determine what is causing higher water and tamarack loss (roads, beaver dams, etc.)	Same as Alternative 1	Same as Alternative 1	No management; spotty regeneration.
Water Quality	Monitoring WQ at 3 lakes and 7 streams for baseline.	Same as 1; perhaps increase monitoring	Same as 1	Same as 1
Chippewa Control Structure	Water level manipulation for wild rice.	Remove the dam	Same as Alternative 1	Water level manipulation for wild rice.
People				
New Hunting Opportunities (i.e. bear, wild turkey, mourning doves)	No new opportunities are proposed. Bear baiting is not allowed on NWRs	Same as 1: consider bear hunting w/o baiting and dogs, and wild turkey and mourning dove hunting.	Same as Alternative 2	Same as Alternative 2
Access	Increased access, but only in select areas.	Reduce trails and access points to promote natural management.	Increased access, but only in select areas.	Existing access
Hunter Safety	Increase education and regulation.	Increased education and regulation.	Same as Alternative 2.	Minimal education opportunities.
Non-hunter Access During Hunting Season	Increased access through specific site openings.	Reduced access through loss of trails.	Same as Alternative 1	Limited. Sanctuary closed.
Night Hunting (Raccoon)	Consider opening in limited areas and limited times.	Same as Alternative 1	Same as Alternative 1	Not Allowed
Lead Sinkers	Eliminate within a few years.	Same as Alternative 1	Same as Alternative 1	No prohibition
Canoeing and Tubing	Not allowed (Ottertail River is designated as a scenic canoe route)	Same as Alternative 1	Same as Alternative 1	Same as 1
Outboard Motors	No power motors on Blackbird, Rice, Johnson, Two Island, etc. Possible no-wake zone on south end of North Tamarac.	Same as Alternative 1	Same as Alternative 1	Allowed wherever fishing/hunting is allowed.

Table 4: Summary of Environmental Consequences for Management Alternatives for Tamarac National Wildlife Refuge

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Management of Habitat in Context of Providing Migratory Bird Benefits and Complimented with Priority Public Use (Preferred)	Presettlement Ecological Processes	Focused Management for Priority Migratory Birds	Current Direction
Lake Access	Possible opening of Lost Lake and Waubus trails to other users.	Same as Alternative 1	Same as Alternative 1	Sanctuary area is closed except for fishing (no bird watching, etc.).
Volunteer Program	Redirect volunteer efforts to environmental education and interpretation.	Redirect some volunteer efforts to hands-on habitat restoration and interpretation.	Same as Alternative 2	Program limited due to lack of resources (staff, funding, facilities)
North Country Trail	Same as Alternative 3	Need to evaluate and/ or designate route through the Refuge.	Same as Alternative 1, except maintain sanctuary area.	Proposed
Wildlife Observation		Designated trails for x-country skiing. Prohibit ski-jouring on set track trails.		
Horse-back Riding	Prohibit on auto-tour & service road. Work with county to eliminate use on county & township roads.	Same as Alternative 1	Same as Alternative 1	Allowed only on county and township roads, auto-tour route & Refuge service road
Cultural Resources	Same 2, but could move one cabin closer to visitor center for interpretation.	Demolish or remove settler cabins. Evaluate options for old historic markers.	Same as Alternative 2	Site-specific actions. Nothing happening with settler cabins.
Snowmobiles and ATVs	Work with Becker County to control by ordinance.	Same as Alternative 1	Same as Alternative 1	Prohibited on Refuge. County can allow riding in county road ROW.

Chapter 5: List of Preparers

Refuge Staff:

- Barbara Boyle, Refuge Manager
- Todd Luke, Deputy Refuge Manager
- Kelly Blackledge, Park Ranger
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Chapter 6: Consultation and Coordination with Stakeholders

The Service and Refuges have conducted extensive consultation and coordination over several years with stakeholders in developing the CCP and EA for Tamarac National Wildlife Refuge and Wetland Management District. In the course of scoping and focus group meetings, the Service consulted with more than three dozen individuals representing Minnesota DNR, conservation organizations, neighboring communities, Refuge users, and other stakeholders. See Chapter 2 of the CCP for a more detailed description of the process.